



ADVANCES IN SUSTAINABLE DEVELOPMENT RESEARCH



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INTRODUCTION

The series *Advances in Sustainable Development Research* includes the Book of Abstracts and selected Papers of the 23rd Congress of the International Sustainable Development Research Society ISDRS held in Bogotá-Colombia in the School of Management at Universidad de los Andes in June 2017.

The abstracts and papers that were selected had a complete peer review process. They show the richness in interdisciplinary approaches, theories, models and applied research presented in the different streams and tracks designed for the conference.

This is an important contribution to the discussion of the state of the art in the different dimensions of sustainable development. This is a conference that offers an academic space known for its interdisciplinary approach as well as a space for academics and practitioners. Here, the reader will find a broad approach including different visions, theoretical orientations to sustainable development as well as a richness in research methodologies from quantitative to qualitative.

Inclusive sustainable development was the main theme of the conference. By inclusiveness, we understand the objective of creating a more equitable society by ensuring wider access and opportunities across social groups, regions and economic sectors as well as reducing the high income disparities that occur today. How to achieve the objective of inclusiveness is a matter of intense discussion and concern as the movement behind the sustainable development goals shows. Governments, private enterprises and communities must play an important role on this process. We believe that Universities must also be engaged in this societal purpose.

This Book of abstracts and proceedings clearly contribute to that important aim.

Sincerely,

Eduardo Wills Herrera

Academic Chair of 23rd ISDRS Conference
Bogotá - Colombia



BOGOTÁ, COLOMBIA, JUNE 14-16, 2017

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1. ASTERISC Communication Research Group. UNIVERSITAT ROVIRA I VIRGLI (URV), 2. CEDAT CENTRE FOR ENVIRONMENTAL LAW. UNIVERSITAT ROVIRA I VIRGLI (URV)

Capacity to associate, subjective wellbeing and perceptions of insecurity: three key variables to understand sustainability in conflictive rural Colombia.

Wednesday, 14th June - 11:30 - SD 701 - Oral Paper

Dr. Eduardo Wills¹, Ms. María Alejandra Rodríguez Duarte¹

1. Universidad de los Andes

Abstract

Sustainability is a multidimensional concept that includes environmental, social, economic and cultural dimensions. We propose in this study that the concept of sustainability is closely related to the quality of life of a community. Under this view, the economic, social and environmental systems that support the community should provide a healthy, meaningful and productive life for all the actual and future members of that community. Some of the basic issues that must be considered in relation to quality of life as sustainability include security, the quality of social relationships (social capital) and satisfaction with life as a whole. In this study, we approach the dimension of security as perceptions of insecurity, an individual variable that processes social conflict and violent environments in the minds and emotions of individuals and communities. We also approach social capital as the capacity to associate, trust, reciprocity and belonging to social networks. The relationship between these variables is explored in a rural context that has been affected by a prolonged social conflict and whose intensity has substantially decreased in the last years. We explore the relations of perceptions of quality of life and social capital at different levels, using the second phase of a survey from 1680 rural producers in Colombia. The main findings of the empirical analysis show a positive relation of social capital on sustainability measured as perceptions of wellbeing. At the same time, perceptions of insecurity have a negative effect on both sustainability and social capital. We found regional differences in the measurements of these variables. These results allow policy-makers to strengthen rural sustainability programs and encourage effective processes of post-conflict development.

Protected Areas under Weak Institutions: Evidence from Colombia

Wednesday, 14th June - 11:45 - SD 701 - Oral Paper

*Dr. Leonardo Bonilla Mejia*¹, *Mr. Iván Higuera-Mendieta*¹

1. Banco de la República

This paper assesses the effects of protected areas in Colombia using high-resolution forest loss imagery for the period 2001-2012. We combine two empirical strategies to identify causal effects: Regression discontinuity for protected areas created before 2001 (long-term effects) and difference-in-differences for areas create after 2001 (short-term effects). Results indicate that both natural protected areas (national and regional) and collective lands (Indigenous Reserves and Afro-Colombian lands) have significantly contributed to reducing forest loss. While the short-term effects tend to be larger in remote areas, in the long-term protected areas perform consistently better in densely populated areas and near roads. Given the predominance of illicit activities such as coca crops and gold mining in remote areas, we interpret our findings as suggestive evidence that protected areas are more effective when authorities are able to uphold the rule of law.

Keywords: Protected areas, deforestation, regression discontinuity, Colombia

SUSTAINABLE DEVELOPMENT AND STABILITY IN POWER SHARING: THE NORTHERN IRELAND CASE

Wednesday, 14th June - 12:00 - SD 701 - Oral Abstract

*Prof. Paul Walsh*¹, *Prof. John Coakley*²

1. University College Dublin, 2. Queens University Belfast and University College Dublin

As the year 2017 began, a political crisis in Northern Ireland caused the collapse of the power-sharing administration for which provision had been made in the Belfast Agreement of 1998, and which had been in office for a decade. Previous crises in the power-sharing administration had been sparked by the very issues that the Belfast agreement had been designed to resolve, such as conflict over ethnic symbols, disagreement over the administration of the justice system and disputes over the process of paramilitary disarmament. What is striking about the new crisis is that the central issue was not one that obviously separated the two communities (the Protestant or unionist community, about 50% of the population, and the Catholic or nationalist community, about 45%). It concerned instead the administration of a renewable energy heating scheme, a so-called “cash for ash” arrangement by which participants in the scheme agreed to introduce wood pellet-fired heating systems in return for a subsidy that in effect paid 160% of fuel costs. The irony that the government collapsed over a sustainable energy scheme that apparently cut across the interests of the two communities raises important questions about the tension between sustainable development and the pursuit of settlement in post-conflict societies.

Our object in this paper is to explore this tension further in the context of the UN's Sustainable Development Goal 16, which focuses on “the promotion of peaceful and inclusive societies for sustainable development, the provision of access to justice for all, and building effective, accountable institutions at all levels”. More specifically, certain of the targets associated with this goal have particular relevance here: the reduction of corruption and bribery, the development of effective, accountable and transparent institutions, the encouragement of responsive, inclusive, participatory and representative decision-making, and the promotion and enforcement of non-discriminatory laws and policies for sustainable development. These targets have obvious relevance for a wide range of societies that face the challenge of development, but are particularly important in ethnically divided societies, where one group has typically enjoyed a position of socio-economic, cultural and political dominance, with all the implication this has for corrupt behaviour, absence of transparency, minority exclusion from decision making, and discriminatory practices. It was precisely the monopoly enjoyed by one community in Northern Ireland in these respects that sparked the conflict in Northern Ireland; and the Belfast agreement in 1998 was an effort to rectify this. In this paper we trace the subsequent tensions that indicated imperfect acceptance of these principles, and we assess the continuing salience of Sustainable Development Goal 16 for Northern Ireland's future evolution. In particular the ability of the power sharing arrangement to introduce policy that induces the necessary economic, social and political transitions needed to achieve a sustainable, inclusive and prosperous society in Northern Ireland.

Environmental peace building, deforestation and the peace accord with FARC.

Wednesday, 14th June - 12:15 - SD 701 - Oral Abstract

*Mr. Miguel Alberto Londoño Gómez*¹

1. Universidad de los Andes

This paper proposes a political analysis and a proposal to monitor the impacts of the implementation of the peace process on sectoral policies relevant to forests and the economic activities of the local population. The two key questions are: ¿how will the Havana peace process and the implementation of the agreements affect the sectoral policies relevant to the forests and economic activities of the local population in Colombia? ¿how can the impacts be monitored? This issue arises in a context of the beginning of the implementation of the peace agreements with the FARC, which tangentially and timidly approach environmental sustainability as a transversal criteria.

The fundamental issue at hand here is what type of development is sustainable and viable in post-agreement in a country with the high relevance and environmental fragility of Colombia, accentuated in areas where the conflict has historically developed with greater intensity -90% of municipalities with priority in the post-agreement have some form of protection or regulation of their use, some with up to 100% of their area under these figures. . These involves restrictions on the type of economic activities that can be developed, and how they can be done. In addition, it is no secret that ecosystems have been war theaters of this conflict: coca crops, illegal mining, deforestation, potrerización, oil spills. The forest situation is particularly worrying not only because they are strategic ecosystems for climate and water regulation, but because there is an obvious, direct and close relationship between conflict and deforestation.

The implementation of peace agreements with FARC entails, rather than juicy environmental dividends, enormous risks and complexities at the environmental level that may even render the peace accord unfeasible. Through a critical review of the environmental provisions contained in the agreements and the dynamics of deforestation in Colombia, it is evident that environmental sustainability is not an accessory, but rather a vital and a strategic aspect for the construction of a durable and sustainable peace. While it is not possible to predict what the impact on the environment and deforestation will be in the post-conflict situation, the enormous risks and complexities are made evident.

Consequently, a proposal for a socio-economic monitoring mechanism is laid out, based on the identification of thirty-two (32) plans, programs, policies and strategies relevant to forests, to be carried out by empowered social groups as an exercise of social control that enriches implementation.

It is demonstrated that the implementation of the agreements can have multiple and significant impacts on forests and deforestation, and that losing sight of and diminishing the priority of environmental criteria during implementation, can make at least the Integral Rural Reform agreement non-viable, among others.

The paper proposes a simple and plausible monitoring system with four indicators initially along with a regional understanding of the drivers of deforestation, so that relevant information is collected by three groups of civil society actors that are already empowered and actually already have an intense environmental agenda for a post-agreement scenario.

An innovation strategy for the governance of a sustainable and territorial peace in Colombia

Thursday, 15th June - 08:00 - SD 701 - Oral Abstract

***Dr. Manuel Perez*¹, *Dr. Eduardo Wills*², *Mr. Andres Bravo*³**

1. IESE/CSIC, 2. Universidad de los Andes, 3. Goberna America Latina -Fundación Ortega Marañón

Colombia is facing a huge challenge of creating the conditions for a sustainable and inclusive peace in the short run. A collaborative effort between the state, communities and private sector is needed. It is necessary to foster a process of economic, social and institutional development for the regions and territories that have suffered a prolonged armed conflict. These new forms of governance require the existence of particular institutional framework, incentives as well as the formulation of public policy on new premises. This process of social construction needs to reverse the historical conditions of abandonment that have biased the development effort in the country in favor for the urban and modern sectors against the rural areas and peasant and indigenous populations. An innovative process that guarantees the conditions for a stronger social cohesion of rural societies is needed. As has been said, peace in Colombia needs to be territorial or otherwise it will not be achieved. In this paper the authors formulate an innovation strategy for territorial and sustainable peace in Colombia based on the following premises: i-) to consolidate a territorial policy that includes issues of distribution of income between the different levels of government as well as territorial ordering as a state policy that has continuity in its implementation over the duration of short-term oriented governments, ii-) the formulation and implementation of the territorial policy is a coresponsibility between state, private sector and communities that operate at the local levels, iii-) the normalization of the institutional framework and the monitoring of risks against institutions at the local and regional levels, including risks of corruption and capture by local illegal groups of state apparatus, v-) the creation of a new agency for territorial development, vi-) the active participation of local action groups, as in the case of the Leader strategy, as main agents of the reconstruction effort. The feasibility and risks of this strategy is discussed and policy recommendations are issued.

Challenges of international cooperation in Colombian post-conflict

Thursday, 15th June - 08:15 - SD 701 - Oral Abstract

Prof. Juana García¹

1. Universidad de los Andes

ODA allocations to middle-income countries are scarcer than those earmarked for LICs. Strong institutions and robust economic growth are summoned to develop societies among MICs. However, countries like Colombia still perceive ODA resources, donor's reasons for their support lay mainly to back local authorities with internal conflict and the 2016 peace agreement reached between the parties sets a challenge for donors and local bodies to build peace in areas forgotten by the state until recently. Through deep interviews and information gathered from sixteen DAC donors present in Colombia about their current peacebuilding projects, this article summarizes the behaviour of the main donors and the characteristics of their aid before the post-conflict period in Colombia. Few donors realize the need of a humanitarian-development-peacebuilding link on the ground since their short-term projects are generally described as humanitarian or development-related initiatives, standing against academic and practitioners view. Also, echoing the literature review, most donors in MICs work with local institutions and a mix of up-bottom and bottom-up projects is noted. Final remarks emphasise on the definition of the role of aid to MICs as assistance that should be based on knowledge-transfer, donor coordination, and government support to reinforce its presence without politicising aid.

Tourism, Peace and Coexistence process: public - community strategy for sustainable development in the post – conflict in Colombia - Study of the outcomes

Thursday, 15th June - 08:30 - SD 701 - Oral Paper

Mrs. Diana Puerta¹, Mrs. Karol Fajardo¹

1. Universidad de los Andes

“Peace and tourism is what we have been doing in the rural territories, it was the engine in the middle of despair, conflict and inequality”

Josefina Klinger - leader of ecotourism in Colombia

“With over one billion tourists travelling the world every year, tourism has become a worldwide social and cultural phenomenon that engages people from all nations as both hosts and guests. The fundamental experience of tourism - visiting a new place and meeting its people and culture – is a transformative aspect that defines tourism’s role as an agent of peace” (Center for Peace Research and Peace Education of the Klagenfurt University / Austria in cooperation with the World Tourism Organization (UNWTO), 2014).

Tourism sector can contribute to peace and coexistence in territories that have been affected by the armed conflict in Colombia, territories with natural wealth and cultural diversity. These territories have been consistently increasing their income through this sector in recent years (more than 10%), even above growth rates in Latin America (5%) and the world (4%) (Lacouture, 2017).

With the aim of exploring the potential of tourism in peacebuilding in Colombia, this study designed a research-action-participation methodology to analyze the results of the design of the community strategy for peace and coexistence in Colombia. This study shows how the members of the tourism chain, and local public institutions of four regions with potential in tourism and peace, and the Vice Ministry of Tourism, built together a sustainable tourism strategy. The main hypothesis of the process is that these territories can replace the illegal and arms industry by tourism as an option for sustainable development, that is, economic growth, equitable and socially participatory and with environmental sustainability. These regions are: *La Macarena* in the Meta Department; *Valle del Sibundoy* and *Mocoa* in the Putumayo Department; *Camino Teyuna* in the District of Santa Marta; and the *Gulf of Urabá* in Chocó and Antioquia Departments.

The results were analyzed through a specific set of 15 indicators among these categories:

- Social equity
- Environmental sustainability
- Positioning of each destination as a tourism, peace and coexistence region
- Satisfaction of tourists
- Quality and formalization

The strategy’s approach and governance scheme are collaborative, co-responsible and community-based. According Bruce Poon Tip, Managing Director of G Adventures: “...for tourism to be an instrument of peace it is necessary to include communities, provide decent work and build capacities”. Increased investment in human capital and social capital is the key to the contemporary practice of tourism as a tool for development, which implies dynamic creation, exchange and knowledge management, supported by the fundamental role of institutions and governance (Fayos, 2014).

Centre for Peace Research and Peace Education of the Klagenfurt University / UNWTO (2014). *International Handbook on Tourism and Peace*. Austria: Drava.

Lacouture, M. (14 de Enero de 2017). El turismo puede crecer por encima del 10%. (P. E. Tiempo, Entrevistador)
Fayos, E. S. (2014). *Tourism as an instrument for development : a theoretical and practical study*. Department of Hospitality and Tourism, University of Wisconsin-Stout.

Forests and Conflict in Colombia

Thursday, 15th June - 08:45 - SD 701 - Oral Paper

Dr. Rafael Isidro Parra-Peña S. ¹

1. Centro de Estudios Regionales Cafeteros y Empresariales | Center for Coffee, Regional and Business Studies | CRECE

- This paper offers evidence on the relationship between armed conflicts and their environmental impacts. For the case of Colombia, using a unique yearly municipality panel dataset (from 2004 to 2012) and an instrumental variable approach to control for possible endogeneity between forest cover and forced displacement, there is evidence that the armed conflict is a force of forest protection and growth.

In particular, the alignment between rural underdevelopment and the rural–urban migration as a result of the violence, along with the presence and control of the illegal-armed groups of some zones contributed to protect forests. However, this effect is negligible. For example, the estimated effect suggests that one person displaced per 1,000 inhabitants increase the share of the municipality covered by forest by 0.013 percentage points at the municipality level. Forest cover changes are also likely to be driven by other factors difficult to measure such as illegal mining, the conversion of forest areas into pastures, illegal logging and forest fires.

The Revolutionary Armed Forces of Colombia (FARC) began engaging in discussions with the national government in 2012 to attempt to end Latin America’s longest-running internal conflict, which endured for more than half a century. Forest degradation often increases in post-war situations.

In conclusion, this paper advocates for an appropriate conservation strategy when peace arrives in Colombia. The government will need to be ready to deploy conservation policies in those areas that are currently under control of the guerrilla. In the past, the protected zones by the state helped in reducing settlements and illegal drug activity. However, this might not be enough in the future.

Enforcement of conservation of currently protected regions and areas previously under a “gunpoint conservation” regime by the guerrillas will be fundamental. Rain forests and their watersheds support the lives of humankind, therefore, their protection and conservation is indispensable.

These findings spotlight a need for increased protection of Colombia’s forests.

Strategies of Successful Anti-Dam-Movements: Evidence from Myanmar and Thailand

Wednesday, 14th June - 11:30 - SD 702 - Oral Abstract

*Dr. Julian Kirchherr*¹

1. Utre

Scholars rarely examine anti-dam-movements that result in project suspensions or cancellations since these cases are extremely rare empirically. Yet these movements are central to understand how anti-dam-movements can succeed. This paper analyzes the movements against Myanmar's Myitsone Dam and Thailand's Kaeng Suea Ten Dam, likely the most successful anti-dam-movements in Southeast Asia in recent years achieving suspension over five years and 36 years, respectively. The research is based on 60 semi-structured interviews carried out over a period of eight months (mostly with the various constituents of the respective movements). Leveraging thinking both from the constructionist and structural school within the field of social movement studies, it is found that the framing of the Myitsone Dam as a project threatening the national cultural heritage of Myanmar (in combination with political change in the country in 2010/2011) largely explains the movement's success. Meanwhile, the set of sophisticated tactics (including inter alia demonstrations, *Thai Baan*research, 24/7-monitoring of the dam site, spiritual activities) was decisive for the anti-Kaeng Suea Ten movement's efficacy. Insights from this research can help anti-dam-movements around the world to enhance their chances of success.

Keywords: Social movements; protests; large dams; Myanmar; Thailand

Oil palm production and socio-environmental impacts on indigenous lands in the Brazilian Amazon

Wednesday, 14th June - 11:45 - SD 702 - Oral Abstract

***Ms. Sandra Damiani*¹, *Prof. Carlos José Sousa Passos*², *Prof. Sílvia Maria Ferreira Guimarães*³**

1. Centre for Sustainable Development, University of Brasilia, 2. Faculty UnB at Planaltina, University of Brasilia, 3. Social Science Institute, University of Brasilia

The expansion of oil palm crops in the Brazilian Amazon over the last decade seems to be negatively affecting indigenous populations that claim to have been suffering a range of social and ecological problems, resulting from land-use changes and intensive pesticide use around their lands. The State of Pará is the largest Brazilian palm (*Elaeis guineensis*) producer, and since 2010 it has tripled its plantation area, recently reaching 167 thousand hectares. According to the agro-ecologic zoning for this palm, the plantations can occupy 31.8 million hectares of areas of supposed degraded land in Brazil. We currently seek to comprehend, from an indigenous perspective, which social and environmental changes occurred since the palm crop establishment around an indigenous land. We analysed how this form of land-use by a neighbouring local oil palm company has been transforming their territories, and possibly affecting their livelihoods and well-being, by disturbing the natural resources they rely on (e.g., freshwater availability and quality, biodiversity, hunting areas, among others). We aim at analysing water and sediments of small streams for pesticide contamination, and mapping land use changes around an indigenous territory. Our research is focused on the Turé-Mariquita Indigenous Land, located in North-eastern Pará, in the heart of an oil palm production area in the Eastern Brazilian Amazon. With a joint anthropological and ecotoxicological approach, we have conducted participative observation, remote sensing and lab agrochemical determination. Field data show that changes affecting the Tembé people have been perceived throughout distinct phases of the plantations' set up, from the initial stage that comprises land conversion, all the way to the land clearing and plantation itself, and during the growing stages as well. While the immediate problems they describe are related to deforestation of secondary forest, streams' degradation, hunting areas restriction, loss of game species, intensive use of pesticides and health complaints, during the plant growing stage over six years of plantation new impacts were perceived and considered relevant by the indigenous community, along with the ones previously identified, such as climate change at a local scale and proliferation of snakes and insects. Our findings suggest that changes in previous land-use to oil palm monoculture are negatively affecting the Tembé People's livelihoods, and shed light on the need for public policies to adopt more restrict standards of sustainability on agro-industrial plantations close to indigenous communities. In the context of this ongoing study, further inquiries are underway that will allow us to understand this issue better.

Acknowledgments: We are grateful to the field work support graciously provided by colleagues from the Fundação Nacional do Índio (Indigenous National Foundation, Brazil) and from the Evandro Chagas Institute (Health Surveillance Department, Ministry of Health, Brazil). This work has been financially supported by the Brazilian Funding Agencies CAPES and CNPq.

Keywords: sustainability, indigenous land, oil palm, social-environmental impacts, pesticides, deforestation, water degradation

Sustainable renewable energy: towards the energy autonomy of rural communities in developing countries

Wednesday, 14th June - 12:00 - SD 702 - Oral Abstract

*Dr. Catalina Silva-Plata*¹, *Mr. Russell Pepper*¹, *Dr. Brian Garvey*¹, *Prof. Mike Danson*², *Dr. Paul Tuohy*¹, *Prof. Paul Stewart*¹

1. University of Strathclyde, 2. Herriot-Watt University

Agrarian reform and Quilombola settlements in Brazil are those that have successfully occupied and won the right to work the land on which they now live. Geographic isolation and their 'invisibility' in public decision making, investment schemes and strongly centralised energy infrastructure projects means many are remote from the electricity grid. This is an experience of many rural communities where families burn wood for water heating and cooking, putting pressure on scarce resources, or rely on expensive and polluting petrol/diesel generators. These have implications for local health and indeed many families cannot afford to use these sources and go without. This puts stress on communities reliant on small scale agriculture for their socio-economic reproduction; pumping water for crop irrigation without electricity is impossible, leading to low yields and income. There is an interest among these settlements in producing or accessing alternative forms of energy that are more affordable and that can be sourced from locally available natural resources in order to improve energy security and, in turn, improve their own productive capacity.

Decentralised renewable energy production has the potential to contribute to addressing significant socio-environmental challenges facing agrarian reform and Quilombola settlements. The successful planning and implementation of such projects must take account of social, cultural, environmental and economic dynamics locally. This process requires a decentralised, democratised method of knowledge production that transgresses traditional academic, techno-scientific boundaries, is attentive to power differentials between the various actors involved and engages communities in democratising the planning, decision making and implementation of new energy technologies. This multidisciplinary research builds upon effective engagement with Brazilian partners over a three-year period to innovate and integrate local assessment for new energy forms. It aims to combine the assessment of energy demand and renewable energy potential, the study of environmental feasibility for introduced technologies and creative engagement to:

- i) Assess potential local sources and sites for renewable energy production;
- ii) Identify challenges regarding the quality, utilisation, governance of, and access to, local natural resources for renewable energy;
- iii) Create strategies for renewable energy generation, work and economic benefit from this potential.
- iv) Produce a new toolkit for integrated assessment of rural and urban spaces for renewable energy towards the standardised, locally engaged approach to installing and governing these projects.

The pilot research undertaken thus far has involved trialling 40 questionnaires, nine focus groups and four interviews with community leaders to gain a clear picture of three rural communities in Brazil. Initial results show that these communities have challenges regarding water, energy and organisational structure as well as support at governmental level. An aspiration towards renewable energy reflects aspirations of social and economic autonomy of the settlements. A lack of previous information on the possible technologies and the costs of purchase, however, are among factors prohibiting take up at this stage. Furthermore, immediate concerns over water availability and quality across the settlements and the impact on produce outlines the importance of addressing energy challenges alongside community priorities.

Keywords:renewable energy, rural communities, sustainability, energy autonomy, agrarian reform

Collective property leads to household investments: Lessons from land titling in afro-colombian communities

Wednesday, 14th June - 12:15 - SD 702 - Oral Abstract

***Dr. Ximena Peña Parga*¹, *Dr. María Alejandra Vélez*¹, *Dr. Juan Cardenas*¹, *Ms. Natalia Perdomo Londoño*², *Mr. Camilo Andres Matajira Gaitan*¹**

1. Universidad de los Andes, 2. Prosperidad Social

In the developing world, after decades of strong rejection, collective land titling has become an important tool for recognizing the historical presence of ethnic communities and safeguarding their rights to occupy and manage their territories. However, little is known about the average impact of these titling processes on the well-being of these communities. In this paper we attempt to estimate the impact of collective land titling in territories inhabited by Afro-descendent communities in Colombia. We compare rural districts in titled areas with rural districts in untitled areas that are similar in all the relevant observable characteristics. We find that the collective titling process in the Chocó region has caused an increase in average household per capita income, a decrease in extreme poverty, larger investments in housing, higher attendance rates among children in primary education, and a decrease in housing overcrowding. Our results suggest that collective land titling creates a more secure natural resource base and a longer time horizon for households in collective territories, which leads to investment in their private physical and human capital.

Comprehensive Village Development Programme: 'One Village One Cooperative' Approach in Rural Development in Bangladesh

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Mr. Md. Salimul Alam Shahin¹

1. Universidad Austral de Chile

Bangladesh is a small country having 147570 square kilometers area with 94% rural area where 76% of the total population live. These rural population mostly depends on agriculture which contributed 40% of GDP during 1980-81 after the independence of Bangladesh. So, rural development is the key element of the country development. On the contrast, rural people live with poverty, unemployment and other socio-economic challenges. After being an independent state in 1971, poverty alleviation and rural development initiatives were foreign aided. Rural poor depended on foreign aids. The then government of Bangladesh tried to focus on poverty alleviation and rural development through cooperative approach giving importance on the role of local government and local level planning. Bangladesh Academy for Rural Development (BARD) initiated a research based 'Total Village Development Programme' in 1975 with the view of 'One village, one organization' to establish rural cooperatives for own socio-economic development and to avoid foreign aids and carried out the project with own resources in a limited scale until 1983. The project was inserted in the Third Five Year Plan as 'Comprehensive Village Development Programme' and accepted in Annual Development Plan in 1988-89 to implement in 80 villages primarily. After the success of the rural development model, it has been implementing throughout the country in 4375 villages.

Thus 'Comprehensive Village Development Programme (CVDP)' is a rural development model that aims to promote overall development of a village through self-help and self-effort by bringing all inhabitants under a single cooperative society. Until December, 2015, about 164500 jobless people are self-employed after getting trade-based trainings from different nation departments and micro-credits from respective cooperative societies in 4375 villages.

The paper intends to review the 'Comprehensive village development Programme'. The paper also focus on effectiveness of this rural development model through analyzing its successes and shortcomings.

The research-data has been collected from both primary and secondary data sources such as key-informants interviews, project manuals and reports, journal articles etc. The researcher used discourse analysis of relevant policy papers to attain the objectives. The research found that the CVDP is highly successful in rural economic development, self employment generation, social and environmental quality enhancement, poverty reduction, public participation enhancement and women empowerment. However, the study identified some shortcomings of CVDP that includes corruption in cooperative governance, illiteracy, poor leadership quality in villages, lack of cooperative values etc.

Key words: Rural Development, Comprehensive Village Development Programme (CVDP), Cooperative approach

Inclusive sustainability: using mindfulness education to reach disadvantaged youth

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

***Prof. Raymond Auerbach*¹, *Mrs. Christina Auerbach*¹**

1. Nelson Mandela University

When young people are fully engaged, all of them are potentially brilliant. A recent study examined the use of mindfulness with disadvantaged young people in South Africa's southern Cape, where students were able to improve their social integration as well as their academic performance. Another study looked at the impact of home vegetable gardens, where diversity of food choices increased but understanding of climate change and the importance of organic food production practices did not improve.

The studies both point to the effectiveness of interventions using mindfulness in empowering young people from marginal communities, but also to the need for critical mass in these interventions, which cannot be applied as an add-on but need to be given sufficient space and resources before they will have transformative effects on the opportunities available to young people from disadvantaged backgrounds.

A new food security education and research programme is described based at the Garden Route Environmental Education Centre in the southern Cape to assist natural science scholars and farmers with mindful scientific observation.

Keywords: mindfulness, agro-ecology, environmental education.

Rural Sustainability through Production-Conservation corridors with Colombian dry-forest Campesino communities

Thursday, 15th June - 08:00 - SD 702 - Oral Paper

Ms. Ines Cavelier¹

1. *Fondo Patrimonio Natural*

Title

Rural Sustainability through Production-Conservation corridors with Colombian dry-forest Campesino communities

Abstract

Colombia's usual approach to conservation establishes people only as a driver of ecosystem degradation and proposes the constitution of restricted-use isolated areas possessing exceptional natural values, but leaves aside the social aspects and cultural values guiding the relationship between people and the natural resources in a territory. For instance, the tropical dry forest (TDF), an ecosystem facing extinction, only has a 6.4% representation within the National System of Protected Areas. Additionally, the restrictive conservation status given to these areas have not completely benefited endangered ecosystems; instead, protected areas have caused estrangement between communities and their territory. This breach has inevitably resulted in additional pressure on biodiversity assets, the increase of illegality in the procurement of key natural resources and the displacement of vulnerable communities. It is known that biodiversity contributes to ecosystem goods and services which support human well-being. The long term perspective, has to take into account those cultural and social values affecting nature and human opportunities in a negative or positive way, to enhance benefits and minimize impacts through conscious actions applied as everyday practice. The Conservation Landscapes Program was designed to improve conservation and livelihoods, while strengthening social capital and participation. This paper will focus on how the local values and perceptions of nature and production, as well as the social capital were important to motivate actions ensuring the sustainable management of their territories. Also, it will explain how innovation, through external ideas and practices, entered into this dialogue to achieve the program's objectives, that is, aligning the means and the ends. Other topics emerged, such as the situation and agency of women in conflict and displacement situations, in relation with conservation activities, food security and sovereignty. The project shows that conservation can be aligned with other societal goals, minimizing tradeoffs, and creating "win-wins" for communities and nature, while promoting better institutions at different levels. For the pilot phase Patrimonio Natural (NGO) introduced the conservation-production corridors as the strategic approach to plan and conserve the TDF with 300 Campesino families in 7 Nodes in the Colombian Caribbean region. The team used human centered design methods and mapping tools such as participatory territorial planning, action-based Conservation agreements and the application of landscape management tools to work along Campesino families in reframing their relationship with the forest. This approach allowed rural communities to decide over their territory with key information at hand and to generate a valuable relationship. This new relationship enhanced productivity and biodiversity recovery bringing new products to the market and securing basic needs. Also, the recovery of techniques and the introduction of technology, gave Campesinos the necessary tools to improve their health and *well-being*. Ninety kilometers of production-conservation corridors were created, in collaboration with Campesino communities, improving their quality of life and income and protecting biodiversity. Economic, social and environmental sustainability are starting to be achieved on a small scale, but escalating calls for the involvement of all stakeholders including policy makers.

The creativity of everyday life in crafting resilient food systems: A framework and case from the Atlantic Forest Coast of Brazil

Thursday, 15th June - 08:15 - SD 702 - Oral Abstract

*Dr. Iain J. Davidson-hunt*¹, *Dr. Carlos Julián Idrobo*², *Dr. Katherine Turner*¹

1. University of Manitoba, 2. Universidad de los Andes

We introduce an approach to consider the role of agency in our understanding of social-ecological resilience in the context of remote indigenous and other rural communities. We introduce biocultural creativity as the everyday actions of harvesters in utilizing biological materials to respond to the challenges they face as actors within dynamic social-ecological systems. We focus on food systems and draw upon that literature to develop an approach that traces the flows of biological materials from the environment and through its transformation, exchange and consumption phases. This approach allows us to systematically locate challenges within a food system to which harvesters respond through everyday choices that lead to transformations of the food system over time. We present a case study from Ponta Negra, Brazil, to illustrate food system resilience as a process of crafting through everyday creativity and the challenges to this process when access to key components of the food system are lost. While much work has focused on the emptying of rural and remote regions emphasizing those who have left, we focus on those who have stayed, or come back, and the actions they undertake to fashion these spaces as meaningful places to work and live. Our goal in doing so is to bring the creativity of everyday life into the broader discussion of the role of agency within resilience thinking.

Changes in Traditional Ecological Knowledge teach us adaptive strategies to manage sustainably the tropical rainforest: lessons learnt from the Colombian Amazon

Thursday, 15th June - 08:30 - SD 702 - Oral Abstract

Mr. Sebastian Restrepo Calle¹, Ms. Valentina Fonseca¹, Mr. Camilo Alejo¹, Mr. carlos hernandez¹

1. Pontificia Universidad Javeriana

Evaluating the effects of cultural and socioeconomic driving forces on local production and harvesting systems is crucial for the proper understanding of social-ecological dynamics of tropical rainforests in the Amazon region. Current and historical changes in Traditional Ecological Knowledge (TEK) linked with livelihoods of indigenous peoples reveal useful contributions to promote pathways for sustainable social-ecological transformations. Based on six case studies carried out in the Amazon region in Colombia, we described how TEK attributes have changed in the last forty years (1976-2016), and how these changes have modified the management of the rainforest. We present a descriptive and comparative analysis of TEK attributes linked to indigenous production and harvesting systems, taking into account classification methods, land and resource management practices, institutional arrangements, and worldviews of seven indigenous peoples. Additionally, we assessed the implications of these changes in social-ecological dynamics of the rainforest and found general lessons towards sustainability. Results showed some differences in knowledge attributes of different ethnic groups associated with certain historical events. Tracked changes pointed out variations between attributes and change of key variables which strongly drive social-ecological transformations. Our approach to TEK and related shifts brings relevant information about the sustainable use of the rainforest and contributes to the understanding of adaptive strategies developed by indigenous peoples to navigate global change.

Keywords: Traditional Ecological Knowledge, TEK, Tropical Rainforest, Amazon Region, Colombia, Qualitative Comparative Analysis

Revising the Ontological Status of Traditional Modes of Living: the concepts and their practical consequences in Sustainability issues in China, Kenya, Colombia and Sweden

Thursday, 15th June - 08:45 - SD 702 - Oral Abstract

***Prof. Frank Birkin*¹, *Mrs. Mónica Ramos*², *Mr. Collins Makunda*³, *Dr. John Margerison*⁴, *Prof. Thomas Polesie*⁵, *Mr. Alejandro Balanzo*²**

1. University of Sheffield, 2. University of Twente, 3. The Oslo School of Architecture and Design, 4. DeMontfort University, 5. University of Gothenburg

Abstract

We inhabit a world dominated by aspects of Modernity which has rejected traditions as an aid to development in favour of a Rationalism that since the Enlightenment has emphasised a “politics of reason” centred upon rational choice and utilitarianism to underpin the neoclassical economic syntheses that today direct development. This paper considers that Modernity and its derivatives are a direct cause of unsustainable forms of development. To overcome such problematics, the epistemic analysis of Michel Foucault and the Modes of Existence study of Bruno Latour are used to reject Modernity, Rationalism and the neoclassical economic synthesis in favour of a pragmatic empiricism. After summarising the scientific justification for this radical approach, this paper revises the status of enduring traditions to that of ontologically distinct Modes of Existence that are fully independent of Modernity and its consequential economic theories and practices. By linking those aspects of traditions that resonate well with the science identified in this paper, it becomes possible to identify, strengthen and use traditions to support everyday sustainable activities that engage local communities with their own, enhanced concepts and terminology to avoid the technical jargon and abstractions of sustainability. In addition, this kind of transition in effect heralds a new civilisation and that has wide implications for all, including urban communities. Indeed it is only by revising the generic goals and processes of development for all that the full utility of the approach taken in this paper can be beneficial for those groups now marginalised by Modernity. Some of the practical consequences of the approach are explored in this paper which uses short case studies from Colombia, Kenya, China and Sweden respectively

The Role of the Arts and Culture in Sustainable Development: The Case of Medellin, Colombia

Friday, 16th June - 08:00 - SD 1003 - Oral Abstract

*Dr. Susan Appe*¹, *Ms. Laura Milanes-Reyes*²

1. University at Binghamton, 2. Universidad de los Andes

Sustainable development is most often recognized by its three pillars: environmental, economic, and equity (social). However, over the last several years, advocates in a global campaign have pushed for the recognition of a fourth pillar: culture. For example, in 2013, the global campaign, called “The Future We Want Includes Culture”, emerged during the post-2015 agenda debates, led by several global and regional cultural civil society organizations. By May 2014, the “Declaration on the Inclusion of Culture in the Sustainable Development Goals (SDGs)” was launched and signed by 900 organizations and more than 2,500 individuals in 120 countries. Advocates for the inclusion of culture in the SDGs proposed that a goal explicitly about culture be included and suggested the wording: “Ensure cultural sustainability for the wellbeing of all”. In the end, an explicit goal about culture was not included in the SDGs that were adopted in September 2015. However, during the post-agenda debates the global campaign did propose targets that might help to benchmark the arts and cultural sector in development. This paper considers these proposed targets and indicators through the case of Medellin, Colombia, a city that has used the arts and cultural sector within its overarching urban planning for some time. We examine archival information, such as Medellin’s development plans and evaluation reports using qualitative methods, to answer the following question: How has Medellin used arts and cultural programming and planning within its development plans? Is SDG language informing recent Medellin development plans and how? Do development plans incorporate or discuss any of the types of arts and cultural targets and indicators suggested by the “The Future We Want Includes Culture” campaign and how? Through the case of Medellin, we assess culture and its contributions to development at the municipal level. According to its advocates, culture contributes not only to the economic and productive sector but also provides a range of non-monetary benefits, such as social inclusion; thus, in many instances it promotes socially inclusive development, the central theme of the conference. The paper fits across several of the conference themes and tracks, including the 23rd ISDRS Conference’s special track of Art & Sustainability; as well as two of the tracks in the theme about Institutions and Governance Structures for Sustainable Development: Advocacy and public participation and Collaborative Governance for Sustainable Development.

A MANAGEMENT MODEL FOR THE SUSTAINABILITY OF PUBLIC THEATERS IN THE CITY OF BOGOTÁ – COLOMBIA

Friday, 16th June - 08:15 - SD 1003 - Oral Paper

***Ms. Katherine Guio*¹, *Dr. Eduardo Wills*¹, *Dr. Nathalia Franco*¹, *Mrs. Juliana Diaz*²**

1. Universidad de los Andes, 2. University Paris 1 Panthéon - Sorbonne

Bogota is a metropolitan city of more than seven million inhabitants. It has a rich tradition of arts and popular culture. Over the last few years, the institutional framework and infrastructure for cultural management has been improved substantially. Bogota is well-known for its cultural diversity and management of different public festivals, and at the same time, it is possible to find a vast variety of popular artistic expressions in the local communities. Consequently, UNESCO recognized Bogota as one of the most musically creative cities in Latin America.

This paper presents a theoretical as well as a practical model for the sustainability of the artistic and cultural expressions in the city's public infrastructure (theaters), as well as the business model for fundraising and financial balance. Based on a systemic view of the arts performance, we proposed the creation of an infrastructure network for Bogota that integrates the individual theaters by organizational, financial, marketing, operational, organizational, logistical, human resources and fundraising processes for optimizing money and resources: in other words, to establish a public network of municipal theaters.

All the theoretical support of this paper is based around a concept: social networks in organizations and the systemic approach where every actor of the network has its own function for sustainability. That has always been a challenge for cultural managers: the financial gain as well as the cost effective cultural programming in terms of audience preferences. This paper aims to reduce this gap between effective cultural management and financial balance. Some references used to support the present research are: Granovetter (1985), Powel, W.W., Smith-Doer (1994), Scott, J (2000), Fligstein, N (2001), Boyd, (2000), Borgatti, S.P. and Foster, P. (2003), Smith-Doer, Powell, (2005).

As mentioned before, this work is based on the systemic approach to the cultural sector. We proposed five principal subsystems for its management: i) Government, ii) Planning and Intelligence, iii) Monitor and Control, iv) Coordination, v) Management of day to day responsibilities and functions. We followed a participative methodology to develop the sustainable arts and business model. In this paper we present the basis for participation of the different institutions involved, how decisions were made, and how they could be improved.

The proposed Management Model seeks to enable a proactive change process, led by e The District Department of Culture and Sports (SCRD) and The Bogota Philharmonic Orchestra (OFB) to overcome the internal operational weaknesses and to create a sustainable cultural programming for the citizens. There is an uneven and differential distribution of income within Bogota's population, which requires these cultural agencies to create differentiated and specialized events for the public, guaranteeing that it is free for some.

To continue Bogota's recognition as a cultural epicenter of Latin America, this process towards a new Sustainable Management Model must be propelled by these principles: i) taking advantage of cultural opportunities, ii) creating and strengthening an institutional and political coalition, iii) communicating this new vision within public institutions, iv) empowering the players, v) establishing short term results and achievements.

Sharing Water: Transboundary Water Governance and Management in Southern Africa

Wednesday, 14th June - 14:00 - SD 701 - Oral Paper

Prof. Larry Swatuk¹

1. University of Waterloo

Water falls and flows, while states occupy fixed space: in Southern Africa, with its odd amalgam of colonially defined borders, this is a problem. The organization of the region's states stands at odds with the character of its water resource flows, both in space and in time. If people and ecosystems are to survive and thrive, this natural resource must be managed holistically, i.e. in terms of the hydrological cycle as that cycle changes through time. The historical approach to water management worldwide is the capturing and taming of a fugitive and wild resource – note the language of discipline and control. Where the resource is shared by two or more sovereign states, however, resource capture – physically through the application of various infrastructure and legally through the codification of actions in policy and law – is bound to be problematic: socially, politically, economically, environmentally and possibly militarily. For many years there has been speculation regarding the possibility of water wars in the region, with several basins having been identified to be 'at risk' of violent conflict. Hence the importance of sharing water fairly and sustainably.

The focus of this paper is on the process and practice of sharing the region's water by Southern African Development Community (SADC) member-states. The paper illustrates how Southern Africa serves as a mostly willing subject for global experiments in IWRM and good water governance. SADC's long-standing relationship with the EU and the Nordics, which began in the late 1970s in the struggle against apartheid, ensures an endless stream of money, technology, expertise and comradely good will. The nature of the region's political economy demands fundamental reforms in the way water is used and by whom. But, paradoxically, it is also this political economy which, in the context of neoliberal globalization, encourages decision makers to stay the course: more mines, more cash crops, less deliberate state intervention on behalf of those most in need. So, the 'institutional configurations and orientations' remain centred on the sovereign state, with state governors being the recognized seat of decision-taking authority, and with (often foreign) expert knowledge constituting the scientific and technical basis for action. We remain, unfortunately, a long way from the IWRM/good governance ideal.

Water values, water governance, and public opinion on the Paraguay-Paraná Waterway, Mato Grosso, Brazil

Wednesday, 14th June - 14:15 - SD 701 - Oral Abstract

Mr. Christopher Schulz ¹

1. University of Edinburgh

The present paper builds on previous research on water values and water governance in the Upper Paraguay River Basin, Mato Grosso, Brazil, which was presented at the 22nd ISDRS conference in Lisbon, Portugal. It falls into the category of research that aims at investigating links between water values and valuation on the one hand, and water governance processes on the other hand, from an interdisciplinary perspective that is best placed at the interface of political ecology and ecological economics. Specifically, it focuses on the planned construction of the Paraguay-Paraná Waterway through the Pantanal wetland, a controversial infrastructure project that would facilitate agricultural exports from the state's booming soybean sector, but may equally impact one of the world's best conserved wetland ecosystems. From a theoretical point of view, it can be hypothesised that supporters and opponents of the project hold different values, and assign different values to the river and water in question. The research to be presented at the conference reports the results of a quantitative study with a representative sample of members of the general public in the Upper Paraguay River Basin (n = 1067) which tested this hypothesis. In line with a conceptual framework recently proposed by Schulz et al. (2017), it looked specifically at assigned values of water (such as economic, ecological, or cultural values), governance-related values (such as sustainability, economic efficiency or social justice), fundamental or psychological values (such as universalism, security, power, self-direction), and their relationship with survey respondents' support of or opposition to the planned waterway. While the analysis of the data collected is still to be concluded at the time of writing this abstract, early findings indicate that indeed we can identify two different clusters of values, or 'value landscapes', which tend to correlate more with one of the two positions on the waterway. Especially people who score highly on self-transcendent values (i.e. those related to helping and caring about others) are more likely to reject the governments' plans to build a waterway, which is often characterised as an elitist project with little benefit for the local population. While more detailed results will be presented at the conference, the present paper should be seen as an invitation to conduct further research on the linkages between water values and water governance.

Tunjuelo is alive. Community proposals for better water management.

Wednesday, 14th June - 14:30 - SD 701 - Oral Abstract

Dr. Andres Vargas¹

1. Universidad de los Andes

Based on ethnographic research, this paper shows how the communities living in the Tunjuelo river basin have established an alternative way of relating with a river within a peri-urban context.

Traditionally, governmental management of the Tunjuelo river basin has been subdued it to the needs of Bogotá city. This has led to disastrous consequences for the basin, its water quality and quantity. The river has been heavily polluted and altered through many development projects; from a dam that altered the ecosystem in the early XX century, to mining contracts and a huge landfill built in the las few decades.

In the face of this environmental disaster, some communities around the river propose alternative ways of relating with the river. Their proposals are based on a decolonial understanding of nature and science, in which science becomes a language to communicate with a sentient river. They state, that their proposals would lead to environmental justice and a better water management.

Water governance modes and sustainable development approaches in Acacías (Meta, Colombia) between 2000 and 2015.

Wednesday, 14th June - 14:45 - SD 701 - Oral Abstract

*Ms. Diana Muñoz*¹

1. *Universidad de los Andes*

During the last 20 years, Acacías has evidenced Colombian economic reprimarization, characterized by the decrease of industrial and agricultural activity, and the increase natural resources exploitation, in particular oil exploitation, drag mining in rivers' alluvial beds, oil palm agribusiness, in addition to the increase of complementary services to these activities and rapid urban growth. This process, accompanied by a limited municipal institutional capacity to manage, regulate and monitor the environmental impacts of these socio-economic interventions, has enable negative social and environmental externalities that limit the conservation and availability for a sustainable use of Acacías' wide water supply by local actors, arousing socio-environmental conflicts in the municipality

This case study addresses the management of water resources in of Acacias' (Meta, Colombia) between 2000 and 2015, through the analytical framework of *water governance* and *approaches to sustainable development*. In that way, the paper explores, from a multidimensional perspective, the complex interplay of three governance dimensions: institutional and normative factors; regulation instruments; multiple actors and intermediation spaces, in order to establish the prevailing governance mode that structure certain ways of water resources use. In this context of governance, the paper also explores the prevailing approach of sustainable development in Acacías, acknowledging whether environmental and social capabilities of water resources are guaranteed to endure the local socio- economic activities.

According to the analysis, in Acacías prevails a hybrid water governance mode, in which two types of governance coexist in tension: a decentralized and closed mode related to environmental and territorial planning issues and a hierarchical governance associated with mining-energy activities. These tensions are expressed in normative conflicts between the hierarchical mining-energy sector and the decentralized environmental and land planning regulations; power asymmetries that foster tensions between government actors and encourage grater influence of governmental actors over social stakeholders in the decision-making process; the prevalence of closed and hierarchical actors' intermediation spaces; and rigid and coercive environmental instruments. In this hybrid water governance context, prevails a weak sustainable development approach, given that the water resources' environmental and social capacities of are limited to support the socio-economic activities. The hybrid water governance mode and the weak sustainable development approach acknowledged through the research, highlight the lack of horizontal and vertical articulation between government and social actors; hierarchical power relations that lead to fragmented, sectoral and coercive decision-making process; tensions between the central state and the municipality; limited environmental regulation instruments, and the socio-environmental conflicts proliferation.

Fostering political participation for better water services: evidence from three cities in India

Thursday, 15th June - 10:15 - SD 701 - Oral Paper

Mr. Francesco M. Gimelli¹, Dr. Briony C. Rogers¹, Dr. Joannette J. Bos¹

1. Monash University

Evidence indicates that the delivery of urban water services in a manner that fosters secure lives among the marginalised is impacted by individuals' ability to meaningfully engage in political processes that govern water. In many cities in the Global South the marginalised are peripheral participants in the political process, either being used as vote-banks or lacking the confidence to engage in the political process. This reality leaves the lived needs and realities of the marginalised outside of decision-making processes, while reducing the transparency and accountability of water governance in the Global South. There is a need to understand how the capacity of political participation among the marginalised can be strengthened in a manner that leads to the delivery of water services that addresses their lived realities and meets their needs and aspirations. This paper draws on interviews with forty-two community members and water development professionals in Faridabad, Delhi and Mumbai, India, to explore their experiences with the political processes impacting on the delivery of water services to slum areas. It identifies five political barriers impeding the ability of individuals to access - and improve their access to - water services, and discusses how these can be addressed by explicitly incorporating a strategy of fostering political participation as a component of urban water development initiatives.

Groundwater Governance and the role of the private sector

Thursday, 15th June - 10:30 - SD 701 - Oral Abstract

Dr. Catalina Silva-Plata¹

1. Universidad de los Andes

Groundwater is a public shared resource interlinked with many areas in the society such as food, energy, water supply, industry and the environment. There is more freshwater underground than on the surface of the planet and it is a critical resource for societies worldwide, and yet its understanding, governance and management have often been overlooked. The Groundwater Governance Global Framework for Action in its third theme identifies that connections with other sectors, such as the private sector, need to be systematically made. Effective groundwater governance is essential for groundwater management and it is only achievable with stakeholder participation. The private sector, and especially the food industry, constitutes a key stakeholder in this process as agriculture accounts for 70% of the global water withdrawals and industry for 20%. This paper discusses the role of this sector by first outlining the reasons why they should work towards a better groundwater management. Furthermore, it suggests ways in which businesses can contribute to an improved groundwater management and governance. In addition, it argues the reasons why an emphasis should be made on the food sector and finalises with suggestions for future avenues for research and practice.

Keywords: groundwater, water, governance, businesses, private sector

The Ecological Efficiency and Funding Performance from Water Charges: the Experience from São Paulo State, Brazil

Thursday, 15th June - 10:45 - SD 701 - Oral Abstract

Mr. Guilherme da Silva¹

1. Universidade Estadual Paulista Júlio de Mesquita Filho (UNESP)

São Paulo's state is considered a reference of hydric resources management in Brazil, becoming the pioneer on adopting a system based on the decentralized french model of basin committees, whom would become generalized across the country at the end of the 1990s decade. One of the main economic instruments from this system, collaborating with its funding and at the same time stimulating the rational use of the water, is the charge for the use of hydric resources. It's based on a mix from the polluter pay principle and the user pay principle, using differentiated values depending of the kind of use of the resources. This article valuate the impacts from the implementation of this charge on the first three hydrographic basins that adopted it (all located at industrial areas) on São Paulo, who went through a severe period of hydric crisis between 2013 and 2015, highlighting the non prepare for the situation and leading to critics to the politics and instruments adopted until that time. First, is made a bibliographic revision on the theoretical fundamentes behind the charge and a short bibliographic revision on the Brazilian and Paulista law of hydric resources, besides some examples of international cases of implementation. Then is made an evaluation of the additional funding that the charge brought to the basin committees and its ecologic efficiency between 2007 and 2015. The used data come from the annual basin committee reports and from the Agência Nacional de Águas. The indicators constructed with the data are about the variability of the funding at the period, the funding differences from each basin and the difference between the charged and the funded values, which affects the financial capacity of public investments. The ecological efficiency indicators show the variations from the Índice de Qualidade de Água (IQA), a synthetic index, composed by many parameters such as dissolved oxygen and water turbidity, offering a general point of view about the water quality. The results about funding show a substantial increase of resources for the basin committees, generally stabilizing after some years with very few variations. During the first years is also normal to have a major difference between what is charged and what is funded, because regional administration gives exemptions and other advantages to the companies in order to give them more time to incorporate the new costs on their operations. The ecological efficiency results show there is a constant increase of the water quality, however this can't just be attributed to this instrument and the actuation of regional committees, but also to state and federal legislation changes and productive process innovations. The article concludes that the use of water charges is positive to the hydrographic basins that adopt it, but that is necessary a policy mix to constantly improve results. The correct management of hydric resources at areas with irregular rain regimes is vital to assure inclusive sustainability and economic development is only possible where there is a safe water management to both the population and the productive sectors.

Payments for ecosystem services and motivation crowding in the Amazon Piedmont

Wednesday, 14th June - 14:00 - SD 702 - Oral Abstract

Mrs. Lina Moros¹, Dr. María Alejandra Vélez², Dr. Esteve Corbera-Elizalde¹

1. Universidad Autónoma de Barcelona, 2. Universidad de los Andes

Globally, there is an increasing level of funding being targeted to pay ecosystem services providers directly to support positive environmental behavior, and particularly forest conservation, for example through Payment for Ecosystem or Environmental Services (PES) schemes and pilots of Reducing Emissions from Deforestation and forest Degradation (REDD) initiatives. In this context, there is a growing concern about the temporal stability of positive environmental behaviors once economic incentives are introduced or removed. We implemented an innovative research design to test for motivation crowding and to distinguish changes in behaviors from changes in motivations with potential PES recipients in the Colombian Amazon Piedmont. We test for the effect of individual, collective or crop-price premium incentives on motivation crowding, using a forest conservation game and a post-experiment survey on different types of motivations based on Self-Determination Theory to test for changes in motivations. Our findings show that collective payments for ecosystem services not only increase forest conservation levels in the game, but also crowd-in motivations related to peer pressure. Payments that involve crop-price premium reduce forest conservation levels and crowd-out intrinsic and guilt/regret related motivations. This research contributes to disentangling the interaction between incentives, motivations and behaviors in the context of forest conservation and agriculture expansion.

Liquidity Constraint, LPG Stoves and Charcoal Consumption: A Randomized Controlled Trial in Tanzania

Wednesday, 14th June - 14:15 - SD 702 - Oral Paper

***Dr. Yonas Alem*¹, *Dr. Remidius Ruhinduk*², *Prof. Peter Berck*³**

1. University of Gothenburg, 2. University of Dar Es Salaam, 3. University of California Berkeley

The high start-up cost of modern cooking appliances has been shown to be the key factor that hinders transition of households from biomass energy to clean energy in developing countries. We designed a randomised controlled trial to identify the impact of relaxing households' liquidity constraints on LPG stove adoption and charcoal use in urban Tanzania. In collaboration with a local micro-finance institution, we randomly assigned households into a subsidy treatment and a credit treatment, which included different repayment arrangements. We show that, relative to households in the control group, adoption of LPG stoves reduced charcoal use by 47.5% in the treated group. However, providing subsidies for stove purchases resulted in a much larger reduction in charcoal use (54%) than did providing access to credit (41%). We highlight the importance of relaxing households' financial constraints and improving access to credit to encourage urban households to switch to clean energy sources and save the remaining forest resources of Africa.

Negative versus Positive Carbon Leakage: The Role of Forest Management Regimes

Wednesday, 14th June - 14:30 - SD 702 - Oral Abstract

***Dr. Jorge H García*¹, *Dr. Anton Orlov*², *Mr. Asbjorn Aaheim*²**

1. Universidad de los Andes, 2. CICERO - University of Oslo

A model of two regions with a common wood market is introduced. Regions may be of two types, according to their forest management regime, namely managed (M) and unmanaged (U) forests. When regions are of the same type, unilateral forest carbon mitigation and enhancement actions lead to positive carbon leakage. When regions are of different types, such actions result in negative carbon leakage.

Social and environmental balance as an instrument of environmental public policy in Brazil

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Mrs. Ana Carolina Ferreira de Melo Brito¹, Dr. Sylmara Lopes F. Gonçalves Dias¹

1. Universidade de São Paulo (USP)

The Brazilian Environmental Policy finds in the environmental licensing the most effective instrument for its implementation (OLIVEIRA, 2008), mainly because this is a complex administrative procedure, through which the environmental agency evaluates and authorizes the location, installation, expansion and operation of activities considered effective or potentially polluting. However, since this is a mechanism that promotes the interface between the entrepreneur and the State (FARIAS, 2010), the social participation and information in the mentioned procedure is very limited indeed. The public hearing and the public discussion of the environmental impact report are only required by law for the enterprises capable of causing significant environmental degradation. That is, a public discussion only occurs about those activities susceptible of causing great environmental impact on the licensing of these ventures, even before their deployment. Although the participation and the social information are part of the environmental policy guidelines in Brazil, there are gaps of legal instruments which promote the interface between the companies and society. Nevertheless, gradually more companies spontaneously disclose their results in this field and show themselves as sustainable businesses. The change is due to the evolution of the perception of corporations about their role in society, about the attitudes of consumers, as well as the institutional image and intangible values that add to their patrimony, with this issue taking a strategic position within the organizations (GONÇALVES DIAS, TEODOSIO 2011), exceeding the mere fulfilment of legal obligations. Thus, the social and environmental balance has been constituted in a tool that has been increasingly used by Brazilian companies. Once accomplished, that balance becomes the concrete expression of a business decision, subjecting it to the control of society and laws. Therefore, the review of all legislation on the social balance can be justified, to search for the command and control mechanisms applicable. However, despite its strategic importance and enabling potential of information and questioning for society, the social and environmental balance is not mandatory in Brazil, neither there is a legal provision of a minimum content, or penalties for its erroneous or fraudulent disclosure. At this pace, it is worth evaluating the guidelines of the Federal Constitution and the main laws that reflect the environmental public policies on corporate communication, in particular via social balance. The study aims to point out challenges and opportunities for the improvement of public policies and corporate management, suggesting the regulation of social and environmental balance through rules that provide for its minimum content. It also intends to discuss cases in which its elaboration and disclosure must be mandatory, as well as the penalties for the breach of its precepts. Whereas the sustainability tripod must be harmoniously conformed, in virtue of the environmental, social and economic aspect, the express contemplation of social and environmental balance for companies that are obliged to demonstrate their economic results periodically would be legal action that would contribute to the advancement of sustainable development in Brazil.

Keywords: social and environmental balance, environmental public policies, Brazilian environmental law.

ANALYSIS OF THE SOLID WASTE DISPOSAL OF THE PETROLEUM SECTOR UNDER THE NATIONAL SOLID WASTE POLICY

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

*Ms. Ana Carolina Chaves Catolico*¹, *Dr. Maria Cristina Alves*²

1. Escola Nacional de Ciências Estatísticas, 2. Universidade Federal

Over the years, oil activity has gained an important strategic position in world economy and politics, and has established oil as the main source of global energy. However, it is characterized as highly polluting and aggressive to the environment, which comes in opposition to the new changes in the paradigm of relations between society and the environment. Globally, environmental variables are now included in the system of planning and management of companies, as well as in official regulatory bodies. In this context, there is reflection of the responsibility of the petroleum sector with the environment and the individuals impacted by its activities. One of the environmental problems is the generation of waste from offshore activities that can directly impact on the terrestrial infrastructure. In Brazil, it is expected that, with the guidelines proposed by the National Solid Waste Policy, companies in the sector adopt measures for an efficient management of the waste generated and landed along the Brazilian coast. Thus, this article adopted the Campos Basin as the object of study, as well as the final disposal capacity of solid waste from the states of Rio de Janeiro, São Paulo, Minas Gerais, Espírito Santo and the waste management system implemented by the facilities Offshore. Throughout the work, it is discussed the importance of an efficient solid waste management and ways of environmentally safe disposal. It was studied how the solid waste management throughout the Southeast Region has been applied, as this consists of the states directly affected by the waste arising from the oil activities in the Campos Basin. It was concluded that the states of Rio de Janeiro and São Paulo are the most affected by the offshore solid waste final disposal from the Campos Basin. Furthermore, the amount of petroleum residues landed (Class I and Class IIA) is insignificant when compared to the daily amount generated by the states of the Southeast Region. The results allowed the observation of the intensification of solid waste generation by the sector, to identify the main faults and to follow in an integrated way the waste management by the sector. In addition, they assist in the implementation of the National Solid Waste Policy and in the Inventory of Industrial Solid Waste, especially if we are considering a horizon of expansion of production due to the exploitation of new reserves. The importance of keep monitoring the evaluation of the environmental impacts of existing and planned petroleum projects is highlighted. Therefore, it is necessary that the companies of the sector adopt measures that allow and prioritize the reuse of the generated waste and, consequently, the extension of its life cycle. It is necessary to cooperate between the stages of the oil industry's production chain, seeking the optimization of consumption, generation, treatment and proper final destination of solid waste. In this way, it would be possible to implement sustainable, inclusive projects that would allow an efficient synergy between the stakeholders, the government and other actors in the chain.

Keywords: Solid waste, petroleum, policy.

Unraveling the efficiency and equity effects of communication in collective compliance: The role of leaders among small-scale gold miners in Colombia

Friday, 16th June - 08:00 - SD 701 - Oral Abstract

*Mrs. Luz Angela Rodriguez*¹, *Mr. Alexander Pfaff*², *Dr. María Alejandra Vélez*¹

1. *Universidad de los Andes*, 2. *Duke University*

It has been widely demonstrated that collective action and self-governance are powerful means for communities to avoid the ‘tragedy of the commons’. The capacity of a community or a group of users to manage common-pool resources depends on their ability to craft and enforce rules to cope with the dilemmas of cooperation (Ostrom 1990). Some settings such as small-scale gold mining in alluvial deposits face some of the challenges of common-pool resources such as non-excludability but the structure of the situation do not provide the incentives to develop and sustain cooperation strategies among participants. Even though the challenges that states face in the regulation of small-scale gold mining due to the huge costs of monitoring and enforcement, states can provide incentives that promote cooperation, reducing the burden of enforcement and changing social outcomes. We designed and implemented a field experiment with 200 gold miners in Colombia’s Pacific region to explore an external intervention based on collective compliance. In our setup, the government sets the target for aggregate compliance, verifies the target and then, conditional on collective compliance, provides a reward to the group. This limits the state’s burden to verifying aggregates, leaving the community members to decide among themselves whether to reach the aggregate target. In this setting, we varied the strictness of the aggregate compliance target and, as our focus, varied communication. Communication, i.e., allowing individuals in groups to talk before decisions, is well established as improving coordination for efficiency. Yet we are interested in details of equity that we believe are much less studied for collective action. We find that collective incentives appear to be promising as a mining intervention. We also confirm that communication enhances the probability of coordination sufficient to achieve collective success and we find that communication raises equity on average. However, in contrast to (implicit) expectations, it does not always raise equity – and inequity can be stable. Concerning when communication raises versus lowers equity, here we add a considerable novel focus on the dynamics of the communications that occur when groups are trying to coordinate. Our greatest focus is “leaders” who play central roles in leading groups towards the efficient or inefficient outcomes they achieve. Those leaders at the same time are establishing how the costs of group compliance will be distributed among group members.

BEYOND THE CLASSICAL PAYMENTS FOR ECOSYSTEM SERVICES (PES): INTRODUCING VALUE CHAINS AND SUSTAINABLE MARKETS TO COMPLEMENT PES IN AGRICULTURAL LANDSCAPES

Friday, 16th June - 08:15 - SD 701 - Oral Abstract

*Dr. María Alejandra Vélez*¹, *Prof. Ximena Rueda*¹, *Prof. ANDRES GUERRERO*², *Ms. Lina Moros*¹, *Dr. Andrés Link*¹

1. *Universidad de los Andes*, 2. *School of Management at Universidad de los Andes*

In recent years, there has been a boom in environmental policies using conservation incentives, aiming to create behavioral change to provide and preserve ecosystem services of high strategic value. One of the most widely used incentives is the Payment for Environmental Services (PES). The traditional approach of this incentive is based on the idea of a payment covering the opportunity cost of the owners of the threatened forest areas. This payment comes from the beneficiaries of ecosystem services, either directly or through institutions interested in conservation. PES have demonstrated positive effects on conservation but limitations in the long term regarding its economic sustainability. Based on a pilot design of incentives for the conservation of biodiversity in the Colombian Amazon (Piedemonte region), this article presents a new approach to PES by including the establishment of value chains in agricultural landscapes that economically recognize environmental practices to complement the traditional PES. The objective of this new design is the conservation of the forest along with the transition to sustainable productive practices. This institutional design allows the articulation of producers to value chains in the long term and markets that reward their efforts in sustainability, reducing their dependence on PES in the long term. The proposed incentive system differs from traditional PES in that a central component is designed to increase the quality of the agricultural product, in this case coffee, conditioned to compliance with a minimum of forest cover. The logic behind this proposal is that agricultural productivity will reduce the pressure on the forest because the market makes the payment conditional on the maintenance or improvement of forest cover. This new incentive system generates the socio-environmental conditions for the conservation and increase of the forest cover as well as the connectivity of the forests in the benefited region. Additionally, it shows how it is possible for small farmers to obtain economic benefits derived from greater productivity and sustainability of their agricultural practices. The article discusses the challenges in the design of the incentive, including the role of differentiated opportunity costs based on productive activity but also size of the farm; the simulation of the associated costs of the program and the opportunities of designing a new system oriented to both the conservation of forests and rural development. In this case, compared to traditional PES, the importance of designing incentives that link conservation to the productive activities of the area is highlighted, facilitating the development of value chains linked to promote forest conservation, with an effect in the economic sustainability of the incentive. The improvement of the income of local communities is transformed into regional benefits for the conservation of the forest and protection of the water resource, and finally in global benefits due to the conservation of the biodiversity and carbon capture. Our article brings new light to the land-sharing versus land sparing debate, offering an alternative in which both productivity and conservation increase, if the incentives are correctly aligned.

PAYMENTS FOR ECOSYSTEM SERVICES, VALUE CHAINS, FOREST CONSERVATION, INCENTIVES

Valuing Victoria's Parks

Friday, 16th June - 08:30 - SD 701 - Oral Abstract

Dr. Zaida Contreras¹, Ms. Helen Betts O'shea², Mr. Tony Varcoe³, Prof. Rob Wallis⁴

1. Energy, Environment and Climate Change | Department of Environment, Land, Water and Planning, 2. DELWP, 3. Parks Victoria, 4. Federation University Australia

Over the past decade much work has been undertaken globally to develop consistent frameworks and methods for accounting and valuation of natural capital and ecosystem services, with an increasing number of case studies demonstrating that well managed natural assets, including parks and protected areas, can contribute significantly to economic and social health and wellbeing.

In this paper we will outline the methods and findings of the application of a new framework for ecosystem accounting to the parks network of the State of Victoria, Australia based on the System of Environmental Economic Accounting (SEEA). To highlight the benefits that Victoria's parks provide to communities and the economy, a range of ecosystem services were assessed in their current land use (i.e. as a park), compared to an alternative land use.

The benefits of these services were estimated both in physical quantities and monetary values where feasible. The assessment has highlighted that Victoria's parks network contributes many and large benefits to Victoria's economy, its productivity, sustainability and liveability. These contributions include to income and jobs through tourism and other industries, cleaner waterways, avoided water costs to consumers and producers, improved health benefits and avoided health costs, increased amenity, protection of coastal assets, regulation of climate, supply of pollination services for agriculture and habitats for flora and fauna to maintain genetic diversity and opportunities for research and education.

The information gained from the project will inform environmental policies and raise awareness among community stakeholders and decision makers about the significant return on investment of management of healthy parks and protected areas, contributing to the State's economy and community wellbeing as well as benefiting biodiversity conservation. Improvements in the ability to quantify the benefits of nature for human wellbeing, including economic benefit, has the potential to substantially shift the current paradigm of for park and protected area management by demonstrating multiple benefits to society and reaching new audiences and cross-sector partners and advocates.

Reducing Hg pollution in small-scale mining through associative entrepreneurship: an experimental and modeling approach

Friday, 16th June - 08:45 - SD 701 - Oral Abstract

Prof. Adrian Saldarriaga Isaza¹

1. Universidad Nacional de Colombia - Sede Medellín

After signature to the Minamata Convention on Mercury in 2013, several challenges remains to deal with the transboundary pollution and reducing the harmful effects that mercury usage has on human health and ecosystems. Artisanal and small-scale gold mining (ASGM) is one of the main sources of mercury pollution worldwide, but it is also the most attractive or the unique source of livelihood several millions of people in the world. The application of conventional practices, mercury amalgamation being the most representative, makes ASGM an activity with a high negative environmental impact, primarily due to mercury pollution. These and other rudimentary techniques continue to be massively popular techniques despite the fact that cleaner technologies are available to miners. Several policy instruments have been proposed to phase out mercury in ASGM, from the traditional command and control to other approaches such as associative entrepreneurship. By associative entrepreneurship, we mean the creation of local associations between small-scale gold miners in order to acquire more environmentally-friendly technologies. This approach, associative entrepreneurship, has been proposed as a scheme that would bring cleaner technologies to miners engaged in the extraction of gold at small scale. By using the results of an economic experiment and with the construction of a behavioral simulation model, we assess the feasibility of associative entrepreneurship (collective action) in the context of the public-good dilemma that ASGM communities face. We investigate the effect of two different institutional arrangements on associative entrepreneurship: (i) exclusion, and; (ii) the interaction between internal communication and the intervention of a non-coercive authority. We show that a sustained collective action (associative entrepreneurship) is possible when miners completely understand the social dilemma they face, but that self-organization is not possible. Features such as reciprocity and temptation to free ride partially explain why self-organization fails. In such a case, external intervention has a key role in promoting programs that improve the understanding of the social dilemma faced by artisanal and small-scale gold miners. However, a monetary (des)incentive such as exclusion did not trigger associative entrepreneurship.

Key words:small-scale gold mining; public goods; co-management; exclusion; mercury pollution.

Building bridges between human cognitive biases and IT-based models in complex decision making contexts with the help of systemic structural constellations in production environments

Wednesday, 14th June - 11:30 - SD 703 - Oral Abstract

Prof. Marlen Arnold¹

1. Technische Universität Chemnitz

Currently, sustainability science is mainly based on conscious information and strongly focused on analytical tools or strategies. Thus, tools, concepts or strategies around sustainability are limited to mainly rational approaches as well as limited in success broadly. Lozano (2015) stresses the need for changes in mental models, behaviour and activities and, thus, rethinking traditional ways and perspectives of discussing and integrating sustainability challenges. Moreover, nowadays, many disciplinary questions cannot be answered or dealt with anymore in a disciplinary context. Many disciplinary questions and challenges become and are interdisciplinary challenges in many ways. So, the increasing complexity and digitalisation in production environments often causes problems in the interaction of cognitive machines and human as well as in the way of handling outcomes of advanced analytics, models and simulations in order to optimise sustainable production processes. This can be caused by cognitive biases – either in decision-making processes or in the assumption and programming structure of simulations and big data analytics – and results in increased production-related costs and reduced sustainability effects. However, unconscious thought theory (Dijksterhuis & Nordgren, 2006) stresses particular advantages of both types of thinking. Nordgren et al. (2011) proofed the combination of both modes of thinking, conscious and unconscious thinking, in complex contexts and decision-taking situations as best. The authors emphasize that unconscious thinking can aggregate plentiful characteristics better than conscious thinking, whereas letter mode avoids rule-violating options better. The new method systemic structural constellations “provide[s] powerful and creative ways to clarifying and resolving complex, possibly intractable issues associated with organisations” (Wade, 2004: 194), systems or social actors. The core idea is that particular foci of complex systems, such as production system, can be represented and simulated through spatial arrangements or physical layout of persons or symbols. It has been shown that these arrangements can be used for manifold issues to reveal so far unknown impact factors and revealed cause-and-effect relationships (Kopp, 2013). So, the guiding research question is “*How can the use of systemic structural constellations improve modelling and IT-based decision-making processes in highly complex and digitalized production environments in order to increase sustainability?*” Based on two constellations workshops with production and logistics managers from industrial practice of steel production, automotive production and machining industry as well as students, the research work shall provide insights concerning: (1) how systemic structural constellations are an appropriate methodology to build bridges between unconscious and conscious knowledge and (2) content-based development for the design of future IT systems and data visualizations. Latter addresses the question how to manage growing complexity and the challenges of digitalisation considering human cognitive biases affecting decision making in production environments in order to secure sustainability effects and the impacts of simulation outcome. Systemic structural constellations open up a new perspective on how to overcome challenges of production systems and make use of the advantages of digitalisation by accepting and managing human biases in a complex environment.

ACCOUNTING FOR SUSTAINABILITY: WHAT NEXT? A RESEARCH AGENDA

Wednesday, 14th June - 11:45 - SD 703 - Oral Paper

Prof. Gary Cunningham¹, Prof. Arne Fagerström¹, Prof. Lars Hassel²

1. University of Gävle, 2. Umeå University

Abstract: This working paper responds to increasing calls for more and different forms of accounting research involvement in accounting for sustainability. It provides background, clarifies the accounting research issues, and suggests research methods. Background analysis indicates that accounting for sustainability must go beyond supplemental reporting of ecological and social information to include such emerging issues as integrated reporting of sustainability information along with financial reporting. Additional emerging issues are needs of users of sustainability reports, auditing and other assurance of sustainability information, and sustainability implications of financial failure, accounting and auditing failures, and lack of enforcement. Analysis of integrated reporting against traditional financial accounting theory concepts of the purpose of financial reporting and the postulates of going concern, reporting entity, monetary unit, and time period, indicates a need for substantial changes in the traditional financial accounting model if sustainability issues are to be integrated. The agenda concludes with five research issues and methods:

- An accounting research framework for sustainability using general systems theory approaches that have been useful for similar emerging issues.
- Reporting of sustainability information which has been the focus of most research to date, and the emerging important topic of integrated reporting.
- Users of sustainable information, their uses and perceived needs, an area that has been largely neglected in research to date.
- Auditing and assurance issues that are taking on greater importance as more users demand assurance for sustainability information. Issues include standards to be used and users' expectations and reactions.
- Financial distress and sustainability consequences of accounting and enforcement failures that are just now being recognized as sustainability issues.

Keywords: accounting for sustainability, integrated reporting, needs of users, audit, assurance

Taller, fatter, older and hungrier: a study of world population, human mass and caloric intake over the past 40 years

Wednesday, 14th June - 12:00 - SD 703 - Oral Abstract

Mr. Felipe Vásquez¹, Mr. Gibran Vita², Prof. Daniel Müller¹

1. NTNU - Norwegian University of Science and Technology, 2. NTNU

Population growth is a major driver for environmental change. Yet, population change has remained as an exogenous variable in most sustainability assessments and methods, playing only a multiplicative function. This is the case of, for instance, the IPAT identity which has governed our understanding of environmental impact for the last 50 years (Chertow, 2000), and where impact (I) is the product of population (P), affluence (A), and technology (T) - $I=PAT$. In this sense, we argue that it is not only the number of individuals that drives the impact and consumption, but also their constantly evolving biological, physical and demographic characteristics. Evidence of this evolution are the worldwide increase in height and weight (Finucane et al., 2011; NCD Risk Factor Collaboration, 2016), and the changes in sex and age structure of societies (Lutz et al., 2014) over the past century. In this paper, we investigate the evolution of the qualities of the human population in terms of changes in human mass and calculate the implications for food-energy requirements over the past 40 years (1975-2014). This study covers the adult population of 186 countries and uses sex disaggregated data on height, for 100 birth cohorts, coupled with annual average body mass index. Theoretical total energy expenditure -the food-energy required to sustain a human- was calculated as a function of weight, age, sex, and physical activity level, following the FAO and WHO guidelines. We found that while the world population increased by a factor of 2.16, the total human mass and the total theoretical food energy expenditure increased by 2.46 and 2.29 respectively. The net increase in mass is explained by a 14% increment in the average weight and a 1.3% increase in average height, resulting in a 6.1% increase of the energy requirements per capita. These numbers indicate a path dependent, positive feedback, where increased food energy intake has allowed for heavier bodies that in turn demand increasingly more calories per person. The total food-energy grew less than the total mass due to a shift in the average age of adults, from of 39.7 to 42.2 years. A person with a constant weight would demand less food energy towards the end of his life. While all countries have increased their average weight, the change ranges between 6% and 33%. Some of largest changes (above 25%) are observed in Mexico, Malaysia and South Korea, while the smallest ones (below 10%) occurred in Japan, North Korea and Zimbabwe, to mention few examples. The phenomena of an increasing human mass and size has broader implications for resource use beyond food. Other energy and material implications are foreseen in mobility, shelter, furniture, clothing and waste management, e.g. larger living spaces and vehicles. Consequently, the results are discussed in the light of the dynamic qualities of populations as key factors for understanding the anthropocene, particularly in the context of the sustainable development goals 2, 11 and 13 in relation to food security, resource efficiency and climate change.

keywords: human mass, population growth, food security, stock dynamics

The Region and Sustainable Development

Wednesday, 14th June - 12:15 - SD 703 - Oral Abstract

Mr. Gustavo Nicolas Paez Salamanca¹

1. University of Cambridge

Sustainable Development is a relatively new academic discipline that aims to understand how human societies interact with the environmental structures. Whereas this topic is fundamental and can be approached from multiple disciplines, it has been quite challenging to define a unit of study that describes the scientific interest in the dynamics between the social and environmental systems. Hence, the purpose of this paper is to promote the concept of “region” as the most appropriate unit of study for the Sustainable Development Science. In the beginning, this word was coined to identify a space. However, given the influence of System’s Theory, many geographers, such as Vallega, modified the concept of region as the interaction of social and environmental systems that take place in a given space and that are in constant interaction among themselves and with other regions. This concept provides two important elements for the development of a Sustainable Development Science: 1) it provides a unit of analysis that shares the same elements as the new science, and 2) it supplies a set of tools from System’s Theory that enhances the research on this area. In order to prove the usefulness of this concept, this paper summarizes a series of seminal cases of study and highlight in each one of them how the concept of the region helps the researcher to have a better understanding of the development problem and which are the properties of a region, based on the System’s Theory approach, that can help understand it in an integral way. In particular, this paper analyses and illustrates six basic properties of a region: 1) bimodularity (the existence of social and environmental systems that are in constant interaction), 2) openness (the fact that a region is not a close unit of analysis but it is in constant interaction with other regions creating horizontal and vertical structures), 3) objectiveness (regions shape themselves around explicit or implicit objectives), 4) evolution (regions are constantly changing based on the interactions among themselves), 5) system dynamics (due to its spatio-temporal behaviour, understanding the time dynamics are fundamental in the concept of sustainability and evolution of a region), and 6) emergence and self-organization (as complex systems, the interactions within and between regions induce synergies that shape the organization of the social and environmental structures on them). From the review of the cases of study, this paper argues not only the relevance of this concept but also how it allows that multiple disciplines have an active role in the study of each of these elements. Hence, by analyzing the concept of a region under a System’s Theory perspective, this paper promotes the usage of a unit of study that is ontologically consistent with the object of study of Sustainable Development and which provides an adequate framework to host multiple academic disciplines in the framework covered by this emerging science.

Keywords: System’s Theory, Region, System Dynamics, Complexity

Construction and application of Bayesian networks to support decision-making in the water, sanitation and hygiene sector: A case study of SIASAR initiative in Central America

Wednesday, 14th June - 12:30 - SD 703 - Oral Paper

Prof. Agustí Pérez-Foguet¹, Mr. David Requejo Castro¹, Dr. Ricard Giné Garriga¹, Mr. Gonzalo Martínez Crespo², Mr. Antonio Rodríguez Serrano²

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The 2030 Agenda includes a dedicated goal on water and sanitation (SDG 6) that sets out to “ensure availability and sustainable management of water and sanitation for all”. SDG 6 expands the MDG focus on drinking water and sanitation to cover the entire water cycle. A clear lesson from the MDGs is that we cannot manage what we do not measure, and there is little doubt about the role of monitoring and evaluation data in providing the evidence base for decision-making. Against this background, a number of composite indicator frameworks have been implemented to make water and sanitation quality services available and accessible to all, particularly to those most in need. Despite their significance in sector monitoring, indicators are not completely adequate to provide an insight into the complex cause and effect relations within water, sanitation and hygiene (WaSH) issues. The flexibility of Bayesian Networks (Bns) have been exploited to integrate multiple and simultaneous cause-effect or dependence relationships and unravel the linkages between poverty and WaSH services. In consequence, Bns have proved to be effective in project planning and monitoring support. Three major weaknesses however hinder a wider use of this monitoring approach in sector planning: i) an increased data demand, ii) software availability to run the networks, and iii) lack of a systematic methodology to deal with networks generation. In this study, open-databases are exploited and free software “R” is applied. One monitoring initiative is selected as initial case study due to its increasing relevance in Latin America in monitoring the WaSH sector: the Rural Water Supply and Sanitation Information System (SIASAR). On the basis of SIASAR’s conceptual framework, a simple Bn model has been applied to reflect the main issues that determine access to WaSH services. Data from Nicaragua is processed and analysed, since the Government has already carried out and completed a national baseline. The paper discusses about i) the proposed methodology to construct the networks, and ii) the potentiality of BNs in terms of evaluation and planning. It concludes that the proposed methodology represents a contribution to facilitate the use of this tool and that Bns are able to accommodate the complexities of WaSH-related issues. Additionally, they emerge as an effective management tool to support decision-makers in formulating and making informed choices between alternative actions.

Keywords: Bayesian Networks, WaSH, decision-making, planning, SIASAR

Understanding the role of services in the socioeconomic metabolism: the case of kindergarten education in Norway

Wednesday, 14th June - 14:45 - SD 703 - Oral Abstract

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1. NTNU - Norwegian University of Science and Technology

Services allows us to satisfy some of our basic needs, for instance education, health care, and communication. Services are fundamental part of our socioeconomic metabolism (SEM) and sustainable development. Yet, the role that services play in our SEM, in terms of the demand, use, disposal, and accumulation of resources in the anthroposphere, has remained largely unexplored. For the most part, SEM studies take either an economy-wide approach or a product/infrastructure process-based approach. These approaches are useful in the study of major resources at a national level, or at the level of specific infrastructures, materials and energy cycles throughout the anthroposphere. However, the approaches fail to acknowledge the role of services on resources. While the fields of economics (e.g. human capital and education economics) and demographics (e.g. human capital formation) have been concerned with the study of services. These do not deal with environmental resources implications. Here we present an approach for the study of services and their role in the anthroposphere under a SEM framework, which integrates principles from demographics, economics, and stock-and-flow dynamics. We define a service as a system composed of (i) two demographic stock-elements, demanders and providers, (ii) an infrastructure stock-element, (iii) their links, and (iv) their associated human, infrastructure, material and energy flows. Hence, the planning for the sustainability and optimal provision of services rely on the adequate understanding of their drivers and the stocks-and-flows' dynamics in the system. We use the case of kindergarten education in Norway to illustrate the principles and applicability of the approach. We analyse the situation of the system in 2013 and forecast the evolution of the stocks and some flows towards 2040 with the assistance of a quasi-stationary model. If present national students-to-teacher and area-to-student ratios remain at present levels, the number of students, teachers and square meters are expected to increase by 11.8%, 11.4% and 11.5% respectively in the year 2040 - under a medium-growth demographic scenario. Satisfying these teaching requirements imply that at least 4,705 new teachers and 197,962 new kindergarten-square-meters would be needed. The findings press for opportune planning and action at the policy, academy, and construction levels to prepare for this coming demand, not only at the national and but also at the regional scale. This paper presents a first approximation towards the study and modelling of services under a SEM paradigm. The method can be used for the design and evaluation of policies related to the fourth sustainable development goal, in relation to inclusive and equitable quality education. Other applications are also foreseen in issues connected to health, employment, information technology, and innovation and research.

Keywords: Services, socio-economic metabolism SEM, education, kindergartens, Norway

Integration of habitat quality index with physicochemical and ecological models oriented to the Ecosystem recovery in the Meléndez River, Cali-Colombia

Wednesday, 14th June - 14:45 - SD 704 - Oral Paper

Mr. alex quintero¹, Prof. Javier E. Holguin Gonzalez¹

1. Universidad Autónoma de Occidente

The ecological quality of the water of the Meléndez River at the medium and low basin was evaluated through the application of quality and pollution indices in the ecosystem by using physicochemical parameters and its association with aquatic macroinvertebrates. In addition, a pollution control scenario was evaluated by the application of a simplified dissolved oxygen model of Streeter Phelps, in the most critical loads into the river. This study was performed in a period of high precipitation of the last quarter of the year 2016. The aim of this project was find the actual ecological situation at the river in order to create a baseline study necessary for the future environmental improvement of the city. In general the ecological quality index showed a significant alteration of the riverside forest in the middle basin and an extreme degradation in the low part. On the other hand the physicochemical parameters results showed high dissolved oxygen levels (7.21 mg / L in the middle basin and 6.63 mg / L in the low basin), pH very close to neutrality in all stations, BOD₅ and COD with values that did not exceed 12 mg/L, whereas fecal coliforms presented high levels in the low basin (up to 66000 CFU) showing a certain degree of contamination in the lower river basin. A total of 22041 individuals of macroinvertebrates of 7 different families were obtained by the catching methods which indicates according to the BMWP-Col index that the river presents very polluted waters due to the discharges of domestic wastewaters. The measured physicochemical parameters and the species of macroinvertebrates present good correlations according to the analysis of canonical correspondence where there are strong associations in the X axis with pH (0.940) and OD (0.919), while in the Y axis a strong correlation With the BOD (0.819). This project contributes to explore new issues to discuss about our ecosystem resources and how our environmental authorities can improve their care through the use of ecological indices, models and its correlation with the aquatic macroinvertebrates providing a frequently tracing spatial and temporal in our Rivers.

Key words: aquatic macroinvertebrates, ecological quality, sustainability indicators, Streeter Phelps model, Meléndez River.

Dynamic of some services ecosystem associated to the capital natural of the soil: The case of socio-ecological systems in basins hydrographic of half montana, Colombia.

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Ms. Linda Berrío¹, Dr. Clara Villegas¹, Dr. Santiago Arango-Aramburo¹

1. Universidad Nacional de Colombia - Sede Medellín

The researches on the processes of land use and land cover change are at the center of attention of the current environmental research, because their implications in relation to the loss of habitat, biodiversity, environmental services and productive capacity of ecosystems; as well as being recognized as one of the most important factors of global change and representing the second anthropogenic source of CO₂ into the atmosphere.

The characteristics of land use are the result of the interrelationship between physical or natural factors and cultural and human factors. Hence, the balance between natural habitat and man-made landscape could determine the future of biodiversity conservation, the provision of ecosystem services and the sustaining of productive activities in large areas of the planet.

Understanding these complex processes and quantifying the degree of human conversion of natural ecosystems is very important, therefore the socio-ecological systems approach represents a support for the holistic analysis between systems since allows the formation of an integrated and unitary system.

Although research in modeling has been carried out under this approach, little attention has been paid to the inclusion of the endogenization (in double via) of their relations between the social and natural systems. Natural and social systems have usually been linked together in only one direction ignoring the feedback between them. This research aims at generating a model of simulation that allows the analysis of the dynamic of some services ecosystem associated to the natural capital of the soil in a basin hydrographic of half mountain Colombian under the of social-ecological system approach.

The methodological stage is composed of four phases

Phase 1: Definition of parameters, endogenous and exogenous variables. This phase comprises activities such as describing the processes to be modeled, as well as the interaction between them and other processes, in addition to defining the modeling tool (s) to be used to achieve the purpose. The agent-based model and system dynamics are the most commonly used tools in the literature. However, it is necessary to evaluate the advantages and the requirements of each one and the possibility of coupling them.

Phase 2. Conceptualization of the theoretical model. In this phase, the dynamic system hypothesis is formulated using causal diagrams.

Phase 3. Design of the computational model. The activities that are included are: Designing the graphic representation of the configurations that are included in the model, and building the formal model with mathematical description.

Phase 4. Consolidation of the computational model. Activities such as model validation and model application are included. The application will be able to simulate the dynamics of the ecosystem services in the future under land use change scenarios.

This research is the doctoral proposal which attempts at contributing to acknowledge some of the challenges that are in force in the modeling of socio-ecological systems. Besides, it also aims at generating a tool that allows to understand the dynamics of the services and their management, since they are input for decision-making processes.

FEASIBILITY OF REPLACEMENT OF THE WATER BY VINASSE FOR THE MANUFACTURE OF CONCRETE

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Ms. Thaise Moser Teixeira¹, Ms. Jéssica Baggio Soares¹

1. UNICESUMAR

The construction area is an activity that consumes a high amount of natural resources, being a constant search for solutions to absorb the waste generated, often in the work itself. The consumption of resources extracted from the environment by construction varies from 15% to 50%, besides its products are large consumers of energy, and it takes most of the alternative materials that attend to this activity. Thus, a construction industry becomes a recipient of large amounts of solid waste that in another situation would be sources of pollution. In the context and in order to reduce the impacts generated in the process, several researches were analyzed as introduction of new materials in the concrete production. The present work had as objective to analyze the viability of the use of the liquid vineyard, effluent generated in the production of sugar from the sugarcane, in the confection of concrete. Sugar is used as raw material in construction, since the product contains more malleability to the concrete and more resistant is used correctly. During a cure, the concrete dries and loses water, which leads to the appearance of cracks and fissures, as well as a mixture with sugar slows the process of evaporation of the water, which can often even totally inhibit a loss of water. The vinasse was used in substitution of water, aiming to contribute to the decrease of the discharge of this residue in the nature, besides the search for economic and efficient forms of recycling. The work analyzes the mechanical strength of concrete specimens, produced in a conventional way and with vinasse. The results show that the concrete with vinasse showed satisfactory effects, being its use feasible for works with non-structural islands. Its resistance was compared to the conventional one, making it a propitious product for use and a sustainable alternative for sugar and alcohol industries as a by-product of the process.

KEY WORDS: Concrete; Agricultural residue; Sustainability.

Visualizing Adaptation Scenarios for Climate Change and Human Population Stress through System Dynamics Modeling in the Biobío River Basin, Chile

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

***Mr. Jason Walters*¹, *Mr. Jae Ryu*¹, *Mr. José Luis Arumí*², *Mr. Gerardo Azócar*²**

1. University of Idaho, 2. Universidad de Concepción

Climate change, population dynamics, and globalization can work in tandem with other internal stressors to constrain or even degrade the development status of states, especially when natural resources exports constitute a large proportion of the GDP. Additional research is needed to better understand the impacts of these stressors on resource-dependent countries that are positioned near either side of the boundary between developing and developed. This research examines hydro-social cycles in an irrigated agricultural zone in the Biobío Region of Chile, which became the first South American member of the Organization of Economic Cooperation and Development (OECD) in 2010. The primary focus is the sustainable water and crop management for agricultural production along the Biobío River. The economic production in the region is partially dominated by agricultural exports, thus the behavior of both domestic and international markets combine with climate stressors when considering individual and societal decision-making. Internal stressors to the water supply in this area also include hydropower production at upstream dam operations, natural disasters, labor shortages, and push-pull dynamics with nearby cities. Thus, the Biobío River Basin (BRB) serves as a “natural laboratory” for studying adaptation strategies to impacts of climate change and population dynamics on socio-economic, ecological, and physical systems, especially given the importance of the BRB to the Regional and National economies. Investigating the interactions and feedbacks of these overlapping systems is critical for decision-making and the development of proactive adaptation strategies in the BRB. The goal of this research is to develop a system dynamics model that captures the complex biophysical, economic, social, and cultural interactions and simulates the overall behavior of the system in response to external and internal stressors. Biophysical data from government and academic sources are being combined with interviews with farmers and other stakeholders to provide the basis for modeling the relationships and feedbacks. An internet-based version of the model will also serve as a decision tool for irrigators, administrators, practitioners, and policy-makers to facilitate dispute resolution and support scenario planning. Both the process and products will contribute to several tracks of sustainability science. Keywords: Water Resources, Agriculture, Climate Change, System Dynamics, and Sustainability Science.

A New Conceptual Perspective on Circular Economy: preliminarily confirmation of the 7R Principle by a descriptive Case Study in Eastern China

Thursday, 15th June - 08:00 - SD 703 - Oral Paper

Mr. Jicheng Xing¹, Prof. J. M. Vilas-Boas da Silva², Prof. Isabel Duarte de Almeida³

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The purpose of this study is to outline and demonstrate an innovative conceptual framework on circular economy. Research questions arise from the background literature review and are further developed into the proposed 7R principle model. Its preliminary confirmation is pursued by a descriptive case study of Suzhou Industrial Park (SIP) in Eastern China, which is located neighbouring to Shanghai and extensively recognized as one of the most initial Eco-Industry Parks (EIP) in China and as one of the most successful EIP. To begin with, traditional 3R principle is introduced and, then, the evolvement into 5R is discussed. After that, a proposal for a conceptual framework promoting a 7R principle is put forward. Its components are reduce, reuse, recycle, recover, rethink, resilience and regulate. The descriptive case study based on secondary data provides instances to illustrate that every aspect of the 7R framework is properly embodied by a serial of SIP practices.

DILEMMAS AND RETURNS OF SUSTAINABILITY PROJECTS IN THE LIGHT OF THE SCIENCE OF SUSTAINABILITY

Thursday, 15th June - 08:15 - SD 703 - Oral Abstract

Prof. idalina dias sardinha¹

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In the debate on sustainable development there is still a concern about the contribution of science to the construction of environmentally and socially sustainable communities. Its impact depends on scientific discipline, the way it is shaped and how it interacts with society and politics. The social sciences and humanities (SSH) are decisive for both knowledge and development. In particular when it comes to challenges associated with socially relevant problems in which scientific knowledge must overcome the traditional boundaries of the discipline and engage in inter and transdisciplinary efforts. In this sense, it is assumed that the potential of sustainability-science lies in focusing on solutions, creating transdisciplinary collaborative research contexts, and reducing institutional barriers beyond understanding the changes that have occurred in the nature-society relationship, creating conditions for the involvement of people in the decisions that affect their lives and their environment. But the development of sustainability-science projects can be an arduous path, producing dilemmas, antagonisms and societal conflicts, requiring time, and having a limited influence on the political decision, reducing the potentiality of its results. This article first elaborates on the valuation of the SSH for the sustainability-science, proceeding in the adaptation of the model of Arnim Wiek *et.al.* (2012) on evaluation of sustainability-science projects. This model allows the analysis and appraisal of sustainability projects in order to understand how concretely a project contributed to the transformation towards the sustainability of the systems in question. The work intends to illustrate the difficulties and benefits that arise of these projects where various scientific disciplines are applied and the communities are involved. Two projects developed in Portugal will be analyzed, one on the valorization of a brownfield, and another on the valuation of intangible archaeological knowledge of a region. The projects arose from the need for socioeconomic and environmental long-term sustainable returns to the stakeholders from the effects of the use of local resources. In both projects the approach listening to stakeholders. In the project of brownfield valorization several disciplines and methods were used: from stakeholder's analysis, auscultation and participation to life cycle assessment, contingent valuation and multicriteria analysis. During the project a collaborative plan for brownfield sustainable (re)development was issued. The project on the valuation of intangible knowledge involved the auscultation of the stakeholders and a contingent valuation analysis. A conceptual creative tourism cluster model was found adequate. It was verified in both projects that the organized involvement in the search for sustainable solutions and the integration of interdisciplinary results, benefited the follow-up activities accordingly with sustainability principles. The approach potentiated focal points of action and continuously dialog with growing transformations towards the sustainability of the sites. However in both cases the transformations are of different value, of small scale, of reduced visibility and slow progress. In these two cases, the financial and political barriers commonly associated with the development of sustainability projects are confirmed. May also limitations such as "lack of advanced stakeholder involvement" (Arnim Wiek et al., 2012) were found. The project evaluation process is still under way.

Action and Decision-oriented Studies as a fieldwork methodology in Germany, Brazil and Mozambique

Thursday, 15th June - 08:30 - SD 703 - Oral Abstract

***Dr. Leandro Fontoura*¹, *Dr. Karin Fiege*², *Dr. Samuel Quive*³**

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Climate change adaptation, food security, disaster prevention, rural development, natural resource protection – the global community is searching for strategies and instruments that will guarantee both dignified and viable development for the future. Young specialists and managers have to learn how to create context-specific solutions to the challenges facing society and universities are called upon to take central stage. Trilateral cooperation between universities in Berlin (Humboldt-Universität), Maputo (University of Eduardo Mondlane - Mozambique) and Rio de Janeiro (Federal Rural University of Rio de Janeiro - UFRRJ) is one of the core projects of curriculum development and knowledge exchange in the area of sustainable development. Field studies are the centerpiece of the student training program of the three universities. In them, students put into practice all that they have learned throughout the program, both the general understanding of international cooperation and the various instruments of this area, such as the methodology of analysis, planning and monitoring, group work, presentation and moderation. In order for the field study to be carried out satisfactorily and within the stipulated time, it is necessary to use a systematic and coherent research concept. The preparation phase, called Action and Decision-oriented Studies (ADS), aims to contribute to the development of an appropriate concept. ADS has for many years used a research methodology known as action and decision-oriented studies. This innovative tool, which combines scientific knowledge with user orientation and hands-on practicability, is applied to study assignments from development organizations. Through the ADS methodology the groups of students should elaborate a research concept that: Clearly state the objectives of the study, Clarify the thematic dimension of the study, Develop a methodological procedure appropriate to the topic and Establish a realistic work plan for the entire period of the study. The methodology is divided into three parts: Phase I - Clarification of the mission: identifying the objectives and potential users of the results, formulate key questions, discuss negative side effects and forms of communication. Phase II Definition of the content: define the key topics and thematic areas of the research, the questions to analyze, identify sources of information and define hypotheses and indicators and Phase III - Selection of methods: select the research units and sample, describe the set of methodological tools to be used to achieve the results and the procedure for the analysis. The group organizes the study and continuously updates the work plan afterwards. This methodology has been successfully applied for three years in interdisciplinary fieldwork in Mozambique and Brazil. It is possible to note the improvement in the organization of activities, responsibilities and deadlines, generating more effective results in learning, financial costs and quality of the final product. We believe that this methodology is suitable for application in different scenarios of fieldworks, generating sustainable products that meet innovative needs on local scale, concretizing intervention projects and changing the reality of poor communities, thus being aligned with the philosophy of the Masters in Sustainable Development Practice.

BALANCED and SUSTAINABLE TERRITORIAL DEVELOPMENT (STD). New Geographical criteria and tools to address complexity, change and uncertainty in the 21 century

Thursday, 15th June - 08:45 - SD 703 - Oral Abstract

***Dr. Carlos Hildebrando Fonseca Zarate*¹, *Mrs. Francý Rocío Castellanos Oviedo*², *Mrs. Lizet Viviana Romero*³, *Mrs. Sandra Velasco*⁴, *Mrs. Patricia Torres*⁵, *Mrs. María De La Paz Vela*⁶**
 1. Corporación Simbiosis / Universidad del Sinú Extensión Bogotá, 2. Universidad ECCI / Corporación Simbiosis, 3. Universidad Nacional de Colombia, 4. Universidad del Sinú Extensión Bogotá, 5. Universidad de los Andes / Corporación Simbiosis, 6. Corporación Simbiosis / Editor Principal Revista Gestión

Sustainability goes beyond protecting nature for future generations; current generation and many other aspects must be considered and included, as well as their balanced relationship and possible synergies. Similarly, complete peace is not just the absence of violent confrontation to settle differences, but the harmonic confluence of justice, fairness, freedom, opportunity, inclusion, presence and transparency of the state to avoid factors and seminal risks of conflict and violence. An increasingly preoccupying paradox is that an important part of the territories being abandoned by FARC, are under fight between ELN, BACRIM and the Government to occupy and control them.

Current prevailing view of development over-emphasizes unlimited economic growth and private economic accumulation; True development is a complex and multidimensional process of permanent construction of individuals, communities, territories, nations towards a better world and a “better life” for all.

Based in this latter logic, we built the Sustainable Territorial Development Index, STD If and apply it to all municipalities and departments of Colombia to test its validity. The index expresses the sum of five “wealths” or richness (human, intellectual, public, private and Natural / Environmental), which should exist in each municipality and territory and interact synergistically. Statistical processing of data provides interesting results: 1) Colombia is growing at the expense of natural resources and ecosystems and of increasing risk of its population; 2) As the value of STD if grows, its variance increases, meaning the distance between the five wealth increases, towards a greater imbalance between them. 3) The difference between the actual values of the five wealth is very large, meaning a high unbalance, which requires reducing the distance between them as soon as possible of more sustainability is sought. PCA, Principal Components Analysis, Moran index for “clustering”) and regression analysis, with some geographic Control variables (Physical distance to capitals and ports, presence of illicit crops, illegal mining and climate preference) confirmed “remoteness” of the Municipalities in reference to the “decision centers” of the country. A fast and effective presence of state is needed in these territories, especially in the municipalities where FARC-EP is leaving their armed presence.

Another planning tool for sustainable development, called PEPET, “Prospective Strategic Planning with Triaxial Scenarios”, (Planeación Estratégica Prospectiva con Escenarios Triaxiales, in Spanish) is presented, as a pertinent tool for more participatory and regionally differentiated decision-making. Delphi method is used for conducting queries to face panels about the most important issues at national level; then, massive online consultations are conducted to regional experts in order to choose the most relevant of these issues to their regions in their areas of expertise, and a synthesis of responses under two opposed scenarios are obtained. The results of two national consultations, one on science and technology and other to public administration professionals about their training requirements for post-agreement of peace era, demonstrate the pertinence and validity of the method and signal the importance of areas such as risk management and environmental and natural resource protection.

Sustainable Program Management: Hierarchical Causal Systems

Thursday, 15th June - 09:00 - SD 703 - Oral Paper

Mr. Bongs Lainjo¹

1. CYBERMATIC INTERNATIONAL

Keywords: Pyramid, Causality, Systems, Sustainable, Program and Management.

Problem Statement:

Donors, Multi and Bi-lateral agencies charged with distribution of development funds to primarily low and medium income countries (LMICs) have been guided by universally accepted goals, agreements and conventions. In a significant number of cases, adherence remains inadequate. Effective sustainable program management systems remain inadequate. These limitations call for a need to design an inclusive and standardized program management framework.

Hierarchical Causal Systems:

Aim and Methodology:

To Strengthen and Standardize Program Management Protocols and mitigate nuances, duplication and redundancies.

Seven components that facilitate the achievement of sustainable management of development program are embodied in a conceptual framework the 'CARROT-BUS' model. CARROT is for Capacity, Accountability, Resources, Results, Ownership and Transparency – all driven by an enabling environment and BUS stands for 'Bottom Up Strategy'. The holistic, inclusive pragmatic and causality model is conceptually synonymous with Abraham Maslow's Hierarchy of needs. In this framework, each step of the ladder has a well-defined description including a corresponding, comprehensive and relevant strategy and case study to facilitate user understanding.

Findings:

Many beneficiaries continue to live in squalid conditions; poverty remains ubiquitous despite reports to the contrary and improved quality of life in vulnerable populations remains a distant dream. Above all, Western countries have woefully failed to meet their own pledges of donating 0.7 % of their GDP to (LMICs). Only four countries have achieved this objective.

Conclusion:

Designing and implementing sustainable development programs remains complex. The systems presented in this abstract are a way of addressing these complexities. They serve as an option aimed at mitigating gaps and nuances that are an integral component of development aid. An urgent need for a streamlined and effective paradigm shift is required. CARROT-BUS is one attempt to fill these gaps.

Program Indicator Screening Matrix (PRISM): A Composite Score Model

Wednesday, 14th June - 11:30 - SD 704 - Oral Paper

*Mr. Bongs Lainjo*¹

1. CYBERMATIC INTERNATIONAL

Over the last six decades since many low and middle-income countries (LMICs) achieved independence, attempts by multi and bi lateral agencies to provide effective foreign assistance have been met with mixed results. There continues to be a need to strengthen understanding of program dynamics, its synergies and results (both intended and unintended). There is also a pressing need to establish a common ground among these donors, implementing agencies, other stakeholders and potential evaluators.

It is in light of the above challenges that the framework: Program Indicator Screening Matrix (PRISM) was designed. The model is defined by six criteria – Specificity, Reliability, Sensitivity, Simplicity, Utility and Affordability.

Relevance

Context

In an attempt to improve results based management (RBM) in general and intervention data specifically; making foreign aid more focused and strategic with compelling evidence-based results; donors have increasingly teamed up and progressively introduced ubiquitous evaluation processes as an integral component of any program. In course of streamlining program implementation, funding agencies in collaboration with recipient governments and other stakeholders have also promoted the availability and utilization of strategic frameworks (SFs). The current most frequently used SFs are the Logic Framework and the Strategic Objective framework. These frameworks serve as complementary elements of RBM.

A critical component that continues to confront many development aid Stakeholders, is the ability to establish equitable, standard and inclusive strategies that include, donors, national governments, implementing agencies, program managers, beneficiaries and oversight systems. Current reviews of existing dynamics continue to be mixed. And hence a compelling need for a paradigm change cannot be adequately emphasized. Informed decisions are only as useful and constructive as the trustworthiness of the relevant data.

Objective of PRISM

The general objective of this model is to strengthen the knowledge of Implementing Agencies, Program Managers and other key and relevant stakeholders in LMICs; emphasizing sustainable engagement by mitigating indicator redundancies and optimizing results in program management.

Framework and Methodology

The model comprises a set of deterministic criteria simultaneously applied in an attempt to identify the most effective set of indicators in any thematic program area. At the same time it mitigates many program management nuisances by making indicators and data more trust worthy. The model criteria include: specificity, reliability, sensitivity, simplicity, utility and affordability. Experts are required to conduct the assessment. The working groups of experts use an analytical approach synonymous with the Delphi methodology. Each

indicator during the assessment process is assigned binary outcome (0,1) based on its performance with the relevant criterion. The resulting composite scores are evaluated against a “gold-standard” or target established by these experts a priori.

As a quality control measure, all the teams’ outcomes are finally evaluated based on the degree of intra-team and inter-team concordance. And it is only after this level of concordance is established that the final indicators are selected. The model is thematically generic with an inclusive target audience. It has been successfully tested in Africa, Pacific Island Countries and the USA.

(Key words: Indicator-screening-matrix, Results-based-management, Gold-standard, Concordance, Binary-outcome, Composite-score.)

The Fishery Performance Indicators: A New Instrument for Assessing Sustainability of World Fisheries

Wednesday, 14th June - 11:45 - SD 704 - Oral Abstract

Dr. Diego Valderrama¹

1. Universidad de los Andes

It has been estimated that world fisheries fall short of their potential earnings by US\$50–80 billion a year, with losses resulting not only from foregone catch due to overfishing, but also excessive harvest cost, low processing yields, product waste, and a failure to reach the highest value markets. The result is lost income to small-scale and industrial harvesters and processors, foregone high quality protein to consumers, and reduced food and income security for fishing dependent communities in both developed and developing regions. Despite the need to understand how to best manage fisheries to capture the foregone benefits, research on global fisheries performance emphasizes primarily the effects of biological management on stock and ecological conditions. While fisheries cannot be sustainable with degraded target stocks, high stock levels will not necessarily lead to an economically healthy industry that can support the community in which it resides. Resolving this social dilemma requires identifying whether and how fisheries are supporting the people who participate in them, and understanding how management influences human outcomes. To this end, the Fishery Performance Indicators (FPIs) were developed by a group of U.S. academic economists as a rapid assessment instrument designed to capture how fishery resources are contributing to the wellbeing of the people and communities that depend on them, and to document factors supporting wealth generation. It includes 67 measures to assess wealth accumulation on 11 dimensions of stock, harvest industry performance, and post-harvest industry performance; and 54 measures of enabling factors – including management and governance – to associate with variation in outcomes. The researcher's task is to score each measure accurately, but not necessarily precisely, and to track the degree of confidence in each measure's score. Each measure is scored on a one-to-five scale using data where possible, but relying primarily on nonquantitative factors that can be scored by experts in any fishery or fishery sector. This feature makes it particularly well suited to applications in data-poor countries or industry sectors. Among the questions the FPIs can help answer are: How well is a fisheries management system working? What are the key factors influencing success (or failure)? What are key investments that should be considered in order to promote successful fisheries management reform? Based initially on 61 fishery case studies drawn from industrial and developing countries around the world, the FPI database has expanded to include nearly 120 case studies since the landmark publication was released in May 2015. This presentation will provide recent applications of the FPIs that illustrate their potential towards improving the economic, community and ecological sustainability of world fisheries.

Exploring Spatial Interactive Sustainability Reporting at Community Level: The Case of Manglaralto, Ecuador

Wednesday, 14th June - 12:00 - SD 704 - Oral Abstract

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It is fundamental to monitor, evaluate and report the state of sustainability at local level, to better implement sustainable development principles and practices. Local sustainability reports should be communicated in an understandable and accessible way for stakeholders, and be supported with its involvement and participation. Despite several initiatives that refer public engagement in sustainability reports, from national to corporate levels, usually the reports are published through the traditional platforms (paper and internet) and participatory approaches are restricted to consultations of stakeholders during the reporting development process. These initiatives do not explore the role that could be played by the physical territory to publish and communicate sustainability reports to local stakeholders. The aim of this research is to develop a framework to support spatial interactive sustainability reports, where stakeholders' involvement will effectively contribute to the (i) planning and conceptualization, (ii) implementation and communication, (iii) operation and action, (iv) follow-up updating and reviewing. The proposed model supports the collaborative development and implementation of an interactive local sustainability report that is presented in the local territorial sustainability hotspots. Different thematic indicators of a sustainability report are physically presented along the local territory, according to the relevant thematic environmental and socioeconomic issues and/or human activity of a certain spatial area. For each set of indicators presented, associated measures of action to be implemented by local stakeholders are similarly presented and proposed, as well as an interactive open board and box to collect stakeholder's suggestions of measures to respond to the sustainability issue covered in that spatial hotspot. The proposed approach was assessed and tested in the Manglaralto Community, located in the Peninsula de Santa Elena, Ecuador. This study showed the importance of a spatial interactive sustainability reporting process, involving local stakeholders. It is concluded that this methodology allows a better understanding of each indicator by the local community and how it could respond to their concerns, aspirations and challenges. It should also help the local decision makers to communicate sustainability data, and receive stakeholders support for the implementation of suitable actions and practices

Key-words: sustainability reporting, spatial interactive, indicators, local communities, stakeholder's engagement

Environmental Policies Performance Evaluation in Portugal

Wednesday, 14th June - 12:15 - SD 704 - Oral Paper

Mr. Pedro Mota ¹, Dr. João Joanaz de Melo ²

1. Faculdade de Ciências e Tecnologia, Universidade NOVA de Lisboa, 2. CENSE, Universidade NOVA de Lisboa

Environment is a central aspect in any sustainable future scenario. Environmental policy, despite being relatively recent, is now one of the most regulated aspects of modern societies. Countries develop at different paces, just as their approach to environmental problems does. Portugal, as a member state of the European Union, has made most of its progress with help from external policies. Portuguese legal and regulatory framework is now wide and embraces almost every environmental subject. However, visible outcomes often do not meet expectations. The main goal of this study is to evaluate the performance of Portuguese environmental policies. Ten themes were selected, a combination of environmental domains and economic sectors: water; waste; agriculture and forestry; energy and climate; mobility and transport; industry; biodiversity; cities and territory; oceans; and tourism. A systematic review of environmental goals and targets in national and European policy instruments was conducted. Quantitative indicators were used to verify the evolution of the main environmental aspects, supporting a comparison with the objectives and goals stated in the policy instruments. The causes and consequences of the noted successes and failures were discussed. Results point to divergent evolutions over different environmental themes. Water and waste have had mainly positive performances, although many indicators are below targets. Energy and climate policy have presented mixed outcomes, with mainly negative trends until 2005, when a paradigm shift has begun, with more attention being given to energy efficiency and renewables. Agriculture, industry, tourism, and ocean management also have shown mixed outcomes: often efficiency of resource use improved, but common practice is far from sustainable. Biodiversity and land management have degraded rapidly for decades; they are now more stable, but most negative trends have not inverted. Mobility shows heavily negative trends: increasing overuse of road transport and private cars. A notable priority has been given to infrastructure construction, often not accompanied by adequate planning and management. This partially justifies the successes achieved in water and waste policies, but also the failure of territorial planning, biodiversity and transportation policies. Results of the study are being presented to social stakeholders and policy-makers, to enable well informed and better quality decision making, leading to successful policy implementation.

DISPOSAL MILK: A HEALTH AND ENVIRONMENTAL PROBLEM

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

***Dr. Edison Schmidt Filho*¹, *Dr. Marcia Aparecida Andreazzi*¹, *Prof. Isabele Picada Emanuelli*¹, *Dr. Fábio Luiz Bim Cavaleri*², *Ms. Rafaela Carvalho Alves*¹, *Ms. Camila Schubert Marques Dos Reis*¹, *Mr. Adriano Rogério Mendes*¹**

1. UNICESUMAR, 2. CENTRO UNIVERSITÁRIO DE MARINGÁ/ UNICESUMAR

The Brazilian dairy production is in increasing expansion due to the evident improvement in the productive capacity of the herd of cattle. However, many dairy farmers face health problems in their herds, such as mastitis, hull problems, parasitic sadness, among others, that require pharmacological treatments. The result of the institution of these treatments is the presence of residues of drugs in milk, a fact that prevents their consumption by humans, because they constituted a health risk. This milk, known as disposal milk, is non-marketable milk which has been rejected by the industry either for diseases such as mastitis or for other reasons for antibiotic treatment or for health problems such as poor hygiene. The objective of this research was to characterize the main ways of destination of disposal milk from dairy farms in southern Brazil. The methodology consist a data collection in 26 dairy farms on the destination of disposal milk: supply for calves, supply to other animals, dumped into the environment or others. The data were tabulated and the forms used were evaluated. The results showed that most of the properties provide untreated disposal milk for calves, showing that producers have limited knowledge about the health, production and environmental consequences of this form of destination. This action represents a serious economic loss for the producer and these practices are not sustainable from the economic, sanitary and environmental point of view. Provision of milk containing residues of antibiotics to calves can lead problems such as increased risk of bacterial resistance and transmission the mastitis bacteria to growing heifers. The literature recommends caution with the use of this milk as not providing it to calves in the first days of life, not using it if it has visual changes such as presence of blood, aqueous milk or excess of lumps, dilute the milk of the first milking after antibiotic treatment in milk without antibiotics or pasteurizing the milk to be used for breastfeeding the calves. These actions prevent their disposal in the environment as well as allow their use in a safe way. It becomes evident guide and disseminate relevant information about the correct destination of disposal milk, seeking to contribute to the milk production chain, making it more economically, sanitary and environmentally sustainable.

Key words: milk with antibiotic, sustainable agriculture, dairy cattle.

Environmental Management Systems in the wine industry: identification of best practices toward a Circular Economy

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Paper

Dr. Alessia Acampora¹, Dr. michele preziosi¹, Prof. Roberto Merli¹, Prof. Maria Claudia Lucchetti¹

1. Roma Tre University

Over the last decades, great attention has been paid to sustainability issues in the wine industry. Thus, many sustainability practices are spreading and at the same time many efforts have been carried out to spread them. In pursuing sustainability, a great number of wine firms have also implemented Environmental Management Systems (EMSs), in compliance with international standards for EMS as ISO 14001 and EMAS (Eco-Management and Audit Scheme). Furthermore, in recent years also the concept of circular economy (CE) has become widely diffused. The transition from the dominant “take-make-dispose” economic model towards a circular economy is engaging governments, institutions and researchers around the world, with the goal of achieving a more sustainable society. Limited natural resources and environmental issues related to production are the main drivers of this revolution. Indeed, several national policies, businesses and consumers are gradually adapting to this new approach. Different tools have been proposed to enhance the process circularity in different sectors, including the EMAS Regulation. The aim of the present paper is to examine the potential contribution of the Environmental Management System, defined by the European Regulation EMAS, toward a circular economy and society. In particular, it explores the potential application of EMAS environmental indicators as a baseline for the implementation of specific CE indicators. It also evaluates the role of EMAS for the dissemination of good practices and the identification of indicators for CE in wine industry. Starting from the analysis of indicators defined by the EMAS European Regulation, we have identified how these indicators can capture the 3R principles of CE. Even though they can describe companies’ efforts in terms of input material and output waste streams reductions, they lack in measuring reuse and recycling practices that are core activities in a CE approach. Nevertheless, these indicators are a starting point to evaluate circular processes that fully embrace the logic of the “closed loop” production. As the paper has shown, the micro-level CE indicators that have been developed till now might be integrated together with EMAS indicators developed in the wine industry to create common metrics to measure CE progress in the wine sector.

Conceptual framework for indicator selection in Water Resources Planning and Strategic Environmental Assessments

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Mrs. Rosa Santos Coelho ¹, Prof. Pedro S. Coelho ², Prof. Tomás B. Ramos ¹, Prof. Paula Antunes ¹

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Indicators are increasingly used tools to support assessment and communication in planning processes. Water resources plans and their strategic environmental assessments are instruments that could be supported by indicators to characterize the baseline situation, assess the status of resources and implications of planning options, monitor the implementation of the proposed measures and communicate this information to stakeholders. Despite the relevant amount of works on sustainability indicators and water resources planning and assessment, there is still a lack of research on the indicator selection stage. Indicator selection is usually conducted by planners and other experts, and little information is reported about how to design and implement this practice. The main aim of this research is to develop a conceptual model to select suitable indicators for water resources plans and respective environmental assessments. The proposed framework is supported by a participatory oriented approach, assuming that effective stakeholder's engagement improves the accuracy and effectiveness of this stage. To put the proposed framework into practice, a set of different steps and procedures is proposed for adoption in a national case study - the Portuguese water resources planning and SEA processes - and the usefulness of this methodology is demonstrated. The tool developed could support future indicator implementation for water resources planning initiatives, allowing greater guidance, objectivity and transparency in these processes.

ACTION RESEARCH: APPLICATION OF THE INDICATOR RATE OF PROCESSING OF MEALS AS A TOOL FOR SUSTAINABLE MANAGEMENT IN RESTAURANTS

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

*Dr. Edison Schmidt Filho*¹, *Ms. Queila Turchetto*¹, *Prof. Isabele Picada Emanuelli*¹, *Dr. Marcia Aparecida Andreazzi*¹, *Mrs. Carlos de Barros Junior*¹

1. UNICESUMAR

The sector of restaurants, for questions of practicality and cost, walks for the contrary way of commodity current for a more healthful and sustainable feeding, substituting foods in natura or minimum processed by processed foods. In this context, this study evaluated the efficiency of the index of processing of the meals (INPR) as indicating of partner-ambient sustainability for restaurants by means of a study of initial case and a research action for intervention of the productive processes of foods. For in such a way, one after became fulfilled two analyses of the calculation of INPR one before the intervention (INPR1) and another one interventions in the menu and list of purchases in the unit (INPR2). The Pointer developed for Matuk 2015 was calculated through the acquisition of foods of the restaurant during one month of functioning. The foods had been classified by the new Alimentary Guide for Brazilian Population and for accomplishment of I calculate it transformed into unit of measure standard, pounds. The first collection of data supplied the INPR of 1,34, inferior index to the acceptable one of 3, what it indicated that the restaurant used superior amounts of processed and multiprocessed foods in relation to foods in natura. After the application of the INPR1, became fulfilled it research action presenting the data to the management of the establishment in brainstorming for changes in the menu and the list of purchases aiming at to use the possible minimum of substances processed cousins. The result found in the analysis of the INPR2 was distinct of first analysis INPR1. After interventions the restaurant presented levels of 3,77 that they are adjusted for sustainability in accordance with the pointer. Based in this research action, we can conclude that the INPR is a pointer of viable sustainability and easy use in restaurants when added it interventions in the menu by means of reduction of ingredients processed in plates. The partner-ambient INPR as manager inferred directly in the nutritional quality of foods, as well as reduced the generation of residues as packings (boxes, glasses, plastics...) exciting the concepts of the sustainability.

KEY WORDS: *Processed foods; Pointers; Ambient impact*

HIP — a Happier Index for the Planet?

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Paper

*Ms. Julia Bondarchik*¹, *Dr. Matylda Jablonska-Sabuka*¹, *Dr. Lassi Linnanen*¹, *Dr. Tuomo Kauranne*¹

1. Lappeenranta University of Technology

Measuring complex and rather intuitive qualities such as sustainability requires combining variety of measures together. The resulting composite indicator depends not only on the component sub-indices but also on the way they are combined together. We are considering the Happy Planet Index (HPI) as an example of a composite sustainability indicator that aggregates information on positive qualities like life-expectancy and human well-being with negative ones like ecological footprint to rank countries according to their sustainability state. However, since component indices are often mutually correlated and feature quite different distributions of entities ranked, elaborate rules are used in the process of combination. As a result, the resulting composite index may look somewhat contrived and its rankings may depend heavily on subjective parameters in the combination process. We propose a geometrically motivated parameter-free method for combining indices with contrasting effects together. The method is independent of the number of sub-indices to be combined and eliminates mutual correlation between component indices by using Singular Value Decomposition (SVD) analysis. By applying our methodology, we reconstruct the latest Happy Planet Index results (2016) and prove the feasibility of the proposed approach. As a result we conclude that altering the measures of life expectancy and wellbeing with the inequality adjustments improves the objectivity of the sustainable wellbeing assessment.

Keywords: Sustainability indicators, Composite indicator, Singular value decomposition, Happy Planet Index

Human development classification from environmental indicators using LDA

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

***Dr. Salvador Ramos*¹, *Dr. Mirelle Picinato*², *Dr. Jose Paula Silva*³, *Prof. Antonio Sergio Ferraudo*²,
*Dr. Monica Andrade*¹**

1. Universidade de Franca, 2. UNESP/Jaboticabal, 3. Universidade Estadual de Minas Gerais

The Sustainable Development Goals (SDG) can be monitored through statistical evaluation of indicators of interest. These indicators might measure social and environmental issues. But there is a lack of studies that assess the association between human development and environmental performance through the use of modern statistical learning techniques. The aim of this study was to estimate the association and a predictive model of the human development index from environmental performance indicators by the means of Linear Discriminant Analysis (LDA) and cross-validation (CV). The dataset was built merging the 2015 United Nations Human Development Index (HDI) and the 2016 Yale's Environment Performance Index (EPI) datasets by country. It consisted of 76 observations of the following selected environmental indicators: population lacking access to sanitation (unitless), tree cover loss (%), health risk from household air quality (unitless), health risk from PM2.5 exposure (unitless), wastewater treatment level (%), exposure to unsafe water quality (%) and population lacking access to drinking water (unitless). A LDA was conducted considering the HDI classification as a response variable and the selected environmental indicators as explanatory variables. The Leave-One-Out-Cross-Validation (LOOCV) technique was used to evaluate the predictive ability of the model. All analyses were conducted using the R Software v.3.3.1. The first two estimated linear discriminant functions showed a cumulated explained variance equal to 97%. The built LDA model was able to correctly predict 84% of the sample observations. Considering the LOOCV technique was used, this results suggest there is a strong association between the well-being of a population and its environmental performance. This means that changes in the studied environmental indicators are linked with changes in a population's well-being. It also suggests the model can predict with high accuracy the well-being of a nation from environmental variables. This tool can help scientists, politicians and managers to monitor and improve the performance of sustainability indicators.

Pollution indicators for use in Life Cycle Assessment: review and simplification

Thursday, 15th June - 14:00 - SD 701 - Oral Paper

Ms. Sofia Luís¹, Dr. João Joanaz de Melo²

1. Universidade NOVA de Lisboa, 2. CENSE, Universidade NOVA de Lisboa

Life Cycle Assessment (LCA) is a well-known tool in the scientific community, useful to compare products and industrial processes. However, LCA is not commonly used in the industry, as it requires a large effort and investment. There is a large variety of Life Cycle Impact assessment (LCIA) methods, some quite complex, each with different methodologies that lead to different results and eventually different decisions. In particular, the integration of pollutants into aggregate indicators has been treated in many different ways, both due to different approaches and because the impact of certain pollutants is not yet fully understood by the scientific community (dioxins and furans are a case in point that merited particular attention). Additionally, the range of local impacts is wide and not easy to adapt to LCA (which of necessity must be standardized over multiple products and processes). The aim of this work is to provide a solid comparison of indicators of pollution to air, water and soil, provided by a variety of LCIA methods: CML2001, Eco-indicator99, EDIP2003, Impact2002+, ReCiPe, TRACI and EcoBlok. The pollutants considered are those in the Pollutant Release and Transfer Register (PRTR), established by the Kiev Protocol under the Aarhus Convention, which covers nearly all pollutants invoked by the LCIA methods and is supported by international databases. The first step was to compare the relative importance attributed by each method to the range of pollutants. The second step was to compute equivalent pollution, as defined by each method, for nine major industrial sectors (energy, metallurgy, mining, chemicals, waste treatment, wood and paper, livestock, agri-food, and others), using available information of the PRTR-Europe database. The third step was to compare results provided by the different methods and examine similarities and differences between them. Results indicate that most methods converge in impact categories such as global warming and acidification potential. The most significant differences emerge in the human health and ecotoxicity impact categories, where the same pollutant may vary in relative importance by five orders of magnitude, from one method to the other; similar differences appear when comparing economic sectors in those impact categories. Although these are preliminary findings, it can be argued that the additional work required by some complex methods does not seem to be rewarded by more robust or useful results. Simpler methods may be as meaningful, more transparent and easier to use in practice by the industry.

Keywords: environmental indicators, life cycle assessment, pollution

ECO-PRODUCTIVITY AS AN INDICATOR FOR SUSTAINABILITY

Thursday, 15th June - 14:15 - SD 701 - Oral Abstract

***Prof. Carolina Daza-Beltrán*¹, *Prof. Martha H. Saravia-Pinilla*¹, *Dr. Gabriel García-Acosta*²**

1. Pontificia Universidad Javeriana, 2. Universidad Nacional de Colombia

The work presented in this paper is part of a collaborative research project looking for the development of ergoecology as a framework for the design and improvement of innovative products and services. Defined since 1997 by García-Acosta, Saravia & Romero as a scientific and technological discipline, the *Ergoecology* –from a systemic focus– takes care of studying the human-being and its relationships with the environment –through its activities (work)– to establish, analyse, reduce, prevent, control and rectify the impacts (positives and negatives) that derive from such a relationship (García-Acosta, Saravia, Romero & Lange, 2014), creating a direct interdisciplinary connection between the area of ergonomics and the broad field of ecology. Looking forward to a dynamic equilibrium and an environmental balance, Ergoecology proposes as postulates ‘eco-efficiency’ and ‘eco-productivity’. However, the last one has not been sufficiently developed in a way to be applied. This work puts forward the concept of eco-productivity and some guidelines for its application from the Ergoecology perspective. The methodology was a systematic literature review with analytical approach using Nvivo 11. The basis for the review was the Ergoecological Fundamentals, which include: principles and postulates (eco-productivity, eco-efficiency and eco-effectiveness (García et al, 2014) as well as some notions (macroconcepts) regarding design, product development, innovation, sustainability, ecology, and ergonomics was built, in order to identify the keywords to build the search equations. After reviewing almost 850 documents from different databases we found 15 that mentioned at least two of the three postulates of ergoecology. Only five of them talked about eco-productivity (Barbiroli, 2006; García-Acosta, Saravia & Riba, 2012; Thatcher, García-Acosta, & Lange, 2013; Lange, Thatcher, & García-Acosta, 2014; García-Acosta, Saravia, Romero & Lange, 2014). Barbiroli proposed the need of achieve eco-effectiveness in order to increase productivity of resources. This relationship is based on restitution and regeneration of resources which could increment the availability of materials and supplies. Instead, ergoecology, defined eco-productivity as the ability of systems to transform energy, matter (resources) and information into products or services, without generating negative impacts on other systems that interact with them. In that sense, this implies in the first place, the rationalization of the impact variables to control the productive system and always tending to the operational equilibrium (García-Acosta, Saravia, Romero & Lange, 2014), and secondly the application of environmentally friendly innovative technological changes to develop environmentally acceptable products and processes. In order to achieve the eco-productivity, some guidelines for its application are proposed from Ergoecology. These guidelines includes three moments of productive processes: The use of resources (input), resource processing (processes) and products obtained and use (output); adopting the axioms of Ergoecology (energy, matter and information) as eco-productivity estimating variables. We may conclude, that the concepts of *eco-productivity* along with the *systemic eco-efficiency* can become strategic indicators to assess the interdependencies between artefact–human systems or sociotechnical systems and natural systems. The eco-productivity guidelines can contribute to decision-making in the different phases of production processes to ensure the long-term sustainability of organizations.

The Sustainability of the Millennium Development Goal to Halve Poverty

Thursday, 15th June - 14:30 - SD 701 - Oral Abstract

Prof. Yaniv Stopnitzky¹

1. University of San Francisco

The United Nations Millennium Summit in 2000 resulted in a commitment by UN member states to a development agenda comprised of eight specific human development goals with accompanying sub-targets, which are to be achieved by 2015. Most prominent among these ambitious objectives has been the halving of global poverty between 1990 and 2015. This MDG represents an international commitment to reduce the incidence of people living on less than \$1 per day from approximately 3% to 15% of the developing world population. Given population growth, reaching this goal meant the abrogation of extreme poverty for an estimated one billion people. This paper makes two contributions to our understanding of the sustainability of progress toward to this goal. First, it extends recent work on sustainability indicators, such as the adjusted net savings figures of the World Bank, by incorporating novel methods for human capital accounting and the country-specific computation of capital-output ratios. Second, the paper applies these new measures of genuine income and comprehensive wealth to assess countries' progress toward the MDG on poverty reduction. I use this new dataset on 126 countries from the period 1990 to 2014 to calculate annual genuine income, genuine income per capita, and genuine wealth per capita, and show that for a large subset of countries this indicators of sustainability were negative. Most importantly, I show that genuine wealth per capita was shrinking rather than growing in 58 countries over this time period. These countries may have made progress toward or achieved their Millennium Development Goal of poverty when looking at traditional income measures such as Gross Domestic Product but a more expansive view of economic activity suggests GDP per capita was boosted at the expense of the overall productive asset base on which the economy, and all human well-being, fundamentally depends. This finding raises concern about the medium to long-term sustainability of the globe's recent halving of absolute poverty.

Sustainability Indicator Approaches in River Basin Planning and Management: An Integrative Review

Thursday, 15th June - 14:45 - SD 701 - Oral Abstract

***Mr. André Batalhão*¹, *Dr. Denilson Teixeira*², *Prof. Tomás B. Ramos*³**

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Sustainability indicators are essential tools to ensure the identification of a comprehensive strategies and realistic way of assessing and improving sustainability. This tool can be used for river basin planning and management, including monitoring, assessment and reporting. Also, indicators are important assessment tools to identify social needs and contribute to public planning and management. However, the proper use of indicators in the public management is still a methodological and political challenge with rather vague guidelines in many scales. Few studies explored the different potential uses and impacts of indicators as complementary tool to decision-making in water management and planning processes. The aim of this research was to conduct an integrative review of different sustainability indicator approaches used for river basin planning and management. The literature review was mainly supported by a selection of scientific papers from Scopus. The analyzed manuscripts were dated from the year 1995 to 2016 with the following keywords: "sustainability", "river basin", and "indicators". The initial list (N = 134) consisted of academic papers based on set of keywords. Secondly we performed a screening based on all the topics of the papers, not limiting the search of the terms in titles or abstracts. We executed this task manually to ensure that the content of the papers was related to the system of indicators (final list N=130). The main findings demonstrated similar results in territorial level however we identified different models of sustainability adopted. Most of the experiences were regional territorial scope, had a systemic approach, and adopted an indicator model supported by environmental metrics. We conclude that the indicators systems reviewed are not only a set of different technical approaches and tools, but a balance of strategies, demands, actions and tacit knowledge.

Keywords: sustainability indicators; river basin, management, planning

Assessing the financial sustainability of ‘Alternative Food Networks’ in the UK using box schemes as an example

Thursday, 15th June - 15:00 - SD 701 - Oral Abstract

Ms. Paola Guzman¹

1. Coventry University

Retailing of organic produce in Europe and North America can be divided into two types -supermarket and non-supermarket. Supermarket retailing of organic produce usually favours production in bigger farms which grow six to ten crops per year, employ low wage labour and are profitable due to the economies of scale. Non-supermarket retailing is perceived as favouring small scale production where farmers tend to grow more than 30 varieties of crops and earn higher returns due to smaller supply chains. Examples of non-supermarket retailing are farmer’s markets, independent shops, food cooperatives, buying groups, online retail, community supported agriculture (CSAs) projects and box schemes. In academia, these types of enterprises have been part of the ‘Alternative Food Networks’ (AFN) literature.

The literature proposes that AFNs are more sustainable than conventional food retail because they aim to provide food sustainably by belonging to a certain locale, being financially viable, ecologically sustainable and socially just. But the sustainability of AFNs is questionable. Literature has highlighted socio-economic problems in the implementation of AFNs such as low wages, exclusion and protectionism. Whilst the organic movement in Europe and North America has developed knowledge and complexity in organic production techniques, it lacks knowledge on how to sustainably retail organic produce. As a result, some AFNs have begun to self-regulate by what is being called ‘beyond organic’ certification.

In the UK ‘beyond organic’ certifications hope to demonstrate that there are AFN retail businesses that have overcome socio-economic problems. They aim to introduce industry standards and benchmark current practices to support the growth of the sector. However, the organisers behind these initiatives have little understanding of the financial sustainability of the sector and what indicators to use in order to assess it. Furthermore, interest in understanding the sustainability, including financial, of the sector has become more important thanks to the uncertainty on food and farming policy in the UK due to Brexit. The AFN sector wants to be able to influence new policy that potentially will be beneficial for it.

This research aims to assess the economic value, economic impact and scalability of AFNs using vegetable box schemes as an example. Vegetable box schemes are businesses that deliver fresh produce weekly and customers pay in advance of delivery therefore ensuring demand week by week. The research will develop indicators to assess the financial sustainability of box schemes

This presentation will show a hybrid approach to assess box scheme’s financial sustainability. This approach considers box scheme’s commitment to locale, environment, social justice and financial viability. It will present results from a desktop research of frameworks to evaluate the financial sustainability of supply chains and food systems and a critical review of the values based supply chain framework developed in the USA. Finally, it will report on initial results of a national box scheme survey and how the hybrid approach will generate financial sustainability indicators that could be adopted by ‘beyond organic’ certifications.

Meta-evaluation of environmental education projects: rethinking the role and effectiveness of indicators

Friday, 16th June - 09:00 - SD 701 - Oral Paper

*Dr. Claudia Pocho*¹, *Prof. Tomás B. Ramos*²

1. Universidade NOVA de Lisboa, 2. CENSE, Centre for Environmental and Sustainability Research, Universidade NOVA de Lisboa

There is a relevant amount work on the assessment of governmental environmental education projects and programs. However, these tools do not usually include evaluation of the performance instrument itself. There is a lack of research on approaches that support the evaluation of the evaluation, identifying the strengths and weaknesses of an evaluation, and drawing conclusions about its overall utility, accuracy, validity and feasibility. This main research aim is to present a meta-evaluation approach to analyze the efficiency and effectiveness of an assessment model of governmental environmental education programs. Meta-evaluation can serve a valuable function as a quality-control tool during the implementation of an assessment. A Brazilian case study in the energy sector is used to test the proposed approach and usefulness of the proposed methodology is demonstrated. The selected case to test the meta-evaluation approach is an assessment model of environmental education programs operating in oil and gas facilities. The assessment model is supported by monitoring indicators. The proposed meta-evaluation framework is based upon a participatory oriented approach and is structured through a checklist of criteria and meta-evaluation performance indicators, that analyses how appropriate the education assessment indicators are and allows an evaluation of overall assessment tool's performance. The case study data were collected through a questionnaire survey and focus groups. Stakeholders evaluated model's performance, covering several parameters: utility, accuracy, validity and feasibility. Stakeholders also conducted a detailed analysis on the relevancy and adequacy of the model indicators and assessment procedures, as well as its capacity to guide teams in the improvement of environmental educational programs and projects. The main results indicated that the analyzed assessment model was accepted by stakeholders as a relevant tool to foster improvements and innovations on education environmental projects, programs and public policies while many suggestions were given to the betterment of indicators and its descriptions. The meta-evaluation process also included governance procedures that pre-established how the collected suggestions about the analyzed assessment model could be judged and implemented. Lastly, a seminar was provided to share the meta-evaluation results to stakeholders in general, including the changes adopted in the assessment model for government environmental education programs. These results enlightened the question about the role and applicability of indicators considering the challenges of supporting government policy development and management strategies, and sustainability evaluation and reporting of strategic instruments (policies, plans and programs).

meta-evaluation, environmental education project, performance assessment, indicators

A Spatial Hedonic Analysis of a Large, Failing Desert Lake The Case of the Salton Sea in California

Friday, 16th June - 10:15 - SD 701 - Oral Abstract

Dr. Amrita Singh¹

1. University of Alberta

A number of hedonic studies report that proximity to a water body increases the value of residential properties, yet many lakes around the world show acute environmental stress (e.g. falling water levels, and pollution) due to water transfer agreements, persistent droughts, and polluted urban or agricultural runoff. Inland water bodies suffer especially from air pollution and falling water levels that contribute to worsening air quality due to the exposure of desiccated lake shores. To our knowledge, however, no published hedonic study has jointly analyzed the economic costs of falling water levels, deteriorating water quality, and the resulting regional air quality impacts for a large inland water body. We conduct such an analysis with an application to the Salton Sea, which is the largest lake in California. In our study we specifically use hedonic regression models to analyze the relationship between distance to the sea and local environmental conditions (e.g. water levels, water clarity, and air quality) on single family home transaction price.

The Salton Sea is a saline lake located in California's Sonoran desert. In recent decades, the agricultural runoff from surrounding farms has led to severe levels of saline within this land locked sea. The nutrient loading has caused environmental hazards such as massive fish die-offs, as well as looming sulfur odors. The eutrophication process will be further exacerbated in the coming years due water transfer agreements, which will severely reduce water inflow into the sea and further increasing salinity. Additionally, as waters recede, the sea's shorelines, along with the remaining salt levels, will become a potential source of harmful fugitive dust in the form of particulate matter PM10, thus threatening the health of the local population, which primarily consist of agricultural farm workers and their families.

Given the problems associated with the sea, we use a spatial hedonic regression model to see if distance to the sea, dropping water levels, deteriorating water and air quality are negatively capitalized in the surrounding real estate values.

Our analyses of single family properties, from 2009-2013, within 10 miles of the sea indicate that proximity to the Sea is negatively capitalized in the surrounding real estate market. On average, a one-mile reduction in distance to the Sea is associated with a \$1,190 fall in the price of a single-family residence. In addition, a one-foot drop in the Sea's annual water level is associated with a \$8,628 price decrease, while a one mg/m³ increase in annual PM10 concentration reduces the value of the average family residence by \$1,249. Water quality is not statistically significant. These results quantify some of the economic costs associated with the severe environmental degradation of desert lakes and illustrate the connection between water quality, water levels, and air quality. Property values are an important source of revenue for any community. We show that further environmental deterioration of the Salton Sea negatively impacts property values, as well as the community's revenue.

Sustainable Neighborhoods Observatory: urban sustainability indicators at the local scale

Friday, 16th June - 10:45 - SD 701 - Oral Abstract

Prof. Renato D'Alençon¹, Prof. Roberto Moris¹, Dr. Stefan Steiniger¹, Mr. David Aviles¹

1. Pontificia Universidad Católica de Chile

The quantification of sustainability is a question that has grown in importance in academic and political circles as sustainability problems gain space in public awareness. In this debate, the installation of independent or consensus representative actors, called “Observatories”, can play a relevant role for the establishment of these tools and their effective use in design, implementation and monitoring of public policies towards sustainability. Whereas in international agreements there is rather a perspective on a country-scale sustainability, private individuals are striving for a more sustainable lifestyle and even cities start to look at their sustainability, mostly from an environmental perspective. In this context, what has been rarely looked at, is sustainability at a neighborhood scale. The construction of indicators to measure urban sustainability is not appropriate today to the neighborhood scale nor to the formulation of urban sustainability policies. A multi-criteria social evaluation is necessary as a general framework for the formulation of policies and adapted to the specificities of the local context.

The work of CEDEUS Sustainable Neighborhood Observatory (Observatorio de Barrios Sustentables, OBS) addresses this particular issue, that is: to explore how sustainability and its trajectory over time can be measured and evaluated at neighborhood scale in Chile, aiming at the formulation of neighborhood sustainability indicators that are compatible with the relevant international framework and at the same time relevant to the local conditions of the neighborhoods in Chile and to the formulation of policies Public policies.

This paper discusses these issues and presents a pilot study that aims to establish indicators of sustainability in neighborhoods, with the intention of becoming a working tool for neighborhood residents as well as for external actors who are interested in intervening. In a first round of meetings a list of 76 sustainability indicators was established based on a literature and policy review. These indicators are covering 10 sustainability areas, such as security, jobs and income, education, access and mobility, etc. For a pilot study 13 + 3 neighborhoods (barrios) were selected based on three criteria: (i) city size (metropolis, intermediate minor, or intermediate mayor), (ii) neighborhood context (central, peri-center, periphery), and (iii) percentage of population that needs social support (qualifying according to a social characterization named “ficha de protección social”). These 13 barrios are to be found in 6 cities, including Copiapó, La Serena, Santiago, Concepción, Temuco, and Valdivia. Additionally, three reference neighborhoods with a higher income or a central location were chosen to account for the full range of indicator values.

For these cases, we establish indicators of evaluation and impact of urban improvement in neighborhoods, differentiating it and relating it to other city, commune and housing scales and their surroundings, recognizing the cultural, social, socio-environmental, territorial and economic contexts of the neighborhood and local level and evaluate the information of the scale of districts according to the processes of social, economic and environmental sustainability and urban sustainability.

Keywords: urban analysis, neighborhoods, indicators, observatory, sustainability.

Stakeholder engagement-based evaluation of social sustainability with respect to the mining sector

Friday, 16th June - 11:00 - SD 701 - Oral Paper

Dr. Evren Deniz YAYLACI¹, Prof. Sibel Kalaycioglu¹, Prof. Sebnem Duzgun¹

1. Middle East Technical University

The mining sector exploits the non-renewable natural resources and supplies them to the industry and energy sector. Hence, it has considerable share in the national and local economies of the large number of countries. Besides the economic impacts, the sector has impacts on environment, and society. Therefore, effective integration of the environmental, social and economic dimensions of sustainability into the decision-making in the mining sector promises contribution for the achievement of the sustainable consumption and production patterns. However, quantitative evaluation of the social impacts, exposed by the local communities, is not performed as effectively as the environmental, technical, managerial and economic issues. In this regard, the paper discusses if and how much the mining sector contributes to enhance the social sustainability in the mining communities in terms of social impacts of the operations based on the quantified parameters. For this purpose, a local stakeholder engagement-based methodology is proposed for quantification and integration of the social parameters into the assessment and decision-making of the mining sector planning. The methodology is applied with a case study in Afşin-Elbistan Coal Basin (AECB) in Turkey. The case study shows that quantitative integration of the social parameters is significantly important to evaluate the negative and positive impacts of the mining sector on the social sustainability at the local-level. Moreover, it is observed that participation of the local communities into the assessment process make the social sustainability concept tangible and it prevents to use de facto social sustainability criteria for different cases.

The Sustainable Child Development Index (SCDI) - A novel way to assess national achievement towards sustainable development

Friday, 16th June - 11:15 - SD 701 - Oral Paper

Ms. Ya-Ju Chang¹, Prof. Matthias Finkbeiner¹

1. Technische Universität Berlin

Children are the key stakeholders for shouldering and shaping societies towards sustainable development. However, an index assessing children development in the context of sustainable development is missing. To address this challenge, the framework of the Sustainable Child Development Index (SCDI) considering environmental aspect was firstly proposed and the indicators were collected and screened regarding data availability. As the following study, the research target of this study is to complete the establishment of the SCDI by selecting the representative indicator set, designing the normalization and aggregation methods, and determining the SCDI scores for countries. First, the 23 representative indicators addressing the five themes health, education, safety, economic status and environmental aspect are selected based on correlation analysis and the trade-off between the number of covered countries and considered indicators. The representative indicators are normalized according to the defined reference points regarding the Sustainable Development Goals (SDGs) and then aggregated into the SCDI for the 137 countries. The SCDI scores are classified into four levels (very high, high, medium and low) to group countries' progress towards achieving sustainable child development. The results show that a great regional inequality on sustainable child development achievement exists. European countries, especially Nordic countries, express their superiority in sustainable child development. On the contrary, 95% of the assessed African countries are evaluated as countries with medium and low achievement. Additionally, some OECD countries, e.g. Australia, Italy and Turkey, are evaluated as medium sustainable child development countries due to their weak performance in the theme environmental aspect, e.g. freshwater vulnerability and renewable energy consumption. Moreover, the correlation analysis of the SCDI, Human Development Index and Child Development Index shows that the SCDI can be applied as a complementary assessment to the existing development indexes in order to provide a more comprehensive evaluation on sustainable development by regarding children perspective and addressing relevant topics of sustainable development, such as environmental aspect and safety. Accordingly, the application of SCDI can contribute to establishing more comprehensive strategies on child as well as sustainable development policies, and to inform the condition on child development to stakeholders.

Sustainability Knowledge in different Country Contexts: The Role of Media Agenda-Setting

Wednesday, 14th June - 14:00 - SD 703 - Oral Abstract

***Dr. Ralf Barkemeyer*¹, *Dr. Aurelien Decamps*¹, *Dr. Guillaume Barbat*¹**

1. KEDGE Business School

Education can be seen as an integral part of any credible and potentially effective global governance solution in the context of Sustainable Development. Naturally, (higher) education institutions play a key role in this regard, but these are embedded into a specific context with a range of other actors influencing the extent to which learning for Sustainable Development takes place. In this paper, we examine a range of individual, institutional and country-level contextual factors and their roles in learning for Sustainable Development. We are interested in the extent to which the mass media support education for Sustainable Development through (sustainability-related) first-level agenda-setting. Using the theory of planned behaviour (Ajzen & Fishbein, 1980) as the main theoretical framework for our study, we examine the levels of sustainability related knowledge among students from higher education institutions in nine major economies (Brazil, Canada, France, India, Mexico, South Africa, Spain, United Kingdom, United States). For our dependent variable, we turn to a dataset compiled by the Sustainability Literacy Test (SULITEST, 2016), focusing on levels of knowledge in relation to climate change, biodiversity, poverty as well as a number of sustainability-related concepts and theories. The main independent variables included in our multi-level models include cultural, economic, environmental and governance indicators as well as those describing the impact of different higher education institutions and respondents' individual characteristics. We apply a multi-level modelling technique using Mplus to explore the relative importance of individual, institutional and country-level factors in a real-life setting employing a large-scale dataset. The results help us to contribute towards a more nuanced understanding of sustainability-related learning, and in particular to shed light on the role of the wider country-level contexts in triggering and facilitating sustainability-related knowledge generation. Crucially, they also have clear implications for higher education curricula which is the focal point of our discussion. Before concluding, we develop a set of recommendation for policymakers in the field of education for Sustainable Development.

The Role of Data Analytics for Sustainable City Development and the Implications for the Academia

Wednesday, 14th June - 14:15 - SD 703 - Oral Abstract

Ms. Laura Carolina Bernal Parra ¹, Mr. Juan Nicolas Melo Martin ¹, Mr. Juan José Díaz Baquero ¹, Mr. Juan Felipe Franco ¹, Prof. Raha Akhavan-tabatabeai ², Prof. Ivan Mura ¹

1. Universidad de los Andes, 2. Sabanci University

Unprecedented technical capabilities to collect data about physical processes, environmental conditions, industrial practices, transportation flows and citizens' habits and preferences are providing us with the possibility of scrutinizing multiple aspects of our cities and characterizing them with huge size digital footprints. These records offer invaluable opportunities for sustainable management sciences, as they can be used to obtain precious information about current conditions and to build predictive models that can forecast the effects of possible interventions along improvement routes. Though, processing large and diverse data sets to extract meaningful and statistically valid evidences entails challenges from both the conceptual and technical viewpoints, and requires the rigorous and disciplined application of techniques from Data Analytics. Data Analytics includes several processes, all being increasingly supported by the aid of specialized systems and software applications, which implement an end-to-end chain from data acquisition, cleaning and validation, processing for descriptive, predictive and prescriptive purposes, until aggregated value in the form of information is produced and made available to decision-makers. The formalization of the above process steps guarantees that conclusions are drawn about the information already contained in the data, limiting subjective judgement and ensuring repeatability. This work wants to present the experience gained in an on-going data analytics project being carried out at the Universidad de los Andes. A team composed by undergraduate, graduate students and professors has been dealing with the historical dataset of air quality measurements of the city of Bogotá, with the aim of understanding the impacts that air pollution control strategies have had over time. This project offers several themes for consideration. On one side, in the case of Colombia, urban air quality data analysis from public authorities and from the academia have been drawing distinct and sometimes contracting results from the same datasets. It is usual that each study builds on specific and often not defined data processing rules, which turns out in scant reproducibility of results. Under these circumstances, defining agreed baseline measurements and air quality control interventions is a very hard task. On the other side, our research unveils the urgent necessity of establishing scientific collaborations between the academia and environmental and public health authorities, to create stakeholder engagement along synergistic bi-directional exchanges. The academia holds very advanced knowledge about Data Analytics. This opens important opportunities to push forward educational programs that can make up for the data science formation gaps, while promoting its use for decision making towards a sustainable urban development. Finally, the project wants to underline that the combination of the knowledge and expertise of the academia, with the experience in management of the city government, translates into benefits for the citizens, who have tools to be more and better informed.

Continuing professional education for engineering faculty: Transversal integration of Sustainable Human Development in basic engineering sciences courses

Wednesday, 14th June - 14:30 - SD 703 - Oral Abstract

Prof. Agustí Pérez-Foguet¹, Mr. Boris Lazzarini¹

1. Universitat Politècnica de Catalunya

The integration of sustainable development in higher education is increasingly recognised as a priority for a growing number of universities, nonetheless, barriers for change remain and particular attention should be given to the success factors fostering an effective integration. The present contribution analyses the extent to which a professional development programme, aimed at engaging and empowering faculty, has positive effects to integrate sustainable human development principles into existing courses of engineering. Specifically, the research focuses on the effects of the integration of sustainable human development in new teaching modules in a subject of basic engineering science, implemented in regular courses of the first year of the degree in engineering. The methodology includes i) a standardised test to assess sustainability literacy of the students; ii) a focus group conducted with the students of the engineering courses involved in the initiative; and iii) an in-deep interview conducted with the academic coordinator of the subject analysed. The results of the present case study highlight the relevance of professional development programmes addressed to academics with regard to the integration of sustainability principles specifically in formal science disciplines. The conclusions highlight relevant insights from the case study that are useful for supporting further integration of sustainable development in engineering disciplines.

Embedding Education for Sustainable Development in the curriculum: an example from Manchester Metropolitan University

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Dr. Hannah Matthews¹, Mrs. Valeria Ruiz Vargas¹

1. Manchester Metropolitan University

There is a growing number of national and international drivers to embed Education for Sustainable Development (ESD) in Higher Education. Through ESD, universities have the potential to educate future leaders, policy makers, business owners and media on issues related to Sustainable Development e.g. climate change adaptation and mitigation. However, research shows that current levels of knowledge and skills amongst university lecturers present a barrier to embedding ESD in the curriculum. This poster provides an overview of a project to review the comprehension and uptake of ESD in the School of Science and the Environment at Manchester Metropolitan University. Stage one of the process involved the development of a new auditing tool to assess the current inclusivity of ESD themes within curricula. Stage two involved an assessment of the 'success' of units in relation to student progression/ number of good honours and the teaching of ESD across a range of subject areas. Development of the auditing tool involved documenting of a range of Sustainable Development 'themes', notably 'keywords' employed in teaching. This included a systematic literature review where phrases reflecting the breadth of related social, economic, and environmental issues and skills were codified. The identified themes were then reviewed and supplemented where appropriate, through a further discipline-specific iterative process. Piloting of the audit tool consisted of two stages; a keyword search of curriculum documentation at the School of Science and the Environment (MMU) and semi structured interviews with unit leaders to test the accuracy of the tool against actual unit content. The second stage involved a series of semi-structured interviews with teaching teams to assess interdisciplinary support for ESD across the School. Levels of inclusion (audit results) and support for ESD were then analysed in conjunction with individual unit success metrics (progression/ number of good honours). Overall, the tool piloted well with 67% of unit coordinators either agreeing or strongly agreeing that the results were representative of the content of their units (25% disagreed). From the thematic analysis of the data, findings included an overall positive response to the tool but a question in terms of which part of the unit documentation (e.g. unit specifications, unit handbooks) is more suitable to evaluate ESD content. Perceptions of the need to embed ESD ranged from ESD being a distraction for students, to it being core to teaching. Similar to other studies, this study also found that individual knowledge or lack thereof, posed a barrier to the incorporation of ESD in taught content. It is recommended that integrating ESD across an interdisciplinary curriculum requires bespoke and individual approaches.

CDIO usage to design a Master in Development Practice

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

***Prof. José Carlos Quadrado*¹, *Prof. Eduarda Pinto Ferreira*¹, *Prof. Angelo Martins*¹**

1. Instituto Superior de Engenharia do Porto

The Master in Development Practice (MDP) intends to be an interdisciplinary master degree program that prepares students to better identify and address the challenges of sustainable development. Integrating the core areas of the health, natural, social and management sciences, the MDP program provides students with the substantive knowledge and practical skills required to analyze and diagnose the multi-dimensional challenges of sustainable development such as extreme poverty, climate change and infectious diseases. By involving faculty members from 8 different schools, from Engineering to Performing Arts, it was a challenge to design a program with so many different people involved, so we resorted to CDIO (Conceive Design Implement Operate) to provide the framework for program design and operation. Though it is not an engineering program, the core of MDP is a problem solving and project development process, i.e CDIO. Therefore the full stack of CDIO standards was applied in the MDP design. Even the CDIO syllabus v2.0 was used. In this paper, it will be provided a short description of the program and its objectives and it will be explained how CDIO was used in the program's design process. The CDIO Initiative is an educational framework stressing engineering fundamentals set in the context of conceiving, designing, implementing and operating real-world systems and products.

Affect and Perception: the role of aesthetics in sustainability ethics and education

Friday, 16th June - 08:30 - SD 1003 - Oral Abstract

Ms. Andressa Schröder¹

1. International Graduate Center for the Study of Culture (GCSC)

In recent studies about education for sustainability, there has been growing recognition of the necessity of integrating different forms of knowledge construction and assessment, as well as the necessity of searching for a more interconnected exchange of information and experiences – finding transdisciplinary ways of addressing sustainability. In this paper, I explore the theoretical implications of the role of aesthetics in discussions of sustainability ethics and the potential of arts-based approaches for sustainability research and education. For this matter, I indicate examples from the environmental arts and some aesthetic approaches that are already being explored in different educational contexts. This is done in order to expand on the much needed transdisciplinary debate within the realms of education for sustainability, as well as to investigate how aesthetic features can help us overcome common divisions in the theory-practice, academic-activist, mind-body dualisms, which tend to make meaningful actions for sustainability unfeasible. Environmental aesthetics is an all-encompassing value to environmental appreciation. Our perception of the environment is permeated by a complexity of experiences that influence how our imaginary about it is formed, as well as how we assess and share this information. Aesthetics is, therefore, a crucial step in finding ways to generate or increase sensitivity to the surrounding environment and to re-think the concept of education for sustainability. Understanding aesthetics as forms of multisensorial experiences and perceptions of the environment, allows one to explore beyond the usual association of environmental aesthetics to a contemplative appreciation of landscape. Aesthetics indicates, instead, the potential for multiple dynamics of engagement and environmental responsibility. Furthermore, the focus on the multisensorial, affective, and imaginative characteristics of aesthetic experiences indicates that not only artistic practice or appreciation encompass aesthetic features, but they are open for a wide range of social interests and activities – including environmental perception, education for sustainability, and interspecies relationships. In this sense, the contribution of environmental aesthetics for the discussions in the realm of sustainability ethics and education enables the exploration of multiple levels of the transdisciplinary approach reclaimed in such fields, integrating experiential forms of knowledge construction and an affective exchange of information and perceptions of the environment.

The circular economy as a key component of sustainable development teaching

Friday, 16th June - 08:00 - SD 702 - Oral Abstract

Dr. Elsa Joao¹

1. University of Strathclyde

The circular economy is a systems-based concept in which production is designed to be restorative and regenerative, while waste is designed out of the system. Circular economy is thus featured as a reaction to the conventional dispensation of the linear 'make-use-dispose' economy, and as a framework for the development and management of a sustainable, 'waste-as-resource' economic system. The value of the circular economy to sustainable development is therefore paramount. However, although the circular economy is gaining interest around the world, there is still a lack of teaching in this area. Due to the value of the circular economy to sustainable development, this paper argues on the importance of circular economy teaching as part of sustainability-based degrees.

The paper presents findings related to an innovative new course on the circular economy (launched at the University of Strathclyde in Scotland in January 2017 and offered across the University) which has become a compulsory element of one of the oldest sustainability MSc degrees in the UK (the MSc in Sustainability and Environmental Studies that has run since 1992). This new circular economy course will be compared to other courses currently available worldwide and their explicit links to sustainability are evaluated. A review is also included of papers on higher education for sustainable development and any links to circular economy evaluated.

Results of a survey of the 50 participants on the new circular economy course at the University of Strathclyde, from 16 different programmes across the Engineering and Business Faculties, are presented. The circular economy is a key component in sustainable development, and has huge implications for research, policy and industrial practice, and therefore it is fundamental that the teaching of sustainable development includes the leading issues in circular economy.

Participation Processes for Social Learning in the Transition towards a Sustainable Circular Economy: The Case of the Resource Recovery from Waste Programme

Friday, 16th June - 08:15 - SD 702 - Oral Abstract

Dr. Anne Velenturf¹, Prof. Phil Purnell¹

1. University of Leeds

If our society continues in its current patterns of production and consumption, we will soon face a twin environmental crisis of resource scarcity and waste overload. Positioning waste and resource management in the context of ecosystem stewardship, we relate our increasing demand for resources and production of wastes to the crossing of planetary boundaries and failure to meet human rights. We argue that a transition towards a circular economy *that contributes to a resilient environment and human well-being* is necessary.

While the urgency of a transition towards more sustainable waste and resource management is well-recognised throughout society, progress has been limited and requires strongly increased engagement from actors throughout society. We argue that academia has a moral obligation to play a more active role in facilitating engagement. We will present the engagement strategy developed and applied by the Resource Recovery from Waste programme (RRfW), running from 2014 until 2018. RRfW is an environmental research partnership with more than 170 academic, governmental and industry members, developing knowledge and tools to reduce pressure on natural resources and create value from wastes. The overriding purpose of RRfW is to support a mentality change in waste and resource management, moving away from end-of-pipe approaches and one-sided thinking about wastes from an economic and/or technological perspective and, instead, towards whole-system thinking about resources throughout their life-cycles including extraction, the cascading of products, materials and components through our economy, and eventually the associated impacts of resource recovery from wastes.

According to the principles of participation process management, the envisioned mentality change and, importantly, uptake of knowledge and tools to make tangible progress in the transition towards sustainable waste and resource management, requires high levels of engagement of key actors in a social learning process. Hence RRfW initiated a participatory approach to facilitate learning through the mutual engagement of academics and government- and industry partners. We present RRfW's approach to identifying key actors active in waste and resource management, applying social network- and stakeholder analyses, and strategies to increase participation, from informing up to consulting and co-producing our research focus, methods, results and dissemination activities. In this way we strive to create a sense of ownership in our government and industry partners; supporting the uptake of research results, a legacy of continued dissemination of RRfW outcomes after programme completion, and ultimately the much needed change in mentality regarding, and management of, wastes and resources for a sustainable future.

Keywords: Waste and resource management; Planetary boundaries; Human rights; Participation processes; Social learning

Challenges of engineering education for sustainable development: the experience of Ingenieros sin Fronteras Colombia - Engineers without Borders

Friday, 16th June - 08:30 - SD 702 - Oral Abstract

Prof. Catalina Ramirez¹, Mrs. Julia Helena Díaz Ramírez¹, Mr. Andres Acero¹

1. Universidad de los Andes

Academy plays a key role as spreader and foster of sustainable development in future managers, workers, entrepreneurs, politicians and researchers. In addition, academy, but specially engineering faculties, has a role in the industrial and environmental setting, through the development of projects related with topics such as sustainable business models, natural resource management and social engagement (Espinosa & Walker, 2011), among others. These approaches to sustainable development must allow theory application and favor students' opportunities to face real environments during their training. Accordingly, this abstract presents an initiative which foster partnership for sustainable development for engineering education, Ingenieros Sin Fronteras Colombia (Engineers without Borders Colombia). This organization is the result of an alliance between Universidad de los Andes and Corporación Universitaria Minuto de Dios, whose purpose is to improve the quality of life of marginalized communities in the country through engineering projects that are sustainable, economically and culturally viable. Furthermore, this initiative aims to develop social and environmental awareness in students, teacher, researchers and industry. To achieve that purpose, this group designed an interaction model based on partnership, teaching strategies and learning communities related with sustainable development issues. This model, that is being used by Ingenieros sin Fronteras since 2009, take social approaches, such as participatory action research (Ramirez et al., 2011), to engage communities to participate actively and teaching approaches, such as active learning (Lucke, Dunn & Cristie, 2016), to unleash students' potential. Accordingly, this group promotes the development of sustainable partnership models between and from direct participation of small and big industries, students of colleges and schools, teachers and community in general. Finally, the application of this model into engineering students have several results. In terms of impact on sustainable development applications, students participate actively into the creation of green business associations, the implementation of green processes and foster water saving on rural areas, among others, meanwhile changes on learning approaches to real problems are implemented each semester. In brief, this abstract summarizes a model to integrate sustainable development teaching with engineering education through hands-on experience and the results of the implementation of this model to several contexts.

Towards 'Transgressive Learning' in Bioregional Transition Labs in Colombia

Friday, 16th June - 08:45 - SD 702 - Oral Paper

***Mr. Thomas Macintyre*¹, *Dr. Martha Cecilia Chaves Villegas*²**

1. Wageningen University, 2. MINGAS en Transición

This research project addresses the emerging calls for more radical learning-based transformations in Education for Sustainable Development (ESD). With the overall aim of confronting 'wicked' challenges of sustainability, this research has the objective of mapping, analysing and ultimately promoting the emergence of 'transgressive' learning processes (radical forms of learning-centered transformation), with the contention that these processes can contribute to sustainability transformations at the food-water-energy-climate-social justice nexus. This research makes up part of the ISSC (International Social Science Council) funded international project 'Transgressive Learning for Social-Ecological Sustainability in Times of Change,' which involves nine countries (Ethiopia, Malawi, India, the Netherlands, Sweden, South Africa, Vietnam, Zimbabwe and Colombia). Making up the Colombian case study, the specific aim of this case study is to develop regional 'transition labs' in community-based settings in Colombia which address local nexus challenges. Building on the educational traditions of 'critical pedagogy' - as a means to address deep-seated assumptions and norms contributing to *unsustainability* - and 'place-based education' - so as to connect such learning to the ecological places people actually inhabit - the Colombian case study works towards a 'critical pedagogy of place' (Gruenewald 2003), demonstrating that such pedagogies are emerging across diverse communities of different ethnic origin in Colombia. We argue that such practices and approaches can contribute to innovative, inclusive, and place-based models for ESD which can bridge the gap between formal and informal education/institutions.

The methodology is based on participatory action research, including co-researchers from each bioregion, with the aim of generating collaborative and inclusive 'transgressive pedagogies' between students and educators, investigators and community members, by connecting people to place through collective action-based change. Methods include participatory mapping, participant observation, and semi-structured interviews.

With the first stage of mapping complete, findings show the presence of learning networks anchored in communities which are challenging traditional educational models and practices. They do this by putting forward alternative pedagogies based on principles of hybrid mestizo-indigenous *buen vivir* (bioregion Muisca-Bakatá), art and social innovation (Bioregión Macizo Acogedor), afro and indigenous rights (bioregion Caribbean) and family agriculture and permaculture in the bioregion Quimbaya. The next stages of the research are to analyse the extent to which such learning really is 'transgressive' in nature, and importantly, how to upscale such learning to other sectors of society. This will be achieved through exploring the power of social networks/movements and intercultural workshops to collectively construct pedagogical programs based on community resources and needs.

By sharing our work into 'transgressive learning,' we provide the opportunity for researchers and educational practitioners to learn from emerging theories and models of learning, as well as early experiences of the bioregional 'transition labs' which we will present.

Education for Sustainable Development in Portuguese Universities Institutional Framework: The key actors' opinion

Friday, 16th June - 09:15 - SD 702 - Oral Abstract

Ms. Carla Farinha ¹, Prof. Ulisses Azeiteiro ², Prof. Sandra Caeiro ¹

1. Universidade Aberta, Portugal and CENSE, Centre for Environmental and Sustainability Research, New University of Lisbon,

2. Universidade de Aveiro, Portugal and CEF, Centre for Functional Ecology, University of Coimbra

Universities have played key roles in transforming societies, by educating decision-makers, leaders, entrepreneurs and academics. However, education and research on sustainability and inclusive development in universities, is still at an early stage in many institutions. Over the last decades several integrated studies were undertaken in Northern and Eastern European countries to evaluate how Education for Sustainable Development (ESD) has been applied in the institutional frameworks of Higher Education Institutions (HEI). In Portugal, the Government promoted the effective institutional autonomy of HEI and the diversity of higher education systems focusing on building human capital. Nevertheless, to date, no attempts were made to evaluate the incorporation of ESD by HEI or by the Government both in their plans, programs and in the development policies regarding, in particular, Universities engagement to embed Sustainable Development (SD) in their academic systems. This study's aim is to determine, from a key actors' perspective, how sustainability was integrated into policies and strategies of HEI, particularly in Portuguese public Universities, within the framework and goals of the United Nations Decade of Education for Sustainable Development (DESD) 2005-2014. Semi structured exploratory interviews were conducted after gathering a sample of 15 key actors of decision-making processes namely from (i) Education, Science and Higher Education Ministers, as well as the Ministry's General Secretary and the General Director of Higher Education, (ii) Chairpersons of the Portuguese University Rectors Council, representing Portuguese Universities Chancellors and, with (iii) HEI and non-governmental key persons who designed and implemented Portuguese ESD. Considering that beforehand only a relatively small number of not particularly insightful documentary resources were gathered and analyzed, these interviews goal was to obtain complementary information either from the key actors themselves or from other documentation they could have accessed. Seven interviews were analyzed to provide a better understanding of the compromises concerning ESD in Portuguese public Universities, as well as the possible forms of the DESD goal implementation and their impact in their strategies and actions. Interviews with key actors led to other hidden or not publicly accessible plans, policies and programs. Preliminary results confirmed the documentary analysis findings that there is a lack of national integrated strategies or policies. Nevertheless, not only there are some relevant international drivers as well as a few good examples at specific national Universities level that have already their own Sustainable Reports published. It is also of critical importance for the effectiveness of the process concerning Inclusive ESD the commitment to the implementation of public policy and sustainability at universities level. Subsequently, there is an urge for a change in Portuguese universities paradigm and characteristics and still several boundaries to overcome. Further investigation will be undertaken, including the analysis of plans, policies and strategies at universities level and a questionnaire survey will also be applied to the person responsible for the sustainability implementation in the HEI, to better understand how the sustainability for development in Public universities in Portugal was accomplished.

Keywords: DEEDS – Decade for Education for Sustainable Development, Environment/Environmental, Sustainability/Sustainable, Inclusive Development, Universities

The Practice of Evidence Based Policy Making in Education and Training System of Ethiopia. Tesfamariam Shimekit, Education Strategy Center, Addis Ababa, Ethiopia E-mail: tesfakit@gmail.com. Mob.No:+251912887336

Friday, 16th June - 10:15 - SD 702 - Poster Abstract

Mr. Akalnew Tesfamariam¹

1. Ed

Abstract

Education is vital for the development of a nation and policy development in education affects all economic, political and social issues of the country. Besides, in this globalized era the education policy development in one country reciprocally influenced by the global contexts. Ethiopia's education system is composed of three sub-sectors, General Education (GE), Technical and Vocational Education and Training (TVET) and Higher Education (HE). The Ministry of Education (MOE) is the government organization which governs the education and training in the country. In addition, MOE designs police, strategies, program, guidelines, and plans for the whole education system and monitor and evaluate the implementations of these policies. This paper argues that the education policy development must be evidence based to improve the role of education in sustainable development. The purpose of this survey was to assess the status and identify factors of evidence based policy making and implementation process in the education and training system of Ethiopia. A descriptive survey method was employed and data were collected by using a questionnaire. Out of 180 experts at MoE which were involved in policy making and implementation, 61 were selected by using stratified and simple random sampling techniques. In addition, five policy documents were analyzed to examine the type of evidences used in formulation and implementation of these policies. The data showed that unsystematic evaluation and monitoring results and data collected by less incapacitated education management information system were most often used as evidence in policy making and implementation than empirical research. In addition, evidence based policy making and implementation process is more affected by national factors than personal (policy makers) and global factors. In conclusion, the practice of evidence based policy making and implementation is low in the country's education and training system. The study implies that policies, which are not evidence based, have little capacity in solving public problem and contribute to national and international development. As a result, the culture of using strong empirical research in policy making and implementation should be encouraged to develop or modify policies that ultimately enhance the contribution of education for national, regional and international development.

Key words: Evidence based, Policy making, policy implementation

Primary and preprimary Teacher Training in Ethiopia: Analysis of Practice Vis-à-vis SDG#4 of 2030

Friday, 16th June - 10:15 - SD 702 - Poster Paper Rejected

Mr. Animaw Tadesse¹

1. Education Strategy Center

Ethiopia, one of the sub-Saharan countries with a population of 95 million, is striving to achieve its goal of becoming low middle income country by 2025. To this end, the country has registered significant achievement in access and equity; primary school net enrollment reached 80% and preprimary enrollment to 49% where the gender parity index is getting closer to one (MOE, 2015). Nevertheless, the quality of education is a critical problem to which the country is struggling. The quality of the teachers is one of the factors that affect the quality of education in the country. This is because an education system is only as good as its teachers (UNESCO, 2014:3). The quality of the teachers largely depends on the way they are trained (Workneh & Tasew, 2013). Hence, the purpose of this research is to assess the practice of primary and preprimary teacher training in the country vis-à-vis SDG#4 of 2030. Specifically, it tried to assess the extent to which the input, process, context and the output were quality enough. To attain this objective, a mixed method research design was employed. Accordingly, data was collected using multi-method data collection instruments from trainees, trainers, AC members of CTEs, education experts and leaders working at the woreda, zonal and regional level. Besides, field observation and different educational documents were used as data sources of the study. The participants were selected using multi-stage sampling technique through which regions, zones, woredas, CTEs, and human and non human participants were selected following sequential and interrelated sampling techniques. Data from sample units have been collected using interview, FGD and questionnaire. Field observation and document analysis were also used to triangulate the data from other instruments; in sum, the data were obtained from a total of 2638 participants. Data collected through the multi-method instruments were analyzed through quantitative and qualitative methods. The result of the study revealed, though teacher supply is increasing as a result of expansion of CTEs per region, graduate teachers lacked the subject matter and pedagogical competence and have low interest to the profession due to inappropriate recruitment policy, in proper training, mismatched curriculum and lack of shared leadership. The results inform, so as to improve the quality of primary and preprimary education in line with SDG#4 of 2030, the country need to revisit the recruitment policy, curriculum, leadership, pedagogical competence and motivation of teacher educators and teacher accountability policy. Otherwise, its goal of becoming low middle income country may be delayed.

Key terms: primary program, preprimary program, teacher education, teacher training, teacher education colleges (CTEs)

IS THE TARGET FOR IN-LAND CONSERVATION SUGGESTED BY THE CONVENTION ON BIOLOGICAL DIVERSITY (CBD) ADEQUATE FOR COLOMBIA?

Wednesday, 14th June - 14:00 - SD 704 - Oral Paper

Dr. Martha Fandiño - Lozano¹

1. Fundación ARCO

Abstract

The persistence of the biota is a fundamental element of sustainable development; it is impossible for us to survive without other species. Natural parks or reserves are fundamental pillars of any conservation strategy. They prevent the complete conversion of natural ecosystems and, in that way, provide intact habitats for wildlife. However, if conservation areas are not selected rigorously, gaps may lead to a species extinction. To be effective, reserves must include viable populations of all the species present in the territory as well as all the ecosystem components and processes that species may require in order to survive and persist. Guaranteeing minimum areas is important as well because of their impact on the size of populations. The Convention on Biological Diversity (CBD) suggested a minimum extent of 17% of in-land ecosystems to be protected and 10% of marine areas. Nevertheless, it did not explain how to achieve these targets. Do these values represent the minimum extent for each ecosystem type? Establishing a general target like this might over or underestimate the real level of conservation needed for each type of ecosystem. Perhaps these values are just meant to be the result of a portfolio of conservation areas selected by applying other targets. In this article, targets are calculated for all in-land ecosystems of Colombia, a gap analysis is done and two portfolios of priorities for conservation are constructed using FOCALIZE: a decision support system that selects groups of spatially related ecosystems using minimum targets calculated based on the requirements of umbrella species. The first scenario considered the existing national parks whereas the second did not include them starting the selection from a hypothetical situation where no parks existed. The results highlight the importance of using effective selection methods including science-based minimum targets. Although the 17% of the in-land territory of Colombia could have been enough to reach the correct size of conservation areas and to cover all the variety of in-land ecosystems, the national parks selected in an *ad hoc* manner in the past overrepresented some ecosystems and added more area than necessary. Now this political target is not enough.

Keywords: Conservation planning, FOCALIZE, minimum targets, political targets.

LUI – A Land Use Intensity Index to Measure a Driving Force of Biodiversity Loss

Wednesday, 14th June - 14:15 - SD 704 - Oral Abstract

Dr. Joachim H. Spangenberg¹

1. Helmholtz Centre for Environment Research UFZ

Biodiversity loss has been identified as the environmental impact where humankind has been trespassing planetary boundaries most ruthlessly (followed by swelling the nitrogen cycle and climate change - both are main drivers of biodiversity loss). Going beyond the pressures causing damages and analysing their underlying driving forces, a series of drivers can be identified. Systematising them, land use (intensity), material (and substance) flows and energy consumption can be considered key categories, with land use intensity the most important factor. However, they are closely interconnected – for instance, energy consumption based on fuel flows enables additional material flows in agriculture (inputs, mechanisation) contributing to intensification. While aggregate energy flows in ecosystems can be characterised by Net Primary Production NPP and its Human Appropriation HANPP, and substance flows by material flow analysis, no such measure is available yet for land use intensity. Furthermore, statistics for individual components of land use intensity are often lacking, incomplete, with insufficient time series, in particular in developing countries, or are inconsistent. In such cases stakeholder interviews provide a means of identifying land use history as a basis for sustainable land use planning. In particular in countries with relatively weak statistical systems, oral information transfer often plays a high role and is of surprising quality. However, as stakeholders observe rather than measure change, classifying observations requires an ordinal scale approach, with classes wide enough to accommodate the observations but still suitable to characterise land use history. We suggest LUI, a new land use intensity index characterising changes in land use intensity over time, to be used in such cases; such an index does not exist so far (thus this is a conceptual proposal for an index to be tested empirically, with no experimental data available so far). It would be a valuable source of information regarding the dominant driver of biodiversity loss. For the qualitative aspect of ecosystem fragmentation, it can be integrated with the EU's habitat fragmentation index. Combining the fragmentation index and LUI based on the same data sets would allow for a comprehensive assessment of land use intensity; it could also be used for monitoring if land use intensity is indeed reduced. Its simple and intuitively understandable structure makes it suitable for citizens' science applications, and thus for participative monitoring when extensive statistical data gathering is not feasible.

Key words

Biodiversity loss, driving forces, land use intensity, fragmentation, Land Use Intensity index LUI

Biodiversity offsets: case studies in limestone mining sector in Brazil

Wednesday, 14th June - 14:30 - SD 704 - Oral Paper

Mrs. Barbara Souza¹, Mr. Luis Enrique Sánchez¹

1. University of São Paulo;

Biodiversity is responsible for maintaining benefits that society obtains from ecosystems. Economic activities such as mining often cause loss and fragmentation of habitat, with consequences for the functioning of ecosystems. In response to the increasing loss of native vegetation and biodiversity, a growing number of countries have adopted “offsetting” policies that seek to balance local habitat destruction by restoring, enhancing and/or protecting. In this context, biodiversity offset is a mechanism that counteracts adverse effects of projects, and is applied to adverse effects that can not be avoided by applying the mitigation hierarchy, as recommended by guidelines such as IFC’s Socioenvironmental Sustainability Performance Standards. Although the offset is already a consolidated instrument in the environmental licensing process in Brazil and in other countries, there are questions about the effectiveness of the compensatory measures regarding the ability to actually offset the losses in terms of biodiversity. Looking to analyse whether the compensation practiced in Brazil is able to compensate losses of biodiversity, three offset projects practiced by limestone mining enterprises, located in the Atlantic Forest domain, in the Southeast of Brazil, are discussed in the light of international recommendations for biodiversity offset to verify the possible adherence or to identify the main gaps regarding the international principles and recommendations of good practices in biodiversity offset. Results suggests that, although Brazilian offset is focused on protection, replacement and restoration of affected habitat, there is some equivalency between compensation and international recommendations for biodiversity offsets. However, improvements are needed in terms of stakeholder participation in offsets design, which could result in gains for the affected beneficiaries of ecosystem services, which were impacted negatively by the project. The results of the research indicate that the offset practiced by the analysed cases do not guarantee the biodiversity loss, because focus only on government determinations, lack of consideration of species richness or monitoring of biodiversity practices.

Participatory mapping of hotspots: where to keep the invaders out?

Wednesday, 14th June - 15:00 - SD 704 - Oral Abstract

***Ms. Jetske Vaas*¹, *Ms. Elizabeth Haber*¹, *Prof. Peter Driessen*¹, *Dr. Mendel Giezen*², *Dr. Frank Van Laerhoven*¹, *Prof. Martin Wassen*¹**

1. Copernicus Institute of Sustainable Development, Utrecht University, 2. Urban Planning Group, University of Amsterdam

Invasive species challenge the integrity of ecosystems, especially on islands. Caribbean islands make up one of the world's 25 global biodiversity hotspots, with about 60% of the region's 12,000 plant species being endemic. Utrecht University works in Saba and St. Eustatius to facilitate decision-making regarding the management of invasive alien plant species (IAS), such as Coral vine. Introduced as an ornamental plant, it is regarded as a beautiful flower by some, a threat to nature by others, and an annoying weed in the garden by almost all. Development is both a cause of this invasion, and could be a solution to it. Economic development in the form of the establishment of an oil terminal in St. Eustatius, moved people away from agriculture by providing higher-regarded jobs. Additionally, the economic development it stirred, redirected consumption patterns towards more supermarket-based consumption, compounding the decline in agriculture. Former agricultural fields are a significant share of the area covered in Coral vine, which on St. Eustatius is estimated to be at 15% of the island's surface. Economic development might also harbor solutions to managing the vine, for example when the promotion of tourism generates an urge to improve land management. We try to link economic development and land use management considerations through supporting decision making on IAS management. To that end, we have looked at the valuation of ecosystem services, and employed participatory mapping.

First, to understand how Coral vine's effects on ecosystem services are experienced by stakeholders, we investigated how different ecosystem services are valued. We employed Q methodology to elicit stakeholder groups around ecosystem service discourses, by having participants rate 48 statements on a normal distribution. The statements were based on 4 discursive claims regarding 12 landscape values, adapted to the local context. Factor analysis will derive several discourses from this, which we take to designate stakeholder groups. Those groups will be the basis for next research steps on the potential for management. Second, the presence and valuation of ecosystem services differs spatially, and hence does the impact of Coral vine. Therefore, we employed participatory mapping by having participants choose 5 areas they would like to see free from the vine, as well as explain why. Overlaying the different areas shows a couple of priority areas, which we will compare with maps on the presence of and habitat suitability for Coral vine. On the "hotspots" that appear like this, one could base zoning proposals.

Having identified the different stakeholder groups and hotspot areas we aim to support decision-making on IAS management, by kick-starting dialogue among government, scientists, citizens and nature managers on the islands in a next research step.

Conservation Units in urban areas and popular participation: the socio environmental situation and the relevance of the protected areas of São Gonçalo (Rio de Janeiro, Brazil)

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Ms. Julia de Marins Costa¹

1. Programa de Pós-Graduação em Práticas em Desenvolvimento Sustentável da Universidade Federal Rural do Rio de Janeiro (PPGPDS-UFRRJ)

Conservation Units (CUs) are fundamental in the protection of biological diversity. In Brazil, they have the function of guaranteeing the sustainable use of the biomes, such as the Atlantic Forest. With only 12% of forest remnants of its original coverage, it shelters the largest Brazilian urban centers, which, in some cases, share space with important protected areas. In the state of Rio de Janeiro, the city of São Gonçalo is one of the dormitory towns that support the state capital, but suffers with structural precariousness. With more than one million inhabitants, it has a history of disorderly population growth that has generated serious basic infrastructure problems that remain to this day, such as lack of access to water and sewage treatment. In this context, the aim of this research was to document the structural and ecological situation of the Conservation Units of São Gonçalo under local government administration and, mainly, the population's perception about those spaces and their use for educational purposes. For this, interviews were conducted with the administration of the CUs, in addition to visits to the areas and interview with the only employee of the units. In result, data were collected regarding the history, characteristics and community involvement related to the Units. Founded in 1991, Engenho Pequeno's Environmental Protection Area (EPA) was created based on a popular initiative to prevent its 13 km² of Atlantic Forest remnants from being transformed into a dumping ground. Ten years later, part of its territory was destined to the creation of the Municipal Natural Park of São Gonçalo. Both areas are administered by the town hall and have almost zero visit rates. Furthermore, according to the official CUs' registration, they do not have a management plan or educational program, although they are described as reserved spaces for conservation activities and academic studies based on Sustainable Development and Environmental Education (EE). Without appropriated security, the CUs become easy targets for depredation. In some forests, irregular constructions threaten the ecosystem balance. At the headquarters, there is only one employee working, and the biology laboratory, with data and samples collected in the Units, is totally abandoned. In conclusion, this study found that the lack of public investment and educational actions on the Conservation Units of São Gonçalo directly implies the difficulty of protecting those spaces. Therefore, access to information about the ecological and social relevance of protected areas is an essential strategy to bring the community closer to environmental issues, as well as to engage it in the protection of the municipality's natural patrimony. Moreover, the data of this work may encourage the local government to plan public actions centered on the protection and occupation of the CUs on the work for a sustainable city. The theoretical references considered in this work were the researches of: Carlos Frederico Loureiro on EE and participatory management of CUs; Michele Sato and collaborators on Environmental Education; Jesus Martín-Barbero on Communication and Education; and Paulo Freire on Pedagogy.

Keywords: urban forests; environmental education; communication; sustainable management.

To the search for sustainability: ecosystem integration, rail and University.

Thursday, 15th June - 09:00 - SD 704 - Oral Abstract

Dr. Esmeya Díaz¹, Dr. Maria Angela Flores P¹, Prof. Arnaldo Briceño², Prof. Roxy Pérez¹, Prof. FREDDY HERNANDEZ¹, Prof. Rafael Rodríguez³

1. Universidad de Carabobo. INFACES, 2. Universidad de Carabobo. DMAI, 3. Universidad de Carabobo. FACYT

The study is conducted on the campus of the University of Carabobo, Venezuela. In the university area there are three natural ecosystems with high biodiversity: wetlands, savanna and gallery forest. The development plan of the national railway system impacts the university campus an environmental service alters ecosystems. The research is justified by the need to reconcile the conservation of ecosystems, the importance of rail for regional development and the equity value of the university. The aim is to describe the process of negotiation between the University of Carabobo and the Instituto de Ferrocarriles del Estado to build the stretch of the railway. The method is descriptive, a case study is performed. Activities since 1996-2015 are analyzed. The information is obtained through the review of projects, reports, environmental legal framework, field, photographic records, etc. are analyzed. The study is divided into four phases: 1. Preliminary University Master Plan. 2. Analysis of the environmental impact. 3. Identification of measures and institutional arrangements. 4. Start of work. Among the results are: a) There was a project of a university park linked to academic activities, b) As for the studies of environmental and sociocultural impact, gallery forest and wetlands they are the most affected. The forest is a relict of the vegetation of the San Esteban National Park. This ecosystem regulates temperature and keeps the local river flow Cabriales. The wetland is a reservoir of vulnerable species and habitats of local and migratory birds. As for cultural impact, noise and disruption of campus landscape are the most important elements. c) An impact matrix was developed ecosystem and work phase of the work and selected 16 key measures: preventive, corrective, and compensatory mitigation. d) An interinstitutional agreement between the parties was signed. This required the development of specific projects for each ecosystem, where impacts and the required measures were considered. The projects were annexed to the interinstitutional agreement. e) To the beginning of the work it was necessary Environmental Monitoring Plan and the authorization for the involvement of Natural Resources, both requirements of the legal framework. It concludes: 1. The impact of the work of the railway at the University of Carabobo is significant and alters the natural and cultural environment of the institution, requiring the modification of the Master Plan. 2. The base study and environmental impact assessments online, they provided critical to the ecological and social value of the area information. 3. It was necessary to establish an interagency committee with experts from different areas of expertise, to monitor environmental impact reports and the selection of the required measures. The contribution of the university community in drafting the agreement was through the constitution of a commission that presented a preliminary document with preventive, corrective, mitigating and compensatory measures. 4. Meet the legal framework and the agreement signed is fundamental to the process of negotiation and execution of the work premise.

Keywords: ecosystem, rail impact, university, negotiation, sustainability.

The Magdalena river valley as an example of pervasive degradation of natural ecosystems and biological communities.

Friday, 16th June - 08:00 - SD 703 - Oral Abstract

Dr. Andrés Link¹, Dr. Ana Gabriela De Luna²

1. Universidad de los Andes, 2. Fundacion Proyecto Primates

The Magdalena river basin in Colombia, concentrates approximately 77% of the country's population and is responsible for 80% of its economy. The basin provides most of the country's hydroelectric power and almost 70% of the nation's agricultural products are produced within this region, which comprises only one fourth of Colombia's geographic extension. None the less, natural ecosystems in the Magdalena river basin have been widely transformed and to date less than 20% of natural ecosystems exist, most of them with a high degree of fragmentation and degradation. Here, we assess the current threats, challenges and opportunities that these ecosystems face at a regional scale and evaluate the impacts of anthropogenic disturbance on keystone species, and specially on large bodied mammals. We combined an assessment of the extent of natural forests from 1990, 2000, 2005 and 2010 combined with maxent modelling (for endemic taxa) in order to estimate the rates of habitat loss and fragmentation. We compiled secondary information to address the extent of habitat degradation associated with extensive cattle ranching, large oil palm monocultures, legal and illegal mining and major infrastructure development in the basin. Finally, we used occupancy models (through camera trapping) for medium and large mammals to better understand the vulnerability of large and emblematic animals to environmental changes from current patterns of land use and management. Based on our models, The Magdalena river valley has lost over 82% of its natural habitats, and rates of degradation have increased dramatically in the last decade. Although historical processes associated with extensive cattle ranching account for the vast majority of transformed areas, in the last decade large palm oil plantations have been the major driver of the transformation of natural forests into economically productive areas. Large predators (e.g., jaguars and pumas) and large herbivores and omnivores (e.g., tapirs and white-lip peccaries) are the most sensitive species to habitat loss and degradation and had a negative relation with the extent of forest cover and proximity to human settlements and access routes (roads, rivers, amongst others). We conclude that even though the Magdalena river valley is considerably degraded, current trends of habitat transformation are still not decreasing. In fact, the agricultural, and extractive industries continue to grow and increase their area of influence in this region. The disruption of biological processes through the potential local extinction of large predators and herbivores, might also derive in unpredictable changes in the diversity and dynamics of the remaining forests in the region. In conclusion, the Magdalena river basin is facing a critical moment in which large inter-institutional efforts will need to reconcile Colombia's development plans with the conservation of natural ecosystems end in order to guarantee their integrity and the goods and services they provide.

STAKEHOLDERS 'AUSCULTATION ON THE NEEDS AND TYPOLOGIES OF AGROBIODIVERSITY DATA THROUGH THE VALUE CHAIN OF THE VINEYARD AND WINE SECTOR IN ALENTEJO, PORTUGAL

Friday, 16th June - 08:15 - SD 703 - Oral Abstract

*Prof. idalina dias sardinha*¹, *Prof. Rui Figueira*², *Prof. Vânia Proença*³, *Prof. Margarida Lima de Faria*², *Dr. Filipa Monteiro*², *Prof. Maria Romeiras*², *Prof. Cristina Branquinho*⁴, *Prof. Margarida Santos-reis*⁴

1. Universidade de Lisboa/ISEG-Lisbon School of Economics & Management/SOCIUS-CSG, Researcher Centre in Economic and Organizational Sociology, 2. Universidade de Lisboa/ Instituto Superior de Agronomia, 3. Universidade de Lisboa/ Instituto Superior Técnico, 4. Universidade de Lisboa/ Faculdade de Ciencias

Agrobiodiversity encompasses all biotic variability of genes to ecosystems that somehow derives or relates to agricultural activities. Agrobiodiversity data is needed to understand the combined ecological and societal functions of agrobiodiversity, to determine its contribution to ecosystem resources and services and its value to society in general, e.g., responding to the current pressure on sustainable agro-food sector. This work focuses on the typology and interactions of information about agrobiodiversity in the vineyard and wine sector in Alentejo, Portugal. This sector of activity has national socioeconomic significance and can benefit from environmental valorization through the agrobiodiversity. A participatory workshop was conducted to assess how the stakeholders perceive and discuss agrobiodiversity, its management, how the information interactions on biodiversity and agrobiodiversity are drawn in and by this group, and the dilemmas associated to the biodiversity data use made available in databases and other collaborative tools. First, focus groups of stakeholders belonging to three groups of activities (i.e., production chain, governance entities and R & D entities), and secondly, in the form of non-target groups of stakeholders were modeled. The workshop was highly valued by the participants and the focus groups allowed for detailed perceptions about the type, information and interactions related to agrobiodiversity. Differences and resemblances in stakeholder groups' perspectives are analyzed and discussed. Recommendations to cover stakeholder's data information needs and actions to promote synergies and foster collaboration between and within stakeholder's groups are provided. This work is part of a larger project on the use and understanding of biodiversity and agrobiodiversity online information needs, which also includes a quantitative and a training approach.

Assessing and valuing ecosystem services from urban greenery -a method developed based on case studies in Sweden

Friday, 16th June - 08:30 - SD 703 - Oral Abstract

Prof. Yvonne Andersson Skoeld (in Swedish it reads Sköld)¹, Dr. Jenny Klingberg², Prof. Bengt Gunnarsson³, Prof. Sofia Thorsson⁴

1. Swedish National Road and Transport Research Institute (VTI), SE-402 78 Gothenburg, Sweden, 2. Gothenburg Botanical Garden, 3. Department of Biological and Environmental Sciences, Gothenburg University, 4. Department of Earth Sciences. Gothenburg University

Despite the knowledge that greenery provides a range of important benefits to city residents, the current fast urban exploitation and densification increases the pressure to transform urban green spaces. The concept of ecosystem services (ES) has been suggested as an important concept to highlight and evaluate the services provided by greenery in relation to this and other pressures. As a result of this, methods for assessing and valuing the ES:s have been developed. There still is, however, a need of further development of methods that also are easy to use in the planning and decision processes. In response to this we have developed an empirically founded framework for integrated assessments of ES benefits and values of urban greenery. The method is based on identification of what can be measured in the urban environment that relates to specific ecosystem services, here referred to as indicators, (e.g. leaf area index, species diversity etc.) that. It is based on the so-called cascade model. The empirical data was collected from study areas in Gothenburg, Sweden. The method output is a semi quantitative estimate of how an area contributes to regulating ecosystem services such as local climate regulation, air pollutant deposition, noise and storm water management, and cultural ecosystem services such as physical activities and perceived well-being. The method also includes a valuation based on ranking preferences. The method is simple to use, and based on the functional indicators that are easy to measure. The empirical data was achieved, and the method was developed, through a cooperation among a multi-disciplinary team of scientists as well as civil servants. The method is highly requested by spatial planners in cities as well as the transport sector. The aim is accordingly, that the method shall be used in the local/municipal planning processes to investigate the current situation and impacts of future planning alternative.

Key Words: ecosystem service assessment, method spatial planning, urban greenery,

Understanding stakeholder-ecosystem (dis-)service associations and the need for policy intervention to avoid environmental conflicts

Friday, 16th June - 08:45 - SD 703 - Oral Abstract

Dr. Joachim H. Spangenberg¹

1. Helmholtz Centre for Environment Research UFZ

Humans attribute different Ecosystem Service Potentials (ESP) to the same ecosystem, and they value different Ecosystem Services (ESS) differently. They do both not only as individuals, but also as collectives sharing similar habits, cultures, value systems and patterns. We have analysed such patterns by (i) conducting a systematic stakeholder analysis in different countries in Europe and South East Asia, (ii) and conducting qualitative interviews with those stakeholders to identify the ESS and Ecosystem Disservices (EDS) they emphasise. The result is a matrix showing the juxtaposition of different ESS indicating synergistic, ambivalent or unclear and obviously contradictory and to a large degree mutually exclusive ESS. It can be used to illustrate that those who define the ESP of any given ecosystem, by this very act, eliminate at least some alternative ESP, which may have been preferred by different groups of agents: trade-offs in terms of loss of other ESP are inherent to any decision which ESP to realise for generating ESS. Any such choice is also a choice on the distribution of cost and benefits. Thus the power to define the ESP structurally and unavoidably includes the power to define potential beneficiaries and those discriminated against, who have to bear disadvantages at least in terms of opportunity cost (lost alternative opportunities). Even more damage can be inflicted on the same or other groups by the EDS which are almost necessarily defined by defining an ESS (e.g. river flood regulation ESS – reducing flooding EDS, but also natural fertilisation ESS; carnivores defines biocontrol ESS – herbivores defined as pest EDS). They are distributed as determined by the ESP definition (biocontrol ESP presupposes agricultural use; it makes no sense for primary forest or wilderness). Of course, such matrices – both ESS vs. ESS and ESS vs. agents – are context dependent: indigenous groups with specific cultures and religions have different ones than urban dwellers, the differences being within and even more so between such groups of agents. Nonetheless the matrices are helpful for inclusive and sustainable land management planning and ESS governance. They highlight which ESS have to be accounted for in evaluating a decision option to guaranty its suitability for sustainable development, which groups have to be addressed for inclusiveness, and which themes have to be addressed when communicating with them. This may help avoiding discrimination and extended disagreements over land use decisions which might otherwise hinder sustainable land management implementation and cause environmental conflicts. Given the powerful role of those defining the ESP, this act must be understood as not scientific but highly political and in need of a legitimised decision. Politics has to accept its responsibilities; neither science nor social interest groups can have this power in a democratic society.

Key words

Ecosystem services, disservices, power, beneficiaries, disadvantaged

Genetics Resources of Wheat – Way Back or Promising Future in Sustainable Development of Organic Farming

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Paper

***Dr. Ondrej Vlasek*¹, *Dr. Petr Konvalina*¹, *Dr. Karel Suchy*¹**

1. University of South Bohemia in Ceske Budejovice

Approximately seven thousand plant species have been cultivated and one hundred and twenty of them have retained their importance in national economic systems. The selection of varieties has been crucial in the breeding of cultured forms from wild ones - the varieties have adapted to environmental conditions (Evans, 1981). Therefore, the previous landraces were very varied and stable. The modern forms have been bred over a short period and they have made important progress; nevertheless, they have not respected local environmental conditions. The varieties are usually adapted to farming technologies and they are not able to respond to unfavourable environmental conditions (drought, weed and disease pressure, etc.) (Lammerts van Bueren, 2002). In case of genetic resources of cereals is important to be adapt to changing environmental conditions. Therefore, the most valuable varieties should be conserve by the on-farm method which assures a dynamic process (Laliberté et al., 2000). Such a method of conservation of genetic resources is carried out in nature-friendly farming systems and it may bring interesting market opportunities.

Our results are composed from more studies made in organic farming system from 2006 till now. We have been working with more than ten neglected wheat species. Evaluation of landraces was oriented to analysis of morphological, biological and economic characteristics. The most important part was oriented to evaluation of technological and nutritional quality of grain.

Our results show potential of some landraces of neglected wheat species to be grown in organic farming system. In many case was main advantage high resistance to common wheat diseases (eq. *Triticum monococcum* L., *Triticum Timopheevi* L. or *Triticum diccocom* Schrank). On the other hand – resistance was crucial problem of some species (eq. *Triticum sphaerococcum* L.). A lot of landraces had a higher competition ability against weed plant in case of non chemical weed management. Interesting findings also came from evaluation of yield. Generally – landraces had lower yield potential than modern varieties of *Triticum aestivum* L. Different situation was on less quality soils or very low nutrition of field. In this example could be in some landraces yield higher than modern varieties (eq. *Triticum spelta* L.). But the main advantage of landraces was quality of grain. There was very high protein content (einkorn or emmer we found accesions with more than 20% of protein). However, the diploid and tetraploid landraces may be difficult to use for common baking (low Gluten index and sedimentation value). Advantage was also high share of nutritionally valuable Albumins+Globulins and Unsoluble rest protein fractions in comparrison with modern control varieties of bread wheat. We found more unique quality parameters in grain of different wheat species. Landraces have potential to be grown in organic farming and used for the preparation of local high quality products. In this case there will be combination of two important aspects – unique value of genetics resources and added value of organic growing methods.

TRENDS IN UK DAIRY FARMS FROM 2001 TO 2014: EVIDENCE OF SUSTAINABLE INTENSIFICATION?

Thursday, 15th June - 10:15 - SD 702 - Oral Abstract

*Dr. Alejandra Gonzalez Mejia*¹, *Dr. James Gibbons*¹, *Dr. David Styles*¹

1. Bangor University

The UK dairy sector exemplifies a consolidation trend widespread across more economically developed countries (MEDC). Between 2005 and 2015, the number of dairy farms fell in the UK by one third, whilst average annual milk yield per cow increased from 7,000 kg to almost 8,000 kg. This study employs Farm Business Survey (FBS) data for England and Wales from 2001 to 2014 to see whether the observed intensification trend has increased sustainability at the individual farm level. 16 metrics were derived from FBS data to characterise farm production and intensification of production. Further, a model based cluster analysis was used on these metrics to classify exemplar farm types over the study period. This approach allows identification of distinct intensification pathways, which may be obscured by aggregation at the sector level. Principal component analysis (PCA) showed that while there was considerable change in the dairy sector over time, the relationship among metrics was constant over this period suggesting that they had identified fundamental farm properties. Results of this trend analysis show that in the earlier years of the study there were three and four types of dairy farms that were consolidated into two main typologies in 2014. These two main types of dairy farming share the same dairy density (1.4 cows/ha) and revenue milk price ratio (1 £/litre/£/litre). The first one is characterised by high milk yield (7,500 l/cow), concentrate-based feed (1.5 tonne/livestock units), high ratio of maize grass area for feed (0.2 ha/ha), low labour intensity (60 hours/ha), and lower utilisation of the agricultural area (UAA) for grazing animals (0.7 grass area/ UAA). The second farm type is a grass-based system (1 grass area/ UAA) with lower milk yield (6,835 l/cow) and lower dependency on concentrates (1.3 tonnes/ livestock units) but higher labour intensity (68 hours/ha). This consolidation shows that financial margins per litre of milk were achieved equally by both intensive grass-based systems and indoor housing concentrated based systems, but the productivity in terms of milk yield was higher with less labour intensity for the later type. Intensification is reflected in the increase of milk yield and decrease in labour intensity from 2001 to 2014, nonetheless the goal of sustainable intensification is to raise productivity and social welfare while reducing environmental impacts. In this context, these results can be used to model scenarios with different management practices, such that a farm type represents a sustainable system, which takes into account the equilibrium among the social aspects (e.g., labour intensity), the economic components (e.g., revenue milk price ratio), and the environmental impacts (e.g., land change use) of dairy farming.

Organic agriculture in Russia: social, economic drivers for development

Thursday, 15th June - 10:30 - SD 702 - Oral Abstract

Mrs. Natalia Nesterenko¹, Mrs. Nadezda Pakhomova¹

1. Saint-Petersburg State University

Follow the increasing consumer demand and environmental consciousness of people organic agriculture demonstrates a stable growth. To estimate this new agricultural model, it is reasonable to take into account the social and economic dimensions more thoroughly. It cannot be ignored numerous examples of violating the law on minimum wage by eco-farmers to ensure their price competitiveness with conventional farms. Agriculture in Russian Federation is faced today with the challenges of growth in the domestic demand of the population for food. Moreover, agriculture must ensure reducing the burden on the environment in terms of greenhouse gas emissions with accordance to decisions taken at the conference in Paris-2015. Lack of mineral fertilizers on the fields for many years is a significant advantage for the development of the organic agriculture. Furthermore, the demand on the organic products grows today. Moreover, a launch of organic farms could be a driver for social and economic development in rural areas. As a result of the analysis, it was identified promising areas. Analysis of promising areas was done in terms of production potential. We analyzed the unemployment rate and the area of unused land, because it needs agricultural land without mural fertilizers and a large number of labor. Thus, we have identified regions of Russia in which the development of organic agriculture has the greatest prospects. In addition, the choice of the development region depends on the strategy of organic production: fresh products, raw materials for the food industry or for other industries. The demand for fresh organic products is concentrated mainly in large cities, where the incomes of the population are higher. So the organic farms of this niche should be located near major cities. We conducted a survey among farmers to estimate awareness and attractiveness of organic farming in Russia. About a hundred farmers filled out questionnaires. The attractiveness of organic production among farmers is not high enough. This is due to limited demand and higher risks and costs of production. Nevertheless, according to a survey of farmers, about a third plan to move to the standards of organic production in the future. Organic agriculture is an innovation intensive, so the development needs a cooperation between business and science. At the same time, more producers are not ready to go to principles of organic agriculture. The reasons are in lack of market of such products, lack of organic technologies and high risks in production processes. Moreover farmers need investment for soil cleaning. Factors of limiting the development of organic agriculture: insufficient popularity of organic products among the population, high production risks. In addition, it requires the formation of a system for marketing of organic products: shops, restaurants, processing enterprises. The lack of development of certification organizations due to the lack of a legislative base complicates the procedure for switching to organic standards. At the same time, it should be noted that the awareness of producers is growing, non-governmental organizations are engaged in promoting organic products in the minds of consumers.

A comparison between organic and conventional farming systems in South Africa's southern Cape.

Thursday, 15th June - 10:45 - SD 702 - Oral Abstract

Prof. Raymond Auerbach ¹

1. Nelson Mandela University

Abstract: Track 2b: Food sovereignty and sustainable agriculture.

Long term comparative organic farming systems research trials have been running for four years, comparing organic and conventional, rotation and mono-cropping, biological and chemical pest and disease control and water use efficiency in cabbage, sweet potato and cowpea crops. In Africa the high cost and limited availability of agricultural inputs make agro-ecological approaches attractive, as they are practically possible and improve carbon sequestration and food quality. The research will show whether the improvements which organic farming brings about (higher soil organic matter, lower acidity, better soil biology, aerobic soil conditions, greater water use efficiency, better food quality) make up for the sometimes lower yields of organic farming systems. The trials will run for ten years, and are laid out as a complete randomised block experiment with four replications, split for farming system, with ten treatments. Four studies examine yield components, soil fertility changes, food quality and water use efficiency (using capacitance probes to 1.1 m depth, and theta probes for surface and mulch moisture content determinations). Results from the first three years are presented, showing how the conventional system has raised available soil phosphate levels more than the organic, but caused some acidification of soils. The organic system has raised soil organic matter and dropped acidity and this has made more potassium available in the soil. As with other long term trials, there is still a yield gap, with organic systems yielding twenty to thirty percent less than conventional, largely due to lower available soil phosphate. This problem is now being corrected using rock phosphate. The challenges for viable organic farming systems are thus seen to include: improving soil fertility, controlling pests and diseases and convincing consumers of the quality of organic products. Benefits include: higher soil water retention, sequestration of soil carbon, improved soil micro-biology, better agro-biodiversity and elimination of poisons from the food chain.

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Keywords:

organic farming systems; soil fertility; water use efficiency.

The Mapping of Resources and Development Potentials of Food-Secure Region in Kupang District, Province of Nusa Tenggara Timur

Thursday, 15th June - 11:00 - SD 702 - Oral Paper

***Dr. Ambar Pertiwinigrum*¹, *Prof. Cahyono Agus*¹, *Mrs. Supriadi Supriadi*², *Dr. Agung Setianto*¹, *Mr. Akhmad Arief Fahmi*¹, *Mr. Yudistira Soeherman*¹**

1. Universitas Gadjah Mada, Yogyakarta, 2. Ministry of Village, Development of Disadvantaged Areas and Transmigration

Indonesia Food Sustainability and Vulnerability Assessment (FSVA) 2015 by the World Food Programme (WFP) classified the Province of Nusa Tenggara Timur as Priority 1, a highly vulnerable region should be improved. The aim of this program was to develop partial and spatial map of current condition, problems, threats, potentials, and strategic policies to develop food security in this area. The program was focused on Kupang district, Province of Nusa Tenggara Timur, through: 1) literature study; 2) identification and mapping of natural resources; 3) Focus Group Discussion; 4) field trip and data collection; 5) data analysis; 6) development of program; 7) workshop. Kupang district has three sub-districts of the most vulnerable to food insecurity or Priority 1, namely Semau, South Semau, and Takari. The determining factors of vulnerability to food-insecurity are: (1) high poverty rate, (2) high prevalence of underweight among children, and (3) low access to clean water. The characteristics of the hilly areas in Kupang are arid-karst-dry-land with very low land productivity. The limiting factors are low rainfall, low water availability, high temperature, low moisture and low fertility. Livestock were still raised traditionally on natural pastures. Some of the programs needed to build resilience to enhance food-security in Tanini village are: (1) Improvement of land productivity, including infrastructure, facilities for intensive livestock systems, and optimization of dry land's potential; (2) Water management through the development of water reservoirs and the preservation of watershed and groundwater basins; (3) Capacity building for communities including farmers, the education on food consumption and processing, society empowerment by improving soft skills and hard skills. The analysis and estimation of WFP showed that after intervention, the composite score of Kupang district changed from 91.18 (priority 3) to 66.54 (priority 5). The food-insecurity map was ideal as a reference in planning an effective and efficient program.

Propagating Success? The Incredible Edible model of community food development

Thursday, 15th June - 11:15 - SD 702 - Oral Abstract

Dr. Adrian Morley¹

1. Manchester Metropolitan University

The Incredible Edible model of community food development originated in the small post-industrial town of Todmorden in the UK nearly a decade ago. With a focus on growing edible plants on underutilised small pieces of land, developing skills and supporting local businesses, the IE model is widely perceived to have played a key role in transforming the town both through economic uplift and by improving everyday living environments. Moreover, this has been achieved largely without the help of existing political / civil society structures or external resources, instead relying on volunteers living within the town. Its success has stimulated the establishment of hundreds of other Incredible Edible groups across the UK and overseas who pursue the same goals, inspired by the achievements in Todmorden.

The Incredible Edible approach directly tackles issues of food sovereignty by developing growing and cooking skills and an awareness of the productive capacity of their locality and the impact of food consumption on the environment and human health. The model also addresses community capacities to act by stressing the importance of action rather than words and not waiting for permission, funding or recognition. An inclusive, holistic approach is illustrated by the guiding principle 'if you eat, you are in'.

This paper will report on recent research that set out to elucidate the Incredible Edible model, as pursued in Todmorden, and critically assess its potential as a community-led framework for improving social, economic and environmental wellbeing. In particular, it explores how the model is conceptualised and communicated by the group, how this compares with actual practice and some of the factors mediating variance from the model. In addition, the study develops both practical policy recommendations to support self-starting food oriented community groups and seeks to contribute to our understanding of the unique role of food as a substantive focus for community development.

The study uses a participatory mixed methods approach, incorporating both qualitative approaches (interviews, focus groups) and quantitative methods (a community survey, a social return on investment study) to derive a holistic account of the evolution of the model and its impact in the town, incorporating a theory of change and narrative based analysis. The paper concludes by setting out a longer-term research trajectory that aims to develop a comparative approach between Incredible Edible groups and between the model and other similar grassroots approaches to food production, for example those embodied within La Via Campesina movement.

Assessing Agricultural Transformation Pathways in Rice Production in Nigeria

Friday, 16th June - 08:30 - SD 716 - Oral Abstract

Dr. Olawale Emmanuel Olayide¹

1. University of Ibadan

Nigeria is the highest producer of rice in West Africa, and the third largest in Africa after Egypt and Madagascar. Yet, there is still excess demand for the commodity in the country. The per capita consumption of rice has grown from 3 kg in the 1960s to an estimated 37.5 kg in 2014. Current government policies to boost local rice production through self-sufficiency in production have less focus on the impact of rice production systems on carbon footprint and climate change mitigation.

The agricultural sector has been implicated as a driving force in greenhouse gas (GHG) emissions and land use effects. Direct sources of GHG from agricultural production systems are emissions from cultivated and fertilized soils which include carbon dioxide, ammonia and nitrogen oxides. Rice (*Oryza spp*) constitutes a major staple crop (and drainer of foreign exchange) in Nigeria. It also contributes to greenhouse gas emissions through its intensive and high-input production system. Proper identification of the nature and intensity of emission (and sources) could assist in appropriate greenhouse gas emission actions as well as proper estimation and reduction of carbon footprint from rice production systems. Hence, the importance of assessing the nature of deep carbonization that would be required for agricultural transformation pathways in rice production systems in Nigeria.

The transformation pathways methodology which seeks to analyse agricultural production systems taking into cognizance climate change and sustainability of the agricultural production systems, was adopted for the study. In this regard, a step-by-step of the analysis of back-casting involved: analysing the present economic and environmental situation of rice production in Nigeria; stating desired future scenario; undertaking feasibility assessment; prescribing a concrete course of action; and elaborating detailed pathways.

The findings yielded a strategic matrix for the transformation of the rice production systems in Nigeria. The transformation pathways have indicators on productivity, biodiversity, climate change scenarios, and nutrient demand. Also, targets, roadblocks and levers for sustainable rice production were presented. These issues are with a view to mitigating greenhouse gas emissions and promoting efficient water management in the rice production system in Nigeria.

Integration Model of Productive Enterprises for Innovation Adoption in Livestock Farming in Argorejo and Argosari Village, Sedayu Sub-District, Bantul District, Special Province of Yogyakarta

Friday, 16th June - 10:15 - SD 702 - Oral Paper

***Mrs. Supriadi Supriadi*¹, *Prof. Ali Agus*², *Prof. Muhadjir Muhammad Darwin*², *Prof. R Rijanta*²,
*Dr. Ambar Pertiwinigrum*³**

1. Ministry of Village, Development of Disadvantaged Areas and Transmigration, 2. Universitas Gadjah Mada, Yogyakarta, 3. Universitas Gad

Adoption of innovation is a process of mental or behavioral changes in the form of knowledge (cognitive), attitudes (affective), and skills (psychomotor) since one recognizes the innovation until one decides to adopt it after receiving it. Integrated livestock development is a model of integrated resource management by integrating livestock and crop in accordance to the areas developed by community with bio-industry and eco-friendly (zero waste) orientation. The study of “innovation adoption of integrated farming” was a case study in Argorejo and Argosari village, Sedayu sub-district, Bantul District in Yogyakarta. Its aim was to explain the process of innovation adoption of integrated farming to encourage the development of productive enterprises that led to the improvement of the local economy and the development of rural areas. Using descriptive analytical method, the data obtained through interviews and focus group discussions related to the innovation adoption of integrated farming was described to define the aspects of who, what, when, and how in group activities. The results of the study formulated the concept of innovation adoption model in integrated farming to develop the rural areas effectively and efficiently by preparing a development program. The program was based on local wisdom as a reference for the empowerment program which included technological training, institutional strengthening, and mentoring program designed to produce innovation agents to conduct the adoption. The concept arose over the adoption process carried out by members of the group to create business activities that were integrated vertically and horizontally which would in turn increased the revenues of members of the business group.

Sustainable agriculture: challenges and opportunities for the vegetable sector in northern Philippines

Friday, 16th June - 10:15 - SD 702 - Oral Abstract

Ms. Mursha Dalay-on Gapasin¹

1. Monash University

The rapid diffusion of modern technology has transformed farming systems around the world, triggering widespread shifts from subsistence to market-oriented production. Indeed, the application of intensive agricultural methods have resulted in higher yield and income. However, the ecological and social consequences have set off debates about the sustainability of conventional (modern) farming, prompting the rise of local and international movements for alternative agriculture. In the Philippines' vegetable sector, concerns about the impacts of current agricultural practices are emerging and driving path-breaking actions in policy, extension work and farmers deciding alternative ways to produce. The recent enactment of a national law legitimizing the advancement of organic agriculture in the country has boosted preceding efforts of various sectors. While government agencies are mandated to implement the policy, this research highlights the essential role of farmers, non-government organizations, academe and civic groups in advocating sustainable agriculture albeit the need for consolidated actions. Drawing from interviews of farmers, policy implementers and advocates in the largest vegetable producing province in northern Philippines, the study explores the challenges in the adoption and promotion of sustainable agriculture practices, particularly organic farming. Findings show that beyond the technological limitations of such methods, historically embedded factors also deter attempts to shift from conventional to sustainable production. As the presentation will illustrate, the institutionalization of a commercial vegetable industry in the locality has generated new social relations between farmers on one hand and market intermediaries and financial actors on the other. It is argued that the power asymmetry intrinsic in these arrangements serves to constrain farmers to conventional methods of production. Moreover, notions about what constitute good and successful farming differ between conventional and organic practitioners. The existence of entrenched elements, such as those found in the research setting, alludes to the significance of understanding local conditions and perspectives in policy implementation and advocacy for sustainable farming. The study also maintains that challenges notwithstanding, organic agriculture presents opportunities for the local economy and its stakeholders.

Keywords: challenges, opportunities, organic agriculture, vegetable industry, Philippines

Novel technological and management options for accelerating transformational changes in rice and livestock systems

Friday, 16th June - 10:15 - SD 702 - Oral Paper

Dr. Ngonidzashe Chirinda¹, Ms. Laura Arenas¹, Ms. Sandra Loaiza¹, Ms. Catalina Trujillo¹, Mrs. Maria Katto¹, Ms. Paula Chaparro¹, Mr. Jonathan Nunez¹, Dr. Arango Jacobo¹, Ms. Deissy (Ciat-ccafs) Martinez¹, Dr. Ana Maria Loboguerrero¹, Dr. Luis Augusto Becerra¹, Mr. Ivan Camilo Avila², Dr. Myriam Guzmán², Dr. Michael Peters¹, Dr. Jennifer Twyman¹, Ms. Maria Garcia¹, Ms. Laura Patricia Serna¹, Mr. Daniel (Ciat) Escobar¹, Dr. Diksha Arora¹, Dr. Jeimar Tapasco¹, Mrs. Lady Johanna Mazabel¹, Dr. Fernando Correa¹, Dr. Manabu Ishitani¹, Dr. Mayesse Aparecida Da Silva¹, Dr. Eduardo Jose Graterol¹, Mr. Santiago Jaramillo¹, Ms. Adriana Pinto Brun³, Dr. Andres Felipe Zuluaga⁴, Dr. Nelson Enrique Lozano⁵, Mr. Ryan Byrnes⁶, Ms. Carolina Alvarez⁷, Dr. Idupulapati Rao¹, Mr. Gabriel Lahue⁸, Prof. Rolando Barahona⁹

1. International Center of Tropical Agriculture, 2. Fedearroz, 3. Ministry of environment - Colombia, 4. Fedegan, 5. Ministry of agriculture - Colombia, 6. University of UC DAVIS, 7. INTA - Argentina, 8. University of California, Davis, 9. Universidad Nacional de Colombia (UNAL), Medellín,

Agricultural producers grapple with low farm yields and declining ecosystem services within their landscapes. In several instances, agricultural production systems may be considered to be largely unsustainable, in socio-economic and ecological (resource conservation and use and impact on nature) terms. Novel technological and management options that can serve as vehicles to promote provision of multiple benefits, including improvement of smallholder livelihoods, are needed. We call for a paradigm shift to allow designing and implementing agricultural systems that are not only efficient (serving as a means to promote development based on the concept of creating more goods and services while using fewer resources and creating less waste), but can also be considered synergistic (symbiotic relationship between socio-ecological systems) by simultaneously contributing to major objectives of economic, ecological and social (equity) improvement of agro-ecosystems. These transformations require strategic approaches that are supported by participatory system-level research, experimentation and innovation. Using data from several studies conducted, we here provide evidence for technological and management options that could be optimized, promoted and adopted to enable agricultural systems to be efficient, effective and, indeed, sustainable. Specifically, we present results from a study conducted in Colombia, which demonstrated that in rice systems, improved water management practices such as Alternate Wetting and Drying (AWD) could reduce both water input and methane emissions (~70%). We also show how women can play a key role in AWD adoption. For livestock systems, we present *in vitro* evidence showing that the use of alternative feed options such as cassava leaves contribute to livestock feed supplementation and cost-effective reduction of enteric methane emissions (22-55%). We argue that to design and benefit from sustainable agricultural systems, there is a need for better targeting of interventions that are co-designed, co-evaluated and co-promoted with farmers as allies of transformational change (as done in the climate-smart villages), not as recipients of external knowledge. Moreover, for inclusive sustainability that harnesses existing knowledge and influences decision-making processes across scales, there is need for constant, efficient, effective and real trans-disciplinary communication and collaboration.

Participatory innovation tools in food sovereignty

Friday, 16th June - 10:15 - SD 702 - Oral Paper

***Mr. Miguel Navarro-Sanint*¹, *Ms. Azalya Latorre*²**

1. Universidad de los Andes - Design Department, 2. Universidad de los Andes

In this paper we present the use of participatory innovation tools in a food sovereignty project. We introduce participatory innovation as a feasible method for engaging a community of farmers in an innovation process regarding food production; and we do not intend to show it as the only way to innovate with farmers. We expose how a participatory innovation approach can be used to transform, through tools that invite to a groupal reflection, the production practices of a farming community. Our approach was a path that established that the transformation of daily practices and the introduction of new technologies is feasible when it involves the active participation of community members. We describe all the stages of a case study with a community of organic farmers in Chocontá, Cundinamarca (Colombia). As a result of the innovation process, the community recognized together their resources and limitations, and discovered ways of transforming their organization in order to achieve better production practices and transform their commercial practices.

Creating edible cities: Urban Agriculture as livelihood strategy and knowledge hub for agroecological cultivation

Friday, 16th June - 10:15 - SD 702 - Oral Abstract

*Ms. Nicole Paganini*¹, *Ms. Anja Schelchen*²

1. HU, 2. Humboldt Universität zu Berlin

Sub-Saharan Africa is the most rapidly urbanized region in the world. Especially in the urban informal areas, Food Security and Food Sovereignty is one of the main challenges for policy makers, city planners, urban farmers and of course - the population itself. Urban Agriculture can contribute to Food Security and could be a solution for improving food and nutritional security as well as safe and healthy food production, especially in disadvantaged urban communities. The international research project, UFiSAMo[1] investigates possible means through which to increase the availability, consumption, and environmental perception of diverse, safe and nutritious foods through improved production (and marketing) of crops in Maputo and Cape Town. The research contributing to this paper is focused on Food Security and Food Sovereignty for vulnerable population in Cape Town and Maputo, but raises also the question on safe and healthy food production in urban space according agroecological production principles to create edible urban landscape. How healthy is the so-called organic food already produced in Cape Town's backyards and smallscale fields, compared to the food produced in Maputo's small scale farms with mostly high chemical input?

Comparative observation of production methods as well as laboratory analysis show differences in food quality and show up the potentials for knowledge transfer through PGS certification on the example of Western Cape PGS movement in South Africa. The grass root movement allows producers to work on their own quality assurance standard, considering agroecological principles, and building up their production on trust, participation, and sovereignty from global and national food markets. The implementation of PGS in Western Cape region is observed, accompanied, analysed and in a next step with participatory action research methods transferred to urban space requirements – so called urbanGAP- as one main outcome of our research.

Results from the present research will show the understanding and practice of GAP in both cities – defining urbanGAP as collection of different, to urban circumstances adapted, agroecological production principles to cultivate in an organic and healthy way with the aim to support Food Security and Food Sovereignty to the producers. It is assumed, that GAPs in Cape Town is far beyond of Maputo. However, two cities – two realities. Good practices outlined in Cape Towns backyards and Maputos “organic machambas”, verified with Participatory Guarantee Systems, could be the theoretical base for more Food Sovereignty in both cities.

The implementation of urbanGAP as innovation is crucial to enhance the access of the urban disadvantaged to safe food and to enhance food and nutrition security. On this basis, the possibility to enhance agroecological cultivation methods in urban area will be shown. Due to an additional analysis on local knowledge exchange and local capacity development systems, an adapted transfer model will be developed to contribute to the adoption of innovations on organic cultivation in the city.

[1] **UFiSAMo**: Research project on Urban Agriculture for Food Security and income generation in Southern Africa and Mozambique. Founded by German Federal Office for Food and Nutrition.

RESOURCE DECOUPLING: EMPIRICAL EVIDENCE FROM BRAZIL

Wednesday, 14th June - 14:00 - SD 715 - Oral Abstract

***Ms. Layza Soares*¹, *Mrs. Luciana Almeida*²**

1. Universidade Federal Fluminense (UFF), 2. Universidade Estadual Paulista Júlio de Mesquita Filho (UNESP)

In 2008, the United Nations Environment Programme (UNEP) launched the Green Economy Initiative, which comprises a set of recommendations aimed at stimulating economic growth, while simultaneously achieving social inclusion and environmental sustainability. UNEP has been using the key-concept of decoupling for achieving these goals. It means dissociating the economic output of the environmental pressure with the increase of well-being of society. Some developed countries have shown decoupling of economic growth from natural resource consumption and environmental impacts, building a trajectory towards a green economy. However, a portion of this resource decoupling may be related to environmental pressure in developing countries, such as Latin American and Caribbean countries, whose economic development model is intensive in natural resources and based on exports of low value-added products. This article aims to investigate the long-term relationship between economic growth and the environment in Brazil based on resource decoupling indicators. To this end, indicators of resource use according to Material Flow Accounting method (MFA) are measured for all categories of materials (biomass, fossil fuels carriers, non-metallic minerals and metallic minerals) from 1970 to 2013 (these indicators are being updated for more recent years). The results show that there was no resource decoupling in Brazil in the 44 years of this study, due to the increase in resource per capita consumption from 7.8 tons in 1970 to 23.6 tons in 2013. Furthermore, there was an increase of 26% in material intensity. Brazil has a Physical Trade Balance deficit especially caused by exports of biomass (soybean, sugarcane) and metal ores (iron), while it is still dependent on imports of fossil fuels and chemical minerals (fertilizer). Empirical evidence for decoupling in Brazil corroborate the studies on material resources consumption in Latin American and Caribbean countries, indicating that the resource intensive economic development model followed by these economies are directly related to dramatic increase in the natural resources exploitation in the region.

Keywords: decoupling indicators; natural resources; economic growth; environmental impacts.

Sustainability of the extraction of coal in Colombia

Wednesday, 14th June - 14:30 - SD 715 - Oral Abstract

Prof. Adrian Saldarriaga Isaza¹, Mr. Luis Salas¹

1. Universidad Nacional de Colombia - Sede Medellín

In the last five decades, most of Colombia's exports have been commodity-based. Along this time, coffee ceased its role in the Colombian balance of trade as the largest product commodity; in first decades of the 21st century, non-renewable resources, coal and oil, are among the main goods that Colombia exports to the rest of the world. No matter the price, Colombian government has boosted the extractions of oil and coal. Moreover, recent evidence shows that those departments of Colombia with high economic dependence of minerals and oil, which are also the departments with the lowest levels of per capita GDP, have a higher rate of economic growth. This evidence shows that a high concentration in the mineral and oil sector has had a positive effect on the rate of growth per capita GDP of those departments. Nonetheless, it is still unknown whether this condition and this rate of extraction is sustainable for this country. Using available data for the 2004-2011 period, this paper shows an application of K.G. Maller's Value of Natural Capital method in discrete-time. Maller's method is used to answer the question of whether coal extraction has been sustainable for Colombia. Consumer surplus and producer surplus are computed with the estimation of a demand function for coal in Colombia, and using the financial statements of coal companies in Colombia respectively. The sum of these surpluses is used as a measure of social welfare, which together with the environmental discount rate for Colombia determines the shadow prices under two models of resource allocation (autonomous and non-autonomous). The analysis of results suggests that the extraction of coal in Colombia for this period has shown an unsustainable path.

Keywords: Intergenerational well-being; coal; value of natural capital; shadow price, sustainability.

Mining impact on potable water and on Zika epidemic development in the Department of Meta, Colombia in 2016.

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

*Dr. Luis Jorge Hernández Flórez*¹, *Ms. Alexandra Pardo Salazar*¹, *Dr. Mauricio Alberto Cortés Cely*¹,
*Ms. Diana Sofía Ríos Oliveros*¹

1. Universidad de los Andes

Justification of the research / research argument

In Colombia mining is a strategic sector for its development and is also a business that trades several millions each year. In the Department of Meta, 65.51% of the 29 municipalities practice opencast mining, which consumes huge amounts of water and benefits the transmission of Zika and other vector-borne diseases, due to the lack of potable water in both urban and rural areas.

Aim / purpose

To identify a possible association between the presence of mining, potable water and presence of Zika's epidemic in the Department of Meta-Colombia.

Methods / approach / theoretical framework

Descriptive study of mining characterization in the Department of Meta, its impact on the potable water and Zika's epidemic. A study was conducted in order to map mining areas in the Department and to track Zika's risks behaviors in the 27 municipalities with high risks of transmission.

In the extraction processes of different minerals, the impacts on human health and on environment are several. Mining usually has a triple direct impact on water in the territories in which it is developed. First, mining consumes water. Second, mining pollutes water. Third, mining destroys water sources.

Findings / results / conclusions;

In the Department of Meta 65.51% of the 29 municipalities practice illegal mining in open areas which consumes water and causes a deep impact in front of Zika's epidemic due to the lack of availability of water in both urban and rural areas. Municipalities with presence of mining and potable water coverage less than 30% had a higher prevalence of Zika.

55% of the municipalities in the Department of Meta record mining activity, opencast mining and drilling of wells affecting water sources in both urban and rural areas.

Keywords:

Mining

Water

Environmental pollution

Implications or relation with the central theme of the conference: including Sustainability for Development.

The presence of legal and illegal mining in Colombia is affecting the availability of potable water, impacting public health, due to higher prevalence of vector-borne diseases such as Zika. It is necessary that the practice of mining reinforces controls on the sustainability of drinking water.

Predicting climate change impacts on vulnerable small farmers in South Africa's Eastern Cape.

Wednesday, 14th June - 14:15 - SD 715 - Oral Paper

Prof. Raymond Auerbach ¹

1. Nelson Mandela University

South Africa's Eastern Cape province has extremely high levels of poverty, partly due to the highly variable rainfall; rainfed farming systems are notoriously risky due to poor rainfall distribution, and this results in widespread food insecurity. Two magisterial districts (Sarah Baartman near Port Elizabeth and Amathole near East London) were selected, and large variability of rainfall distribution was noted. Factors implicated in food insecurity were analysed including resilience, biodiversity and productivity, and five climate prediction models were examined to assess their relevance in supporting small scale farmers. Sensitivity of the models to variable data input was assessed. Given that rainfed crop production requires 500 mm of rain during the growing season, that all of the models examined were highly sensitive to variations in rainfall and that rainfall in the sub-districts varies from year to year between 200 and 900 mm per annum, it was concluded that none of the climate change models available would be useful in the Eastern Cape. It was rather decided to use existing rainfall data as an initial predictor of likely drought patterns, as these are already a severe constraint on rainfed crop production. Strategies to assist vulnerable farmers should therefore focus on small livestock production, home gardens with rainwater harvesting and soil management systems which improve soil water holding capacity, such as organic farming and conservation agriculture.

Keywords: climate change; drought prediction; plant available water; food insecurity, water use efficiency.

Climate Change and Vulnerabilities in Colombia

Wednesday, 14th June - 14:45 - SD 715 - Oral Abstract

Mr. Jorge Enrique Gutiérrez¹, Mr. Javier Eduardo Mendoza¹

1. IDEAM - PNUD

Colombia has been strengthening processes and learning regarding the assessment of vulnerability to Climate Change. Starting with the Third National Communication, that will be signed in 2017 to the United Nations Framework Convention, new approaches are presented both to methodologies and to the results of a comprehensive analysis for the national territory. Based on the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), frameworks are proposed that interweave conceptual dialogues between disaster risk approaches and climate risk analysis, including the latter Component of vulnerability.

The present paper seeks to highlight the main challenges facing the country, and what the results were based on the methodology that integrates IPCC approaches from the AR5, where social, economic and ecosystemic factors are identified, among others, which have the effect of creating or generating elements that increase or decrease vulnerability to climate change in a territory.

SUSTAINABLE DEVELOPMENT CO-BENEFITS OF WIND POWER CDM PROJECTS IN NORTHEAST BRAZIL

Wednesday, 14th June - 14:45 - SD 716 - Oral Abstract

*Ms. Maria de Fátima Barbosa Góes*¹, *Dr. Celio Andrade*², *Dr. Marcelo Santana Silva*³, *Ms. Augusta Coelho Santana*²

1. Bahia State University, 2. Federal University of Bahia, 3. Federal Institute of Bahia

Clean Development Mechanism (CDM) projects prompted by the Kyoto Protocol allow developed countries to finance GHG emissions reduction in developing countries. The energy sector plays a critical role in successfully reducing GHG emissions and facing climate change. Worldwide, according to the International Energy Agency (IEA), use of low-carbon energy sources is expanding rapidly, with renewable energy accounting for almost half of all new generation capacity in 2014. There has also been increasing investment in the wind power sector in recent years in Brazil. At the end of 2014, Brazil ranked 10th in the world ranking of wind power generation. Brazilian potential for wind power generation is quite large, especially in the Northeast Region. Data from the Brazilian Wind Energy Association (ABEEólica) show that 78% of wind power installed capacity in Brazil at the beginning of November 2015 was concentrated in Northeastern states, mainly Rio Grande do Norte, Bahia and Ceará. In addition to the main objective of reducing GHG emissions, CDM projects should have as a secondary objective the promotion of sustainable development co-benefits. Given the role of renewable energy in consolidating a low-carbon economy, the purpose of this paper is to analyze the sustainable development co-benefits of wind power CDM projects in Northeast Brazil. In order to achieve this aim, a desktop analysis of 47 Project Design Documents (PDDs) of all the wind power projects in Northeast Brazil registered by the CDM Executive Board until May 2016 was carried out. During the desktop analysis, size, location, actors, organizations, annual estimation of emission reductions in tons of CO₂e, crediting period and declared co-benefits for sustainable development were identified. Preliminary results show that approximately half of the projects are located in the state of Rio Grande do Norte; about 70% rely on less than 40 wind turbines; and around 60% estimate an average annual GHG reduction of up to 100,000 tons of CO₂ equivalent. In regard to sustainable development co-benefits, the most cited environmental co-benefit was, as expected, the improvement in air quality. As for the social co-benefits, the generation of new employment opportunities was the main one listed. At last, the most cited economic co-benefits were the stimulus of regional economy, the promotion of sustainable energy use and the introduction and diffusion of imported technology. Finally, some suggestions are made in order to increase the sustainable development co-benefits of the wind power CDM projects in Northeast Brazil.

Keywords: Sustainable Development Co-benefits, CDM projects, Wind Power, Brazil.

Green Hydrogen and Lithium sources: toward Green Brazil

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Dr. Corinne Arrouvel¹

1. Universidade federal de São Carlos

The human population is today of 7.5 billion and is still dramatically growing with a high demand for access to technology and transportation. In Brazil, the fossil fuel extraction is still taking a high part of the internal demand to expand the transport industry but the world oil reserves are expected to end in about 46 years. Other primary sources are also economically competitive such as sugar cane producing ethanol. However, the use of such energy sources contributes to high levels of greenhouse gas emissions. Brazilian industries are slowly converting their researches in offering other alternatives thanks to governmental pressures and international directives to decrease gas emissions. Electricity from hydraulic or nuclear plants coupled to lithium batteries offers such an alternative, nevertheless environmental impacts and safety problems are still important. In European countries, nuclear centrals are being dismantled and sustainable programs become the priority. In order to reach a sustainable form of transport, fuel cells based on hydrogen are a promising substitute. Rich and poor countries can benefit from the revolutionary technology. Recent discoveries indicated that there are natural hydrogen sources in Brazil; they could potentially become a green solution to generate energy [1] (following the example of the village of Bourakebougou in Mali [2]) and to develop non pollutant vehicles at a larger scale. Some improvements on nanotechnology in order to safely store hydrogen and lithium [3,4] are under progress. This work presents then an economical aspect and the technology of fuel cells and lithium-batteries to reduce considerably GHS emissions.

[1] Alain Prinzhofer and Eric Deville. *Hydrogène naturel. La prochaine révolution énergétique ?*, Ed. Belin, 2015.

[2] <http://africa-me.com/hydrogen-...>

[3] C. Arrouvel, S. C. Parker and M. S. Islam, "Lithium insertion and transport in the TiO₂-B anode material: a computational study", *Chemistry of Materials*, 20, 4778-4783 (2009).

[4] C. Arrouvel, T. R. Peixoto, M. E. G. Valerio S. C. Parker, "Lithium migration at low concentration in TiO₂ polymorphs", *Computational and Theoretical Chemistry*, 1072, 43-51 (2015).

Keywords: fuel cells, natural hydrogen, lithium batteries, zero gas emissions

Acknowledgment: CA would like to thank Anthony Le Viavant and Hervé Toulhoat for fruitful discussions.

Renewable Energy Integration into the Japanese Electricity Grid: Dealing with Intermittency through Smoothing and Ocean Energy

Thursday, 15th June - 10:15 - SD 703 - Oral Abstract

***Dr. Miguel Esteban*¹, *Dr. Jeremy Bricker*², *Dr. Ben Mclellan*³, *Dr. Keiichi Ishihara*³, *Dr. Hiroshi Takagi*⁴, *Dr. Joana Portugal-pereira*⁵, *Dr. Volker Roeber*⁶**

1. The U, 2. Delft University of Technology, 3. Kyoto University, 4. Tokyo University of Technology, 5. Universidade Federal do Rio de Janeiro, 6. Tohoku University

Following the 2011 Fukushima nuclear disaster, Japan is having to re-think its overall energy policy, as the country has been increasingly reliant on imported fossil fuels, though it will eventually have to decrease the amount of greenhouse gases emitted into the atmosphere under the COP21 climate pledges. Increasingly, renewable energy sources such as solar and wind are seen as being destined to play a major role in the power generation mix. However, detractors of intermittent energy sources often claim that they cannot be used to reliably power a country, given that there are times of the day when little solar or wind power is generated at a given point. Essentially, these intermittent generation sources can only really work if integrated over a large grid, where an excess of production in one region can compensate for adverse weather in another area, an effect known as smoothing. However, to date comparatively little work has been done on developing actual realistic simulations of how such a system would work, which require the input of hourly meteorological data to calculate how much electricity would be produced, and whether this could meet demand.

Essentially, smoothing becomes more pronounced as more types of renewable energy are introduced into the mix. In the present paper the authors have built a grid-simulation tool that simulates the hourly future electricity production based on wind, solar, wave and tidal data. The system uses pump-up storage and electric batteries to balance the daily fluctuations in supply and demand, essentially demonstrating how a viable system can be created in the middle to long term. The results have import implications at the policy making level, as they shows how such a system is technically able to increase the share of renewables in Japan up to 100%, guaranteeing a stable and reliable supply.

Portugal – A pathway towards 100% renewable electricity

Thursday, 15th June - 10:30 - SD 703 - Oral Abstract

Prof. Francisco Ferreira¹

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In the last Conference of the Parties of the United Nations Framework Convention on Climate Change in Marrakech, Portugal stated the objective of becoming carbon neutral by 2050, as a form to fulfil the Paris Agreement objectives. One crucial area in relation with this goal is the transition to 100% renewable energy, which should initially take place during the decade of 2030 for electricity. In 2016, 64% of the electricity consumption in Portugal was assured by renewable energy sources and the country bet a record of 107 continuous hours, almost 5 days, of consumption fully supplied from renewables. The research focused on the specific characteristics of the electric management system and the particular circumstances that enabled this event during that period. At the same time, and under a long-term perspective, it is important to identify the major economic, environmental and technical obstacles to increase renewable electricity production, such as the higher consumption forecasted due to electric vehicles, the increasing role of solar power with a higher seasonal variation like hydroelectricity, the storage management capacity in dams particularly with pump-storage capabilities, and the role of interconnections between countries at the Iberian and European level. Data from electricity demand forecasting models developed by different institutions were used to interpret different possible pathways and to evaluate how to achieve the current long-term challenges of full net renewable electricity sources and carbon neutrality. Also, near-future political decisions aspects currently being discussed at the European level under the energy winter package from late 2016, such as regional cooperation, market rules, and state-aid are included in the analysis. It is concluded that a major increase in solar power up to 9 GW (currently at approximately 500 MW) with a complementary increase of both wind (up to 8 GW) and hydropower (up to 8,2 GW) is required to assure the 100% renewable electricity goal. Energy efficiency measure will be crucial also for attaining the objective. This pathway will be fundamental for climate change mitigation. However, negative environmental consequences, such as the large occupation of land by energy infrastructures, will have to be considered along the next decades. Price and market considerations were not evaluated in sufficient depth due to uncertainties under the future rules of the carbon and electricity market within Europe.

Modelling renewable energies in macroeconomic energy-climate models

Thursday, 15th June - 10:45 - SD 703 - Oral Abstract

*Ms. Ganna Gladkykh*¹, *Ms. Nathalie Spittler*²

1. *University of Clermont Auvergne*, 2. *University of Iceland*

The currently operating fossil-fuel-based energy system has proven to be one of the main drivers of earth system change. It has become to be the main driver for climate change. The transition from the fossil-fuel-based energy system to a renewable-based energy system is one of the widely advocated and modelled solution pathways for achieving long-term sustainable development and climate change mitigation. However, results regarding their contribution to climate change mitigation and sustainable development are dependent on the assumptions made with regards to renewable energies. Therefore, the study deals with the following research question: *How to model renewable energies in macroeconomic energy-climate models?* To answer this question, we analyse renewable energies and their technological, environmental and economic characteristics in a disaggregated manner. This is followed by an overview of current macroeconomic energy-climate models, where we describe different approaches applied to model renewable energies and discuss simulation results. Based on the review of current practices of modelling renewable energies and contrasting it with other research in the energy field (e.g. resource limitations on harvesting technologies, impact of climate change on renewable energy), we explore the gap between the current knowledge on renewable energy potentials and modelling practices. Thereby, we challenge the assumptions of many models that renewable energies are unlimited and that their relation to climate change is unidirectional. To support this argument and to present a possible advanced way of modelling renewable energies, we built a model structure that starts from the existing model structures regarding renewables but also allows to incorporate the necessary environmental, technological and economic, characteristics found in the relevant literature of renewable energy on a global and local scales. The method applied to build this model structure is System Dynamics. There are two main goal of our modelling effort: (1) gaining insights into how different assumptions on renewables can affect model results and (2) identifying the most relevant characteristics to be considered in order to draw the right conclusions on how renewable energies can contribute to climate change mitigation, and how long-term sustainable energy system can be designed.

Keywords:energy, climate change, renewables, resource limits

Assessing the impact of a wind farm in the Colombian Power System

Thursday, 15th June - 11:00 - SD 703 - Oral Paper

*Mr. Alejandro Piñeros*¹, *Mr. Javier José González Ruiz*¹, *Dr. Ángela Inés Cadena Monroy*¹, *Mr. Javier Rodríguez*¹, *Mr. Luis Posada*², *Mr. Álvaro Ramírez*²

1. Universidad de los Andes, 2. Isagén

The wind energy potential in La Guajira region and its complementarity with the hydrological regimes justify the current interest in Colombia on this source and technology. The power production potential is estimated up to 18 GW, enough to satisfy in excess the current peak demand of the system. The market spot price could be reduced due to the low variable costs of these generation technologies. Also wind energy could help to preserve water reservoirs in a system with a large participation of hydro plants during extended droughts, like the ones caused by El Niño phenomenon. Lastly, the inclusion of renewable generation in the Colombian mix can be viewed as a climate change mitigation option since it could replace energy generated using thermal plants, and therefore reduce greenhouse gas emissions. In this study, the impact of a hypothetical 376.2 MW wind park located in La Guajira region on the Colombian electrical system is evaluated. A retrospective analysis is performed to evaluate hypothetical changes due to the operation of this park during the period 2006 – 2016 in: i) market clearing prices and energy marginal costs, ii) levels of the aggregated reservoir through time and iii) carbon emissions due to electrical generation. Two different methodologies are used to assess those impacts: a reconstruction of the spot market supply curve by using historic economic dispatches and including the new plant, and a full long-run simulations of the marginal cost curves of the ‘new’ power system by using SDDP (hydrothermal dispatch model, based on stochastic dual dynamic programming). Wind park generation is calculated by using data from weather stations located in the selected region and a park model that includes wake effect for a given layout. The demand to be attended is represented in different scenarios. Results showed reductions of the spot price and energy marginal cost, increases in the level of the aggregated reservoir and reductions in emissions due to the operation of the wind park.

Keywords: Wind energy, Renewable impact, Merit Order Effect, Colombia, La Guajira.

Methodological considerations for the Life Cycle Assessment of clay masonry

Thursday, 15th June - 11:15 - SD 703 - Oral Paper

Prof. Sergio Ballén¹, Prof. Liliana Medina¹, Prof. Adriana Cubides¹, Prof. Luz Amparo Hinestrosa¹, Prof. James Ortega Morales¹

1. Universidad Colegio Mayor de Cundinamarca

This paper presents the progress of an investigation developed in 2016, whose general objective was to set a methodology for the life cycle assessment of clay masonry in Cundinamarca State, based on the evaluation of energy resources consumption. Recently, progress in the study of energy efficiency in the production of the brick industry in Cundinamarca State have been developed, taking into account the equipment of combustion and / or fuel injection, as well as the combustion process and its proper functioning. On the other hand, regardless of the development of eco-labels methodologies type I, the LCA in this industry does not constitute an element that leads to an eco-label type III regulated by ISO 14040: 2006. This data could be an input for national and local sustainable construction policies, energy efficiency, low-carbon growth, environmental product declaration, and also, makes it as easy to deploy of standards under the Colombian Environmental Seal of the Ministry of Environment, and whose main goal is to minimize greenhouse gas emissions and improve energy efficiency from the construction industry and the brick industry.

Powering agriculture: actions, actors and renewable energies technologies in region of Los Lagos and Los Rios southern Chile

Friday, 16th June - 10:15 - SD 703 - Oral Abstract

Ms. Maria Fernanda Romero¹, Ms. Jilles Van Gastel¹, Mr. Gustavo Blanco¹

1. Universidad Austral de Chile

Powering agriculture becomes strategic in a country which has privileged an export-oriented model aimed to be on the top 10 of food producers in the world, according to government expectations. Indeed, the concern arise due to energy costs and market demands regarding low carbon footprint, as well as agriculture emissions and waste management.

In respond, the government has promoted non-conventional renewable energies (NCRE)[1], to provide solutions for energy production and the emission reduction in agriculture sector. Moreover, farming applications for reducing energy cost and usage of clean energy have been target for irrigation, drying, heating/cooling or waste management. This has been done in a row of several programs and projects to introduce renewable energies technologies. These actions have induced changes in the role of the sector for the country energy transition process.

However, an actor oriented approach of how people who design, plan and implement the interventions in the agriculture sector give meaning to this energy issue in the sector, is needed to understand the setup landscape for fostering this shift in the sector. At the same time, together with the actor's perspectives the variety of institutional arrangements have engendered different pathways in the energy transition to renewable energy in the agriculture sector according to the spatial embeddedness of the technical solution promoted. Finding that the most important hock for farmers engagement have been energy cost alleviation, also an alternative for coping with water and waste resource management within the agriculture prodcution.

The overall environmental goals are set in the policy/program level while at implementation project is transformed in manageable units for the farmers. Initially, the programs where in the agriculture agenda, afterwards the agenda is set up by the energy sector. Today, the energy is understood as a new sector for economic development and energy deployment should be in line with local development in which the projects take place. Therefore, today agriculture sector play a key role for energy development projects due to its transversely in the management of natural resources and its centrality in local and regional development.

[1] "Non-Conventional Renewable Energy" is used to exclude major hydroelectric projects in the category; "Renewable Energies" include large hydroelectric plants (>20 MW of install capacity). Law 20.698/2013 Chilean Government.

Reliability mechanism : 2015-2016 El Niño crisis and future integration of renewable generation technologies

Friday, 16th June - 10:30 - SD 703 - Oral Abstract

Mr. Javier José González Ruiz¹, Dr. Ángela Inés Cadena Monroy¹

1. Universidad de los Andes

During 2015 and 2016, Colombia suffered one of the strongest El Niño phenomenon recorded to date. Precipitations stayed in historical lows for a long period of time, leading an electrical system depended in hydro sources in to a financial and physical crisis. To avoid this kind of situations, in 1996 and later modified in 2006, an expansion mechanism was proposed to provide firm energy to the system. The generators were paid constantly to make this energy available throughout scarcity events, and then sell it a price that reflected the cost of the most inefficient plant of the system in 2006. Thermal generators, those using liquid fossil fuels, denied the services during the El Niño crisis arguing that the mentioned scarcity price did not reflect their variable costs. The situation was finally solved with government intervention, an emergency demand respond program and a lot of carbon emissions due to the hydro power that was replaced for conventional generation for more than six months. The modifications to the capacity mechanism presented in this article, designed with the main objective of avoiding similar crisis in the future, change the auction in which the energy firm requirements are assigned. With the idea that it remains technology neutral, an agent offers in the new auction two values that more accurately represent the project; a premium for its firm energy and a scarcity price. This information is later analyzed in an independent and technical organism where each agent is evaluated with the ideas of James B. Bushnell and Shmuel S. Oren shown in the paper Bidder Cost revelation in Electric Power Auctions. This performance function rewards plants with low scarcity price because their energy is available a greater percentage of the time, having a constant effect on the spot price of the system. Additionally, a pollution term is added to include the carbon costs of the firm energy produce in a plant. The results is a mechanism that would help renewable generation, as is expected that their participation in the auction comes along with a high prime, due to their also great installation costs, a low scarcity price and minimum emissions costs. Using LCOE methodology, and available data for the Colombian Market, a different range of technologies are evaluated with the auction function. Renewable plants in general but especially the ones with a high capacity factor, like geothermal, are benefit in the methodology. This change in the capacity mechanism would help to incentivize these sources that currently have no participation in the Colombian system.

Key words: Capacity mechanism, Energy auction, El Niño phenomenon, Renewable energy sources, Colombia.

SUSTAINABILITY PERFORMANCE FOR BRAZILIAN ELECTRICITY POWER INDUSTRY: AN ASSESSMENT INTEGRATING SOCIAL, ECONOMIC AND ENVIRONMENTAL ISSUES

Friday, 16th June - 10:45 - SD 703 - Oral Abstract

***Dr. Simone Sattori*¹, *Prof. Lucila De Souza Campos*¹, *Dr. Sjors Witjes*²**

1. Universidade Federal de Santa Catarina (UFSC) - Brazil, 2. Copernicus Institute of Sustainable Development, Utrecht University

The increased pressure on companies to address sustainability issues has resulted in the development of several voluntary corporate sustainability integration approaches. The array of existing approaches is large and overwhelming, resulting in companies not understanding what corporate sustainability really means for their businesses. Considering environmental, economic and social issues, this paper aims at assessing the performance of the Brazilian electricity power industry in terms of its sustainability performance. An analysis of Global Reporting Initiative (GRI) indicators for the energy sector lead to an assessment of its sustainability performance by applying Data Envelopment Analysis (DEA) specified with a directional distance function (DDF). Five scenarios were created: (i) Flexible weights; (ii) Triple bottom line; (iii) Social issues; (iv) Economic issues; and (v) Environmental issues. With considering (i) flexibility weights, almost all companies are efficient. We also found a significant difference when we compared (i) with the other four scenarios (ii, iii, iv and v). Taking into account the triple bottom line scenario (ii), the results indicate that companies were less efficient when compared with the flexible weights scenario (i). Taking into account the last three scenarios (iii, iv and v), only four companies were considered as providing top benchmarks in sustainability performance.

The construction of an enabling platform for sustainability at a house hold level. PRIMA cookstove's participatory design process case.

Friday, 16th June - 11:15 - SD 703 - Oral Paper

***Ms. Lina López*¹, *Ms. Klaudia Cardenas Botero*²**

1. Fondo Patrimonio Natural, 2. Alexander Von Humboldt Institute

Colombia's conservation Fund 'Patrimonio Natural' through USAID funding carried out the Conservation Landscapes Program (CLP) in an effort to interconnect remaining tropical dry forest patches in the Colombian Caribbean region where campesinos and indigenous communities have long suffered from displacement and only until recently, were able to return to their territories. This landscape approach takes into account adaptive management, including traditional or local knowledge and practice recovery as well as the participation of local people and institutions. As part of this program an efficient wood stove model called PRIMA was developed with the active participation of 6 local communities. A social innovation approach and a participatory design methodology led to the generation of a small social business and furthermore, to the creation of an enabling platform to develop activities at a household level that contribute to the generation and sustainable management of tropical dry forest corridors. This paper explores the broader dimensions of clean cookstoves beyond traditional deployment strategies shown in other conservation programs in Colombia through the PRIMA clean cook stove's development process. The discussion focuses in the potential the participatory stove design has and its use as an enabling platform in conservation programs working with communities to introduce or/and reinforce sustainable practices at a household level. As a result, this approach enabled the design of an appropriate clean cookstove and related services that promote sustainable wood consumption in the region. It also made possible the strengthening of a group of women entrepreneurs and the constitution of a social business that is currently selling clean cook stoves and solar micro-grids in the Montes de María region. The traditional energy grid was expanded and campesinos in 10 different "veredas" are now using alternative energy for their daily activities. New knowledge about the use of biomass for cooking has been transferred to more than 800 people after the implementation phase ended. Finally, the use of stove during the implementation phase generated an enabling platform to strengthened the local cultural identity and increase the different actions of conservation and decision making at a household level to reach more sustainable livelihoods.

Hydrologic model for predicting drought hazard under Climate Change scenarios

Wednesday, 14th June - 14:00 - SD 716 - Oral Paper

Mr. Juan Velandia¹, Ms. Jessica Bohórquez¹, Dr. Luis Yamín¹

1. Universidad de los Andes

Nowadays climate change is one of the main issues human beings face. Its consequences have been reflected on the modification of recurrent patterns of meteorological existing phenomena in the form of an increasing humidity demand by the atmosphere, due to the rise of superficial earth temperature. One of those phenomena, droughts, have been presenting on a more prolonged way and with heavier impacts on different areas such as agriculture, the ecosystems, and water reservoirs, among others. In consequence, a need has surged to develop tools able to predict the behavior of this hazard, thus take the necessary measures in order to reduce the vulnerability of the exposed elements in anticipation of a drought event. This project proposes a methodology in relation with the Latin-American setting based on the most recent probabilistic and geographical system information developments in the subject of drought hazard prediction. The proposal consists in fitting probabilistic curves to the characteristics of drought events: severity define as the total impact of the anomaly, duration as the total extent and intensity as the maximum impact. These three characteristics are derived by the employment of indexes, which are obtained from meteorological data such as precipitation and temperature of the area of interest. From this point, the procedure lies in the use of the fit probabilistic curves with the aim of calculating the frequency and the numerical values of the different drought characteristics; in addition of curves and maps that are tools with the ability of summarize in a visual way all the stochastic information of the hazard in the study location. In this way, the result is a model with the ability of showing in a graphical and numerical manner the expected behavior of future events; thereby decision makers could take actions on this aspect by proposing ways to prevent and mitigate the associated damages. The methodology was tested and ratified in a South American basin. For the tested region the conclusions forecast more extensive drought events with lower intensities. In a general aspect, the implemented process and the application yielded satisfactory results which shown the multiple applications that the model can blend for decision making and a subsequent risk analysis. This type of analysis implies a more inclusive government by making easier and possible to decide the target zones that require special attention. This implies a more equitable society in which all regions are better prepared to the future upcoming threats.

Keywords: Drought, Methodology, Forecasting, Decision, Hazard

Tool for riskassessment and risk reduction

Wednesday, 14th June - 14:15 - SD 716 - Oral Abstract

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According to climate scenarios the global mean temperature will increase by up to 5 C, the nearest 50 to 100 year. Dry areas will become drier and humid areas will become more humid. Regional climate scenarios for Northern Europe show increases in annual precipitation and heavy rain events in most parts of Sweden and large part of Northern Europe. Accordingly, the risks for flooding will increase. Also, the risks of erosion and landslides are expected to increase. Natural events such as floods and landslides already today can cause severe consequences and costly damages. The risks are expected to increase, not only as a consequence of climate change but also due to increased vulnerabilities, especially in urban areas. Although preventive measures are often cost-effective, some measures are beneficial to certain values, while some may have negative impacts on other values. In order to counteract this, methods for risk assessment and impact assessments of risk reduction measures are being developed. Here methods applied for risk analyses in Gothenburg and a method for impact assessment of risk reduction measures will be presented. The assessment tool for risk reduction aims to contribute to a more transparent and sustainable risk management process by assessing strategies and interventions with respect to both short- and long-term perspectives, including local impacts and wider environmental impacts caused by climate change, for example. The tools also cover social and economic aspects. The assessment tools provide checklists that can be applied in the local spatial planning and climate adaption process as a support for decision, thus allowing for more transparent decisions.

Key Words: climate change adaptation, flooding, risk assessment, risk reduction assessment, short and long term, decision support

Assesment of Rural Household's Vulnerability to Climate Change and Its Extremes - Ourika Watershed, Morocco

Wednesday, 14th June - 14:30 - SD 716 - Oral Abstract

***Prof. Abdellatif Khattabi*¹, *Ms. Sara Benbrahim*², *Prof. Lahssini Said*²**

1. Ecole Nationale Forestière d'Ingénieurs, Salé, 2. Ecole Nationale Forestière d'Ingénieurs

The natural variability of climate has always been a challenge for communities' livelihoods. Climate change has given a new and complex dimension to this challenge. Evidence shows that the natural variability of climate, exacerbated by climate change, will undermine communities' livelihoods, particularly in the rural areas of developing countries that lack sufficient capacity to adapt. The manifestations of climate change and its impacts vary locally as well as are adaptive capacities and strategies to cope with these impacts. Those, effective planning of adaptation programs requires an assessment of local vulnerabilities. The livelihoods framework can be adapted to the assessment of vulnerability at a local level and adaptive capacity through analysis of the state of five active assets: financial, human, social, physical and natural. This framework has been applied to study the contextual and multidimensional nature of vulnerability in the watershed of Ourika, Morocco, exposed to floods and droughts. This Climate Vulnerability Index (VCI) adopted a bottom-up approach to recognize climate change effects and the social and natural vulnerabilities in five distinct rural communities. The index is composed of household parameters for the three dimensions of vulnerability such as exposure, sensitivity and adaptive capacity. Exposure is defined by natural disasters and climate variability. Sensitivity is expressed through Health, Food and Water. Adaptive capacity is defined by the socio-demographic profile, subsistence strategies and social networks. These parameters were assessed through observation and survey of 120 households randomly selected from the five communities. The results obtained showed strong but differentiated vulnerabilities according to the communities studied. These results imply that the exposure of a locality to the long-term evolution of climate hazards is the most important element in determining the overall vulnerability of a community. Of the three components of vulnerability, adaptive capacity is the component with direct implications related to the management modes and strategies followed by decision-makers at the territorial level. Improving adaptive capacity has indirect implications for improving the sensitivity of a community. The comparison of the results of vulnerabilities obtained shows that, despite having the capacity of adaptation higher, this capacity cannot be entirely realized in front of a higher exposure. The analysis of the vulnerability components shows that most vulnerable households are those with the lowest adaptive capacity and are faced with the highest exposure independently of the locality. Improving the adaptive capacity of these vulnerable households will reduce their sensitivity and finally reduce their overall vulnerability. Among the various components of adaptive capacity, the main emphasis should be placed on local policies to create opportunities for non-farm livelihood options, which will not only improve the income of the Community, but also to reduce their dependence on natural resources.

Adaptive Strategies for Urban Rainwater Drainage Systems in Climate Change Scenarios

Wednesday, 14th June - 15:00 - SD 716 - Oral Paper

*Prof. Juan Saldarriaga*¹, *Ms. Jessica Bohórquez*¹, *Prof. Maria Cunha*², *Prof. Pedro Iglesias*³, *Prof. Javier Martínez*³, *Dr. Inés Camilloni*⁴, *Dr. Nicanor Quijano*¹, *Dr. Carlos Ocampo*⁵, *Mr. David Celeita*¹

1. Universidad de los Andes, 2. Universidade de Coimbra, 3. Universidad Politécnica de Valencia, 4. Universidad de Buenos Aires, 5. Universidad Politécnica de Cataluña

Significant changes in the rainwater regime are amongst climate change's most noticeable consequences. Urban flooding occurs because of drainage systems' inability to transport all the runoff that is generated. Because of urban floods, cities may present several economic, social and health issues. In this research we attempted to minimize these effects by adapting and not replacing cities' current drainage infrastructure to the new hydrology conditions. The main objective was to determine the feasibility of implementing temporary storage structures in any big city, regardless of its geographical and socioeconomic context, to reduce rainfall peak flow rates and avoid urban flooding events. This project was developed in cooperation with universities from Colombia, Spain, Portugal and Argentina, and allowed us to create a methodology to optimize the location and volume of these tanks to adapt cities to climate change conditions. Additionally, this project tested a methodology to calculate future rain intensities, so cities can be better prepared to face future challenges. Finally, regarding sustainable development, we concluded that future urban drainage systems should try to imitate the natural drainage that existed in the basin long before cities were built. This is important since human intervention has distanced itself from natural drainage, which is a mistake since natural drainage is more effective than what we have done in the cities as urban drainage.

Keywords: Climate Change, Urban Floods, Storm Tanks, Urban Drainage, SUDS.

Introducing an Appropriate Financial Support System to Cope with Post-disaster Risks in Agriculture: A Study in North-eastern Haor Region, Bangladesh

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Mr. Md. Salimul Alam Shahin¹

1. *Universidad Austral de Chile*

Bangladesh is a disaster prone country due to its geographical location. North-eastern Haor region in Bangladesh is susceptible to flash flood and high waves. The people living in Haor region are helpless to the Mother Nature. They have to cope with natural calamity to harvest crops, to acquire food security, livelihood security even to protect their tiny homestead. Flash flood occurs in Haor region in mid-April when farmers wait to harvest *boro* crops. Flash flood causes huge damages to dry season *boro* crops just before harvesting. As a result, farmers lose their all properties for the whole year. It is estimated that about 4% (1.2 million hactors of rice, 7300 hactor of jute, and 7000 hactor of other crop area) of total cropped area was damaged due to flash flood from 1993 to 2010. From 1993 to 2010, farmers could not harvest about 2.44 million tons of rice, 64000 tons of jute and 40000 tons of other crops because of the flash flood hazard. Possibility of early flash flood causes extensive damage of crops that leads farmers to starvation. Thus, the disaster events make these poor people poorer. They need financial support to cope with post-disaster shocks. The research intends to identify the appropriate financial support system for the people of *haor* region so that they can withstand through securing food and livelihood.

To attain the objective, the researcher has collected data both from primary and secondary source. The researcher carried out a discourse analysis of existing financial support systems after a flash flood heat in the case study. Relevant policy papers, journal articles are studied for analyzing the existing financial support system for poor farmers in haor Region. The researcher has also taken some semi-structured telephone interviews of government officials who are involved in financial support provision to validate the data collected from secondary sources.

The research found out the local adaptive strategies to cope with disaster risks in agricultural sector at the case study area. The study also found the existing financial support system in haor region such as crop-insurance, Social Safety Net Program, community based financial institutes. After analyzing each financial support system the researcher has come to a conclusion that, cooperative societies as a financial institutes can play the most sustainablerole to support haor-people so that they can cope with the sudden shocks induced by natural disaster in agricultural sector. The study findings can be replicated to other parts of the country as Bangladesh is a country living with floods and farmers lose their crops very often due to annual floods and flash floods.

Key-words: Haor, climate change and flash flood, food security, adaptation strategies

Extreme rainfall, poverty and poor sanitation associated to leptospirosis, a climate sensitive disease in Brazil

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

***Dr. Silvio Queiroz*¹, *Dr. Jose Paula Silva*², *Dr. Salvador Ramos*³, *Dr. Monica Andrade*³**

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There are numerous transmissible diseases that are climate-sensitive and associated to lack of treated water and sewage. It may be aggravated by the occurrence of extreme hydrological events, such as droughts or excessive rainfall, leading to water shortages or floods. These waters when contaminated lead to the emergence of cases of leptospirosis. The aim of this study was to describe the spatial distribution and incidence of leptospirosis in the Brazilian capitals from 2005 to 2014; to identify the epidemiological profile; to verify if there was an association between the incidence of leptospirosis and precipitation patterns, and between the incidence of leptospirosis and socioeconomic variables in the period of this study. This is a descriptive and exploratory study that used exploratory analysis to treat data on the reporting cases of leptospirosis in the Brazilian capitals obtained at SINAN (Information System of Notification of Grievences). Rainfall data were obtained from INMET (National Meteorology Institute), and the environmental and socioeconomic data from Atlas Brazil, and demographic data from IBGE (Brazilian Institute of Geography and Statistics). The results showed that Leptospirosis had high incidence in the North and South regions of Brazil. Among the Brazilian capitals, Rio Branco and Amapá had the highest incidence rate. The most affected age group are males in productive phase of life. The most frequent environment of transmission are urban area. Leptospirosis is related to the low level of schooling in the country places and Capitals. There is a positive and statistically significant correlation (at 1%) between rainfall and leptospirosis incidence. An increase of 10 mm³ in the average rainfall of the Brazilian capitals increases the incidence of leptospirosis by 2%. We concluded that cases of leptospirosis occur more frequently in periods of extreme rainfall, however are also associated with poverty and poor sanitation. Predicting rainfall thresholds can be useful to prevent flooding and leptospirosis cases.

A scientifically-driven approach for the sustainable development of Arctic coastal zone

Friday, 16th June - 11:00 - SD 703 - Oral Paper

Prof. Wojciech Sulisz¹, Dr. Lechoslaw Suszka¹, Dr. Maciej Paprota¹, Mr. Duje Veic¹, Mr. Dawid Majewski¹, Prof. Marek Szmytkiewicz¹

1. Polish Academy of Sciences

The Arctic coast has been strongly influenced by the effects of climate changes. Accelerating global warming and impact of storms imply a rapid permafrost degradation and drastic shoreline retreat in an Arctic coastal zone. In many regions shoreline retreat exceeds 30 meters per year. Impact of storms on permafrost coast causes much faster processes than it has been expected. These processes impose large impacts on social and economic conditions in the region including quality of life, housing, infrastructure and developments. The observed processes significantly affect activities in the Arctic area and have also drastic effects on the degradation of glaciers by accelerating breaking and melting processes and, in consequence, accelerate climate changes. More effort is necessary to reduce negative impacts of climate changes on polar areas. These require a new approach to predict and control changes in the Arctic coastal environment. More effort is required to develop knowledge on increased coastal erosions through better recognition and understanding of physical processes as well as reliable modeling of permafrost thaw and shoreline shift. A novel approach to this problem has been proposed and its program is currently under implementation. The approach is based on original experimental investigations on wave-induced erosion of permafrost, a series of field measurement campaigns, and numerical modeling of erosion processes in Arctic conditions. Extensive experimental studies have been conducted to identify physical processes responsible for increased sediment transport rates of the frozen sandy bottom. Experimental data and theoretical analysis indicate that the new approach provide novel results of significant importance for understanding of erosion processes in polar areas.

Acknowledgements

The research leading to these results has received funding from the Polish-Norwegian Research Programme operated by the National Centre for Research and Development under the Norwegian Financial Mechanism 2009-2014 in the frame of Project Contract No. POL-NOR/200336/95/2014

Keywords: *Climate changes, Permafrost erosion, Sediment transport, Arctic coasts*

INFLUENCE OF ASH DEPOSITION ON MICROBIOTA OF AGRICULTURAL LAND

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

*Dr. Edison Schmidt Filho*¹, *Ms. Aparecida De Fátima Cracco Rodrigues*¹, *Ms. Thaise Moser Teixeira*¹,
*Dr. Francielli Gasparotto*¹, *Dr. Ednéia Aparecida De Souza Paccola*¹

1. UNICESUMAR

Boiler ash from ethanol plants can be used as an agricultural fertilizer, because it is considered a source of nutrient and soil corrective, due to its alkalinity. The nutrients found in the soil are transformed and accumulated by microorganisms, favoring the development of the plants. The objective of this work was to investigate the influence of ash on the development of bacterial colonies found in the agricultural soil. The emergence of colonies of bacteria, cultivated in Petri dishes, in BDA culture medium (potato, dextrose, agar) was quantitatively evaluated. In the laboratory boiler ash was added to the soil and incubated for 15 days in colorless plastic bags, following the treatments of 0 g kg⁻¹ soil; 10 g kg⁻¹ soil, 20 g kg⁻¹ soil and 30 g kg⁻¹ soil, three replicates were performed for each treatment. The results showed that ash influenced positively the appearance of bacterial colonies for a period of seven days after incubation in the treatment of 20 g kg⁻¹ soil. The treatment of 10 g kg⁻¹ did not show significant alteration and the 30 g kg⁻¹ alone promoted an increase in the appearance of bacterial colonies upon reaching 15 days of soil incubation. The results showed that the boiler ash of the ethanol industry can positively influence the development of the soil microbiota due to the nutrients present in this by-product. The treatments tested in the incubated soil showed that the addition of low quantities of boiler ash in the agricultural soil did not influence the reproduction of the bacterial colonies. However the 40 ton dose Ha⁻¹ of ash applied to the incubated soil promoted the greater development of colonies of active bacteria when compared to the control soil. Therefore an alternative of destination of this boiler residue can be its use as fertilizer of the agricultural soil. Since properly employed according to agronomic recommendations not to alter the natural development of colonies of bacteria found in the soil.

Keywords: Bacteria. Bagasse. Cane sugar. Microorganism

THE POTASSIUM RATE INFLUENCE ON PERCOLATED WATER BY USE OF PURE VINASSE AND TREATED ALKALINE PROCESSES AS AGRICULTURAL FERTILIZER

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

*Ms. Thaise Moser Teixeira*¹, *Dr. Jurandir Pereira Filho*², *Dr. Edison Schmidt Filho*¹

1. UNICESUMAR, 2. Univali

The vinasse can be considered the main wastes of the sugar and alcohol industry, being produced thirteen times more than the ethanol. Today, this wastes is deposal in soils, because according to studies the vinasse promotes the increase of the fertility of the soil when applied respecting the retention capacity of ions. If this capacity is not respected, the process of leaching of several of these ions, especially potassium, can be move to the sub-surface water. Our objective was evaluate the presence of potassium in the percolated water and the contamination possibilities of this element resulting from the addition of different forms of vinasse on the soil surfasse as a fertilizer. The vinasse was used under four differents forms, beeng a pure vinasse, three kinds of vinasse treated by the alcaline processes and one more tratmente as a comercial fertilizer made with N, P and K . That three kinds of vinasse treted by the alkaline processes, the first consist only of the alkalinization of the vinasse by the addition of alkaline material until the mixture reached pH 12. The others two kinds consist in a incorporation of ash boiler, another wastes from the ethanol manufacturing process. In this case, the decrease of the moisture content and subsequent adjustment of the pH with the addition of alkaline material in different proportions. The treatments were applied on the surface and in each column was cultivated wheat (*Triticum aestivum*). For 70 days, distilled water was added as controlled irrigation, and the volume recorded was recorded in order to guarantee that all the material percolated and resulted only from the treatments. Each treatment received the next volumes: vinasse, $25\text{m}^3 \cdot \text{ha}^{-1}$; Vinasse pH12, $10\text{m}^3 \cdot \text{ha}^{-1}$; Treated vinasse + ash + 25% alkalisizer, $8\text{m}^3 \cdot \text{ha}^{-1}$ and treated vinasse + ash + 50% alkalizing, $6\text{m}^3 \cdot \text{ha}^{-1}$. It should be noted that the volume of vinasse applied was based on the values allowed by the Brazilian standard and the other treatments based on the soil need. It was observed that at thirty-five days of percolation the potassium content in the water reached the maximum value of $1.0 \text{ ml} \cdot \text{ha}^{-1}$ for comercial fertilizer (NPK) treatments, vinasse + ash + 50%, vinasse + ash + 25% and vinasse pH12. It was concluded that the alkalinized vinasse can influence the potassium contents present in the superficial water percolated after 35 days of its superficial application to the soil.

KEY WORDS: Agricultural wastes; Sustainability; ethanol industry

Land requirements for Mediterranean diet: standard agriculture vs new agroecology

Thursday, 15th June - 08:00 - SD 204 - Oral Abstract

Dr. Francesco Spanò¹

1. Royal Holloway University of London

The transition towards sustainable human interaction with the surrounding ecosystem requires a change in the fundamental aspects of its behaviour. Food production is at the cornerstone of our survival and consequently it has the highest priority in the face of declining resources, increasing pollution and population.

Understanding the parameters to judge and quantify methods of food production alternative to the present mono-cultural, energy intensive and mechanized agricultural system is crucial to support, develop and improve new techniques and practices to transition to. Land surface use is one of the important parameters to derive for any given food system. The surface required for food production has strong impact on the care for the ecosystem (avoid soil erosion, impose energy and water efficient usage, set up balance with other living vegetable and animal species, close cycles, set up urban food schemes) and it is correlated with resource usage and feasibility of alternative approaches to deliver nutrition to communities.

The first goal of this study is to determine the typical land surface required in central and southern-Europe to produce the basic elements of the typical Mediterranean diet defined by the Italian Food Pyramid (www.piramideItaliana.it) in a few scenarios combining different diets, techniques and regions. The scenarios will range from food production for an omnivore diet to a vegetarian diet, both including or excluding typical cereal-based food and obtained by using both standard mechanized agriculture and examples of alternative agroecological techniques in specific regions (bio-intense, synergic, organic..). The second goal is to compare land surfaces obtained in the different scenarios.

The analysis method is to use the yields per surface and per year available in the FAOSTAT public database for food products and derive a robust estimate for surface yield for each product by averaging over space (production in central and southern Europe countries) and time (over about 10 years of production data). Similar yields for alternative agroecological will be obtained by literature, small scale experimental setups and local organizations (particularly obtained from the center of Italy). Such yields derived for different techniques and regions will be combined with the different dietary requirements to provide the land surfaces to be compared. The scenario comparisons allows to determine a first immediate, easily visualizable sustainability parameter to correlate with food production organization in communities and with the associated resource basis (fuel, fertilizer, water..).

The Nature Sports Chart of Arrábida: promoting sustainable visitation of a sensitive area

Thursday, 15th June - 08:15 - SD 204 - Oral Paper

Dr. João Joanaz de Melo ¹, Mr. António Galvão ¹, Ms. Maria João Flôxo Sousa ¹

1. CENSE, Universidade NOVA de Lisboa

The coastal mountain range of Arrábida is a limestone massif with a Mediterranean microclimate exposed to the open Atlantic, located 30 km south of Lisbon. It was one of the natural warmer sanctuaries during the Ice Ages and has been used by Humankind since Palaeolithic times. This setting created a unique and diverse mosaic of natural and cultural landscapes, biodiversity and geodiversity, a place of outstanding beauty. This combination of factors led to the creation of the Nature Park of Arrábida covering 170 km², including 50 km² of a Marine Park). The area is subject to great pressure for tourism and recreation, because Arrábida is one of the few near-natural territories inside the Metropolitan Area of Lisbon. This paper reports on the development of the Nature Sports Chart of Arrábida. The goal of the project was to regulate visiting in the more sensitive areas of the Park, especially by outdoors enthusiasts: trekking, trail running, mountain biking, horse riding, rock climbing, caving, coastering, bird- and dolphin-watching, snorkelling, scuba diving, kayaking, sailing, hang gliding and paragliding. The underlying philosophy is that a near-natural area subject to many pressures is best protected by people who love and live in it; hence, we must create conditions for low-impact visitation and the education of visitors, with some benefit for local inhabitants. Our methodology comprehended: literature review of best practice of outdoor sports in sensitive areas; identification and quantification of outdoor activities in Arrábida; identification of stakeholders (municipalities, nature sports clubs, federations who organize competitions, active tourism business, landowners, local inhabitants, official agencies like the maritime authority and the regional tourism office); personal meetings with key stakeholders; systematic review of actual and potential conflicts, both between users and with nature conservation restrictions; construction of an online platform and georeferenced data base; definition of preferred sites for outdoor activities based on best practice, careful management of conflicts and available public access. The most difficult task was the definition of trekking routes, because 90% of Arrábida is privately owned. Our strategy, put to practice with the willing cooperation of many stakeholders, was successful: we were able to generate a notable consensus, and the Nature Sports Chart is now ready for implementation, pending legal procedures. The Chart is one tool among a complex set of tools that includes land use planning, financing sources, fiscalization, and Nature conservation policy.

Keywords: Arrábida, outdoor sports, Nature conservation

Multi-criteria methods for prioritizing wetland restoration and creation sites based on ecological, biophysical and socio-economic factors

Thursday, 15th June - 08:30 - SD 204 - Oral Paper

***Prof. Francisco A. Comín Sebastián*¹, *Dr. Nadia Darwiche*², *Mr. Ricardo Sorando*², *Dr. Juan Jiménez*²,
*Dr. José-Manuel Nicolau*³, *Dr. Rocio Lopez*³**

1. Pyrenean Institute of Ecology-CSIC, 2. IPE-CSIC, 3. EPS-University of Zaragoza.Huesca

Wetland restoration and creation has been recognized as a useful tool for improving water quality and land use planning. Many studies have focused on developing strategies and models to optimize wetland performance. However, some important wetland placement characteristics have not been taken into account. Due to the importance of integrating environmental, biophysical and socio-economic factors in wetland restoration projects, a comparison of two multi-criteria methods (a suitability model and a greedy algorithm) was conducted. With nitrate removal as the main goal, the suitability model was applied considering the “terrain slope”, “proximity to watercourses” and “soil permeability”. The greedy algorithm was executed based on the “availability of public lands” and the “wetland restoration project costs”. These factors were chosen based on the Eu Life-CREAMAgua Flumen River project and provide a more effective and comprehensive site selection via comparison of the two methods. Both the suitability model and the greedy algorithm provided critical information for siting a wetland and demonstrated the effectiveness of both approaches. The suitability model described the priority sub-basins for wetlands restoration using biophysical criteria, and the greedy algorithm reported the availability of public lands or the tasks to be performed. This research and its possible adaptations can be used by decision makers to improve water quality using social and economic criteria, resulting in the efficient implementation of ecological-restoration projects. This approach can be useful for land-use offsetting practices which are highly demanded in intensively and extensively used territories searching for more sustainable land use. However specific criteria should be used for each type of territory.

BIOCLIMATIC CLASSIFICATION FOR THE MUNICIPALITIES OF CUNDINAMARCA-COLOMBIA

Thursday, 15th June - 08:45 - SD 204 - Oral Abstract

***Prof. Martin Perea*¹, *Prof. Liliana Medina*¹, *Prof. James Ortega Morales*¹**

1. Universidad Colegio Mayor de Cundinamarca

Urban and environmental policies are structured to contribute to the conservation and improvement of human health, to solve structural problems of cities, to promote inclusive cities and the appropriate use of natural resources in the buildings, in order to take advantage of environmental conditions, optimize the use of materials and their waste and generate more and better solutions on the built environment. In this sense, Resolution 0549 of 2015 of the Ministry of Housing, City and Territory, "The Guide to Sustainable Construction for saving water and energy in buildings", classified the country in four climates: warm dry, warm wet, temperate and cold to establish the percentage of water and energy to save, according to the specific conditions of each municipality. However, this classification in general ignores some particularities of the weather of municipalities, that can provide specific information to develop better sustainable buildings. Therefore, the objective of this research was to propose a bioclimatic classification that includes the climate and at the same time the human comfort, since they are the reason for the consumption of water and energy. The research was descriptive, at an exploratory level, with a documentary and correlational design based on secondary information. For the information survey of each municipality, the coordinates was taken of Google Earth. With these coordinates, we obtained the climatological data from Meteonorm software and the recommended bioclimatic strategies from Climate Consultant software, which were consolidated in a database and analyzed with MS Excel to relate variables. This allowed, to propose a Bioclimatic Classification System with seven bioclimatic zones, based on the Caldas-Lang classification. A system recognized in Colombia that allowed to designate as bioclimatic indicators, for Cundinamarca State, altitude, temperature, precipitation, relative humidity and solar brightness. Variables such as relative humidity, wind speed, predominant wind direction, and solar radiation were found to be homogeneous for the entire territory of Cundinamarca studied. Thus, it was possible to individualize each municipality and establish a normative based on an analysis that considered the environmental context of the municipalities, which offers the opportunity to impact regulation and local public policies, which makes the proposed bioclimatic classification a tool of social inclusion.

Integration of Big Data Analytics and Social Research for monitoring of rainforest threats in the post-conflict settings of Colombia and Peru: supporting a more sustainable development agenda

Friday, 16th June - 10:15 - SD 704 - Oral Abstract

Mr. Alejandro Coca-Castro¹, Prof. Andres Perez-Uribe², Dr. Augusto Castro-Nunez³, Dr. Hector Fabio Satizabal-Mejia², Dr. Louis Reymondin³, Prof. Mark Mulligan¹, Dr. Glenn Hyman³, Mr. Julien Rebetez²

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International Center of Tropical Agriculture

Post-conflict phases can lead to growing environmental threats but also to open up greater conservation opportunities. Peace generally can enable forest exploitation since national reconstruction and development demand increasing amounts of natural resources (i.e timber exploitation). Additionally, the need to incentive foreign investment often reduces the political will to protect forests. Therefore, good governance in the forest sector should be established before opening it to post-conflict exploitation. Both Colombia and Peru represent countries (and case studies proposed by this research) where armed conflict has had played a remarkable role in land-use and migration dynamics within forested areas. Armed conflict in both countries has generated large flows of migration either from the countryside to urban centers, or to unexploited frontier lands. Additional to the threats to human rights, for the environmental conservation side, there is documented evidence of both “gunpoint conservation” and “gunpoint fragmentation” in these countries’ forests. In one hand, the presence of illegal armed groups actively hinder large-scale exploitation to protect the environment. On the other hand, due to violent conflict can disrupt local economies, it also encourages, specially in these two countries, the cultivation of illegal crops and the exploitation of natural resources. With the advance of peace and the rehabilitation of infrastructure, the Colombian and Peruvian forest, in particular their most pristine forested areas in the Amazon, will be under mounting pressure by vested interests and market forces. Additionally, beside the expansion of commercial crop plantations and others human land-use types, planned or unplanned (spontaneous) migration will potentially exacerbate existing land-titling tensions and thus trigger new conflicts. The main goal of this research is to inform peace building and forest conservation policies using Colombia and Peru as case studies. Specifically, we are interested in understand the links between migration and forest conservation in post-conflict settings. These two countries were selected as case in point because they face similar issues regarding migration, sustainable development in fragile ecosystems as the Amazon biome, and post-conflict recovery. We propose to combine the application of field based research with knowledge from Big earth-observation data analytics to maximize transdisciplinary analyses which support policy development and facilitate the intervention and vigilance of most of stakeholders (national and international) involved in the post-conflict agendas of target countries. We expect that the research moves towards to a land-cover change monitoring tool dedicated for informing decision makers on the rates, locations and characterisation of proximate drivers of deforestation events in the post-conflict regions of study. Such a tool coupled with the field work will allow to determine the current state of the rainforest in the regions of study and might serve as a reference level for preparing payment schemes for forest conservation such as REDD+. These results might be exploited by other teams in a wide range of studies. Last but not least, this research will support the achievement of the sustainable development goals in Colombia and Peru and will reinforce the international development collaboration.

State and spatial production in a transition to post-conflict extractive economies: The case of Quibdo, Colombia

Friday, 16th June - 10:30 - SD 704 - Oral Abstract

Dr. Edwar Calderon¹

1. University of Edinburgh

This paper examines the spatial production of injustice in Quibdó – the main commercial centre of El Chocó, Colombia, and the principal fluvial port of the Atrato River. The paper seeks to understand the processes shaping the contemporary development and rapid transformation of land use in Quibdo, and how these processes deepen and extend inequality and injustice in the city. Quibdo is something of a frontier town – the capital of Colombia’s ‘Wild West’ it lies in one of the regions worst affected by the Colombia civil war and is in the heart of Colombia’s extractive industries – both legal and illegal. The paper is organized around 3 stories. The first is a story of a disappearing building that highlights how attempts of democratic, equitable and participatory planning in Quibdó become distorted by national government neoliberal economic policies, weak state actors, poor governance, corruption and disrespect for the rule of law. The second story serves to highlight the significance of foreign capital from extractive industries is driving uneven urban development. Focusing on the expansion of the city’s airport and the airport service centre, the paper shows how spectacular investments at the periphery of the city are displacing already marginal populations. The third story focuses how theories of accumulation through dispossession can help explain the contours of injustice in Quibdo. It focuses on the displacement and dispossession produced by forced migration from rural areas due to armed conflict and the legacies of the civil war, as well as the displacement produced by gentrification in the city center as capital from illegal extractive industries is laundered through an inflated property market.

Sustainable land management decisions among smallholder coffee growers: A dynamic optimization approach

Friday, 16th June - 10:45 - SD 704 - Oral Abstract

Mr. J. Nicolas Hernandez-Aguilera¹, Dr. Jon Conrad¹, Dr. Miguel Gomez¹

1. Cornell University

About 40% of all livable land area globally is allocated to agriculture. Consequently, sustainable strategies for land use require the identification of feasible agro-ecological practices. Shade-grown coffee is a sustainable product which has been associated to the provision of various ecosystem services. The conservation of forest canopy, combined with growing coffee, provides overwinter habitat for coffee berry borer predator songbirds, reduces agrochemical dependency, improves soil health, and serves as an adaptation strategy to climate change. In addition, shade-grown coffee enhances product quality, representing a quality-price premium alternative for smallholders in developing countries who provide 80% of worldwide coffee production and are frequently exposed to price volatility and coffee diseases. Despite the advantages of shade-grown coffee, many growers have shifted to sun-grown coffee in response to coffee leaf rust crisis. This shift involves the utilization of disease-resistant high-yielding varieties, which often exhibit lower product quality. In particular, from 1990s to 2010, most Latin American countries decreased the percentage of coffee production area dedicated to traditional diversified shade coffee production, and sun-grown coffee dominated many new coffee-growing regions like Vietnam, Thailand and Indonesia. Previous studies document several broad trends that influence coffee management decisions between shade-grown and sun-grown coffee including: yield-focused government incentives and policies, subsidized agrochemicals, farm size, certifications and economic incentives linked to innovative value chain models. However, there are limited economic models shedding light on the optimal choice between shade-grown and full sun-grown coffee systems. We use a formal stochastic dynamic profit maximization model to understand the management decisions of a representative smallholder grower and the effects of quality and eco-friendly price premiums on these decisions. Our model chooses the optimal land allocation of sun- vs. shade-grown coffee that maximizes expected net present value subject to land endowments and available technology observed among smallholder growers and accounts for the ecosystems services provided by coffee borer predator birds and tree canopy. In addition, we identify optimal conditions to switch from sun- to shade-grown systems, considering uncertainty coming from disease and price volatility. We collected detailed farm level data on production costs for 265 smallholder growers' farms in Colombia, Honduras, Mexico and Peru. In addition, we empirically measured smallholders' discount rates using controlled inter-temporal decision games. Furthermore, we estimated consumers' willingness to pay for product quality and "bird friendly" coffees in a survey that included 1095 US potential coffee consumers and bird's conservationists. We employ these results to calibrate the optimization model. Results from this study shed light on cost effective strategies to mitigate and compensate risks associated with shade management. Moreover, our model can identify conditions under which smallholders can increase profits and promote biodiversity conservation simultaneously. Preliminary results suggest that shade-grown coffee could be a profitable alternative if growers were able to receive the premiums that consumers are willing to pay. These results are useful to other crops such as cacao, in which tropical region countries could benefit from having a comparative advantage based on product quality and biodiversity conservation. **Keywords:** Sustainable agriculture, land use, rural development.

A SPATIAL METHODOLOGY FOR TRANSPORT IMPEDANCE WEIGHTINGS IN CELLULAR AUTOMATA LAND-USE COVER CHANGE MODELS

Friday, 16th June - 11:00 - SD 704 - Oral Abstract

***Dr. Daniel Paez*¹, *Dr. Francisco Escobar*²**

1. Universidad de los Andes, 2. Universidad de Alcalá

Land Use Cover Change (LUCC) models are increasingly being used to support long term urban and regional planning. These models forecast future land coverage based on land-use interactions, policy restrictions, environmental conditions and accessibility. Until now, limited research has been conducted to scientifically determine the impedance or influence of transport infrastructure on each land-use type in an LUCC model. An example could be how attractive a new metro is compared to a highway for new residential developments, which is not always well known by LUCC models. This paper presents customized geospatial analyses to calculate accessibility distance decay factors (ADDF) using a time series geospatial approach called overtime-spatial decay determination (OSDD). The ADDF factors were developed and tested as part of the practical implementation of a LUCC in Bogota – Colombia. The model, called the Bogota Land Development model or BoLD, was built using commercial cellular automata software. In BoLD, two transport infrastructure scenarios were modeled and compared for the west of the city: a highway-based transport network and a suburban rail system. The results from the scenarios are presented in a graphical representation called mobility circles, which are also a key contribution of this research. The validation of the results obtained suggests that the OSDD contributes to better technical backing to LUCC models, particularly when evaluating urban scenarios in which transport projects are the focus. Additionally, the use of geospatial tools for transport impedance weightings appears to facilitate the general understanding of LUCC modeling with cellular automata.

Keywords: land-use coverage change model, Transport-land-use interaction, Scenario planning, Indicators, LUCC.

The application of earth observation information to help manage land use change in Brazil: An analysis of user needs

Friday, 16th June - 11:15 - SD 704 - Oral Paper

***Mr. Mercio Cerbaro*¹, *Prof. Stephen Morse*¹, *Prof. Jim Lynch*¹, *Dr. Geoffrey Griffiths*², *Prof. Gilberto Camara*³**

1. University of Surrey, 2. University of Reading, 3. National Institute for Space Research (INPE)

Brazil is a country with some of the most important forest ecosystems and natural resources in the world. The expansion of agriculture, livestock, demand for food production, extractive industries, illegal logging, land conflicts, hydropower projects, deforestation and fire are some of the main pressures associated with land use and land use change in different regions of Brazil. Despite the attempts of different institutions aiming to promote the use of earth observation to support land use management and conservation projects in Brazil, established institutions at the national and state level are encountering several problems to implement environmental policies and to improve the quality of services provided for the Brazilian society. The specific agenda and lack of communication between institutions, finance, bureaucracy, legal frameworks, politics, finance and the user knowledge to access and apply all the geospatial technologies and remote sensing data available are some of the issues across a wide range of public and private organizations. Expanding on recent debates in environmental governance and political issues associated with deforestation levels, we show the challenges to promote the use of earth observation and how institutions are dealing with political and economic instabilities to apply environmental policies. The conflict of interests, historic political agendas, pressure groups within national and state governments and the lack of coordination and the conflict of national policies on specific agendas to promote the expansion of agribusiness and environmental policies at the same time. The use of earth observation and advanced technologies is very important to assist policy-making, but is just one essential factor to help governments to promote sustainable development and to reduce the complexity of institutions arrangements and particular agendas in different sectors.

Envisioning versus realizing products for people in poor communities: The case of Victor Papanek and Nordic designers

Wednesday, 14th June - 11:30 - SD 715 - Oral Paper

Dr. Astrid Skjerven¹

1. Oslo and Akershus University College

An increasing number of people is currently living under poor conditions in enclaves of rapidly growing urban areas. They lack basic equipment for living a healthy and decent life. The products have to be simple, cheap and useable for people with different cultural and geographical backgrounds. Methods to realize the design, production and implementation of such appliances is a matter of urgency. Therefore, the ideas of the Austrian-American designer Victor Papanek (1923-98) have gained new actuality.

During the 1960s and 1970s Papanek played a significant role in the international design community. The hot topic was the growing Western affluence and waist in contrast to the so called Third World's increasing poverty. His ideal was the less polluting design traditions of indigenous people, made by simple methods in local materials. His basic idea of design was to create "survival kits" based on local indigenous traditions. He had many supporters among design students in Scandinavia and Finland. Some of them tried to adapt their work practice to his ideology. Design from these countries was reputed for its democratic approach, innovative simplicity and use of natural local materials and handicrafts and constituted a platform for fruitful cooperation.

The aim of the paper is to investigate what impact his ideas had on the Nordic design community, and particularly whether it was followed up by stakeholders and eventually reached the target groups. Success factors and failures are displayed and discussed to clarify how the ideas might be utilized in today's situation.

The empiric study is based on literary reviews, and additionally of interviews with designers in Denmark, Finland, Norway and Sweden.

The investigation shows that Papanek's ideas made a tremendous and lasting impact on designers in the Nordic countries including some of their work. Workshops at the design schools and local communities disengaged great creativity and ideas for products. Still, design and production for indigenous people in least developed countries seldom occurred, as he and his followers refused to interfere with stakeholders like politicians and producers. Therefore, they had little impact on the lives of the target groups. One of the few exceptions was the foundation of the Norwegian organization "Design without Borders", which was mainly financed by the government, i.e. by ways of political decisions.

In conclusion, without contact and cooperation with stakeholders, particularly the political and commercial sector, and users in the local communities on the other hand, it is not possible to realize ideas of this kind in the form of products and their use.

The paper deals with ideas that directly support a sustainable development, which factors that are necessary to realize it. Considering the new interest that Papanek's ideas newly has gained, it is of vital importance to analyse, present and discuss these factors to secure a fruitful utilization of them in our era and with our set of problems.

Keywords

Victor Papanek The Nordic countries Design for poor communities Indigenous people

Informal settlements and community vulnerability: a multiscale strategy to improve local resilience through waste upcycling

Wednesday, 14th June - 11:45 - SD 715 - Oral Abstract

***Dr. Andrea Cecchin*¹, *Mr. Mathieu Lamour*¹, *Mr. Michael Maks Davis*², *Mr. David Jácome Polit*²**

1. Independent Researcher, 2. Pontifical Catholic University of Ecuador

Informal settlements and informal buildings are a common practice in many Developing Countries: in Ecuador, for instance, more than 70% of constructions are informal. This has implications that often affect the quality of life and the level of resilience of local communities, especially those with a population characterized by high social vulnerability.

This research project is an attempt to contribute in improving the resilience of informal settlements, by introducing new practices and technical solutions in the Ecuadorian informal construction sector by using end-of-life tires (ELTs). ELTs are a type of waste that is only partially recycled or reused in Ecuador, despite a national scheme (an Extended Product Responsibility policy) that has been put in place to this extent. Furthermore, ELTs are potentially an available and cheap construction material, which have mechanical properties that could in theory be successfully used in informal settlements to reduce the impact of natural disasters such as earthquakes, landslides and other hydrogeological phenomena. As such, through a more extensive use of ELTs as a raw construction material, the project aims to decrease the physical vulnerability of informal settlements in Ecuador. Additionally, by converting ELTs into a substitute building material, this kind of waste can be incorporated into a value chain with potential beneficial opportunities for micro-businesses in marginalized urban communities.

The strategy proposed in the project is a mix of bottom-up and top-down approaches. The research team is working with both local communities and national policymakers to find a multiscale scheme to effectively employing ELTs in the informal construction sector in Ecuador. In order to develop local solutions, two case studies have been selected. The first is an urban area of Quito, while the second is a rural area in the northern coastal region of Ecuador, which was affected gravely by the earthquake of April 16th 2016 and is in the process of reconstructing demolished buildings and infrastructure. To date, the fieldwork with local communities and informal sector builders in the coastal region has highlighted a great potential: resilient construction techniques with ELTs tailored for the informal sector were successfully introduced and disseminated throughout the area. Simultaneously, at national level, actively engaging policymakers and the other stakeholders involved in ELTs management has enabled a potential policy framework to be identified, where the innovative use of ELTs for informal construction initiatives could be incorporated into the national recovery system.

Evaluation of the improvement in thermal comfort with the incorporation of sustainable building materials in the ongoing self-construction processes for housing in the district of Bosa in Bogota

Wednesday, 14th June - 12:15 - SD 715 - Oral Paper

Prof. Franz Calderon¹

1. Universitaria Agustiniana Uniagustiniana

The use of sustainable materials incorporates environmental benefits, especially for large cities due to the current high pollution rates (Ferrer, 2015). Currently, cement, brick and steel are the most used materials for construction, unfortunately they are the ones that generate more CO₂ emissions in their manufacturing process. The objective is to evaluate the process of incorporating sustainable materials in order to improve the thermal comfort of a group of dwellings with ongoing self-construction processes in the La Libertad neighborhood of Bosa in Bogotá. The Comfort problem in this project was approached as a fundamental condition of housing, if one takes into account that the thermal conditions of the space affect the human metabolism, from this it is derived that temperatures outside the established ranges imply more energy demand For its inhabitants, unfortunately in Colombia, thermal comfort has not yet been incorporated as a variable in the processes of self-construction, the houses respond to a need for habitat understood as the need to have a space of their own regardless of the way in which this space Respond to climatic variables. The project takes place in Bosa, an area of Bogotá, which is located on the south-western border of the city. Its total area is 2394 ha, of which 1885 ha are urban land and 508 ha are protected areas. The methodology was considered a chronological experimental quantitative case study. The response provided by them is that: a) co-variation between the independent variable (materials) and the dependent (s), (existing housing) b) the application of the independent should precede the measurement of the Dependent variable and c) other variables, different from the independent one, have to be discarded as possible explanations of the changes observed in the dependent ones. In the second phase the quantitative approach of the project was initiated, with the diagnosis and beginning of the measurements that determined the thermal comfort of the homes that are part of the case study. The methodology of thermal analysis based on ISO 7730 will be used. With the community will begin the incorporation of sustainable materials in the houses under study. Finally, measurements will be made to analyze the thermal comfort of the houses that incorporate the materials. This project is in progress and the conclusions can not yet be presented, however for the presentation some results will already be obtained. The theme of the project is of great relevance for the conference for two aspects, the social one due to the geographical context in which a marginal zone of the city of Bogota is developed and the sustainable aspects that analyze when incorporating the project the study of the thermal comfort in Self-build houses and the use of non-traditional sustainable materials for the improvement of these houses.

Sustainable urban development: the case of São Sebastião, a municipality on São Paulo's coastal region

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Paper

Mrs. Isabella Azul¹

1. Universidade Presbiteriana Mackenzie

São Sebastião is one of the municipalities located on the northeast coast of São Paulo, Brazil. The surface relief in this region is formed by the Serra do Mar, a system of mountain ranges and the current vegetation is the Atlantic rainforest, where an endemic ecosystem can be found. Part of the territory belongs to an environmental protection zone called Serra do Mar State Park, which is the largest continuous reserve of Atlantic rainforest in the country. Inside the protection zone, constructions are forbidden by law in order to preserve nature and due to the risk of landslide from the mountains, which is recurrent in summer when heavy rains are more frequent. Informal housing has become common in those risk areas. The high real estate prices found in sites closer to the beach made them unaffordable to locals, for this reason, luxury condominiums were built for vacation homes, where most of the perennial inhabitants carry out their economic activities as service providers.

This problematic background demands an urban intervention whose guidelines take into account the environmental issues and social inclusion of residents. São Paulo's state government has been responsible for the program Sustainable Development Project of the São Paulo's Coast since 2007, which intends the regional development in municipalities along the coast to provide better living conditions for the entire population in a balanced way with the environment. Thereby, the families residing in the risk areas will be removed and reallocated to social housing units. The *Companhia de Desenvolvimento Habitacional e Urbano (CDHU)* is the public body that promotes the construction of social housing at the state level, including this case.

The aim of the present paper is to evaluate the relation between the current urban public interventions in São Sebastião and the actual sustainable development of this municipality. The method used combines the analysis of primary and secondary data. The primary data were collected and observed in visits made on September 19th and October 20th, 2015 to the community including the irregular settlement called Vila Sahy, whose part is within a risk area. The secondary data are publicly provided by official Brazilian institutions, such as the urban diagnosis accomplished by the Pólis Institute, the socioeconomic censuses promoted by the Brazilian Institute of Geography and Statistics (*IBGE*) and theoretical references on the subject.

A Regional Agenda for Sustainable Development was developed by the program. The main guidelines involve resettlement, provision of infrastructure and sanitation, as well as recovery, conservation and enforcement actions for environmental protection. The *CDHU* foresees commercial and institutional use in social housing projects to relocate the inhabitants. The mixed use instigates the emergence of new urban centralities, which consequently weakens the fact that the local population depends economically on the summer houses. Therefore, the interventions have the potential to leverage the sustainable urban development of *São Sebastião*.

Keywords: risk areas, social housing, sustainable development

Assessing Nodality in Neighbourhoods of Transformation: a Concept of Sustainable Urban Form. The Case Study Of Rahue Bajo, Osorno, Chile.

Thursday, 15th June - 08:00 - SD 704 - Oral Abstract

Ms. Jilan Hosni¹, Dr. antonio zumelzu¹

1. Universidad Austral de Chile

The transformation of Chilean cities has followed the same pattern change as observed in European and North American state of affairs everywhere in consumption of energy as well as land. More demand on the possession of individual housing units and automobiles was a subject of the decade. From individuals to communities, social relations has been in a decreasing observed manner following the individualistic family model. Consequently, this way of living has reflected its features on the morphological function of the city; forming new residential structures, changing the city scale and hence provoking numerous environmental debates on sustainability. In recognition of city patterns at different scales, neighbourhoods are identified as the basic unit of sustainable urban form (SUF) in which socio-urbanistic concepts are rather tangible. By looking critically at the unfolding of urbanisation process and the change of social relations, neighbourhoods are under threat to lose their vitality and identity. Vitality of neighbourhoods is a concept that was termed both by some urbanists on vibrant urbanities expressing the presence of communities in public areas. In turn, public spaces in neighbourhoods represent the hub of social control over territories. The current notion is observed in public outdoor areas deserted of people, although some others are seen to be congested. Accordingly, this shows the gap that appears in the urban design practice that has spiralled out of control. Despite the misleading debate about sustainable city concepts, professionals have agreed upon the necessity of acting locally since generalizing statements added up more difficulties for applying theories into practice. In order to analyse the SUF, five dimensions were set by researchers as: accessibility, connectivity, density, diversity and nodality. These criteria have been applied successfully in a number of cities for the construction of urban regeneration program areas. By applying nodality in neighbourhoods as a strategy to comply with the current transformation, the city scale can be redefined. Like many cities in the Patagonian region, Osorno is passing through a dramatic transformation phase. The research aims to evaluate the quality of public spaces in Rauhe Bajo, according to how users perceive them. Through cartography, the neighbourhood is re-organized with a new hierarchical map that is defined by nodes of social interaction. The research follows an empirical case study approach with a qualitative analysis of urban space. Furthermore, the research interprets the new map that is confronted with the normative map that is prepared by the municipality. Despite its technical depth, it gives a new perspective of the collaboration between academia and municipalities to help officials advance with new methods and analytical tools and accordingly achieve better design results. This can be seen as a step forward towards more inclusive city development and can expose the discussion of new management systems, since the results are based on user-oriented design mind-set, illustrating people's behaviour in space.

Urban-rural development: Small towns in the strategic Altillanura region, Colombia

Thursday, 15th June - 08:15 - SD 704 - Oral Abstract

Ms. Maria Fernanda Romero¹

1. Universidad Austral de Chile

The Altillanura region is a low tableland located between the departments of Meta and Vichada, in Colombia. This area has an extension of 92.500 km²; nearly a quarter of Germany's size. The predominant ecosystem in the region is dry and seasonal savanna, characterized by soils with poor nutrient content, strong acidity, low cation exchange capacity, extreme poverty in phosphorus and aluminum levels approaching toxicity for the vegetation. These conditions have imposed several constraints on the use and occupation of this territory.

The region covers seven municipalities: Mapiripan; Puerto Lopez y Puerto Gaitan in Meta county; and Santa Rosalia, Cumaribo, Primavera y Puerto Carreno in Vichada county. This region concentrates a high incidence of poverty: 90.5%, on average. Overall, it has one of the lowest population densities of the country: 0.47 inhabitants/km², in contrast to the national average of 39.5 inhabitants/km². The total population is estimated in 143,000 inhabitants; one third of them belongs to indigenous ethnic groups. Moreover, 44.1% of total inhabitants are concentrated in urban areas while 55.9% remains in rural areas. Additionally, the distances between the urban centres and the country's capital city, Bogota, range from 194 to 860 km, which highlights the wide extension of this territory and the implications of geographical dispersion.

In the recent decade, the Altillanura region has been referred to as the last agriculture and livestock frontier. The national government has decided to promote its productive transformation through inserting it into the national and international markets based on an export-oriented large-scale agricultural production, with several implications in environmental, economic and social terms.

This document is an attempt to provide an analysis small towns' role in the Altillanura region towards an integral urban-rural development framework and, is supported by a review of relevant literature, official statistics and other previous studies done about the region. This study highlights the need for spatial planning approaches in sparsely populated territories with high environmental significance and prevalence of poverty because of high-density city model or classical urbanization path (concentration/agglomeration) is not feasible in this region. These new approaches should bring suitable options for the resources management and good and services delivery, ecologically friendly and economically viable in order to achieve a balance territorial development.

Innovation and knowledge exchange systems for sustainability: The case of urban agriculture in Maputo

Thursday, 15th June - 08:30 - SD 704 - Oral Abstract

Ms. Anja Schelchen¹, Ms. Nicole Paganini¹

1. Humboldt-Universität zu Berlin

The international community set the goal “Zero Hunger” as one priority in its global commitment of achieving the Sustainable Development Goals by 2030. One priority is also given to urban areas; cities are growing fast but economically highly unequal and access to safe and healthy food remain problematic for urban disadvantaged groups. Recent studies have shown that particular in Sub Saharan Africa urban agriculture can play a pivotal role contributing to income generation and food and nutrition security if adopted adequately. In this context, agroecological practices are widely recognized as a key for the production of healthier and safer food. Urban Agriculture in Maputo, Mozambique is an income source for more than 10% of the population and has two main functions: commercialization and subsistence, still, 1300 ha are used for agricultural activities. Main challenges are on production as it is characterized by weak diversification and harmful use of inputs with impacts on human and environmental health. In the last six years, just 79 out of 11.000 organized farmers adopted agroecological innovations such as the use of plant protection product and diversification in crop production. For better marketing options, farmers got certified by the newly introduced Participatory Guarantee System (PGS). The aim of the study is to investigate innovation and knowledge exchange systems to identify successful ways of dissemination. For this purpose, we use the Innovation System Approach, where we look at all involved stakeholders in the innovation process, their role, networks and applied knowledge exchange mechanisms. Our special focus is on the introduction of agroecological techniques applied by urban farmers and PGS quality assurance for associations. Using an action research approach and based on qualitative and quantitative data obtained from the urban farmers and main stakeholders, the study looks at the type of agroecological practices, challenges and constrains of production and commercialization. We also expect to find out what the reasons and motivations are for farmers to adopt agroecological practices. The assessment of the innovation and knowledge exchange system allows us to identify drivers and barriers for a successful dissemination. Based on the results, a multiplication strategy can be developed and results could be transferred to policy makers and urban planners. Considering the vision of making Maputo’s green zones more sustainable, this can contribute to urban food and nutrition security on the one hand, and on the other hand to a more sustainable city in terms of environmental friendly areas with benefits for the community.

Using land readjustment in rebuilding the earthquake-damaged city of Bhuj, India

Thursday, 15th June - 08:45 - SD 704 - Oral Abstract

***Dr. Sweta Byahut*¹, *Dr. Jay Mittal*¹**

1. Auburn University

Major earthquakes cause large scale devastation disrupting life, destroying homes, damaging properties and vital community infrastructure. Such events also offer opportunities for reorganizing neighborhoods and rebuilding disaster resilient communities. This article presents the case of reconstruction of Bhuj City in India following its devastation in the 2001 Gujarat earthquake, and showcases how consultative and planned intervention can rebuild better cities after a natural disaster. The land readjustment (LR) process was applied in reconstruction of a densely built, historically significant inner city area of Bhuj to transform it into a safer community resilient to disaster. LR, a micro-area planning technique, is characterized as a strategy to carve out private lot sizes to create adequate public land for widening and straightening of streets, accommodating parks and amenities, and planning land lots and urban blocks with access to public infrastructure. Bhuj is one of the rare cities outside of Japan where the land readjustment technique was successfully implemented for post-earthquake planning. This article provides insights on the challenges and opportunities that land readjustment implementation offers for post-disaster reconstruction.

This paper is of value for planners and policy makers who are interested in disaster planning and building back better. It is also of interest for land use planners interested in understanding the application of land readjustment as a versatile tool for planning and land reconstitution, infrastructure provision, and building community resiliency. This paper is has been published in the *Journal of Urban Planning and Development* in July 2016, and may be cited as follows:

Byahut, S. and J. Mittal. 2016. "Using land readjustment in rebuilding the earthquake-damaged city of Bhuj, India". *Journal of Urban Planning and Development*, Vol. 143, No. 1.

Sustainability of Social Design Laboratories: Infrastructuring of publics and Micro-planning in the development Design Networks

Friday, 16th June - 08:00 - SD 704 - Oral Paper

***Prof. Carlos Delano Rodrigues*¹, *Dr. Carlo Franzato*², *Dr. Rita Almendra*³**

1. University of Lisbon, 2. Unisinos Creative Industries School, 3. CIAUD, Faculty of Architecture, University of Lisbon

This paper presents the initial results of the doctoral research in design held at the Faculty of Architecture of the University of Lisbon, which is based on the possibility of expert and non-expert designers acting jointly in co-design processes, which make the infrastructure of design networks feasible from the engagement of young residents of neighborhoods stigmatised by poverty and social vulnerability. From January 2016, participatory design dynamics are being conducted in neighborhoods located in Lisbon, Portugal; and in São Luís do Maranhão, in Northeastern Brazil. Here we present the developments of the field study conducted in the Desterro region, the historic centre of São Luis do Maranhão, Brazil, where the LABDES - Desterro Social Design Laboratory was constructed, a platform for collaborative research based on design experimentation which is intended to search for solutions to complex social problems. The question that arises in this experiment is how to continue the LABDES platform beyond its initial scope. This involves the responsibility to reflect and to define strategies to ensure that the participatory design initiatives can continue when the expert designers cease to operate in the design network, understanding how they start, operate and not least, how they leave a project. In other words, we question the sustainability of the participatory design project when the designers or design researchers no longer have the central role in these initiatives. We understand the ability to establish lasting relationships between various stakeholders to promote continuous appropriation of the problems of a particular design network as project sustainability. At first, reflections are presented from the theoretical framework of participatory design, co-design, micro-planning, infrastructuring and living labs. After this first phase, as the LABDES design network was established, which used the participatory design approach, guided by "bottom-up" decisions and "peer-to-peer interactions" involving designers, members of the Desterro neighbourhood community and other stakeholders. The results presented explain the difficulties for the engagement of young residents. Apathy and resentment caused by the lack of continuity of actions undertaken in the past, hidden agendas, conflicts of power, the need for leadership and the legitimacy of the established leaders, the scarcity of resources, the impact of the use of social networking tools and the influence of the power of drug trafficking are the challenges that are presented to the sustainability of the lab project. In the discussion of the issues, planning, participatory design and low complexity prototyping tools were used, Participant Observation being used for the collection of data for action in the field. We conclude the paper by discussing strategies to support designers and researchers in their practice for training, performance and sustainability of design networks.

Inclusive Sustainability in Slum Upgrading and Incremental Housing. The case of the Rocinha, in Rio de Janeiro.

Friday, 16th June - 08:15 - SD 704 - Oral Abstract

***Prof. Nuno Martins*¹, *Ms. Jacira Saavedra*²**

1. CIAUD, Faculdade de Arquitectura da Universidade de Lisboa, 2. PROURB, Universidade Federal do Rio de Janeiro

Rocinha is a favela (slum) located in the south zone of Rio de Janeiro, located 15km from the city center. Its population of more than 100,000 inhabitants is distributed around a 143.72ha valley that is surrounded by the rock formations of the Tijuca Rocky Massif and Atlantic forest of the national park, and occupied by the compact construction of the favela houses. This paper addresses two different urban phenomenon's that currently take place in the Rocinha. On the one hand, that of the expansion of the houses, typically made through the construction on the rooftop (the upper slab), an operation locally known as the *construção de laje* (upper slab construction). These works are self-help processes whenever the goal is to meet families needs regarding built areas to accommodate new family members, or; constructions featuring local contractor or workers, as seen in recent times, when the construction results from the selling of the building rights relate to the rooftop, in a process of verticalization that may acquire significant and unexpected dimensions. Thus, it is common to find three, four or even five and six-storey houses, built in seemingly precarious techniques, with narrow superposed volumes defying gravity. These operations express with remarkable clarity the concept of incremental housing, not grounded in design and intellectuality, as delivered by acclaimed architects, such as Pritzker-winner Alejandro Aravena, rather in its most popular and pragmatic sense, instead.

On the other hand, as a result of public resettlement operations consisting of clearing of tangled webs of narrow and dark and unhealthy alleys that cross upside down the favela, new urban spaces rises. They are often bordered by lines of remaining superposed houses punctuate by collective social houses with low density, frequently three-storey buildings. These buildings replace the row houses stuck at the alleys and provide decent and affordable houses to the removed families. As an example, we will take the Number 4 street, accessible to cars, built on the old road of the same name through a complex process of de-densification that involved demolition and removal of many houses, partially or entirely. This urban renew was carried out thanks to the resources of a federal program of urbanization of precarious settlements (favelas) conducted by the state government, but with the involvement of different local actors, including local associations and community activists. This paper analyses both phenomenon, the incremental housing and the urban renew, emphasizing the social sustainability issues underlying the private and public process. It will be looking at the role-played by the different stakeholders, from householders to local leaders, NGO and social technicians, as well as designers and local representatives, analysing their interactions. The collection of data and subsequent analysis comprises diverse methods ranging from literature review, examination of architectural and urban projects, surveys, interviews, co-mapping and inquiries to the householders. Conclusions highlight the social networks that arose and consolidate over the slum upgrading process and qualify the interactions among the members of those networks.

Microgrids as an alternative energy solution for off-grid rural areas in Colombia

Friday, 16th June - 08:30 - SD 704 - Oral Abstract

*Mrs. Laura Hinestroza-Olascuaga*¹, *Dr. Célia Maria Santos Cardoso De Jesus*¹

1. CERis, Instituto Superior Técnico (IST), University of Lisbon

Access to electricity contributes to increase productivity, enables and improves the delivery of social and business services from a wide range of village-level infrastructure such as schools, financial institutions, and farming tools [1].

Considering the Colombian case study, energy access in rural and remote areas represents one of the most challenging issues [2]. Although the country has a high average electricity coverage index (99.59% in urban areas and 84.84% in rural areas), two-thirds of the national territory correspond to non-interconnected zones (ZNI) [3]. During the last decade, the national government, through the Institute of Planning and Promotion of Energy Solutions for Non-Interconnected Zones (IPSE), has installed 16 hybrid microgrids across the country. However, they are not enough to extend the service to approximately 1565 small localities without electricity access. In addition, the Mining and Energy Planning Unit (UPME) launched a series of sustainable rural electrification plans for Colombia's departments (PERS), but only five departments have enacted PERS: Nariño, Guajira, Cundinamarca, Choco, and Tolima [4].

Although state-owned utilities have traditionally carried out electrification, limited public and donor funds have proven insufficient to meet the aggressive access goals that governments and international organisations have set [1]. Main barriers include: a lack of clear and effective public policy, high levels of risk, lack of enough subsidies, low population density or isolated areas, payment culture and low willingness to pay, low income families, and potentially low returns.

Although extending the grid could be also an alternative, high costs associated with the generation, transmission and distribution of electricity in these zones, have made that provision of the electricity service is mainly performed by means of diesel generation plants. Therefore, there is the need of more investments to promote the installation of hybrid microgrids in these areas.

This paper will focus on the benefits and challenges of enabling microgrids in the electricity supply system in rural areas, specifically in milk producer areas. Due to a lack of clear and effective public policy and high levels of risk and potentially low returns, microgrid electrification studies are not attractive opportunities for the private sector. Specifically, there are two primary drivers of uncertainty for investors: *fuel price* and *electricity demand volatility*.

Interviews constituted the primary source of information for this research. Interviewees were selected in order to obtain comprehensive insights from the different stakeholders involved in the electricity market: generators, regulators, public agencies, retailers, consumers, and academic institutions. We analysed the qualitative data through the software NVivo.

Results from this study will support the formulation of policy recommendations for energy planning in off-grid rural areas, as well as enabling the participation of private investors in microgrids projects.

Afforestation and urban crime in Bogotá

Friday, 16th June - 08:45 - SD 704 - Oral Abstract

Prof. Fernando Carriazo¹, Prof. Jorge Tovar¹

1. Universidad de Los Andes-Department of Economics

The relationship between vegetation and crime has been the subject of recent research among urban scholars. While vegetation may have positive effects on human health, it could be related to a greater propensity for certain criminal activities. Using census and georeferenced data of trees, we explored the relationship between the process of afforestation and criminality in Bogotá-Colombia. Results from econometric estimations suggest a negative and significant relationship between the afforestation activity and crime, measured as the reported number of robberies. These effects are significant both temporally and spatially. Existing literature on this topic has focused on case studies in developed countries. This study is the first effort to quantify this relationship in an emerging country. We discuss implications of our findings for city planning and public policies aimed to reduce urban crime.

Innovative management of urban renovation processes and its contribution to the sustainable development of cities. The case of Progresa Fenicia

Friday, 16th June - 10:15 - SD 203 - Oral Abstract

***Dr. Nathalia Franco*¹, *Mr. Juan Felipe Pinilla*²**

1. Universidad de los Andes, 2. JFP&Asociados- Derecho Urbano

Cities have taken a leading role in debates about sustainable development. Their expansion turn them into key scenarios for the analysis of global challenges.

As for the Colombian case, the country experienced an accelerated process of urbanization during the 60's, which meant a significant increase in the population density in different cities of the country (PNUD 2011). This showed the need of making a new legal framework capable of regulating efficiently the new social demands in terms of housing and a better planning of Colombian urban centers.

In the middle of the challenges already mentioned appears the concept of Urban Renewal: a “deliberate effort of changing the urban environment through the planned and large-scaled adjustment of the existing urban areas, taking into account the present and future requirements of the city's housing and labor” (Grebler, 1963; 13).

During the last three decades a series of laws and regulations have been established in order provide local authorities with more tools of intervention in the market of urban land. This way, the need of understanding urban development as a process where costs and benefits are distributed equally and democratically among stakeholders, has emerged as a fundamental principle.

These laws brought with them several land management tools that became key components for the implementation of urban development in Colombian cities. Tools such as Land Readjustment, Urban Actions Units, Partial Plans and others included in the Master Plans (POT) will be explained throughout this article and have become pillars of the country's planning structure.

It is in this context that the *Plan Parcial Triángulo de Fenicia* emerges: a project of private initiative that promotes urban renovation in the surroundings of Los Andes University, in Bogota's downtown. The way the formulation process has been carried out as well as the characteristics and basic goals of the project have turn it into a role model in the city. Fenicia presents three atypical characteristics: first, their promoter is neither the state nor private investors or landowners but Los Andes, a high education institution. Second, an explicit effort has been made during the formulation process in order to avoid many of the social and environmental problems identified in similar projects. This was done through inclusive, participatory and deliberative dynamics between the promoter, local authorities and landowners of the area. Third, an innovative strategy like land readjustment is applied in order to avoid gentrification phenomenon. This strategy offered alternatives to the settlers to participate as partners and main actors in the decision-making processes of the project.

The paper describes the *Plan Parcial de Fenicia*, highlighting its stages of negotiation and agreement among the stakeholders, its governance structure, and the managerial model in order to stand out the contributions of sustainable development in the city of Bogota. We explain how this proposal went from a model of classic urban renewal to an urban revitalization proposal. Additionally, we explore the role of the stakeholders involved, highlighting aspects such as participatory decision-making processes and social inclusion (both, topics included in the SDGs).

Synergistic policies and measures are key to advancing sustainable forest management and forest-based development

Friday, 16th June - 10:30 - SD 203 - Oral Abstract

Dr. GLENN GALLOWAY¹, Dr. Pia Katila², Dr. Wil De Jong³, Dr. Pablo Pacheco⁴

1. University of Florida, 2. Natural Resources Institute (Luke), 3. Center for Integrated Area Studies, Kyoto University, 4. CIFOR - Center for International Forestry Research

The International Union of Forest Research Organizations' Special Project "World Forests, Society and Environment" (IUFRO WFSE) carried out 27 case studies worldwide with the participation of 144 scientists and experts. Using a common analytical framework, the case studies analyzed initiatives seeking to further sustainable forest management (SFM) in which considerable effort and resources have been expended over a protracted period of time. The analytical framework included a number of "prerequisite conditions (PC)" for progress towards SFM, based on prior IUFRO WFSE publications and current scholarship on the topic. The PCs were grouped in the following four realms: 1) Policies, institutions and governance; 2) Livelihoods, capacities, cultural and socioeconomic aspects; 3) Natural resource base and 4) Research and monitoring. The presentation will discuss the degree to which progress has been made in fostering the PCs that positively influence SFM. Attention will also be focused on the PCs that have been difficult to address across the case studies and that often undermine progress towards SFM. The importance of interactions among the PCs within specific cases will be emphasized, noting that efforts to attain SFM involve complex systems characterized by non-linear interactions among the conditions leading to observed outcomes, specifically in relation to contributions to local livelihoods and forest condition. Alignment among the PCs was determined to be key to creating synergies that favor progress towards SFM. The presentation will conclude illustrating how this analysis of SFM provides important lessons for the Agenda for Sustainable Development 2030 that seeks to attain the Sustainable Development Goals (SDGs).
Key words: Sustainable forest management; case studies; SDGs

Sustainability as social choice. The public policy of territorial ordering in Colombia

Friday, 16th June - 10:45 - SD 203 - Oral Abstract

Prof. Fabio Arias¹

1. Universidad del Valle

In this paper it is argued that sustainability is a matter of collective choice. There is no definitive definition of what it means and standard procedure to achieve it. Sustainability is always ambiguous, and may be redefined in each context where it is applied. This feature of the sustainability becomes a matter of collective choice, where the results depend on the ability of society to solve common issues. To corroborate this argument is presented the experience of some Colombian municipalities in their territorial ordering. The public policy of territorial ordering in Colombia, for its multidimensional and long-term planning, is an ideal space to investigate the practice of sustainable development. The law 388 of 1997 requires municipalities to develop a land use plan, considering social, economic and environmental aspects.

This research deals with land use experience of a sample of cities in Valle del Cauca, Colombia: Cali, Yumbo, Buga, Cartago and Versalles. The paper starts from an exploratory question: how and to what extent has the territorial ordering policy, Act 388 of 1997, induced sustainability actions in the cities of Valle del Cauca, between 1997 and 2010? To answer this question we use an inductive and exploratory methodological approach. This approach demanded qualitative information, interviews and documentary analysis to reconstruct the interaction of actors in the process of collective choice. The ability of municipalities to deal with that was related to the characteristics of the relationships of those involved.

In Yumbo the territorial plan was favored by sustainability synergies between the local bureaucracy, the local government and the regional environmental authority. In Buga, one of the strategies of the plan was defending a sustainable rural sector. This initiative had a strong social base, but was weakened by the Colombian armed conflict. In Cartago, the plan was the focus of discussions about growth strategies of the city on the one hand and environmental controls of this expansion, on the other part of the environmental control comes from social sectors that oppose a the power of drug trafficking and corruption present in the municipality. In Versalles, the territorial ordering and sustainability results depend on a local leader and community participation. In Cali, the relationship between territorial ordering and sustainability was weak in its first application, currently such a relationship is inevitable and depends on the formation of the local bureaucracy, local academics and social movements.

Analysis of externalities from transportation in Bogota

Wednesday, 14th June - 12:00 - SD 715 - Oral Abstract

***Mrs. Mónica Espinosa*¹, *Prof. Stef Proost*², *Dr. Ángela Inés Cadena Monroy*¹, *Dr. Eduardo Behrentz*¹**

1. Universidad de los Andes, 2. Ku Leuven

Different policies have been implemented in Bogota in the last decades to improve urban mobility. The Bus Rapid Transit system, the car-use restriction and 400 km of bike paths construction are among the examples to be highlighted. Despite these measures, transportation is currently facing different types of problems limiting urban mobility and affecting productivity and quality of life in the city. The growth in motorization rates of private vehicles and motorcycles is associated with more congestion and long travel times. Overcrowding in the mass public transport system during certain periods has negatively affect the quality of the service. And in terms of environmental effects, mobile sources have been identified as the main source of atmospheric emissions. The existence of different kind of externalities, poses an additional challenge, as the solution for one problem can increase other consequences. The aim of this study is to analyze pricing and regulatory options to address traffic congestion and air pollution issues in Bogota. We use a static model to represent the partial equilibrium of the transport market, and evaluate different policies by estimating changes in welfare in comparison with a baseline scenario. Some policy lessons are drawn from the results and analyzed given the local context.

The role of railway for sustainable mobility in Algarve, Portugal

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Paper

Ms. Sofia Silveira ¹, Dr. João Joanaz de Melo ², Mr. Eduardo Zúquete ³

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The railway line of Algarve in southern Portugal was built between the late nineteenth century and early twentieth century. Although the line has driven the development of the region at the time, now it is not adjusted to the needs of the population and the region; the stations are removed from some of the main tourist areas and other major traffic nexus. Public transportation modes are not well linked to each other, so private cars are the main transportation means. Car traffic is the largest energy consumer and air polluter, including greenhouse gas emissions. Inter-modal public transport is crucial to fostering more sustainable mobility in urban areas. The goal of this research was to analyze the effects of redevelopment of the Algarve railway and the role it may have in the development model for the region. Three topics of research are reported: an analysis of current shortcomings of the system, based on historical data and a survey to the municipalities; the development of a model to refit the old railway; and an analysis of effects of the proposed model on sustainability indicators in the region. The simulations carried out on various railway-refitting scenarios indicate a qualitative improvement of sustainable development indicators. Better rail service will increase quality, reliability and efficiency in regional mobility, along with an incentive for better land use management. Even modest investments in the railway will cause significant improvements in air quality, road congestion, road safety and accidents, noise and CO₂ emissions. Conservative best-case scenarios suggest reductions of up to 24% in overall transport-related CO₂ emissions in the region, plus interesting results in other environmental and socio-economic indicators. In short, a shift to rail will contribute significantly to a more sustainable development of the region.

Keywords: Algarve Railway Line; railway mobility; Algarve; Sustainable mobility

MOBILITY THROUGH BICYCLE: ALTERNATIVE OF SUSTAINABLE INCLUSION IN THE CITY OF VALENCIA, VENEZUELA.

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

***Prof. Roxy Pérez*¹, *Dr. Esmeya Díaz*², *Dr. Maria Angela Flores P*¹, *Prof. Carmen Andara*³, *Mr. Raúl Paiva*⁴**

1. Universidad de Carabobo. INFACES, 2. Universidad de Cara, 3. Universidad de Carabobo/Dirección de Extensión/Facultad de Ciencias y Tecnología, 4. Ciclistas Urbanos de Carabobo

The bicycle is a vehicle that fulfills a social function, promotes a model city through the health and environmental, economic and social contributions. It is characteristic of sustainable cities developing programs to mitigate the effects of climate change. In this context, the city of Valencia has a population of 2,494,810 inhabitants, and is recognized as an important industrial and automotive park for the country; However, it lacks a sustainable and inclusive public transport system. The research seeks to propose the key elements for planning and sustainable mobility for Valencia, with the bicycle as a means of transport. The methodology is descriptive, and the way to gather the information is field, with the support in the document, as well as the purpose of the feasibility, how to solve problems, requirements and needs of social groups. It is developed in three phases: diagnosis, through the profile of the urban cyclist, by means of a questionnaire to cycling users in the city; The sample was of the participants in a regional event to celebrate National Bicycle Day. Second: review, on the road conditions of cyclists in the city, through visual inspection. Third: proposal, which establishes elements to be developed by key stakeholders in the management and development of sustainable mobility. As for the profile of the urban cyclist in Valencia, young sons, in the range of 18 to 40 years, the male gender in more than 80 percent, uses the bicycle as a means of transport for work in the first option, as well as sports discipline, Frequently used daily; In terms of perception, they identify the bicycle with words such as freedom, companionship and health. While the conditions are not favorable, because there are no laws at regional and national level to regulate the mobility of bicycles in the city. In addition, the bikes do not cover the whole city, it lacks maintenance and it has no connection with other means of transport like the subway. Finally, the keys to the development of mobility are: regulation, investment in infrastructure for urban cycling, dissemination and educational promotion of benefits and monitoring of mobility indicators. It is recommended a census of urban cyclists, the integration of civil society and government entities, education programs for pedestrians and motorized.

Keywords: sustainability, mobility, city, inclusion, bicycle.

STUDY OF STRATEGIES TO PROMOTE CYCLING IN FOUR LATIN AMERICAN CITIES: THE RESULTS FROM BOGOTA, ROSARIO, MEXICO CITY, AND RIO DE JANEIRO

Friday, 16th June - 09:00 - SD 704 - Oral Abstract

***Dr. Daniel Paez*¹, *Ms. NATALY SAENZ*¹, *Mr. Miguel Angel Ortiz*¹, *Mr. Miguel Dario Hoyos*¹**

1. Universidad de los Andes

The Inter-American Development Bank (IDB), as part of its commitment to the development of sustainable cities in Latin America, has supported the development of a platform to promote cycling in the continent. As part of the platform's development framework, four cities (Bogotá, Mexico City, Rosario, and Rio de Janeiro) were studied and compared in terms of their abilities to promote cycling. This paper uses a comparative methodology to assess the promotion of cycling and presents the results from the four cities. The fundamental criteria on which the comparisons were based were demand, infrastructure, regulations, and promotion of cycling. On the whole, we found positive aspects in terms of the increase in both the size of the bikeway network and demand from cyclists. This was particularly the case in Bogotá, where the increase in cycling has led to the city having the most extensive bikeways in the region. In the region, multimodality bicycle programs have also become common, as have the implementation of specific informative campaigns in each city. However, the comparisons that we undertook showed the need to improve road regulations. We also found that in the four cities the advertising campaigns do not paint the cyclist as vulnerable, and they also do not portray the responsibility of drivers as something fundamental in preventing fatalities. Due to the social inequality evidenced in this study, design and develop strategies that increase the status of the bicycle as a social and gender equal transport mode is a necessary promotion in this cities. In this sense, it is worth highlighting the success of the "Sunday cycling" program, in which there is a new contact with the bicycle and create a change of vision. Lastly, this study found there to be a need to define strategies to gather suitable information that demonstrates regulatory actions as well as the promotion of management and development indicators.

Urban Cycling Platoons Syncing Traffic Infrastructure

Friday, 16th June - 11:00 - SD 203 - Oral Abstract

Dr. Juan Salamanca¹, Dr. Sandra Cespedes², Dr. Leonardo Rivera³, Mr. Francisco Camacho¹

1. Universidad Icesi, 2. Universidad de Chile, 3. Universidad del Valle

Although benefits of cycling in traffic congestion and pollution are concrete, in several cities such as Copenhagen and Amsterdam the adoption of bicycles as means of commuting has overflowed the dedicated infrastructure, deriving in safety risks and gridlocks due to the lack of explicit coordination among cyclists themselves and with city transit coordination infrastructure. In this paper we present how coordinated platoons of cyclist in urban settings can be extremely useful to maximize the positive impact of synchronized sequence of traffic lights, so called “green waves”, that allow cyclists to flow without having to stop at intersections. Our project addresses the coordination of collective behavior of platoons of cyclists that could pervade dedicated express roads such as the London’s 18 mile East- West Cycle Superhighway, as well as bike paths threaded with urban car roads. Aiming to provide safer and comfortable environments that facilitate cyclist circulation in urban settings, technological solutions that integrate vehicle-to-vehicle (V2V) communication, vehicle-to-infrastructure (V2I), and human-to-machine interfaces can be developed. Our case presents a system that explores the use of control mechanisms for providing coordinated driving to a group of bicycles enabled by ad-hoc communications and embedded computing. This allows for the consolidation of unplanned “schools” of cyclists that can be detected by traffic control infrastructure as composited units, prioritizing their flow over motorized vehicles. Our empirical method integrates cycling and a well established platooning algorithm developed for car or truck convoying. In the proposed system, cyclists respond to a Cooperative Adaptive Cruise Control delivered through specific human-machine interfaces designed to elicit positive or negative acceleration from individual cyclists. As a result a school-like behavior emerges from cyclists. The benefit for cyclists riding together with others is to maintain a critical mass large enough to deserve prioritized use of urban roads that otherwise they wouldn’t get by their own. The benefit for car drivers is to stop less frequently at intersections with bike paths. The contribution of the technology reported herein to green waves is twofold: it constantly informs when cyclists are subscribed to a green wave, and triggers the green waves on collective demand. These findings and technologies could be applied in the coordination of a group of two-wheeled vehicle including moped and self-balanced electric vehicles.

This work has been partially funded by Project FONDECYT Iniciación 11140045

The interdependent relationship between organisation identity and sustainable Innovation in the evolution of the firm.

Wednesday, 14th June - 11:30 - SD 716 - Oral Abstract

Dr. Gary Buttriss¹

1. *The Australian National University*

Smart companies now treat innovation as sustainability's new frontier requiring development of more sustainable products, process and practices, new markets, and new sustainable business models. These innovations are influenced by and influence a firm's identity. While organizational identity is considered to be core, distinctive, and enduring, it may need to change as a result of a misalignment between identity and perceived image of the firm as it is confronted with changes in its environment. Closing the gap requires the firm to innovate. The dynamic between identity and innovation varies depending on whether the innovation is identity-enhancing, identity-stretching, or identity-challenging.

An *identity-enhancing* innovation is one where there are minimal changes in the environment and the firm's identity and innovative activities are consistent with each other, resulting in incremental innovations. An innovation is considered *identity-stretching* when the firm faces a continuously shifting landscape that causes significant disruptions across its operations. Radical innovation is required that differs significantly from past practices and principles that have shaped its identity. The strong feedback dynamic between identity and innovative activities results in continuous cycles of enabling innovation and identity reconfiguration. *Identity-challenging* innovation results when a lack of alignment between identity and innovative activities results in significant organizational dysfunction. Such innovations typically occur where the disruption caused by the shifting environment is significant enough to affect the whole network, markets and the economy. This requires firms to engage in deeper, 'systems level' change including technology, and organizational and managerial innovations with affects beyond the firm.

Our research focuses on the evolution of identity of Veolia International an environmental solutions provider. Veolia's identity communication was observed through document interpretation of Veolia's annual Sustainability Reports and articles from the press.

We found that organizational identity plays a key role in the firm's sustainability orientation and strategy when sustainability is viewed as an integral part of who they are and entails pursuing sustainability as a core strategy direction rather than as a non-core add-on. Veolia progressively moved beyond compliance towards an internalized ideology of commitment towards sustainability, re-examining and re-defining how a sustainability-focused firm should operate, and development of innovative products, services and markets. A sustainability-focused identity, activities and innovation have a synergistic cycle of co-dependence, -influence, and -production. While identity can influence the type and amount of sustainability-oriented innovations the firm engages in, the performance of those innovations and activities feedback evolving the firms identity. Identity does not change holistically or linearly, instead developing interdependently over a spatial and temporal landscape along several paths at different speeds, influenced by different events and actions both inside the firm, and with key relationships and within the broader environment. As a result, organisational change can result from innovations that are incremental and identity-enhancing; radical and identity-stretching; and/or transformational and identity-challenging

Keywords: Organisation identity, process, innovation, sustainability, change

Sustainable entrepreneurship shaped by design thinking

Wednesday, 14th June - 11:45 - SD 716 - Oral Abstract

Ms. Monica Ramos Mejia¹, Mr. Juan Manuel Jauregui Becker¹

1. University of Twente

Conventionally, opportunity recognition has been the main factor characterising entrepreneurship. This opportunity refers to a gap or a missing link between what people need/want and what is provided to them. Thus, this gap constitutes an opportunity for economic exploitation. This rationale has enabled the emergence of ventures that profit from and reproduce a consumerist and unsustainable society. In this paper we explore to what extent an opportunity-recognition process led by empathy (rather than by economic purposes) alters the outcome of such process. In order to do so, we have conducted our research in two pre-incubator programmes that aim at developing empathy at the first stage of the pre-incubation process. One programme was run in The Netherlands, with the objective to support refugees to rebuild their lives by providing them with the tools and training they need to start their own enterprise. The other programme was run in Colombia, with the objective to support community leaders to create solutions for their own local needs. Both programmes attempt to develop empathy using design thinking as the main tool. Design thinking is characterised by two main elements. First, iteration between the 'problem and solution space'. Second, an ideation process based on 'divergence and convergence'. Throughout these iterative processes, participants are encouraged to develop and practise empathy. We have conducted interviews to the programmes' participants in order to understand in which ways the development of empathy affected the ideation process and the business model they finally developed. Our findings suggest that a strong emphasis on developing empathy (1) transforms conventional business ideas and models into more sustainable ones; (2) promotes business models based on product-service systems, which are believed to be good means for achieving competitiveness and sustainability simultaneously (Tukker, 2004); (3) brings about more sensitive entrepreneurs to the social and environmental challenges their communities face; (4) increases awareness of the role businesses play in developing a more sustainable society.

Keywords: sustainable entrepreneurship; design thinking; empathy; pre-incubation

Purchase Behaviour of Sustainable Products: Insights from Big Data

Wednesday, 14th June - 12:00 - SD 716 - Oral Abstract

Dr. Phani Kumar Chintakayala¹, **Prof. William Young**¹, **Dr. Ralf Barkemeyer**², **Dr. Michelle Morris**¹

1. University of Leeds, 2. KEDGE Business School

Our research examines how the demographics and environmental attitudes of retail customers influence their purchasing behaviour of niche and mainstream sustainable products and whether this influence varies by products. We employ actual supermarket sales data from over 300 outlets in England covering 18 million customers, and examine two products that can both be labelled as sustainable but have very different market positions: organic milk as a typical niche product, and free range eggs which (based on market share) can be seen as a mainstream product. Our results partially confirm previous research – which is typically based on self-reported behaviour – identifying both price and deprived catchment areas as barriers but green attitudes as a driver of sustainable purchasing behaviour. Yet, the results clearly indicate that not all sustainable products are considered the same by consumers, and that consumption behaviour varies considerably across sustainable product categories.

For organic milk as a niche product, we find more affluent people more likely to be purchasers. What is new is that we also see older families and those aged 25-44 as purchasers. White and Asian ethnic origin are a negative influence. On the other hand, consumption of free range eggs – as a mainstream product – does not seem to be influenced much either by attitudes or by demographics. Comparing our two different products, the impact of socio-demographic factors in particular on purchasing behaviour therefore appears to be fading with increasing market penetration.

Our results may provide important cues for the ongoing debate on the need to mainstream sustainable consumption. The fact that we observed very different underlying dynamics between niche and mainstream sustainable products raises questions about the current positioning of sustainable (niche) products more generally. Further research needs to be done around the marketing methods retailers have employed for sustainable labelled products. Are they using methods that just appeal to niche green consumers who may not be buying their products from a mainstream retailer anyway? Are these marketing methods putting off mainstream consumers who may buy organic milk but need better marketing that appeals to their mainstream consumer values? This is key as mainstream consumers are used to buying sustainable labelled products but retailers need to change their marketing of these products to mainstream consumers.

Keywords:

Corporate sustainability strategy; mainstreaming; sustainable products; big data; organic milk; free range eggs

Sustainability understanding and strategies in selective German water companies

Wednesday, 14th June - 12:15 - SD 716 - Oral Abstract

Prof. Marlen Arnold¹

1. Technische Universität Chemnitz

Water is one of the most essential resources of our time. At the same time, sustainable water policy and management is a priority area in the German national sustainability strategy. Since German water supply is characterized by diversity in supply, organization and size, it is of interest how water companies define sustainability activities and integrate sustainability within their strategies. Arnold (2015) stresses: although based on rather stable and far-reaching governmental regulations the water industry needs a change towards sustainability and forward-looking strategic planning. Holistic or integrative sustainability management tools and approaches are underrepresented. There is an imbalance in the application of tools regarding managing tasks and sustainability principles: The implemented tools are mainly focused on general management and participation as well as targeting in particular. There is almost no implementation of the polluter pays', integration, sufficiency & substitution, resilience principle. Based on this investigation it is of interest how the companies describe their sustainability understanding and strategies. During 2015 more than 500 water companies were asked for their sustainability engagement by email. 65 water companies took part in the survey. Three main categories were used: (1) sustainability management, (2) resource water, and (3) characteristics of the company.

Only some results are highlighted here: Taking strategic decisions, the preservation of the water quality shows the highest relevance for the organizations (65 %) followed by consumption volumes, new water management laws and existing infrastructure (40%). Consumption patterns and lifestyles are not relevant for decision-making in the sample. Sustainability seems to have a high relevance for the respective companies (82 %), and only 12 percent of the companies state they do not have any sustainability tool implemented. Sustainability water management is mainly securing the water resource as well as the long-term preservation of its quality while respecting given environmental management systems and regulations as well as the ability to regenerate of the water resource. Moreover, addressing transfigurations by media and society, the company representatives state the following attributions as inappropriate for the water resource: tap water has an inferior quality, the price is inflated, water saving is ecologically meaningful and water is an inexhaustible, naturally pure resource.

Identifying change agents for Corporate Sustainability integration

Wednesday, 14th June - 14:00 - SD 205 - Oral Abstract

Dr. Sjors Witjes¹, Mr. Michiel Zijp², Ms. Jennifer van den Berg¹, Dr. Walter J.V. Vermeulen³

1. Copernicus Institute of Sustainable Development, Utrecht University, 2. RIVM, 3. ISDRS & Utrecht University

CS change agents play an important role for companies when integrating Corporate Sustainability into their business activities. While change agents can be differentiated by their worldviews, little is known about the contextual factors influencing their success in supporting CS integration. By presenting and illustrating a framework based on contextual factors of CS integration and change agents' worldviews, this paper contributes to the understanding of their influence on CS integration. We conclude that CS integration can be characterized by different types of context, with CS change agents holding a worldview profile instead of only one worldview. Consequently, different situations within one organisation require change agents with different worldview profiles. The framework enables the understanding of the individual and group level of CS integration. When discussed with company representatives, the outcomes enable an improvement in the selection of key individuals to support CS integration activities.

Voluntary Environmental Programmes for organisational learning: A Colombian experience

Wednesday, 14th June - 14:15 - SD 205 - Oral Paper

Mrs. Juanita Duque-Hernández¹, Prof. Bart van Hoof¹

1. Universidad de los Andes

This article discusses voluntary environmental programmes (VEPs) as mechanisms that encourage better social and environmental performance in companies. The research aims to study why firms, in an emerging market context, join VEPs and what they learn from their participation. The conceptual framework combines literature on organisational learning and voluntary programmes. The research method is quantitative, using empirical longitudinal data from 54 facilities that participated in the first 2 editions of an environmental disclosure programme in Colombia (RACES – *Reconocimiento Ambiental CAR a Empresas Sostenibles*). The main findings evidence a mismatch between firms' ex ante motivations to join RACES and their ex post assessment of the benefits obtained from participating. Firms manifest their main driver to join RACES is reputational, however the most valued benefit from participating is capacity-building. In fact, facilities participating in RACES achieve diverse levels of organisational learning regardless of their economic sector. Larger firms tend to achieve higher levels of organisational learning than micro and small companies. The significant organisational learning achieved by RACES firms can also be influenced by the programme's design features and by the fact that the facilities are early entrants in the first two editions of the programme. Academic contributions are made by integrating two bodies of literature to understand the organisational dynamics of companies participating in voluntary disclosure programmes. Recommendations to practitioners involve how to participate in VEPs and the recognition of VEPs as tools for capacity-building in environmental management. Possible implications offered for the design of public policy and voluntary mechanisms that complement command and control and generate organisational learning.

How networks of innovative sustainability technology producers deal with the dilemma of collaboration versus competition

Wednesday, 14th June - 14:30 - SD 205 - Oral Abstract

***Mrs. Julia Planko*¹, *Dr. Maryse Chappin*¹, *Prof. Jacqueline Cramer*², *Prof. Marko Hekkert*¹**

1. Copernicus Institute of Sustainable Development, Utrecht University, 2. University of Utrecht

To increase chances of market success of their innovative sustainability technologies, firms can strategically build-up an innovation system or business ecosystem around their innovative technology. Transition literature refers to this process as ‘collective system-building’. Firms collaborate in networks, which can include public and private actors, to optimize their technology, create a new market and trigger socio-economic changes. When engaging in collective system-building, firms face a profound dilemma that may hamper collaboration: should they invest their limited resources into collaboratively building up the innovation system, or should they invest them into competing against their rivals for market share? Firms have to carefully weigh the advantages and disadvantages of collaboration versus competition when engaging in collective system-building. We examined how firms who collaborate on developing and implementing a new technology deal with the dilemma of competition versus collaboration in system-building. The transition literature has not addressed this dilemma yet. To fill this gap in the transition literature, we use insights from the cooptition literature. The cooptition literature addresses the issue of simultaneously competing and collaborating with a partner. To make cooptition strategies more effective, it is important to manage cooptition processes at both the firm-level and the network-level. So far, little research exists on cooptition management at the network-level. In this paper, we examine how actors in networks deal with the benefits and risks of cooptition, and how they manage these. Our empirical case is the Dutch smart grids sector. We conducted a multiple-case study on the six important system-building networks in this sector. Semi-structured interviews have been conducted with key actors of these networks. We found that system-building actors use coping strategies to minimize the risks inherent in cooptition. But moreover, they already prevent risks from the start, by setting up mechanisms that reduce risks and increase benefits. They try to reduce the dilemma of competition versus collaboration upfront.

Key words: sustainability technologies; innovation systems; cooptition strategy; collaboration; system-building

Innovative business models: sustainable or not?

Wednesday, 14th June - 14:45 - SD 205 - Oral Paper

Ms. Petra Soltész¹, Dr. Gyula Zilahy¹

1. Budapest University of Technology and Economics

Sustainability practices characteristic of most contemporary business organizations foster incremental change by product, process and management innovation. While this is very important, incremental improvements neglect a number of larger opportunities associated with new forms of doing business and ‘the underserved markets at the bottom of the economic pyramid’ (Hart and Milstein, 2003, p. 65). A growing number of experts recognise this and emphasize the role of more radical change to be brought about by innovative business models. According to Schaltegger et al. ‘the business model perspective is particularly interesting in the context of sustainability because it highlights the value creation logic of an organization and its effects and potentially allows (and calls) for new governance forms such as cooperatives, public private partnerships, or social businesses, thus helping transcend narrow for-profit and profit-maximizing models’ (Schaltegger et al., 2015).

However, research on business models and their various impacts on sustainable development is still in its infancy and the majority of existing documents dealing with business models takes a pragmatic approach describing the basic characteristics of product-service systems, the sharing economy, the collaborative enterprise, innovative financing solutions, etc. from a practitioner’s point of view. Apart from a lack of deeper understanding of these innovative business models their environmental and social impacts have not been uncovered yet. For this reason, research efforts at the Budapest University of Technology and Economics concentrate on the collection of empirical evidence relating to the fast spread of the sharing economy. Which social groups are affected by sharing economy businesses and how? How do lifestyles change as a result of their fast growth? What are their negative and positive environmental impacts and what is their net effect on natural ecosystems?

The aim of the empirical research to be introduced at the 23rd ISDRS Conference is to provide answers to these questions through the practical experiences of a regional sharing economy business, which has been operating in the transportation sector for several years. Data gathered as a result of the operations of the net based company reveal tendencies during its growth and its actual and potential effects on society and the environment. Early findings of the research suggest that the fast growth of the sector require the attention of policy makers who do not have the necessary data and understanding yet to make informed decisions (Zilahy, 2016). Research findings may also contribute to the development of an assessment framework of new business solutions and as a result, to policy recommendations with regard to their development and support.

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DEVELOPMENT OF THE WEBSITE OF THE UNIVERSITY PARK FOUNDATION AS A LEVERAGE FOR THE PROTECTION AND IMPROVEMENT OF ECOPARQUE UC IN THE FRAMEWORK OF SUSTAINABILIDAD

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Ms. Yenin Rodriguez ¹, Dr. Esmeya Díaz ², Dr. Maria Angela Flores P ³, Prof. Roxy Pérez ³, Mr. Angel Romero ¹

1. Universidad de Carabobo.DTA, 2. Universidad de Cara, 3. Universidad de Carabobo. INFACES

The Internet has become a powerful medium of communication and recently a tool for financing. Internet penetration in Venezuela stands at 37.7% of the population, placing these consumers slightly above the average in Latin America. In Venezuela, news sites lead clearly, however there is another group of web pages focused on e-commerce and entertainment. This navigation behavior of Venezuelan users, shows the challenge of positioning the institutional pages. In this context, the University Park Foundation of the University of Carabobo, established within its objectives to inform and disseminate to the community the projects under development, especially Ecoparque, using the principles of marketing, economic management and sustainable development, in order to familiarize users with this concept and to demonstrate the required change in people's attitudes and actions, as well as to obtain financial resources for their development. The objective of the research was to develop the website of University Park Foundation with multiple purposes, related to the promotion of Ecoparque, its potentialities; Institutional capacities for self-management, as well as promoting the concept of sustainable development. The research was developed under the modality of feasible project, using as methodology Extreme Programming for the development of the web. The study contemplates five phases 1. Preliminary project, 2. Project planning: definition of the team of specialists, user stories with the client and the incremental delivery plan, 3. Project design, 4. Iterative and incremental development of the website And 5. Tests of designs made. The result obtained is a dynamic, self-managing website with applications and web design functionalities aligned to the needs of the Foundation. The integration of art, technology, scientific information and the application of financial strategies was achieved. The overall quality, based on the formal structure and contents, visibility and image projected towards the outside, facilitates the objective of improving the institutional diffusion and the channels of communication of the same using social networks. We used a series of elements, such as accessibility, usability, fidelity, content adequacy, among other aspects, in the context of Web Information. Within the final considerations, Extreme Programming, which is oriented towards the end user of the system, reduces the cost of change in all stages of the system life cycle, and combines best practices to develop software. In terms of financial self-management strategies, Crowdfunding was used, understood as the financing of small enterprises, which in this opportunity are linked to Ecoparque activities and the provision of conservation and training projects in companies, within the framework of Corporate social responsibility. The website encourages an understanding of the concept of sustainable development through the appropriate use of resources, educational means and programs, creating a formal, non-formal and informal learning space; Invites you to know more and act in favor of the conservation of the environment and improvement of the quality of life. In this modality there are important expectations regarding its applicability in the Venezuelan market via the Internet.

Research fosters the sustainable use of biological diversity in communities

Keywords: Website, ecoparque, extreme programming, financing of microprojects, Crowdfunding, sustainable development

Sustainable business models: The case of Hybrytec, a Colombian solar-energy start-up

Thursday, 15th June - 10:15 - SD 704 - Oral Abstract

*Dr. Nathalia Franco*¹, *Mr. David Schnarch*²

1. Universidad, 2. Universidad de los Andes

In Colombia, two million people and approximately 66% of the country's territory does not have access to the electrical grid. Peasants, indigenous, and Afro-descendant communities, who live without grid, usually satisfy their needs by using diesel generators. Communities have to pay high costs for the fuel and 99% of them have less than 6 hours of service a day (Florez, et al., 2009).

Colombian situation is a mirror of what is happening globally. According to United Nations, in 2015 about "2.8 billion people had no access to modern energy services and over 1.1 billion do not have electricity" (UN, 2015). Discussion about renewal energy has grown in the past decades. The FAO of the United Nations, for example, promotes the generation of electricity from photovoltaic solutions as a possible vehicle for agricultural and rural development (van Campen et al., 2000). However, in many contexts, the success of such efforts is limited due technical limitations, lack of basic skills in the management of solar solutions, and limited financial support.

The aim of this article is to analyze the transformations and adaptations needed to develop a business model in order to provide affordable and manageable solar energy solutions to vulnerable population in isolated rural areas. Specially, the article highlights how to incorporate a sustainable approach (social, financial, and environmental value generation) to consider a wide range of stakeholder interests, including environment and society. It also shows how to develop such an approach from the early development of start-ups.

To do so, we examined the experience of Hybrytec, a solar-energy Colombian start-up that strengthened its business model to include a triple bottom approach (balance among economic, social and environmental issues). Helped by ECOS group, a Swiss investment fund, the business practices evolved and new management practices were implemented.

A qualitative approach was taken. In-depth interviews with several stakeholders of the company were conducted (CEO, employees, local distributors and clients). Categorization and analysis of the data was conducted and validated with secondary sources (triangulation process).

Hybrytec, in a short period of time, became leader of its segment with 23% of the market share, providing basic electricity needs for 43.400+ people. Its business model was re-configured to create social and environmental value. For one of its business lines (which represents 40% of the revenue), Hybrytec developed a network of distributors. The network includes over 200 rural small entrepreneurs that receive training to design and distribute solar energy projects in remote areas. A second business-line is related to social impact projects. These projects -normally financed by public and international cooperation resources- are aimed to impact vulnerable or isolated communities by providing them with electricity, water pumping systems, and cooling through solar energy. The third line develops large projects with private companies to reduce their CO2 emissions.

The evidence of the case shows that through a profit-making initiative it is possible to develop a business model that creates social and environmental value by empowering low-income populations, and lowering barriers to access to safe, affordable and clean energy.

CORPORATE SOCIAL PERFORMANCE IN FAMILY-CONTROLLED BUSINESSES

Thursday, 15th June - 10:30 - SD 704 - Oral Abstract

Dr. Luis Diaz-Matajira¹

1. Universidad de los Andes

Family-controlled businesses (FCB) are the predominant organizational form around the world (La Porta, Lopez-de-Silanes, & Shleifer, 1999). I define a Family-Controlled Business as “*a business that is governed and/or managed by two or more members of the same family with significant ownership by those and possibly other members of that family and with the intent to pass the ownership and management of the firm on to the next generation*”. FCBs seem to outperform non-family businesses, especially over the long run (Miller & Le Breton-Miller, 2005). In recent years, scholars have been writing on stakeholders, ethics and social responsibility in the context of family firms (Berrone, Cruz, & Gomez-Mejia, 2014; Cennamo, Berrone, Cruz, & Gomez-Mejia, 2012b; Dyer & Whetten, 2006; Zellweger & Nason, 2008). This literature also suggests that family involvement is a critical issue to comprehend when asking why FCBs may be more socially responsible than non-FCBs. Following this trend, my paper attempts to contribute to this emerging literature by analyzing the relationship between the constructs of familiness and corporate social performance (CSP), thus exploring if FCBs promote sustainable management practices. I use the following definition of CSP as a “*business organization’s configuration of principles of social responsibility, processes of social responsiveness, and policies, programs, and observable outcomes as they relate to the firm’s societal relationships*”(Wood, 1991: 693). My paper focus on private FCBs and follow the case survey methodology (Larsson, 1993) as it allows to combine quantitative analysis with qualitative data. I survey, analyze and compare a sample of 30 longitudinal in-depth private family-firm case studies from all over the world. Cases were theoretically sampled out of the STEP case pool which consists of more than 100 case studies (Sieger, Zellweger, Nason, & Clinton, 2011). Preliminary evidence also indicate that family involvement correlates with social initiatives towards external stakeholders (local communities and the environment), while internal being neglected. FCBs tend to prioritize relationships over transactions with regards to their stakeholder management (Le Breton-Miller & Miller, 2011). Thus, FCBs are prone to connect with the broader community, making contributions to the causes they believe in. Results suggest that FCBs are heterogeneous and that different dimensions of familiness (especially family involvement in governance) appear to explain some of this variation. Family involvement seems to be a complex phenomenon that may explain why some FCBs can behave in a socially responsible way and work towards sustainability, while others do not. Moreover, results open lines for further research.

THE PROCESS IS THE KEY: FINANCIAL PROFITABILITY WITHOUT EXCLUSION OF SOCIAL AND ENVIRONMENTAL PERFORMANCE THROUGH IMPACT INVESTMENT.

Thursday, 15th June - 10:45 - SD 704 - Oral Abstract

Prof. ANDRES GUERRERO¹

1. School of Management at Universidad de los Andes

The Impact Investment is the investment made in companies with the intention of generating financial returns and positive environmental and social impacts at the same time. The concept was coined ten years ago. Some authors associate this kind of investment with an evolution of the “Socially Responsible Investment”, and others to a diversification of investment portfolios in the face of the financial crisis of 2008. Anyway, the Impact Investment has had an important growth in the last years, from US \$ 4 billion in 2011 to US \$ 60 billion estimated for 2015 worldwide; in Latin America it has developed significantly in Mexico, Brazil, Colombia and Peru, these four countries would reach 8.5% of the total Impact Investment globally by 2015. This fast process of growth implies that, compared to traditional investment, the actors involved in the impact investment are newcomers in this kind of investment. Investment funds, invested companies and support organizations, such as incubators and accelerators, have little experience in jointly managing the key elements of impact investment: financial returns and social returns, including environmental return. The accelerated growth of an investment model that includes new dimensions to traditional investments, social and environmental, makes the management of the organizations involved in these processes a challenge so that their management really contributes to sustainability. The value promise in the sector is a positive return in financial, social and environmental dimensions. This paper explores the question of how to find an “appropriate positive return” on impact investment, using the results of investment processes supported by the New Ventures Colombia Program, operated by the School of Management at Universidad de los Andes, between 2008 and 2014. The investment process becomes the mechanism to determine the possibility of return required on the investment impact, which goes beyond the financial profitability of the investment.

IMPACT INVESTING, IMPACT INVESTMENT, FINANCIAL AND SOCIAL BENEFITS

What can Industrial Change Agents Teach us Corporate Sustainability Theorists?

Thursday, 15th June - 11:00 - SD 704 - Oral Abstract

Ms. Kyra Weerts¹, Dr. Sjors Witjes¹, Dr. Walter J.V. Vermeulen²

1. Copernicus Institute of Sustainable Development, Utrecht University, 2. ISDRS & Utrecht University

Companies need to address their impacts on the sustainability of society to achieving long-term success. To satisfy current demands while simultaneously being prepared for tomorrow's developments entails a dynamic capability and management of organisational change. In the implementation process of Corporate Sustainability (CS), physical and social dynamics of business activities play an important role. Scientific research however generally focuses on optimizing physical dynamics in the CS implementation process, discarding the influence of the created and affected social dynamics. This article therefore focuses on optimizing social dynamics in the CS implementation process. Three literature analyses were carried out, analysing to what extent the propositions made by scientists to optimize social intervention dynamics in the CS implementation process correspond with literature written by successful CS change agents from the industry and what lessons can be drawn from this comparison.

It is found that firstly, a leader centred approach seems to be most successful when initiating the corporate cultural change necessary to optimize the social dynamics within the company. Leaders can mould a corporate culture for it to help optimize the social intervention dynamics resulting from the CS implementation process. For companies that did not start from a CS perspective it is observed that the corporate culture needs strong leader centred guidance to enable and establish cultural change for a longer period of time. Habits need to be broken and employees need to be convinced of the new vision, which takes more dedication and effort of a leader than when a company starts from a CS perspective, and the leader can simply recruit people that fit to the vision. Once, the moulding process of the corporate culture has matured the leader can take a step back and become more observing, trusting his employees to have enhanced the corporate values and to be capable of acting within the set vision. Depending on the level of risk that is considered acceptable, a leader can either guide corporate cultural change through channelling or accepting ambiguity. Channelling ambiguity entails that there are several value dimensions on which everyone within the company agrees. Here, cultural change happens as a result from different cultural backgrounds of employees. Accepting ambiguity means a lot of innovative freedom is granted to employees by keeping evaluation criteria vague.

The growing acceptance of eco labelling: An empirical analysis in Spain

Thursday, 15th June - 14:00 - SD 702 - Oral Paper

*Mrs. Vanessa Prieto-Sandoval*¹, *Prof. Marta Ormazabal*¹, *Prof. Carmen Jaca*¹, *Dr. José Alfaro*¹, *Prof. Andrés Mejía-Villa*²

1. *University of Navarra*, 2. *Universidad de La Sabana*

An ecolabel is the visible manifestation of a voluntary eco-innovation process. In this process, consumers' environmental expectations are met; firms increase their created and captured value and enhance their sustainability, and governments and institutions foster sustainable production and consumption. The European Ecolabel, also known as EU Flower, has the mission to regulate and propose common standards in the region and it has been considered one of the ways to promote the Europe's transition to a circular economy in Europe. Even though, the European Commission communicates the evolution of EU Label in the whole region, little is known about the EU Ecolabel evolution in Spain and it is not clear what are the drivers that encourage its implementation. Thus, the aim of this study is to assess the EU Label growing acceptance in the European Union and, more specifically in Spain by product categories and by geographical regions. The analysis shows that the major part of EU Label awarded products, in Spain, belong to the following categories: do it yourself (paints and varnishes), paper products, cleaning up, and electronic equipment. Interestingly, this study also shows that there are clear indications that the regions with higher incomes and exports in the country tend to register more products with eco-labels. Moreover, the regions with higher rates of ecolabelling have implemented and promoted sustainable public procurement criteria. Finally, this study may contribute as an important guidance for policy makers and firms to trigger ecolabelling practices and the transition to a circular economy in Spain and other regions with cultural proximity, like Ibero-America.

Keywords: Environmental certificates, EU Flower, eco-innovation, Spain, Circular Economy indicator, eco labelling.

Exploring the relationship between green hotel attributes, guest satisfaction and loyalty

Thursday, 15th June - 14:15 - SD 702 - Oral Paper

Prof. Roberto Merli¹, Dr. michele preziosi¹, Dr. Alessia Acampora¹

1. Roma Tre University

Sustainability in tourism emerged as a critical issue for a long-term strategy of industry's growth. The accommodation sector is responsible for roughly one-quarter of tourism GHG emission and, since decades, have been applying eco-friendly practices on a voluntary basis. The implementation of these practices is partly a consequence of consumers' growing awareness toward environmental sustainability. Examining the results of a survey addressed to guests of an Italian hotel awarded with Legambiente Turismo Eco-label, the paper investigates the relationship between guest perceptions of hotel green attributes, guest satisfaction and loyalty. Variance-based Structural Equation Modelling (SEM) has been employed to test hypothesis. Findings suggest that the environmental practices implemented by the hotel have positive impact on guest overall satisfaction, loyalty. Moreover, results indicate that the staying at green hotel lead guests to develop a specific loyalty toward the whole range of hotels implementing green practices.

Management Challenges of a Circular Economy

Thursday, 15th June - 14:30 - SD 702 - Oral Abstract

Prof. Rupert J. Baumgartner¹

1. University of Graz

The concept of a circular economy has received an increased interest by public, societal and corporate actors in the last years. The basic idea is that the current linear industrial system, which uses raw materials for infrastructure, products and services which are disposed after their life time, is changed to a circular system where products, materials and energies are used in cycles as long as possible. The advocates of a circular economy ascribe different benefits coming along with this change from a linear to a circular economy; especially environmental benefits like less/zero waste, increased resource efficiency and less negative impacts in ecosystems, but also societal and economic benefits. However, two research questions require still further attention. First, is circular economy contributing to the vision of sustainable development? Second, which implications for companies come along if principles of circular economy are being applied in our economic system?

To answer these research questions the concept of a circular economy is analyzed from both, a management and a sustainability perspective. By doing so, it is revealed in which way and under which conditions a circular economy contributes to a sustainable development of our societies and which implications the concept of a circular economy has for the management of companies pursuing this idea of circularity (or loop-closing). This analysis follows a pragmatic approach to combine insights from management science, especially strategic management and supply chain management, with sustainability studies. Propositions are developed to explain the relationship between a circular economy and sustainable development as well as business management, these propositions are based on a comprehensive literature analysis. The results of this analysis are relevant for those interested in the links between circular economy, sustainable development and business management. The theoretical contribution is that it is clarified, when and how circular economy can contribute to sustainability and which implications circular economy has for business management. Managerial implications are that managers can identify central issues for the integration of circular economy into their organization.

B Corps in Colombia: a legitimate alternative to face the sustainable development challenges?

Friday, 16th June - 08:00 - SD 715 - Oral Abstract

Dr. Nathalia Franco¹

1. School of Management at Universidad de los Andes

B-Corps are recent organizational models that are opening a path between the traditional business and the nonprofit organizations to support the sustainable development. Since their arrival to South America, they have become an attractive alternative to address socio-environmental issues in a profitable way. To become a B-Corp, organizations need to certify that they meet rigorous standards of social and environmental performance, accountability, and transparency. This new kind of enterprises started in the US around 2006, and arrived to South America around 2012. In fact, these all came together in the tendency of for-profit organizations adopting the social purposes through CSR initiatives, and non-profits implementing business logics to develop and scale their social projects.

The convergence between these two sectors (social and business) call the attention of scholars around the world, and some researchers focus on the institutional changes of such integration. Literature has studied the managerial dilemmas that these organizations face using the concept of hybrid organizations by considering legal, financial, commercial and organizational dimensions (Battilana & Lee, 2014). These dimensions determine the underlying identity of the organization understood as the underlying logic for decision-making.

Identity changes and evolution affects organizations' structures, but also social cognition. Through the hybridization, social structures to assess the organizational outcomes change, and can affect the organization legitimacy. According to the institutional theory, legitimacy is a socially built construct based on stakeholders' perceptions about organizational outcomes (Suchman, 1995). Cognitive legitimacy exists when social actors believe that certain types of organizations contribute to the public good. Social and environmental value migration represents a change on the structure and framework that society has to assess organization's contribution to the public good, and implies a challenge in cognitive legitimacy management.

The aim of this article is to explore how organizational identity of the B Corps evolved over time, in order to identify the main organizational mechanisms these organizations use for managing organizational identity and cognitive legitimacy.

To develop the study we analyzed four B-Corps working in Colombia. Two of them, *La Tercera Mirada* and *Green Factory*, working in the service sector (consultancy); the other, *Hybrytech*, a company that offers sustainable solar energy to low income population in isolated rural areas of the country; and the last one, *Alcagüete*, a business model that seeks to offer better nutrition alternatives to green consumers and low income children. These cases showed a clear example of hybrid organizations, with both commercial and socio-environmental logics at their core business.

Findings of the study highlight the role of the entrepreneur in the legitimation process, as well as the importance of the certification as B-Corp to enforce the social understanding around their business model.

Likewise, the analysis of the evolution of these B-Corps, allow us to identify key stakeholders who influence in the legitimation process, as well as the main tensions that the organizations face to maintain the commitment with the social, environmental and economic value generation.

Corporate sustainability: from anthropocentric to eco-spherical vision

Friday, 16th June - 08:15 - SD 715 - Oral Paper

***Prof. Martha H. Saravia-Pinilla*¹, *Prof. Carolina Daza-Beltrán*¹, *Dr. Gabriel García-Acosta*²**

1. Pontificia Universidad Javeriana, 2. Universidad Nacional de Colombia

Due to the challenges met by companies when facing problems like population growth, climate change and lack of resources, while responding to the economic and market demands, one of the issues required in global sustainability agendas is *Corporate Sustainability*. As a framework, this document is based on a research project that carried out a systematic search of specific concepts as key words to find the existing relationships and proposals that could associate *sustainability aspects* with *human aspects*. The results of the search showed that a conceptual development has taken place from two disciplines: economy and ergonomics. From this approach we refined the search using three concepts: eco-efficiency, eco-productivity and eco-effectiveness obtaining 15 documents which were read and analysed carefully and comparatively. It was found out the three concepts used are tightly related to Corporate Sustainability development. In this context, and considering the Ergoecology approach we may say that Corporate Sustainability needs to reorient its traditionally anthropocentric and economic-based view towards a holistic, integral, and ecospheric approach. To structure this paper we introduce the model proposed by the economists Dyllick and Hockerts (2002). It is based on six criteria for the management of Corporate Sustainability and their work from the concept of Triple Bottom Line (TBL). From there, it is presented the anthropocentric vision of the ergonomists Zink, Steimle, and Fischer (2008). Based on Dyllick and Hockerts proposal, these authors involve on a determinant way the Human Factors and Ergonomics approach in the development of Social Sustainability. Then, going back to the economics point of view presenting the Mauerhofer's approach (2008), which proposes "3D Sustainability" to understand the concepts of *three capitals*, in order to achieve equity and environmental sufficiency. Finally, with the literature review it was confirmed that there is a different manner to approach forward and understand Sustainability. This new manner is exposed first, in the Ergoecology proposal by G. García-Acosta et al. (1997), and then in Green Ergonomics proposed by Thatcher, (2013). The starting point comes from the systemic approach of ergonomics towards the ecology aspects to become aware of the interdependence between natural systems and human systems, seeking a dynamic balance. Parallel to the development of the research project, other perspectives are recognized from the approach of the economists who move from the classic view of the Financial Economy, through holistic proposals such as the Ecological Economy and Economic Degrowth, among others, but are not directly related to the human aspects and therefore are not included in the theoretical framework. Concluding, it may be said that under Sustainable Development, the eco-efficiency criterion has become the main objective of organizations, which misrepresent the notion of *economic growth* and neglect environmental and social aspects. Likewise, it is needed to develop other criteria to address issues such as *ecological equity* with a view to achieving *social sustainability*. In order to achieve this transition, *from Ergoecology approach*, routes and strategies are raised allowing to identify actions that organizations should make to achieve true *Corporate Sustainability with an ecospheric approach*.

Corporate Social Responsibility in Community Development: A Case of GAIL (India) Limited

Friday, 16th June - 08:30 - SD 715 - Oral Abstract

Prof. Arun Sahay¹

1. Birla Institute of Management Technology

This study attempts to gain insight into corporate social responsibility (CSR) policy and processes of GAIL (India) Limited; how CSR initiatives are planned, aligned and implemented and how these initiatives contribute to the community development and company's growth. A descriptive case study research design has been adopted for the study. The study shows how community development which earlier was a separate thrust area is now (after the enactment of CSR Act) undertaken within different thematic areas and projects providing the trend in amount spent in community development under CSR. Further, it highlights issues and challenges faced by GAIL in undertaking CSR initiatives. The limitation of the study lies in the fact that the opinion and perception of communities benefited by GAIL projects could not be captured.

Key Words: Corporate Social Responsibility, Community Development, CSR Act

Private contribution on public schools and academic performance. Efficiency measures using non-parametric frontier techniques

Friday, 16th June - 08:45 - SD 715 - Oral Paper

***Prof. Alexei Arbona*¹, *Prof. Diego Prior*², *Prof. Josep Rialp*²**

1. Pontificia Universidad Javeriana, 2. Universidad Aut3noma de Barcelona

This study measures the effect of voluntary contributions from private companies on the academic quality of public schools in Colombia. The impact is measured by integrating non-parametric frontier techniques in efficiency analysis (*order-m*) with a meta-frontier framework, which is a contribution of this study to the empirical literature on efficiency in education. This methodology decomposes the students' total inefficiency to estimate the direction and magnitude of the *Private Contribution Effect (PCE)*. With a sample of 101,874 students, we found a positive PCE that for certain regions reaches a maximum equivalent, on average, equal to 25% of the total effect.

Assessing the Impact of Triple Helix Intermediaries within Circular Economy Oriented Protected Space Networks: A Methodological Overview

Thursday, 15th June - 08:00 - SD 715 - Oral Abstract

Mr. Jack Barrie¹, Dr. Girma Zawdie¹, Dr. Elsa Joao¹

1. University of Strathclyde

The transition to circular economy offers a solution to the challenges of rapid population growth, economic stagnation and environmental degradation. A promising policy tool for accelerating such a transition is Strategic Niche Management (SNM), the central tenet of which is the formation of 'protected space' networks to support the growth of sustainable innovation. Studies have demonstrated that current top-down policy approaches to governing protected spaces have led to the unintended consequences of network tensions, low quality learning processes and low innovation adoption rates outside protected spaces. This limits the impact of SNM as a transition tool. This paper introduces a novel devolved governance framework for protected spaces in the context of transition to circular economy. The framework addresses current limitations of SNM by acknowledging the synergistic relationship with the triple helix innovation system; and innovation intermediation. In order to empirically assess the outcome of such a policy framework, a case study on the Scottish industrial biotechnology protected space was undertaken between September 2016 and May 2017. The aim of this paper is to outline the novel methodological technique developed to assess the impact of triple helix intermediaries within circular economy protected space networks. The methodology involves a combination of a complete social network analysis of the network and a novel technique to measure the impact a triple helix intermediary has had on the network with regards to its alignment with the circular economy trajectory. The proposed methodology is sought to shed more light on the complexities of innovation networks than traditional methods and offers a useful monitoring tool for policy makers to empirically assess the effects of policy interventions on innovation networks. By doing so, the proposed methodology lays bare the salient features of transition to a circular economy which is likely to involve the strengthening, nurturing and empowering of multiple circular economy oriented protected spaces.

Key Words: Circular Economy, Strategic Niche Management, Triple Helix, Social Network Analysis

Practice work: What it takes to lead transitions to sustainability

Thursday, 15th June - 08:15 - SD 715 - Oral Abstract

Ms. Monica Ramos Mejia¹, Dr. Alejandro Balanzó¹

1. University of Twente

It has been argued that sustainability transitions research should pay attention to sustainability experiments in developing countries, because they represent alternative opportunities for reshaping socio-technical regimes that could lead to sustainable production-consumption systems in these regions (Berkhout *et al*, 2010). Despite a few exceptions (Ghosh *et al.*, 2016), little attention has been paid to the role of actors involved in these experiments, i.e. change agents that aspire to lead sustainability transitions within contexts of market imperfection, clientelist and social exclusive communities, patriarchal households and patrimonial and/or marketized states (Wood and Gough, 2006).

This paper aims at contributing to fill this gap, by discussing an experiment for developing eco-social business models in Colombia. Conceptually, the paper explores two complementary aspects. The first aspect refers to agency. Leading transitions to sustainability requires specific forms of agency from actors, distinctive from other kinds of agency. The paper discusses literature on change agents and social innovators to give more detail about the features of these specific entrepreneurial facets. The second conceptual aspect refers to the way change agency relates to practice. In this case, the creation or maintenance of emerging sustainable fields of practice. Here the paper discusses the notion of practice work, a conceptual approach useful for addressing the layered ways in which an actor 'goes about' practice in the attempt to create change (Balanzo, 2016).

Empirically, we have followed the activities of community leaders in Santa Rosa del Sur, a small town in the rural area of Bolívar in northern Colombia. This region exhibits great sustainability challenges: main economic activities include coca plantations and gold mining in river banks, which bring about environmental degradation and biodiversity loss (because of large deforestation and heavy-chemical pollution), and negative social consequences such as informal jobs, violence and short-term mentality. These leaders have promoted other economic activities based on environmental protection and restoration and community development.

Following an interpretive approach, we documented the activities of four actors, from April 2015 until April 2016, who actively participated in an experiment for developing eco-social business models. By paying attention to both narratives (expressions of sense-making) and practices (shared behavioural routines), we have found evidence of what it takes for actors to negotiate and tinker changes for sustainability. This agency-based approach constitutes a contribution to the understanding of more diverse and somehow messy processes of sustainable socio-technical changes in the developing world (as it has been previously suggested by Smith and Raven, 2012).

Overall, the paper argues that leading transitions to sustainability implies actors' active involvement in various fields and, as such, the deployment of multiple identities (Downey, 1992) relating various entrepreneurial repertoires (Balanzo, 2016). These many facets cohere along a specific take on practice work, by means of which actors manoeuvre to bring about change and strive to sustain it.

Comparing cleaner production potential in Colombian and Mexican SMEs

Thursday, 15th June - 08:30 - SD 715 - Oral Abstract

Prof. Bart van Hoof¹, Mrs. Juanita Duque-Hernández²

1. Universidad de los Andes, 2. Universidad de l

The adoption of sustainability practices in small and medium enterprises (SME) has been an issue of growing importance given SMEs predominance and contribution to environmental degradation, particularly in emerging markets. This research analyses differential performance in cleaner production dissemination among small and medium-sized enterprises operating in emerging markets such as Colombia and Mexico. In both countries, a similar sustainable supply network mechanism was applied, to disseminate cleaner production in a significant group of SMEs. Cost-benefits analysis regarding economic and environmental gain is performed to review differences on system levels such as project types, firm categories, network types and country contexts. The methodology used is based on the models applied by van Hoof & Lyon to establish cost-benefit analysis for CP projects designed and implemented by SMEs in Mexico. The main findings suggest that the firms participating in the program in Mexico (PLAC) achieved better economic benefits than those participating in the Colombian program (RedES-CAR). However, in terms of environmental benefits Colombian firms surpassed Mexican ones achieving higher reductions in water consumption, energy usage, and waste generation. Both programs had broad participation of micro, small and medium enterprises, although RedES-CAR had greater participation of micro and small firms than PLAC, which presented higher involvement of medium-sized firms. PLAC gathered solely industrial networks, whereas RedES-CAR assembled networks composed of firms in the agriculture, livestock, construction, services and industry sectors. This study uses empirical, longitudinal evidence to deepen on the understanding of country, company and project characteristics that may influence outcomes of cleaner production implementation. Moreover, it provides a broader, multi-country comparison of the potential economic and environmental benefits of sustainable supply initiatives in emerging markets. The paper has possible implications that can contribute towards a broader implementation of innovation for sustainable development.

HARNESSING THE POWER OF STUDENTS TO CHANGE HOW INNOVATION IS LEARNED AND PRACTICED IN A UNIVERSITY: THE CASE OF THE UNIANDES SOLAR DECATHLON 2015 TEAM.

Thursday, 15th June - 08:45 - SD 715 - Oral Abstract

Mr. Rafael Vesga¹, Prof. Jorge Hernandez¹

1. Universidad de los Andes

This paper examines how a university and a corporate partner worked together in a substantial project with an ambitious sustainability goal and how, in the process, the university discovered new methods to achieve its own objectives as an innovative academic institution, capable of providing its students with knowledge and experiences that turn them into more innovative and socially responsible individuals.

The focus of the research is the use of an extracurricular, non-graded activity to renovate an environments where innovative thinking is learned and practiced. The research examines the experience of the Universidad de los Andes (Uniandes) team in the Solar Decathlon 2015 competition. The Solar Decathlon is an international university competition that was created in 2002 by the US State Department of Energy (DOE). Students are challenged to design and operate a full-scale, innovative and sustainable accommodation that uses solar energy. Projects are evaluated according to ten criteria in the fields of urban planning, architecture, engineering and construction, energy efficacy, communication and social awareness, innovation, house functionality, energy consumption and house comfort. The participation of Uniandes in the competition happened through an alliance with Codensa, electric utility company in Bogotá (Colombia).

Coached by one of the coauthors of this paper, a multidisciplinary team of 40 students, which set its own rules and practices for work, was able to harness support from their professors across the university and also from private sponsoring firms. Students went through an intense, 18-month process, in which they were able to design, build and set up a sustainable house that complied with the demands of the competition. This paper applies a qualitative approach where detailed interviews were performed with the students after the competition was finished. The responses were classified and clustered with the purpose of discovering patterns of behavior, collaboration and learning among the students. The analysis of the experience shows that, within a context of autonomy and self-regulation, and faced with an ambitious goal that captures the imagination and inspires individuals, a team of students can work with scant resources and find creative solutions that may seem to lay well outside the realm of possibility. The process is described using the conceptual tools proposed by the theory of effectuation (Sarasvathy, 2001), where individuals recognize who they are, what are their resources and who they know, and generate a dynamic that takes over in unpredictable ways and generates results. The study identifies that the process was punctuated by clear crisis events, which put the whole enterprise at risk and forced individuals to take a grip on their innermost innovative capabilities. The paper is relevant in the ISDR conference as it shows how a university-industry alliance, called upon to make a contribution to an international competition on sustainability, served as a fruitful environment for a process which contributed to enhance a missional objective of the university, that of forming more innovative and responsible graduates, and revealed how it is possible to summon unpredictable resources that exist among the stakeholders of the university-industry ecosystem.

Diversity of eco-innovations in the context of emerging economies

Thursday, 15th June - 09:00 - SD 715 - Oral Abstract

***. Fernando J. Diaz Lopez*¹, *Dr. Javier Carrillo-Hermosilla*², *Dr. Pablo Del Rio Gonzalez*³, *Dr. Totti Könnölä*⁴**

1. Netherlands Organisation for Applied Scientific Research TNO & Stellenbosch University, 2. Universidad de Alcalá, 3. Instituto de Políticas y Bienes Públicos, Consejo Superior de Investigaciones Científicas, 4. Impetu Solutions

Eco-innovations are commonly related to innovations that contribute towards environmental objectives of sustainable development (Rennings, 2020). Scholars often assume that (companies in) developing and emerging economies have lesser degree of environmental performance and are less profitable [c.f. Horbach, in press]. However, recent evidence challenges the dominant status quo by showing examples of frontrunner companies in those latitudes offering profitable, environmentally sound, green(er) products. Available evidence reports a positive result in terms of knowledge accumulation in material efficiency strategies in emerging economies, above the average in Europe and the USA. To cite an example, UNEP (2014) reports a dozen of companies in emerging economies producing eco-innovative products and leading to growth rates between 10 to 40% in markets where incumbent companies may suffer stagnation. This paper attempts to fill a theoretical gap in the literature by providing a first approximation to dimensions for eco-innovation in the context of selected cases from emerging economies. The authors of this paper depart from the hypothesis that the higher degree of specialisation in emerging economies and its companies upstream the value chain shapes different features or dimensions explaining eco-innovation. Next, it is also proposed that the perceived effect of internal and external drivers to eco-innovation may depend on the framework conditions where companies operate, in developed or emerging economies. More concretely, the lesser external pressures (e.g. regulatory, social norms, etc.) the more the expected effect of internal drivers for eco-innovation (c.f. Montalvo 2002). For example, available studies (based on econometric evidence) have proposed that an international orientation of companies in Europe, say by having export markets or collaborating with foreign suppliers, have no positive effect on their environmental innovation activities (del Río et al., 2013, Chiarvesio et al., 2014). Counter-intuitively, such findings may be interpreted as if local markets (in Europe) are more suitable for eco-innovators, irrespectively of the country of origin of the company. A higher degree of formalization of institutions and better functioning of innovation systems is often used to explain such findings (c.f. Chaminade et al 2014; Villavicencio 2012). More over, empirical studies from countries such as Mexico or Brazil have reported that export activities and more stringent regulation is often perceived as a significant driver of eco-innovation (Dalcomuni, 1997, Diaz Lopez 2009). The above is partly explained by process of trade liberalization and enhanced regulatory frameworks leading to an eventual capability gap (c.f. Truffer et al 2012). In order to provide a first validation of the assumptions above described, this article presents a qualitative validation of cases of eco-innovations in particular emerging economies, namely Brazil, Mexico, and South Africa and Small Island States, e.g. Aruba. Using secondary sources of information three cases are evaluated using the eco-innovation framework proposed in Carrillo et al (2010). Furthermore, the authors of this paper focus on produce, service or product-service eco-innovations showing different maturity levels and degrees of disruption (incremental versus radical eco-innovation), which have faced several barriers to their development/adoption and are affected by different policies.

Organic innovation in African agriculture

Friday, 16th June - 08:45 - SD 716 - Oral Abstract

Prof. Raymond Auerbach¹

1. Nelson Mandela University

The green revolution was a disaster in Africa for three reasons: water was a major limiting factor, most crop research was on rice and wheat, while maize is the staple for much of Africa; the inputs recommended (hybrid seed, chemical fertiliser, pesticides and irrigation) were simply not available, or were too expensive to be justified in the context of high-risk rainfed agriculture. Two approaches have been advocated to assist with African food insecurity: one is the new green revolution, with its Millenium Villages Project (AGRA-MVP); the other is the Export Programme for Organic Products from Africa (EPOPA). Five years of implementation of these two approaches were compared in terms of financial and human capital invested, numbers of farm families reached and costs per farm per year. The investment in both money and people for the EPOPA project was a fraction of that invested in AGRA-MVP, more than twice as many farmers were reached and the cost per farm for AGRA-MVP was estimated to be US\$120 per year, while EPOPA spent \$2 per farm per year. AGRA deployed one doctoral-level and four masters-level scientists for each village cluster, while EPOPA had only three professional staff running the programme. We concluded that both approaches had merit, and that EPOPA should learn from the greater focus on infrastructure development adopted by AGRA and the grander scale of intervention, while AGRA could learn about institution building, market linkages, capacity building for farmer training and use of locally available natural resources.

Keywords: Organic agriculture; capacity-building; institution building; farmer market linkages.

Sustainable usage of circular economy principles applied to self-made rocket stoves design as innovation on communities near wildlife conservation areas

Wednesday, 14th June - 14:45 - SD 206 - Oral Abstract

***Mr. Edgard David Rincón Quijano*¹, *Mr. Luis Miguel Gómez Cuentas*¹**

1. Universidad del Norte

Dramatic deforestation of tropical dry forest (TDF) of the Colombian Caribbean, clearcutting for charcoal obtainment and illegal traffic of wild species, made the Cotton-Top Tamarins (*Saguinus oedipus*) declared in Critically Endangered by the International Union for Conservation of Nature (IUCN). For communities near to natural reserves don't have access to all basic services, electricity supply is unstable, and they get water from wells and streams, and mostly cooked in three points wood-burning stoves because they don't have access to gas.

This project focus on two specific problems linked to mitigate threats: TDF conservation, habitat Cotton-Top Tamarins, through reducing firewood consumption for cooking or charcoal generation; and the reduction of human pressures on the species as hunting for illegal trade through awareness of coexistence with wildlife species.

By Providing an option for young men in the community and reduce the cutting of native trees for firewood consumption and reduce the illegal trade of species through the implementation of workshops and community intervention based on the principle of facilitating circular economy the self-efficient and healthy stoves, firewood stocked for fast growing species in a controlled domestic cultivation.

Universidad del Norte and Fundación Proyecto Tití work mainly with men who hunt and sell the Tití of the Colorado and Hobo communities in the department of Bolívar, to raise community awareness of the meaning of coexistence between species; achieved by reducing the firewood consumption for food cooking, through building and using of more efficient self-made stoves under circular economy principles.

During the process of research tend to articulate international testing procedures for use and talk aloud techniques for rocket stove construction according to cultural use and feeding tradition.

The different designs proposed end up giving, from their specification requirements, a deep understanding of the main challenges for "Do it Yourself" (DIY) stoves as empowering tool for communities facing direct impact on endangered species conservation and first outcomes to circular economy application by the acceptance of a controlled domestic supply plantation of fast growing trees.

New designs may replicate the principles used in this project to enhance performance of the synergy needed between DIY artifacts and their supplies given a specific conservation issue related to nearby communities.

Evaluation of biodiesel co-products in petroleum wells drilling fluids

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

***Ms. Ana Carolina Chaves Catolico*¹, *Dr. Jorge de Almeida Rodrigues Junior*²**

1. Escola Nacional de Ciências Estatísticas, 2. Universidade Federal do Rio de Janeiro

The increase of environmental pressures and efforts to build a sustainable world encouraged the emergence of international policies for the use of biodiesel, which contributed to the consolidation of this fuel as an important energy source. The use of biodiesel has a number of benefits over fossil fuels such as: more complete burning, which reduces the emission of polluting gases, greater safety in handling and storage, renewable character and biodegradability. Although biodiesel and petroleum are in the same market niche, with different characteristics and intentions, both fuels can share and dilute the energy matrix. The increased participation of biodiesel in the Brazilian energy matrix has resulted in the growing production of its co-product: glycerin. The high supply, along with the low cost of glycerin has driven the development of several products from this raw material. The search for new drilling fluids that are increasingly suited to environmental and cost-benefit constraints foster a range of new additives research. In this context, the application of glycerin in drilling fluids presents as a promising alternative. Biodiesel is produced from transesterification reactions of vegetable oils with methanol (or ethanol). In the reaction, biodiesel, which consists of methyl esters (or ethyl esters) of fatty acids, is formed together with glycerin (glycerol). However, products of the incomplete reaction, such as mono and diglycerides, can be formed, even if on a small scale, as part of the glycerin phase. Thus, the objective of this work is to use the glycerin from the production of biodiesel from frying soybean oil as a lubricant in aqueous based drilling fluids. Two samples of methyl biodiesel were produced, one from frying oil and the other from commercial soybean oil. At the end of the reaction, there was separation of phases, being the upper constituted of biodiesel and the inferior one of glycerin. Various fluids containing frying oil glycerin, commercial soybean oil glycerin and a commercial lubricant (DP400) were formulated. The obtained fluids were evaluated through rheology, weight, hot-rolling, filtration and lubricity performance tests. It has been verified that the glycerin from biodiesel production has considerable lubricating activity, representing a significantly feasible alternative, low-cost and environmentally friendly additive alternative for aqueous-based drilling fluids. Generally, the frying glycerin obtained results comparable to those obtained with the available commercial lubricant. It can be concluded that the use of frying glycerin as an additive for drilling fluids presents significant advantages, since it is a co-product of the production of biodiesel, which in turn is produced from a waste, in this case frying oil. In this way, the importance of integration among different productive sectors and government policies for practices and development of sustainable technologies is highlighted.

Keywords: biodiesel, glycerin, drilling fluids

Bio inspired design: when sun and wind are there to help

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Dr. Francesco Pomponi¹, ***Ms. Liliana Medina Campos***², ***Dr. Alice Moncaster***¹

1. University of Cambridge, 2. ManCo Ltda

Colombia is increasingly acknowledging the role that bioclimatic design of buildings can play within both environmental sustainability — through reductions in energy consumption and GHG emissions — and social sustainability — through the promotion of vernacular architecture and the reconnection of citizens with their surrounding environment.

Façades, at the interface separating the internal and external environments, have the role of regulating the heat and air transfers between the two. In developed countries ventilated façades are a well-understood and widely-used technology to reduce energy consumption whilst providing indoor comfort. While there is little knowledge of how they would perform in climates such as that of Colombia, some initial comparative studies have shown promising results. The peculiarity of several Latin-American countries (with Colombia and Brazil *in primis*) is that they are so diverse that one single climate is insufficient to characterise them. Indeed, in July 2015, the Colombian Government, through resolution No. 549, defined four separate climatic areas for building design.

This paper reports on the findings of a funded project based on a real building in the District Capital city of Bogota', which is a mixed purpose 19-storey building, with the first two floors of commercial space, two floors of car parking, and residential space for the remaining 15 floors. The building includes a ventilated façade which was developed based on dynamic energy modelling and general design guidelines. Its performance has been monitored in partnership with Colombian academics and compared with predictions to assess the potential of this technology in new contexts such as Colombia.

This research is therefore relevant to monetary/energy savings and economic development as well as people's health and wellbeing. As such, it relates to several UN SDGs; specifically, No.3 (health and well-being), No.4 (clean energy), No.8 (economic growth), No.9 (innovation), No.11 (sustainable cities), and No.13 (climate action).

Integral design of wastewater management systems: Challenges and opportunities to contribute to environmental sustainability

Thursday, 15th June - 14:00 - SD 703 - Oral Abstract

*Dr. Nancy Vásquez Sarria*¹, *Prof. Luis Enrique Mora Arismendi*¹, *Dr. Mario Andrés Gandini Ayerbe*¹

1. Universidad Autónoma de Occidente

Abstract

Wastewater has been one of the most widely researched environmental resources due to the environmental, social and economic impacts of its discharge on aquatic and terrestrial ecosystems.

The development of wastewater management systems has caused, that currently a numerous of technological developments are available, ranging from transport structures for wastewater to advanced treatment systems, that allow the separation of pollutants that limit its use; However, in many cases these systems have been conceived as independent structures or components, which has limited the efficient and integral use of resources derived from wastewater management.

According to van Loosdrecht et al. (2014) the future performance indicators of the urban and municipal wastewater systems should be include apart from the water quality limits, five fundamental aspects, related with the management of resources such as water, solids, air, energy and chemicals.

For water, options such as reuse, aquifer recharge, potabilization and industrial or agricultural consumption are proposing. For solids are proposed the use in industry or agriculture and their adequate final disposal. For the air is proposed the control of the greenhouse gases emission. For energy is proposed to potentiate the generation and exploitation of methane and hydrogen as a result of the organic matter of the wastewater transformation, and for the chemical alternatives are proposed, the recovery of nitrogen and phosphorus of the wastewater and reduction of chemical uses, through the use and monitoring of the biological communities present in the wastewater treatment systems and for the incorporation of new environmental microbiology developments (Reardon et al., 2013; van Loosdrecht et al., 2014).

From this perspective, this research analyzes the challenges and implications for an integral management of wastewater and proposes some technological schemes to promote the sustainable management of this kind of systems.

Conclusions

Preliminary results have shown that the main challenges regarding the integral management of wastewater are:

Ensure strategic planning of wastewater treatment systems as an integral part of the projections of municipal, departmental and national development, through the integration of life cycle analysis and resource recovery tools, into the technical regulations for drinking water and basic sanitation.

- Undertake the technological conversion to take advantage of the methane and hydrogen generated in wastewater treatment systems, and reduce the generation or emission of greenhouse gases.
- Reduce energy consumption for nutrients transformation.
- Incorporate strategies that allow community participation to guarantee the adequate flow of resources, the fulfillment of the goals of wastewater management systems and the support of investors and managers of technological development.

Keywords: Resources recovery from wastewater, nutrients recovery, integral management for wastewater.

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WOOD AS A TOOL FOR SUSTAINABLE URBAN MOBILITY

Thursday, 15th June - 14:15 - SD 703 - Oral Paper

***Dr. Andrés Valencia*¹, *Dr. Alejandro Zuleta*¹, *Mrs. Yuliana Areiza*², *Dr. Esteban Correa*³, *Mrs. Laura Marín*², *Mrs. Laura Osorno*², *Mr. William Tibavija*², *Mr. Sergio Soto*²**

1. Universidad Pontificia Bolivariana, 2. SENA CTM, 3. Universidad de Medellín

The use of bicycles for transportation activities has shown a high contribution to the environmental care in urban contexts. Between all bicycles types, folding bicycle is presented as the most effective for intermodal transport strategy since combine easily its use with the use of subways, buses and streetcars, among others. On the other hand, wooden bikes has been built since the beginning of the bicycle history, however, during the XXI century, the wood has reborn as a material full of metaphysical, mechanical and environmental properties for the building of bicycle frames. There are a lot of bicycles frames made out of wood, but there is no one commercial folding bicycle built with this material. The aim of this project was to design a frame for a folding bike using local wood available in Colombia. To do this a strategic alliance between the Design Studies Research Group GED at the Universidad Pontificia Bolivariana and Materials Group for Furniture MATERMOB at the SENA CTM arises. A methodological scheme of systematic concurrent design process was used in which science of materials, structural design, techniques of digital manufacturing and industrial design converged in a multidisciplinary design team. The requirements for the project were identified as well as the wood was selected, the geometry of the parts and the structure and the different components were defined. Finally, the folding mechanism was developed and several prototypes were built and validated in order to define the final specifications for the product. The final model was made out of teak strip board showing not only aesthetic features but also an acceptable structural behavior. It was found that teak strip board could be used for folding bikes frame if a set of variables related with an optimum combination between shape, material and structure are considered. Morphological transitions between all the parts of the frame, wood grain orientation, adhesive materials and flexural behavior were identified as the main design parameters.

Design Challenges for the implementation of Product Service Systems in Colombian Companies. Design as Co-creator of worlds Sustainable

Thursday, 15th June - 14:30 - SD 703 - Oral Paper

***Mrs. Nancy Mahecha*¹, *Dr. Alejandro Boada*², *Dr. Salomón Montejano*³**

1. Universidad de Caldas Manizalez/ Universidad Externado de Colombia, 2. Universidad Externado de Colombia, 3. Universidad Autónoma de Aguas Calientes

This research derives from the recognition of an ethical conflict for the design discipline as a result of being in the middle of two visions: The Sustainable vision and the vision of the Free Market Economy Model. This conflict has generated a deeply reflection on the practice of design, wich allowed rethink its meaning as a discipline

Among the solutions generated in the extension of the scope of design, there are the Product-Service Systems (PSS) solutions. The basic idea behind the concept is that it is an innovation strategy, which shifts the business focus from the design and sales of physical products to the design and sales of a service system.

The PSS solutions have been implemented mainly in European countries since the decade 2000. With the aim of transferring their benefits to the national economy and generate a contribution to overcome implementation barriers in emerging countries, this research seeks to answer the question regarding the critical factors in the implementation of PSS in the Colombian business context.

The methodological approach used was qualitative, selecting the case study method (four cases) with an explanatory approach.

Study cases, consisted of designing a business model under the concept of the PSS: (Sustainable Mobility, Package Assessment; Energetic Efficiency and Assessment of reels). In each case was following the Study case methodology proposed by Yin R. K (2014) with the following stages: Study Case Design, Preparing Study Case, Data Collection, Analysis and Conclusions. Proposal guiding the study cases was: There are contextual factors that inhibit or enhance the development process of business models under the concept of Product-Service System

The main results are:

The theoretical analysis identified and synthesized 43 Critical Factors for the implementation of PSS. 12 factors were selected and validated in the Colombian context

Identification of new context factors: Calling Capability, shared value between organizations, Complementary Business, Multidisciplinary participation, Management commitment.

Conclusions:

The relationship between the success of PSS solutions development and the percentage of presence of Critical Factors acting as Potentiators was clearly established: the higher the presence of these factors, the greater the probability of success of a PSS. The absence of any Critical Factor becomes an inhibitor of PSS development
Critical implementation factors for emerging countries identified by the UNEP are confirmed: availability of knowledge, lack of tools and design methods, poor entrepreneurship skills, lack of experience in service process and a weak legal framework of support.

Five Critical Factors offer a promising level of success in the development of PSS solutions: Culture of Innovation, Knowledge Level of Environmental Economics, Design Capabilities and Trust, Public Policy. Given the low level of development of these factors, they should be considered in the planning stage of a PSS.

The circular economy in emerging economies it is presented as a solution to develop the Factor E-8 Management and Technology Capacities, where the knowledge of Technology of closed production cycles, it is required.

In the context studied the importance and necessity if Design discipline was valited.

Eco-design methodology for new material development in favor of society, products and services.

Thursday, 15th June - 14:45 - SD 703 - Oral Abstract

Ms. María Escallón¹, Ms. Alejandra Fernández Valencia¹, Mr. Daniel Gonzalez¹

1. Pontifical Xavierian University

Facing the increasing environmental dilemma and the responsibilities as Industrial Designers concerning industrial production and waste, eco-design has become one of the most current methodologies in the conception and development of new products. The requirements for eco-design imply the achievements of strict ecologic conditions that reach complex products rigorous with the raw materials, machinery and available production processes, which may limit the range that the proposals want to attain. As professionals, we elaborated the following design methodology focused on the development of products based on the creation of new materials taking into account important principles such as: “Design Thinking”, “Cradle to Cradle”, “Inverse Engineering” and “Eco-design”. We propose a new process with different steps from those known in common design methods. The comprehension and exploration of unused raw materials is the first step to this procedure. Simultaneously, it is required to understand the usage opportunities for the raw material and explore how its properties may be applied in objects, products or services for the possible solutions of problematics and/or market needs. The axis for this methodology is the development of eco-design strategies and eco-efficiency that guarantees the desired environmental sustainability. There are diverse stages where the ideas are produced, a new material is explored, and in consequence, a new product, object or service is born accomplishing the requirements set by this methodology. The next step includes the life cycle analysis that encloses the phases of products from the collection and use of the raw material till the end of its usage life, understanding the critical points of each phase to be able to improve them decreasing the negative environmental impact. In the same way, the material is explored, defining its properties by testing it with official laboratory tests and categorizing it in different selection matrices. The opportunity, needs and problematics are then analyzed, taking into account the selected scenario and how the material may play an important part of the solution. This results in an extended compilation of information based on qualitative investigations that shows the character and understanding of the problem while proposing effective and precise solutions. Our premise understands Industrial Design as an user and environment-centered discipline where a new material is developed and it is placed at the service of nature and our community. As a result of this methodology, we developed a project starting with coffee grounds, an organic residue that is not frequently used in Bogotá, Colombia. We created a new material that favors the cultivation initiative in homes: reducing time, operations, processes and contaminating materials resulting of a chore that aims helping the environment and self-consume. CAFIVO is a cultivating system, 100% biodegradable, for homes based on agglutinated coffee grounds (BOA) by industrial designers: Escallón, Fernández and González. The material BOA and the product CAFIVO testifies the reaches of this methodology, the investigation of causes and alarming problems for the chosen raw material and the synthesis of a product design for a specific group of people with a widespread of application possibilities.

PACKAGING PRODUCTS FROM CONTEIRA LEAF: A MARKET INVASIVE PLANT!

Thursday, 15th June - 15:00 - SD 703 - Oral Abstract

Mr. Roberto Amorim¹, Dr. Telmo Eleutério², Prof. Maria Meirelles³, Mr. Afonso Pinto⁴, Prof. Maria Pereira⁴, Prof. Helena Vasconcelos⁴

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Presently, polymeric materials are used in many objects of our daily life, and their use is still growing. They play an important role in the economy, particularly in the packaging industry. However, there are two major drawbacks related to these products: 1) they are obtained from fossil fuel resources in decline; and 2) they are non-biodegradable wastes after use. During the last years there has been a renewed interest in natural materials as substitutes for a wide range of polymers motivated by potential advantages of weight saving, lower raw material price, and 'bio-recycling' or the ecological advantages of using resources which are renewable. An adequate, abundant and renewable resource is that which comes from invasive plants. In particular, conteira is a plant of the species *Hedychium gardnerianum* originally from the Himalayas that became invasive in the Azores, an archipelago of volcanic origin with fertile soils and humid forests, where it was placed as an ornamental plant. Presently this plant is seen by the people as a resource without any utility and by the scientific community as a threat to local biodiversity. Stopping the spread of an invasive plant is almost impossible and very expensive and so instead, it can be transformed into value-added products. A promising solution is using their leaf as a source of raw material to develop packaging and disposable daily objects. In this work, green leaves from conteira were used to create eco-designed packaging products in the framework of a sustainable business approach through the commercial valuation of endogenous Azorean products, under the motto "from nature to the market". However, the range of products is for now restricted to non-structural components such as daily domestic pieces (e.g. plates) that usually are made of polymers. Their use is clearly limited to situations of low impact properties. Although leafs are natural composites, they have their shortcomings, namely lower durability and lower strength, and these have to be solved in order to be competitive with polymeric materials. Recently our group has developed a leaf transformation procedure that has improved these properties considerably. Tailored sizes and shapes and relative high thickness transversal sections are possible. Therefore, our thermopressing technique enables the manufacture of products with suitable mechanical properties. To understand its behavior and how this kind of natural materials should be treated, a closer look into their structure is required. Fourier Transform Infrared (FTIR) analysis revealed that structurally, such leafs are rich in hydroxyl and phenolic groups. Moreover, the conteira leaf exhibits hydrophobic properties and a peculiar geometric fiber/matrix combination together with an inherent surface roughness that was characterized by Scanning Electron Microscopy (SEM) and Atomic Force Microscopy (AFM). The leaf's mechanical properties were derived from the force versus displacement curves obtained using the AFM probe. In addition, the related adhesion forces maps and histograms provided also valuable information about its surfaces adhesion properties. Thermal decomposition analyses of conteira leaf were investigated in terms of global mass loss by thermogravimetric analyzer (TGA) and Differential Thermal Analyzer (DTA).

End-of-life tire management in Colombia

Wednesday, 14th June - 14:00 - SD 206 - Oral Abstract

Prof. Jooyoung Park¹, Dr. Santiago Mejía¹, Ms. Nohora Díaz¹

1. Universidad de los Andes

Extended producer responsibility (EPR) is a policy tool that extends the responsibility of the producers to cover the management of their end-of-life products. By shifting the burden of end-of-life management costs from municipalities to producers, it aims to provide incentives for producers to internalize the environmental costs, such as through produce design changes, throughout the life cycle of their products. In 2005, Colombia adopted the principle of extended producer responsibility into its first national policy on hazardous waste management (Decree 4741). Since 2007, Colombian EPR regulations had entered into force covering waste streams such as pesticide packaging, pharmaceutical waste, car and small batteries, used tires, light bulbs and computers. Seven waste streams are currently subject to the EPR regulations and additional waste electrical and electronic equipment and packaging waste are expected to be added to the EPR programs. While Colombian EPR systems have expanded with regards to the number of covered waste, participating organizations, collection points and the level of collection, these systems have also faced significant challenges in the context of emerging markets. In this study, we examined the evolution and current states of the tire EPR system in Colombia to analyze the system's performance and challenges. In Colombia, the used tires had increasingly posed significant concerns related to the inappropriate disposal and burning. For the proper management of end-of-life tires, the Resolution 1457 of 2010 established the financial and performance obligations on about 220 producers and importers of tires. In response to this Resolution and its EPR responsibilities, four collective and eight individual EPR programs has established. Particularly, the Rueda Verde, a collective EPR program that covers 91% of the tire market, has led the development of a tire EPR system by establishing 179 collection points and 760 institutional partnerships, achieving 35% of the collection goal in 2015. About 27% of the collected tires were retreaded, while the rest were mainly crushed into 1-4 mm of granulated rubber for further reuse.

However, despite such advancement, significant challenges remain. One of the biggest issues is a low demand for recycled tire products such as rubber pellets and associated burden and operational difficulties for waste management companies. Other issues include weak regulatory control, non-compliance and free riders, no link to product innovation, unrealistic collection targets, lack of commitment or incentives for consumers and retailers, and lack of cooperation among actors and/or EPR programs. These observed challenges point that the Colombian EPR regulations adopted foreign experiences without a full adjustment and proper contextualization.

The circular economy: New or Refurbished as CE 3.0? – Exploring Controversies in the Conceptualisation of the Circular Economy through a Focus on History and Resource Retention Options

Wednesday, 14th June - 14:15 - SD 206 - Oral Abstract

Ms. Denise Reike¹, Dr. Walter J.V. Vermeulen², Dr. Sjors Witjes¹

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The concept of the ‘circular economy’ (CE) is receiving growing attention on various levels, among them policy making, advocacy and consultancy, and science. Critical voices have questioned the potential ascribed to CE. Existing controversies are reflected in academic output and diverging perspectives affecting policy making, stakeholders and CE implementation. Set aside the views of proponents and critics, both camps have so far largely overlooked that it is the current dominant framing of the CE which jeopardizes its potential impact. This paper explores the revival of CE as a controversial concept through a focus on its history and the key concept of value retention options (ROs) in the form of a ROs-hierarchy. We argue that it is the framing and conceptualisation of CE which has reincarnated various times while its basic thoughts can be found back in other sustainability sub-concepts. Realisation of CE seems to imply an extended notion of collaboration – among businesses as well as between businesses and other key stakeholders, most notably end-consumers, – wherefore the development of a common language on CE is needed to enable the integration of CE into the organisational systems of all these participating stakeholders. In this process, the typology of the different ROs can serve as a guideline. The outcomes of pilot projects on collaboration for CE show lower ROs prevail at an expense of higher value ROs which are identified in literature. Although it is often difficult to state that one RO is better than the other, thinking in terms of ROs helps for developing a shared understanding of organisational processes required for CE implementation and can assist in defining clear goals and making first assessments. Whereas systematic efforts continue to foster mainly the lower value ROs, we argue for inducing a change in the conceptualisation of CE that places emphasis on the strive for the higher level ROs, i.e. creation of closed-loop supply chains through short loops, including repair and remanufacturing, rather than through the more established long loops. In order to attain higher forms of reuse we also call for a clear measurement system of the different options. We suggest that politics carry a key responsibility to foster enabling mechanisms for implementation of higher level ROs, amongst others public procurement is critical in incurring efforts to seriously measure the sustainability impacts to show viability, increase legitimacy and thereby scalability of the CE. In the end, CE is principally an environmental concept but it is through the collaboration between humans that a contribution to the sustainable development of wider society can be attained.

Co-producing a Vision and Approach for the Transition towards a Circular Economy: Perspectives from Government Partners

Wednesday, 14th June - 14:30 - SD 206 - Oral Abstract

Dr. Anne Velenturf¹, Prof. Phil Purnell¹, Dr. Kenneth O'Callaghan², Mr. Mike Tregent³, Mr. John Ferguson⁴, Mr. Andrew Woodend⁵, Dr. Lee Davies⁵, Mr. Arjan Geveke⁶, Ms. Louise McGregor⁷, Dr. Helen Jamieson⁵, Dr. Caroline Spencer⁵, Mr. Andrew Dickson⁷, Mr. Alan Holmes⁸

1. University of Leeds, 2. Ablephraser (current), Department for Environment, Food and Rural Affairs (former), 3. Environment Agency, 4. EcoideaM (current), Scottish Environment Protection Agency (former), 5. Department for Environment, Food and Rural Affairs, 6. Department for Business, Energy and Industrial Strategy, 7. Zero Waste Scotland, 8. Independent (current), Environment Agency (former)

Since the mid-20th century, people have changed ecosystems at a speed and scale incomparable to any other developments during the existence of the human species. Ecosystem change is primarily driven by the increasing demand for food, water, timber, fibre and fuel i.e. growing resource use. On top of that, the supporting infrastructure for these resource flows and the discharge of waste and pollutants drives further environmental changes. While the growing resource economy has generally increased welfare over time, important negative impacts have emerged which could impede the long-term well-being of people as well as the resilience of the biophysical environment. Moreover, we are increasingly faced with growing resource scarcity. Hence we argue that a transition towards a circular economy *that contributes to a resilient environment and human well-being* is necessary. Such radical transition in our society will require changes from a wide array of actors, such as government, industry and the general public. We argue that academia has a moral obligation to play an active role in facilitating the transition process. The Resource Recovery from Waste programme (RRfW) developed an extensive engagement strategy based on principles of participatory governance, a form of collaborative governance. With the participation process, RRfW aims to create a shared vision and approach to realise more sustainable waste and resource management in the UK. Through engagement of key actors in the co-production of research focus, methods, results and dissemination of outcomes, we strive to create a sense of ownership and commitment to use research results, in support of tangible changes in management of wastes and resources as well as contributing to a mentality change. In our presentation we will focus on the engagement of government partners. We present our approach to identify and engage key actors, share the co-produced results on key themes for sustainable waste and resource management as well as policy and regulatory approaches, and reflect on our experiences in the facilitation of social learning between academia and government in the transition towards a sustainable and increasingly circular economy.

Keywords: Waste and Resource Management, Collaborative governance, Participation processes, Co-creation, Social learning.

Improve material efficiency through an assessment and mapping tool

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Paper

***Mr. Sasha Shahbazi*¹, *Mrs. Pernilla Amprazis*²**

1. Mälardalen University, 2. IVL Environmental Research Institute

Material efficiency in manufacturing results directly in cost and energy savings in fabrication, transformation, transportation and disposal, as well as reduced greenhouse gas emissions through increases success rates of waste management initiatives. Previous sustainability related studies on manufacturing companies indicated several barriers towards material efficiency and circular economy, including lack of a suitable tool for environmental initiatives, limited environmental motivation and engagement, lack of effective measures to evaluate sustainability, poor visualization and limited intra-organisational interaction. This paper aims to adjoin this functional gap via simplified Environmental Value Stream Maps (EVSM) to evaluate, measure and visualize material/waste flows of a limited operation in manufacturing. Two case studies were performed on (1) productive material flow (2) auxiliary material flows. Applying EVSM proved to be a practical solution to engage different organizational functions in material efficiency improvement, to visualize material and waste streams, to realize the value of wasted material and costs associated to waste handling and treatment, to define or update relevant KPIs and to support lean principles such as “go to gemba”. This paper contributes to the area of lean and green and circular economy through aiding manufacturing companies to better manage, measure and visualize industrial waste and material consumption in order to go up the waste hierarchy, reduce waste and material consumption.

Key strategies to implement circular economy in SMEs

Thursday, 15th June - 10:15 - SD 715 - Oral Paper

*Mrs. Vanessa Prieto-Sandoval*¹, *Prof. Carmen Jaca*¹, *Prof. Marta Ormazabal*¹, *Prof. Javier Santos*¹

1. University of Navarra

Circular Economy (CE) is fast becoming a matter of high importance for researchers, governments, and firms, to pursue social prosperity and to increase the resilience level of the natural environment. In this context, Small and Medium Enterprises (SMEs) has an important role because they represent some of the most important motors of development and progress. Thus, the main objective of this study is to identify the key strategies which may favor the CE paradigm in SMEs. Moreover, these key strategies should encourage the eco-innovation to build competitive advantage and create value in coherence with nature. Regarding the purpose of this study, we used a mixed methodological approach, based on a literature review and a focus group to gather qualitative data. This focus group has been carried out via experts such as researchers and practitioners from recognized universities, sustainable SMEs, and consultancy firms in Spain. As a result, this study proposes a kit of strategies that could help SMEs to mature and orient their corporate strategy towards the circular economy and build a competitive advantage in the market. Moreover, this study proposes a group of internal and external factors that should support the implementation of the kit of strategies. Finally, some useful dynamic capabilities are defined to undertake the CE in the business performance.

This research is part of the EcoPyme project which has been sponsored by the Spanish National Program for Fostering Excellence in Scientific and Technical Research and The European Regional Development Fund: DPI2015-70832-R (MINECO/FEDER).

Keywords: Circular Economy, SMEs, competitive advantage, environmental management, dynamic capabilities

Adaptation of a Zero Waste System into the Circular Economy's ReSOLVE framework: potential and barriers in a retail store in Mexico City

Thursday, 15th June - 10:30 - SD 715 - Oral Abstract

*Mr. John Rincon*¹, *Dr. Maria-Laura Franco-garcia*¹, *Mr. Jorge Carlos Carpio-aguilar*²

1. University of Twente, 2. Tecnológico de Monterrey

At different stages (from harvest to consumption) the food is thrown away even if it is still edible. This fact is having significant impact on the current food system posing many uncertainties on environmental liabilities as in many countries organic waste is buried in landfill locations. As an example of this situation, Mexico reported that about 96% of the Municipal Solid Waste (MSW) is still disposed of in landfills. 50% of the total of the disposed MSW is attributed to organic components. Thus, Mexico's current waste management system is considerably lagging in recycling, energy recovery and offers little regulatory incentive to avoid food being disposed of. In that sense, some companies are concerned about their impacts throughout the value chain as well as their corporate reputation facing the consumer. Trying to address the above-mentioned problematic, this study aims to elucidate a framework that can improve the organic waste management in a Mexican retail corporation by combining a circular business model and a Zero Waste system. This was done by integrating the Zero Waste philosophy into the ReSOLVE framework proposed by the Ellen MacArthur Foundation (2013), as the conceptual framework method employed towards a circular business model. As a result, the recorded information in the retail store identified two main groups of food waste at the organic end-of-life chain: 1) fruits and vegetables; and 2) bakery and pastry. Approximately 95% of the food waste stream were fruits and vegetables. The remaining of the food waste stream were mainly cakes, bread and crackers. Afterwards, the Zero Waste principles applied to this type of organic materials were translated to four management streams: (i) reduction, (ii) donation, (iii) animal feeding, and (iv) anaerobic digestion. Later, all of them were incorporated into a circular business model for the case study in hand. After applying these framework, findings showed that most of the food considered as waste can be recovered through different stages. It also showed the benefits of managing the food waste by saving about 40% of the food waste management costs through 3 business actions associated to those recovery stages. Potentials for this type of integrative managerial approach are foreseen optimistic as it can motivate the development of circular business models/actions for other type of discharged materials from the technical loops (MacArthur, 2013) e.g. clothing, electronics, among others. The barriers for this study to be implemented in a short-term are related mainly to financial constraints and Mexican current legislation. Although, the key concepts and benefits of the Zero Waste system and Circular Economy principles have been available for many years, very often the technical-environment-financial relationship are misaligned which have resulted in not circular systems, so far. Therefore, the results of this study contribute to raising awareness among different stakeholders regarding not only the economic losses associated to food waste but also to address the ethical dilemma posed by just simply throwing away food that might be returned in the value chain.

Material, energy, and carbon footprints of the residential construction in Colombia: scenarios to 2050

Thursday, 15th June - 10:45 - SD 715 - Oral Abstract

Mr. Felipe Vásquez¹, Dr. Yris Olaya²

1. NTNU - Norwegian University of Science and Technology, 2. Universidad Nacional de Colombia - Sede Medellín

Almost 60 per cent of the world's population will live in urban areas by 2030, with 95% of urban growth expected to occur in the developing world. Yet, the developing world currently has vast unsatisfied housing needs characterised by rising numbers of people living in slums, inadequate dwellings, deficient access to basic sanitation and water, and constrained and inefficient use of resources like construction materials, land, and energy. Solving these housing issues is at the core of the Sustainable Development Goals (SDGs) 9, 11 and 12, however, the expected urban population growth reinforces concerns about sustainability of cities and challenges both urban planning and the achievement of the SDGs. Hence, fostering a transformation towards sustainable and resilient human settlements requires of an adequate understanding of the drivers and patterns of the urbanisation process and the implications for resources - materials and energy - and the environment. Industrial Ecology tools, particularly those in the areas of socioeconomic metabolism (SEM) and material flow analysis (MFA), can assist the formulation and evaluation of housing policies by favouring the understanding of the long term evolution and dynamics, past and future, of housing and construction under different socioeconomic development scenarios. A dynamic MFA stock-driven model that integrates demographic, economic, lifestyle and technological components is developed and applied to the case of Colombia in order to assess major construction materials demand (cement, steel, gravel, sand, brick), and indirect energy consumption and CO₂ emissions from materials between 2016 and 2050. The model illustrates the use of Industrial Ecology methods to assess sustainable development policies and goals in developing countries in relation to the residential sector. Material, energy and carbon emissions are analyzed for different development paths that incorporate changes in demographic and economic conditions, construction techniques, policies targeting housing deficit, as well as lifestyle-related preferences for type of dwelling. Discussion and conclusion will focus on policy information towards the achievement of the SDGs 9, 11 and 12, particularly related to sustainable resource management, resilient infrastructure development, upgrade of slums, and provision of adequate, safe and affordable housing and basic services for all population.

Circularity assessment in companies: conceptual elements for developing assessment tools

Thursday, 15th June - 11:00 - SD 715 - Oral Paper

*Ms. Juana Camacho Otero*¹, *Ms. Isabel Ordoñez*²

1. NTNU - Norwegian University of Science and Technology, 2. Chalmers University of Technology

Circularity assessment is a relatively new term that started to be used by organisations promoting the circular economy, but that has not been adequately defined in the scientific literature yet. Different actors have recently developed proposals for circularity assessment at the company level. Having an assessment tool that could be used as a measuring stick has been suggested as the first step in the transition towards a circular economy. Existing proposals for circularity assessment tools have different approaches to what should be evaluated, risking their potential for meaningful comparisons. To contribute to minimise the gap between tools, this paper provides a general framework of what a circularity assessment at the company level should include, based on input from expert sources. The framework was used to evaluate four existing circularity assessment proposals at the company level developed by four (4) stakeholders, Circle Economy and PGGM, Ellen Macarthur Foundation, Viktoria Swedish ICT and VBDO, resulting in the identification of alignments and misalignments. From this examination, it is possible to conclude that the main disagreements relate to what principles and criteria of circularity are used in the proposals, while scale and purpose of the assessment are the most agreed upon elements. Our results suggest that there is still room for improvement of existing circularity assessment tools for companies if they aim at supporting the implementation of a comprehensive circular economy strategy.

Initiating resource partnerships for industrial symbiosis

Thursday, 15th June - 11:15 - SD 715 - Oral Abstract

***Dr. Anne Velenturf**¹*

1. University of Leeds

Industrial symbiosis is a strategy to limit carbon emissions whilst promoting resource efficiency and business development. This study interprets industrial symbiosis as waste-to-resource innovation. Understanding how these innovations are actually realised, and hence how they can be promoted by public and private partners, is still limited. Particularly initiating resource partnerships for waste-to-resource innovations in the absence of a government-funded facilitator, such as previously the National Industrial Symbiosis Programme in the UK, has remained underexplored. This presentation will explore how companies identify potential resource partners in terms of a) network and b) geographic distances. Based on case studies of waste-to-resource innovation in the Humber region, UK, this study concludes that a) companies identify resource partners among/ through their direct contacts that are involved in resource management themselves and b) that ca. 73% of these connections are located within a 75 miles radius. Furthermore, various new types of 'facilitators' were identified, demonstrating the need for a refined government approach to facilitate industrial symbiosis as part of the wider transition towards the circular economy.

Keywords: Self-organised industrial symbiosis; Networks; Geographic proximity; Circular bio-economy; Business strategies

Regulating resource recovery: issues raised by recovery of metals from steel slag

Thursday, 15th June - 14:00 - SD 704 - Oral Abstract

***Prof. Pauline Deutz*¹, *Dr. Helen Baxter*¹, *Prof. David Gibbs*¹**

1. University of Hull

Policy drives towards the circular economy raise the prospect of attempting to recover resources from hitherto neglected sources. One such source is legacy waste from industrial processes, such as steel slag. However, bringing substances back into economic use that have previously been disposed of raises challenges for regulation and regulatory compliance. This study draws on a project examining both the technical and policy issues relating to the recovery of vanadium from steel slag. New markets for vanadium have opened up as the result of its suitability for use in renewable energy technologies. Given that virgin vanadium is not produced in Europe, implementation of recovery technologies has implications for security of supply. In this paper we focus on the response of and to regulators relating to the proposed recovery strategies. Alongside an extensive review of policy documents, we have carried out more than 20 semi-structured interviews with stakeholders, including industry representatives and, prominently, Environment Agency officials. Our attention has been focused on the UK, with some attention to the wider context. Findings suggest that the relationship between the regulated and regulator is an important but sensitive one, which in the UK has been put under stress as a result of austerity cuts. This implies that the social and economic benefits expected to come from the circular economy may not be easily accessed as a means to offset strains elsewhere in the economy.

Circular economy, steel slag, regulations, UK, austerity

Developing sustainable local systems through Industrial Symbiosis: the cases of Agro-Industrial and Urban contexts

Thursday, 15th June - 14:15 - SD 704 - Oral Abstract

***Prof. Roberta Salomone*¹, *Prof. Pauline Deutz*², *Prof. Andrea Raggi*³, *Prof. Giuseppe Ioppolo*¹**

1. University of Messina, 2. University of Hull, 3. University "G. d'Annunzio"

Industrial Symbiosis (IS) is an environmental business practice and one of the founding notions within the interdisciplinary field of Industrial Ecology (IE). It describes the operation of communities of firms, from various industrial sectors and of various sizes, where the by-product/waste of a company serves as a raw material for one or more organizations in the same network, obtaining both environmental and economic benefits connected to the improved efficient use of materials and energy.

Since the concept of IS emerged, many forms of IS implementation have been identified in different places. Indeed, there are many different local contexts that could be associated with different forms of the IS model. Comparing these forms and their relationships with the places where they occur is challenging because a comparative analysis of IS experiences in different national contexts, involves finding concepts that identify equivalent empirical phenomena in different countries. It is therefore difficult to begin to generalise the processes by which IS has developed and the extent to which the conditions necessary for it to flourish are generalisable. Considering these complexities, in this paper, the key findings of different authors that have dealt with the classification and characterization of IS systems are put together. Leaving aside a common and specific definition of IS, as well as the influence that local circumstances may have on the form in which IS may take place (on which a significant scientific debate persists), this paper aims to identify the main general attributes that an IS network may satisfy. Then an evolutionary path toward sustainable local systems for the specific cases of agro-industrial and urban context is presented, in order to verify the role played by the identified attributes. The evolutionary approach looks at how companies/organizations respond to the external economic, social, cultural and environmental changes. Three main stages of evolution are identified, based on the literature, representing progressive network of an IS network. Type I is a linear immature system which includes firms that have no connections with each other, even if they operate geographically close; type II describes a system in which the previously isolated actors start to co-operate, also including other companies and creating new shared activities; type III is a mature system with roundput material and energy flows, characterized by a high degree of diverse exchange relationship between firms, but also by links with firms external to the system boundaries. The analysis highlights that differences and specificities for each case of IS exists, but also that the evolutionary path seems to confirm the role of the identified attributes and that common situations may be identified for the development of sustainable local systems.

The multiple dimensions of urban contexts in an Industrial Ecology perspective

Thursday, 15th June - 14:30 - SD 704 - Oral Abstract

Prof. Alberto Simboli ¹, Prof. Andrea Raggi ¹, Dr. Raffaella Taddeo ¹, Prof. Roberta Salomone ²

1. University "G. d'Annunzio" of Chieti-Pescara, 2. University of Messina

Industrial ecology (IE) includes approaches and tools aimed to an efficient management of resources and a reduction of the environmental impacts associated to limited spatial contexts. They are also recognized as “place-based” (PB) and are focused both on the analysis of these contexts and on the definition of improvement actions in a perspective of sustainability. These actions, inspired by biological systems, often exploit the potential associated with the differences among the various entities that compose the system. Within IE, “life-cycle-based” (LCB) approaches have also been developed to assess the environmental, economic and social impacts of products, processes and organizations throughout the various stages of their life cycle. Recent studies on IE show a great interest in the analysis of urban contexts, considered to be very promising for the achievement of the economic, environmental and social sustainability at local level. Urban Metabolism (UM) is recognized as a PB approach focused on these contexts; however, their study in an eco-industrial perspective shows, at present, some limitations: i) urban contexts are complex systems and are constantly changing; ii) urban contexts primarily include consumption activities (and this implies a limited variety); iii) PB approaches are still lacking as regards the measurement of the effects, especially environmental, of the proposed scenarios. In addition, scholars from economic geography and urban planning, recognize the need of an expanded view of the “urban contexts”, to include different forms of estates, with which the residential areas strictly interact, by means of physical, energy, services and human flows (s.c. Urban Economies or Urban Systems). In an IE perspective, expanding urban contexts (e.g. to include neighboring industrial and rural areas) allows them to be analyzed in synergy with other approaches, such as those inspired by Industrial Symbiosis/Metabolism. The broadening of the scope would also enable an easier integration with the LCB approaches in the measurement of symbiotic scenarios. This is especially true in the case of local economies that grow up showing a strong integration among the urban, industrial and rural dimensions (e.g. in the districtual models). This article, after a comparative analysis of PB approaches deemed suitable for urban contexts, offers an integrated analytical framework in which the main flows and synergies among urban, rural and industrial systems are depicted. It also shows an analysis of the critical issues (functional unit, etc.) and suggests trajectories for the development of LCB tools for the measurement of potential eco-industrial scenarios. As a result of an integrated view of these multiple dimensions, the typical urban flows (e.g. products, energy, food, water) can be identified and efficiently managed beyond their use and consumption, and improvement actions (leveraged by the greater heterogeneity and by the proximity) can be better defined, together with more effective policies for a sustainable local development.

Adoption of best practice standards by dairy farms in Colombia

Wednesday, 14th June - 11:30 - SD 205 - Oral Abstract

*Ms. Diana Valencia*¹, *Dr. Fu (Jeff) Jia*¹, *Dr. Adrian Bailey*¹, *Mrs. Laura Zuluaga Cardona*¹, *Dr. Mark Van Der Giezen*¹

1. University of Exeter

This work presents a qualitative study conducted in Colombia in the dairy regions of “Antioquia and the coffee corridor” and “región Cundi-boyacense”, focusing on the factors affecting the adoption of the Colombian public standard of best agricultural practices for dairy cattle, ICA-BPG (Buenas Prácticas Ganaderas del Instituto Colombiano Agropecuario ICA). The International Trade Centre ITC currently reports more than 200 private standards worldwide related to sustainable agriculture. Southern countries in an effort to provide more “legitimate” and flexible alternatives have built certification schemes tailor-made to their own food safety, public health standards and policies (Farina, Gutman, Lavarello, Nunes, & Reardon, 2005; Mamine, 2016; Schouten & Bitzer, 2015). Colombia has likewise developed its own best agricultural practice standards for dairy cattle, managed by the Colombian Agricultural Institute ICA, ICA-BPG, in an effort to strengthen the sustainability of the national milk production. Colombia has 494.402 cattle farms between beef and dairy, with most being double-purpose, but only 642 (0.13%) are ICA-BPG certified for dairy and 134 (0.03%) with beef certification, from the time when the law was enacted in 2008[1] to this day (2016). Considering this low rate of adoption, it is important to gather information on the factors affecting the farmers’ decision-making towards the standards, particularly for small and medium dairy farms, to understand their motivations, concerns and needs in order to reach a successful implementation of the norm.

Supported by interviews and visits to both certified and uncertified farms, this multiple case study identified factors affecting the adoption or rejection of the standard implementation. Additionally, it builds the validity of the multiple case study through cross-case analysis and contrasting this with evidence and comparing with factors found in the literature such as certification costs, market demand, land tenure, technical assistance and knowledge (Borges, Oude Lansink, Marques Ribeiro, & Lutke, 2014; Rodriguez, Molnar, Fazio, Sydnor, & Lowe, 2009). The factors identified in Colombia were classified for analysis as economic, institutional and personal: the first refer to the certification bonus in the price of milk, the certification costs, the land tenure and the inputs market; institutional factors identified include technical assistance, rural education, associations, relevance of standards, the audit approach and infrastructure; and finally, personal factors include interest in environmental conservation, resistance to change and other farmers’ attitudes. The ICA-BPG standard initiative is important for the sustainability of a polluting activity such as dairy farming in Colombia, and according to the findings of this study, incentives that are meaningful for farmers need to be strengthened in order to increase the level of adoption that this certification currently has.

Keywords: Standards, dairy certification, Colombia, adoption

[1] Resolution 3585 (20th October 2008)

Sustainable supply chain management in the Colombian agricultural sector

Wednesday, 14th June - 11:45 - SD 205 - Oral Abstract

*Prof. Ximena Rueda*¹, *Mrs. Laura Zuluaga Cardona*², *Dr. Fu (Jeff) Jia*², *Dr. Adrian Bailey*²

1. Universidad de los Andes, 2. University of Exeter

Civil society organisations and consumers in importing countries have begun pressuring international suppliers to provide products that meet higher social and environmental standards. This has prompted many companies to undertake initiatives to make their supply chain more sustainable. The way in which companies engage with suppliers has been categorised in two general methods: **assessment** (evaluation of suppliers, such as site inspection, CSR audits, certifications requirement) and **collaboration** (working directly with suppliers providing them with visits, training and joint efforts). Some authors argue that assessment itself is not enough and collaborative relationships are needed, especially when working with emerging and developing countries. Sustainable supply chain management (SSCM) is an emerging topic relevant for Colombia because of its rapidly economic growth, and large land assets for agricultural expansion. In recent decades, large national buying companies have collaborated with their agricultural suppliers to introduce sustainable practice. These practices aim to improve supplier's overall competitiveness and sustainability, while securing the supply of raw materials and meeting growing demand for agricultural and agro-industrial products. These partnerships are diverse in terms of the degree of formalization, the governance structure and their ability to share knowledge, practices and value along the supply chain. In this paper, we aim to understand how SSCM practices are incorporated in the production processes of agricultural companies and their suppliers and why some succeed while others fail in the context of an emerging economy. Using a case study methodology, we conducted an analysis of such relationships in one of the biggest dairy processors in Colombia. We explored: i) the motivations for introducing sustainable practices in the value chain ii) barriers or bottlenecks that prevent collaboration between companies to implement sustainable practices iii) the factors that facilitate organizational learning and scaling up of these practices; and iv) the impact on the eco-systemic services and welfare of the actors in the supply chain. These factors are identified separately for buyers and suppliers as they face different challenges in the supply chain, also addressing the lack of supplier's perspective in the academic literature. Internal leadership and two-way communication were found among the most important factors to maintain the alliances. Lack of knowledge and awareness was one of the ex-ante barriers for suppliers to join sustainable programmes. However, that is overcome through the partnership leaving the high economic cost as one of the ex-post barriers to continue with the collaboration and scaling up the programme. This paper contributes to theory by better understanding how these aspects interact in the journey of achieving sustainability along the supply chain through collaborative relationships in emerging economies.

Keywords: Sustainability, emerging economies, supply chain, agri-food supply chain, collaboration

Biodiversity Conservation through Landscape Level Voluntary Standards

Wednesday, 14th June - 12:00 - SD 205 - Oral Abstract

Mr. Len Blom¹

1. *Utrecht University & UNEP-WCMC*

In the light of unprecedented global biodiversity loss, due largely to increasing pressures from economic activity, this research aims to study the intersection of economic activity in the shape of international supply chains and biodiversity conservation. Since biodiversity has invaluable functions that underpin our very existence, biodiversity conservation should be increased and improved significantly. *International supply chains* play a central role in both the problem and solution. Voluntary sustainability standards are a market-based scheme to render these supply chains more sustainable. However, many VSS have neither incorporated biodiversity sufficiently nor appropriately and struggle to address beyond site-specific elements. Over the last few years, the 'landscape approach' has made a comeback in conservation research because of its integrated and holistic scope, its focus on multifunctionality of landscapes and the acknowledgement of the variety and complexity of landscape units that influence biodiversity. In terms of biodiversity conservation, both voluntary standards and landscape approach initiatives have difficulties in proving empirical effectiveness. Additionally, whereas standards have difficulty addressing landscape level elements going beyond site-specificity, landscape approaches have had difficulties engaging essential economic actors in its efforts. This study will explore the feasibility of combining both approaches in a '*landscape level voluntary standard*'. This approach has the potential to, according to this study, alleviate an array of current barriers and improve biodiversity conservation considerably in certain areas. In addition, an integrated approach to land management via voluntary standards has specific benefits for (local) communities as well by fundamentally increasing their inclusiveness in the governance process. This eight-months study will entail four phases of *explorative research* to fill the evident research gap of the juxtaposition of biodiversity conservation, voluntary sustainability standards and landscape approaches, guided by the following research question: '*What are the barriers and opportunities of applying a landscape approach in international supply chain oriented voluntary standards systems for biodiversity conservation, and how could such an approach be practically feasible?*' After an exhaustive literature review, a current practice review scopes current biodiversity conservation approaches related to voluntary standards and conservation initiatives. This involves interviews with key experts and stakeholders at organizations such as ISEAL Alliance, UNEP-WCMC, WWF, Flora and Fauna International, FSC and others. The third step presents potential 'ideal' prototypes of a *landscape level voluntary standard*, based on the barriers and opportunities found in the previous phases and in collaboration with key actors in the field (e.g. ISEAL Alliance, Rainforest Alliance). Finally, a case study in a Colombian biodiversity hotspot explores the feasibility and desirability of such an approach by interviewing key potential implementers and people affected by it. The results present different possible models of landscape level voluntary standards, with varying viability and desirability to improve biodiversity conservation. Based on these models, the results show a clear potential for mainstreaming biodiversity, e.g. by linking national biodiversity targets with landscape management of tropical commodities. Implications and recommendations for policy makers and voluntary standard organizations conclude the research. Keywords: *Voluntary sustainability standards, biodiversity conservation, landscape approach*

Value mapping: exploring the challenges of sustainable business modelling in the Ecuadorian Amazon

Wednesday, 14th June - 12:15 - SD 205 - Oral Abstract

Prof. Maria Helena Jaen¹, ***Prof. Nunzia Auletta***²

1. Universidad de los Andes, 2. IESA

Sustainable Business Model (SBM) has been accepted as a unit of analysis to identify business rationales, structures, tools and “sustainable mindset” (Stubbs & Cocklin, 2008, p.123) that could contribute positively in “improving the quality of life” (Hellstrom et al., p. 2015). Through SBM design and innovation firms may create, deliver and capture value by contributing to the development of the natural environment, human society and economy (Boons and Lüdeke-Freund, 2011; Boons et al., 2013). The SBM value proposition should reflect a business-society dialog which balances economic, ecological and social needs engaging a variety of stakeholders –i.e. suppliers, customers, communities, shareholders, employees and government- into a relationship of mutual need and expectations recognition (Boons & Lüdeke-Freund, 2013, Matos & Silvestre, 2013). To facilitate sustainable business modelling and innovation Bocken et al. (2013) propose a value mapping tool “which introduces three forms of value (value captured, missed/destroyed or wasted, and opportunity) and four major stakeholder groups (environment, society, customer, and network actors)” (Bocken et al., 2013, p.482). This paper focuses in analyzing the business model of Runa Group (a hybrid organization) (www.runa.org) which has developed the *guayusa* (an ancient Amazonian plant) value chain, engaging with the local Kichwa farmers and communities, the Ecuadorian Government and a variety of international stakeholders (ONG’s, mission brand shareholders, Hollywood celebrities, and commercial partners), launching a new category of organic and natural teas and energy drinks into the USA market. Based on the application of the value mapping tool, our main research questions are: What are the types of value that can be identified in a SBM? What are the challenges of sustainable business modelling? Using a single case study methodology, we investigate the “phenomenon in depth, within its real-life context” (Yin, 2009: 14) considering that “the object of study is a specific, unique, bounded system” (Stake, 2008: 443). Our preliminary findings relate to: (1) mapping the SBM value emphasizing the current value proposition, the value missed and destroyed, and the opportunities for value creation; (2) understanding the positive and negative outcomes of the value proposition and the conflicting values from different stakeholders points of view; (3) identifying the main challenges that sustainable business modelling poses as well as the opportunities for business modeling redesign and stakeholders’ realignment to better suit the sustainability vision.

Keywords: value mapping tool; stakeholder analysis; sustainable business models; value creation; Latin America enterprises

Reviewing the evidence on responsibility in global business and supply chains

Wednesday, 14th June - 12:30 - SD 205 - Oral Abstract

Ms. Valerie nelson¹

1. University of Greenwich

Rapid processes of economic globalization have led to the development of global value chains and a subsequent rise in responsibility challenges including local and global environmental and community impacts and worker wellbeing and rights. A number of different kinds of voluntary responsible business initiative have emerged to stimulate greater responsibility in the practice of multi-nationals and small enterprises, and voluntary initiatives articulate with mandatory initiatives. These intermediary responsible business initiatives include, *inter alia*, the Global Reporting Initiative and the UN Global Compact. However, it is not clear how successful the different initiatives may be in achieving greater corporate transparency and disclosure, and whether this leads to actual corporate behaviour change and positive impacts both at an individual corporate level and at a sector or industry level.

This paper presents the findings of a comprehensive literature review focused upon empirical evidence of the social and environmental impacts of businesses, which can be specifically linked to corporate reporting. Two key research questions guided the literature review which forms the basis of this study: First, to what extent is corporate reporting effective in changing corporate behaviour, and second, what is the evidence that this leads to positive social and environmental benefits? The academic evidence was reviewed against a theory of change for responsible business. The theory of change is presented for corporate reporting, as well as the inherent assumptions, capturing aspects of existing theory regarding why companies adopt corporate reporting (including internal and external drivers), and the less well theorised role and capacity of external users of corporate reports.

The methodology is explained for a review of scientific databases using word search terms, including effectiveness and impact, corporate reporting, and sustainability and the key findings are presented. Four databases were reviewed using eighteen specific search terms and following a screening process, sixty-six articles were selected as being of direct relevance to the topic. The findings are presented with respect to: a) the drivers of uptake of corporate reporting, referring to stakeholder and legitimacy theory; b) the quality of corporate reporting; c) the utility of corporate reporting to stakeholders; d) changes in corporate behaviour; e) impacts of corporate behaviour.

The paper presents reflections on the findings of the evidence review and sets out a research agenda on key gaps and priorities, as well as the challenges for researchers in seeking to evaluate private sector performance and sustainability impact. The paper further develops a theoretical framing of corporate reporting but also other types of responsible business initiatives, such as ISEAL, Ethical Trading Initiative and the Workforce Disclosure Project and B-Lab, which all engage with companies to improve their reporting and/or impact performance, including addressing supply chain sustainability and ISEAL, which is the membership body for sustainability standards. The analysis teases out the similarities and differences in their theories of change to contribute to an understanding of their effectiveness, as well as linking anticipated change to theories of sector-level and landscape transformation.

Eco-certification: A stepping stone towards upgrading? Evidence from the cacao sector in Ecuador

Thursday, 15th June - 08:00 - SD 716 - Oral Abstract

***Prof. Ximena Rueda*¹, *Ms. Romaike Middendorp*², *Mr. Sergio Puerto*³**

1. Universidad de los Andes, 2. U.C. Louvain, 3. Universidad de los A

World cocoa production faces crucial challenges. The demand for cocoa is rapidly and steadily growing, driven by higher incomes across emerging economies, urbanization and the westernization of diets (Reardon et al., 2009; Rueda y Lambin, 2014). But current cocoa production is marked by a combination of low productivity, high price volatility and high concentration of value in the lower links of the supply chain. This has limited production capacity and impoverished socioeconomic conditions of about 5 million small farmers worldwide. A number of public and private initiatives to mitigate such effects have been established. Eco-certifications and other privately-driven instruments attempt to enhance environmental protection, improve labor conditions, increase social capital, reduce the reputational risk of companies, and generate more income for small producers. This could eventually help cocoa farmers to insert them in more valuable supply chains. Most studies evaluating impacts of certification focus on the economic effects; studies on environmental performance and sustainability are scant.

Using the Global Value Chain Approach we aim at evaluating the effects of voluntary certifications on upgrading. We look at upgrading from three perspectives: social, economic, and environmental. Upgrading is defined by farmers' ability to enhance their position in the value chain, producing and capturing a higher portion of the value created by means of higher bargaining power, better contract agreements, larger appropriation of (tacit) knowledge about quality, technologies, and market outlets and improvement on natural assets.

This work is based in 207 surveys and field transects conducted in four provinces in the west coast of Ecuador. A first round of surveys was conducted at the end of 2013 in Guayas, Los Rios, Manabí. The second round conducted in the Esmeraldas province was conducted in mid-2015 as an extension of the first round study to include the northern region of the coast. We compared the ability of certified and non-certified farmers to join higher value chains as well as the environmental and land practices derived from their type of market insertion (i.e., for mainstream, certified or high-quality cocoa).

The emergence of inter-firm collaboration: Two case studies from a Colombian sustainable supply chain initiative

Thursday, 15th June - 08:15 - SD 716 - Oral Abstract

Dr. Santiago Mejía¹, Prof. Jooyoung Park¹, Prof. Bart van Hoof¹

1. Universidad de los Andes

Inter-firm collaboration has been considered a central element of sustainable supply networks. It involves a complex dynamic process in which actors engage in synergistic activities such as joint technological innovation or dissemination of sustainability strategies to reduce environmental impacts as a whole along the entire supply chain. To enhance environmental performance of a supply network through collaboration, it is important to improve our understanding about what drives and determines collaborative activities. The sustainable supply chain literature highlights various enablers of collaboration activities, including stakeholder pressure, pressure from a buyer, the role of external agents (e.g., consultants, trainers, and brokers), changes in legislation, and risk-sharing.

Our study examined two cases of inter-firm collaboration in a sustainable supply chain initiative in Colombia (called RedES-CAR), with the intention to find what drove and influenced the emergence of such collaborations. The RedES-CAR program was initiated in 2013, with the objective to promote environmental improvements by disseminating cleaner production practices throughout the participating companies' supply networks. The initiative brings together academia, industry, and government. Participating companies are required to design projects aiming to improve their environmental performance. We conducted semi-structured interviews with the companies to explore overall processes and influencing factors.

We found that external agents who led the workshops and assisted the company's development of cleaner production projects had little influence on the development of collaborative projects, which led to the rejection of our initial hypotheses. Instead, we observed the following characteristics in the two cases of collaboration:

- Companies engaged in collaboration activities have had long-term relationships with their collaboration partners (which reflects the trust they have built with time and is required for collaboration to emerge).
- In both cases, companies that agreed to cooperate with those who proposed the project did not mention a particular economic benefit. However, they agreed to collaborate to reinforce the business relationship, and because their operations were not affected by the changes resulting from the collaborative projects.
- The main driver was the recognition from the environmental authority (and the perceived increase in reputation), which led to more support from the companies' top management.

This study contributes to literature on sustainable supply chain management, with a special focus on environmental collaboration, a relatively new area that still lacks solid empirical studies.

Food product return management and food waste prevention for manufacturing and retail companies: case studies in Colombia

Thursday, 15th June - 08:30 - SD 716 - Oral Abstract

*Ms. Vivian Rangel*¹, *Ms. Daniela Florez*¹, *Mrs. Isabel Agudelo*¹

1. Center for Latin American Logistics Innovation, LOGYCA / RESEARCH

It is estimated that annually, one-third of the food produced in the world is wasted. In Colombia, this figure represents more than 9 million tons (approximately 450 pounds per person), which could feed more than 8 million people. This situation entails wasted natural resources disposed in landfills, an increase in solid waste and a contribution to climate change. Social impacts related to hunger are intensified as well. Food waste and undernourishment are primarily related to logistics inefficiencies across supply chains, where 21% of the food waste is linked to distribution and commercialization. The present study analyses return management processes from one retailer and two manufacturers, in a joint work with the Association of Food Banks of Colombia - ABACO. A fieldwork-based method to prevent product losses was designed to assess critical aspects, gaps and best practices for businesses. Thus, three main opportunities were identified: 1. Product handling and storage: knowledge and abilities of back store operators on issues like cross-contamination, cold chain and quality standards are vital for proper handling and storage of returned products. 2. Decision making processes: classification and separation of returned products do not make part of the traditional core operations of retailer operators, so there is lack of attention to these activities. 3. Cost and legal issues: donating product returns that are still suitable for human consumption can mitigate food waste and give access to tax benefits. Finally, this study proposes establishing food banks as logistic operators to support product return management processes for manufacturing and retail companies.

Keywords: Reverse logistics, food banks, food, waste, supply chain, returns, and food security.

Evaluation of the social impacts of the salmon ASC certification system from the local community' perspective in the Aysen Province. Contributions to understand local-global interactions within the salmon governance.

Thursday, 15th June - 08:45 - SD 716 - Oral Abstract

Mrs. Aurelia Guasch Antúnez¹, Mrs. Irina Montenegro²

1. Universidad Austral de Chile, 2. WWF Chile

Chile is the second largest producer of farmed salmon in the world, covering 30% of the global demand. However, after the infectious anemia virus (ISA) crisis (between 2007 and 2010) and its multiple economic, social and environmental losses, was revealed that despite this economic activity brought socioeconomic benefits (Infante, 2007), also had detrimental effects on people and natural resources such as precarious conditions regarding work, health, and safety of the labor force (Barret & Caniggia, 2002); transformation of traditional cultural practices -based on traditional ways of using the coastal areas- to become a salaried dependent population (Sunkel & Infante, 2009; Muñoz Gomá, 2009); and the dispute over the use of natural marine resources, which is still the traditional source of livelihood for some local and indigenous communities (Barret & Caniggia, 2002). Therefore, to mitigate the impacts of aquaculture, WWF Chile implements since 2011, the Strategy for the Promotion of the ASC Certification System that seeks to reduce the ecological and social footprint of this activity through social and environmental standards and good practices. Since 2013, 40 farms have been certified in Chile, representing over the 10% of the national salmon production. The studies for assessing the environmental and social impacts of the ASC adoption are being developed by WWF since 2016. In the case of assessing the social impacts, the question is whether the requirements for certification are sufficient for decreasing the negative social impacts of salmon farming by translating them into good practices perceived by the local community- associated to free access to natural resources, conflict resolution, and governance- in order to clarify the social impacts of the ASC certification. This study case will help to clarify whether there are changes in the salmon industry's practices as a result of the adoption of the ASC certification according to the local community' perception as well as understanding the local-global relations based on the certified salmon farming centers located in the Aysen Province. The whole research, which includes at least 3 evaluations, is extremely relevant to understand the effectiveness of the ASC certification and to improve it if necessary.

The research will be developed through a *qualitative case study* (Yin, 1989) of two towns located in the Chiloense Marine Eco-Region of Chile (Aysen Province), a worldwide prior biodiversity site populated by indigenous and Chilean communities. The fieldwork will be developed in February and the results and conclusions will be handled in May 2017.

The study is directly related with the central topic of the conference since it seeks to contribute to develop a salmon certification which ensures social sustainability at the local level, including aspects of human, social, and cultural life such as equity, public participation in decision making, protection of the indigenous peoples rights, and cultural autonomy (see Apostle et al., 1998; Bernstein, Crow, & Johnson, 1992; Chambers, 1987 in Barret 2002).

Key words: salmon farming, ASC certification, governance, social impacts, local community.

Value creation and distribution through sustainable enterprises

Thursday, 15th June - 10:15 - SD 716 - Oral Abstract

Dr. Roberto Gutierrez Poveda¹, Dr. Ezequiel Reficco¹

1. Universidad de los Andes

Sustainable enterprises, to a large extent, are created to redress undesirable imbalances between people, profits and planet –to catalyse positive change around them. Thus, while innovation in traditional business models is primarily focused in maximizing value capture by the organization, in sustainable business models innovations should be geared towards maximizing benefits for society and the environment (Schaltegger et al., 2012). In sum, sustainable enterprises exist to bring about a more fair and balanced distribution of the value created along their value systems. If the distribution of value created by sustainable enterprises were not different from that created by mainstream commercial enterprises, the concept of sustainable enterprise would be mostly devoid of meaning.

To date, few studies have sought to measure the value created by sustainable enterprises. Published work on the subject has been conceptual and exploratory. In this paper, we seek to explore in systematic way how sustainable enterprises go about the creation of value, and how that surplus is appropriated along its value system. Our study is a multiple case study; the sample is composed of five companies that are profitable, dynamic and regarded as having successfully engrained sustainability in their business models. All firms relied entirely on low-income communities as providers of commodities. An in-depth review of the business models of sampled companies was carried out, with a focus on those innovations that impacted value creation and capture along the entire value system.

We assessed value-creation through a value-based approach (Brandenburger and Stuart, 1996), looking at how these value propositions drove a wedge between buyers' willingness to pay and suppliers' cost of opportunity. Once value is created, the available surplus is then divided between suppliers, producer and buyers. To analyse the distribution of value along the value system, we used gross margins per unit: the ratio between the product's gross profit (wholesale price – COGS) to wholesale price. Gross profit has been found an appropriate metric to assess value capture in a product-specific level of analysis, as it leaves aside administrative efficiencies (reflected in operating profit) and non-production factors (Dedrick et al., 2010). To put the impact of the innovation in context, we then compared the distribution of value in each of these sustainable enterprises, with their counterparts in mainstream commercial value systems.

Findings suggest a distinct pattern of value-distribution in sampled organizations, one that departs from their mainstream counterparts. The study also identified mechanisms through which sustainable business models created more equitable and environmentally sustainable value systems. The study contributes to theory by developing a set of metrics to measure the creation of value through sustainable innovation in value systems, and to assess how it is distributed between a company, the environment and society.

Transitory paths to a more sustainable textile value chain

Thursday, 15th June - 10:30 - SD 716 - Oral Abstract

Dr. André Matthes¹, Prof. Marlen Arnold¹, Prof. Holger Cebulla¹

1. Technische Universität Chemnitz

For more than ten years, the concept of sustainable development has changed the textile industry worldwide and its business models, indeed partly, current more fundamentally. At the same time, a comprehensive and integrative sustainable textile chain is not within reach (Aridov et al., 2015; Gjerdrum et al., 2015; Pedersen and Gwozdz, 2014; Ricchetti, 2016; Pedersen and Andersen, 2015).

Thus, the following challenges are still unsolved:

- **A lack of an overview of all chemicals:** Which chemicals are used for which raw materials and processing substances at which process and value-added stages of the textile chain to be used and possibly to act in humans and in ecology?
- **The label jungle:** Uncertainty about the certification standards that refer to which chemicals, industrial technologies and processes as well as the sustainability area in the entire textile value chain. No certification standard pursues the integrative approach of sustainability universally for all products of the textile chain.
- **Sustainable consumption:** How can end-users and purchaser or retailer be informed about the non-sustainability and toxicity of the textiles, and how can transparency be created in the whole textile chain?

These challenges are addressed by new and ongoing research to develop recommendations for the next steps towards a holistically more sustainable textile chain regarding to economy, ecology and social issues for each of the three pillars of a society, civil society organisations, politics and the economy. So, the aim is to generate graphics (e.g. of potential path changes) as well as the use in industry, trade and education in order to enable greater transparency along the textile value chain. The comparison of different textile process chains, the use of chemicals and their sustainability content can be used for recommendations of alternative paths and technology-chemical combinations as well as to develop adequate training materials.

In addition to the analytical-integrative approach, workshops with selected practice partners discussing new diffusion and consumption patterns are a transdisciplinary component of the research in order to be able to better understand sustainability-related changes in consumer patterns of different milieu groups with regard to textiles and to form adequate incentives and structures. In addition, a feasibility analysis should be carried out to identify possible regional and international real-life laboratories to realize an essential contribution to the strengthening of sustainable development.

The combination of textile value chain, use of chemicals, analysis of laboratories, sustainability requirements as well as economic, consumption-based and political recommendations follow an holistic approach. By means of discussion forums (companies, consumers and politics), the intention is to identify the paths of awareness and action, and to discuss alternative value-added paths and / or new forms of regional economic forums (e.g. cooperative alternatives or regional economic communities) and political control mechanisms. Diverse and innovative diffusion methods, like summer school, digital training materials, interactive publications enable the entrance into the textile reality. All at once lead to real transition to sustainability in textile chain from fibre to garment.

Keywords: textile chain, laboratories of reality, chemicals, digital trainings, regional economic forums

Corporate sustainability: A simulation model to evaluate its feasibility

Thursday, 15th June - 10:45 - SD 716 - Oral Abstract

***Prof. Juan Pablo Soto*¹, *Dr. Andrés Link*², *Dr. Nathalia Franco*³**

1. Universidad de los Andes, 2. Uni, 3. Universidad

Given the Sustainable Development Goal agenda defined by United Nations in 2015, there is a new trend to create new business models looking for the social, environmental and economic equilibrium. Business models are “concerned with how the firm defines its competitive strategy, through the design of the product or service it offers to its market, how it charges for it, what it costs to produce, how it differentiates itself from other firms by the value proposition, and how the firm integrates its own value chain with those of other firm’s in a value network” (Rasmussen, 2007). On the other hand, Sustainable Business Models (SBM) “incorporate the triple bottom line approach and change of stakeholders interests including environment and society” (Bocken et al, 2013). They are important to incorporate and evaluate sustainable innovation and development within business, and used to understand the way in which firms incorporate sustainable innovations, considering dynamics within the internal firm and with the environment surrounding the firm.

Bocken et al.2014, define nine types of SBM archetypes. Those models were obtained from the observation and classification of different business models observed in practice. Those archetypes can determine different strategies that organizations can use in order to improve their sustainability. However, for a certain firm or industry, it still difficult to evaluate which of those archetypes fits better with the current company situation in order to become more sustainable.

Sustainable development concepts and applications have been receiving growing attention in management literature and practice during the last 20 years (Hahn, T., Figge, F., Pinkse, J. and Preuss, L.; 2010). Currently there still several challenges in terms of finding scenarios and conditions in which economic, social and environmental fields are in harmony. For a given ecosystem (e.g. company, industry, geography) is it possible to find which are the common areas where they can coexist? Or at least is it possible to better understand how trade - offs are present?.

This paper contributes both to literature and to practice by introducing a new conceptual framework to model ecosystems and analyze how the trade-offs between social, economic and environmental wellbeing are present and if there are viable conditions in which the three of them can be in equilibrium. The model states that there are different rates that shape the environmental, economic and social dynamics: [1] The rate of natural processes defined as the rate at which biological systems can recover from disturbances, such as natural disasters or anthropogenic resource extraction; [2] the rate of corporate processes defined as the minimum rate at which goods and services are produced to guarantee financial viability, and [3] the rate of social processes defined as the need of societies to growing and develop, with the satisfaction of the needs of society.

This conceptual framework is tested with a simulation model where some of the archetypes introduced by Bocken et al. 2014, are used to evaluate the different tradeoffs between the economic, social and environmental areas and how they reconcile with the concept of sustainable development.

Cracking the Base of the Pyramid nut: How a MNC implemented a scalable and profitable BoP program in Latin America

Thursday, 15th June - 11:00 - SD 716 - Oral Abstract

***Dr. Ezequiel Reficco*¹, *Dr. Roberto Gutierrez Poveda*², *Dr. Veneta Andonova*¹**

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In the last decade, the so-called BoP—acronym that stands for Base (or Bottom) of the Pyramid—consolidated as a strand of research and practice that approaches the poor not as objects of charity, but as active economic agents (Márquez, Reficco, & Berger, 2009). However, increased interest on the subject has not been accompanied by a surge in lucrative BoP ventures; on the contrary, those “still are the exception, not the rule” (Jenkins & Ishikawa, 2010, p. 4). To the extent that successful experiences with the BoP have been documented, those were *not* led by large established corporations, but by NGO’s or SMEs (Márquez & Reficco, 2007; Reficco & Gutiérrez, 2016). “Despite enthusiastic advocacy by prominent management scholars and endorsement by large multinationals, BoP has failed to deliver its promise of a market-driven solution to poverty” (AoM, 2011). Such a performance deficit is regrettable, as large corporations have the scale, the financial muscle, the R&D capabilities and the global reach to potentially have the most positive impact on the lives of the poor (Prahalad, 2005).

The scarcity of success stories makes the publication of case studies of prosperous BoP ventures by large MNC all the more valuable, as “empirical research on the profitability of market-based initiatives involving low-income sectors (LIS) remains scarce” (Bruni Celli & González, 2010, p. 229). The crux of the matter in this literature is showing *real* profitability, as many MNC have succumbed to the temptation of bragging about unprofitable ventures with the poor, that were actually little more than disguised philanthropic or public relations programs, aimed at boosting reputation or social goodwill, not shareholder value (Bruni Celli, González, & Gómez Samper, 2009, p. 52).

This paper seeks to contribute to filling that gap. We document in detail a commercial initiative carried out by Nestlé, a Swiss multinational, in the Dominican Republic. This is a mature initiative, that has been running for over a decade, which has achieved scale and solid performance results, both on the business and on the social sides. Those attributes make the experience a *rara avis* in the field, a succulent “information-rich” case “from which one can learn a great deal about matters of importance and therefore worthy of in- depth study” (Patton, 2002, p. 242). Nestlé’s BoP venture focused downstream, with an innovative “micro-franchise” scheme that engaged the company mainstream distributors and community organizations. This novel approach has been termed “inclusive distribution” (Observatorio SCALA, 2016), and published academic cases studies on the subject are virtually non-existent.

In this study, we show how this value network has created the incentives for all parties involved to scale up. Preliminary results suggest that venture growth and community betterment did not come about through the redistribution of value from one pocket to another. On the contrary, the BoP appears to have succeeded in creating value, or “expanding the pie” of the value system (Brandenburger & Stuart, 1996; Nalebuff, 1997), with all parties operating at or above cost of opportunity.

Perspectives on the environmental impacts caused by the silver rain in Santa Cruz, Rio de Janeiro city, and adjacencies under the optical at Environmental Justice.

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Ms. Irineia Rosa ¹, Mr. Polyana Souza ¹, Mr. Mariana Murakami ¹, Mr. Paolo Belfiore ¹, Mr. Vagner Luiz Cardoso De Medeiros Cunha ¹, Prof. Fabiola Garrido ¹

1. UNIVERSIDADE FEDERAL RURAL DO RIO DE JANEIRO

The present article presents a reflection on the transformations in the conception of nature and the socio-economic, political and cultural changes that occurred after the installation of the Tyssenkrupp Steel Company - Companhia Siderúrgica do Atlântico (CSA) in Santa Cruz, Sepetiba Bay, West Zone City of Rio de Janeiro, Brazil. A series of impacts on human health and citizenship, as well as events related to the installation and operation of this company were analyzed. The methodology used in this study involved the collection of information disseminated in print and digital media between the years 2010 to 2016, and literature review. Air pollution caused by the operation of the blast furnace with continuous explosions and silver soot launched into the air was observed.

The company started operations in 2010, with the operation of the blast furnace without adequate environmental licensing, facing popular manifestoes opposed to the project and concerned about the pollution and the quality of life of the local population. Immediately after the start of operations, surrounding neighborhoods and neighboring cities, such as the City of Itaguaí and City of Mangaratiba, were covered with a bright dust, which the population called "silver rain". This dust is composed of silver particles and has caused problems in public health.

Aerial pollution is also accompanied by the destruction of a mangrove area of Sepetiba Bay, with dredging of deepening of the Port of Itaguaí, access Channel used for Motorboats and boat traffic and the contamination of the waters with untreated effluent discharge have prevented fishing on the spot.

The population has gathered and demonstrated through the written and televised media, so that the Brazilian authorities adopt preventive measures against environmental impacts with a reflection on the health of the population surrounding the project and the neighboring Cities. Nowadays, the population is characterized by situations of Environmental Injustice, environmental protection agencies have allowed the Company to operate through a Term of Adjustment of Conduct (TAC), without the Operating License, which is leading to environmental damage and Public health; It is important to emphasize that it is a universal right to a healthy environment, in the Federal Constitution of Brazil of 1988, where Article 196 states that "health is the right of everyone and the duty of the State, guaranteed by social and economic policies aimed at reducing Risk of disease, and universal and equal access to actions and services for the promotion, protection and recovery of the population's health including the environment". Although Brazilian laws are well drafted, environmental protection agencies do not apply the law as they should, Favoring to Entrepreneurs to the detriment of the population, that gets sick in the territory in which they live breathing the silver dust. The Public Prosecution Office of the State of Rio de Janeiro has denounced TKCSA and its directors for atmospheric contamination at "levels capable of causing harm to human health", based on studies showing an average increase of 600% in iron concentration.

Keywords: Environmental License, public hearing, silver rains, public health, Environmental Justice.

Countryside in the city: effects of urban agriculture in the livelihoods of internally displaced peasants in Bogotá, Colombia.

Thursday, 15th June - 14:00 - SD 715 - Oral Abstract

Mr. Juan Camilo Sandoval Vasco ¹

1. Universidad de los Andes

Forced internal displacement caused by Colombia's internal armed conflict constitutes one of the country's main challenges nowadays, with more than 6.6 million victims during the last four decades and nearly 225,000 new cases just in 2015 (UNHCR, 2016. p. 5). According to Refugees International (2012), the city of Bogotá holds nearly two thirds of the grand total of internally displaced people in Colombia, 65% of whom are peasants who migrated from the countryside. During the last few decades the Colombian government has incorporated several institutional tools with the purpose of assisting and repairing this vast universe of victims. In parallel, during this time period the Colombian government has designed and implemented several projects with the purpose of assisting vulnerable communities —more broadly defined, but including internally displaced people— in cities like Bogotá. Some of these programs have focused on the implementation of Urban Agriculture (UA) practices to assist these communities. This research attempted to do a multi-dimensional sustainability analysis of the effects of UA practices on the livelihoods of internally displaced peasants residing in Bogota, by using a qualitative approach, involving semi-structured interviews, focus groups and participant observation with two communities of internally displaced peasants living in San Cristóbal (a neighborhood of Bogotá).

The research concluded that *a*. UA has traditionally been considered by scholars to be a merely socio-economic dynamic, nonetheless it also has a profound symbolic impact on the lives of internally displaced people and their process of healing the wounds of armed conflict and displacement. This symbolic aspect has not been explored adequately in the literature. *b*. By understanding *displacement* not only as a social dynamic but as an identity in constant transition, it was possible to observe that the particular context of the internally displaced communities plays an important role in the way they identify themselves and interact with local institutions. *c*. By analyzing UA activities from a holistic sustainable development framework —thus taking into account social, economic, environmental and cultural elements—, it was possible to identify the multiple benefits that UA has brought to these communities. These include access to low cost, highly nutritious, organic food, as well as the spatial relationship between peasant and land, and the way spaces of UA became safe places where internally displaced people can communicate with others they conceive as equals, allowing them to share their life stories and entering into a realm of catharsis, thus healing their pain while also being able to use their traditional knowledge and cultural backgrounds to grow crops, feel re-empowered and contribute to the notion of *community* inside their neighborhoods. This last point relates to the main theme of the conference as it poses a bottom-up view of local initiatives towards sustainable development while aiming to reframe UA as a plausible tool for the assistance and reparation for internally displaced people, the victims of the armed conflict in Colombia.

References:

- Refugees International. (2012, December). IDP's report in Colombia.
UNHCR. (2016). Global Report on Internal Displacement (GRID).

Ethical aspects of the Sustainable Development Goals: a reflection

Thursday, 15th June - 14:15 - SD 715 - Oral Abstract

Prof. Bert de Vries¹

1. Copernicus Institute of Sustainable Development, Utrecht University

The Sustainable Development Goals (SDGs) contain explicit and implicit ethical components, for instance in the goals to ensure universal access to health and education services, reduce inequalities and promote sustainable use of ecosystems. These ethical statements are framed within the paradigm of (late) Modernity, with its emancipatory politics and its imperatives of justice, equality and participation. They express the aspiration and necessity to reconcile desires of the individual, the core unit in Modernity, with that which is collectively desirable. The implicit assumption is that there is such a thing as a collective – and the emerging signs of global unsustainability reinforce the notion that there does and should exist such a planetary community of humans based on universal values.

The reality is that only a rather small fraction of the human population lives in accordance with the premises of Modernity, although global trade flows and (social) media may give a different impression. In this presentation, I explore the history and philosophy of ethics and morality in various epochs and cultures and use the findings to present a broader palette against which the SDGs can be interpreted and implemented. It will be illustrated with examples and case-studies in scientific (Global Change) modelling and religious practices.

Endeavours like this one can hopefully help to bridge the rational and universalist view of Modernism on the one and the more emotional, particularist and contingent worldviews on the other hand. This is an urgent need in a fragmented world of increasing interaction as well as inequality. It is also in line with and supportive of the deliberate attempts to decentralize the operationalization of the SDGs.

Development and Heritage: An Unfounded Paradox in Sustainability

Thursday, 15th June - 14:30 - SD 715 - Oral Abstract

*Mr. Luis Franklin Combariza Luna*¹, *Mr. Alberto Escovar*¹

1. *Ministry of Culture*

The term patrimony has two distinct meanings: i)Cultural: “Heritage is our legacy from the past, what we live with today, and what we pass on to future generations” (Unesco, 2017); ii)Legal-economic: “value of the assets that a person or business has, after any debts are taken away” (Cambridge dictionary, 2017). However, the two definitions can converge in their synonyms: *inheritance* (when it is used after death or bankruptcy), *heritage*, *legacy*.

Heritage has been seen as an obstacle to development. However, recent discussion about the disruptions that development can have and about alternatives pose strategies that coincide with the concept of heritage: i)to place value on cultural traditions to reduce dependence on expert knowledge and a greater attention to the efforts of common people to construct more humane culturally and economically sustainable worlds; ii)to multiply production centers and agents of knowledge, making forms of knowledge that are produced by the beneficiaries of development visible, thereby helping them to become subjects and agents of development; iii)*Counterwork*:adaptations, subversions and resistance carried out locally in reaction to development interventions(Arturo Escobar, 2005). Put another way, people converting heritage into net worth for the good of humanity.

The goal of this work is to show Colombian cases in which the application of heritage is scalable and viable. With minor legal adjustments, and within an ecosystem of State-academia-entrepreneurs, the model promotes the status of sustainable development practices, leading to a new way of conceiving progress.

Each case consists of describing traditional practices, actors, materials, products and market conditions. This is followed by an analysis of i)legal advances fostered by Colombian ministries including Culture and Education, ii)research applied to other cases and to entrepreneurship in the University of los Andes and others. The following cases are described.

- **Construction practices in housing in the Pacific Region** i)significant decrease of overhead costs caused by heat and humidity, ii)materials (wood, bamboo, soil and fibers) produced sustainably in the region; iii)advances in research in the sustainable production of existing materials that can be cultivated in the region; iv)Legal Framework: Ministry of Culture, changes in the norms regarding earthquake resistant structures that include local sustainably produced materials and traditional practices and the concept of “cultural interest housing” as opposed to low-income housing or public housing.
- **Traditional midwives and the decline in infant mortality/morbidity from access barriers in the formal healthcare system** Legal Framework: Tertiary education as an alternative to reduce access barriers to the health system.
- **Gastronomy and contamination:**Alternatives to plastic packaging in culinary traditions: use of natural materials such as banana leaves and gourdes, wooden utensils to serve and preserve traditional foods, including tamales, sweets, wraps. Legal Framework: health regulations imposed by Invima, the National Institute for the Regulation of Health and Safety.
- **Traditionally produced wooden boats using local materials:**Legal Framework: Cost reduction in harbor fees compared to boats constructed with conventional materials.

The cases will establish different factors that make heritage preservation viable in terms of net worth in sustainable development.

A Healthy Environment: Human Health versus Environmental protection- dilemmas for policy makers

Thursday, 15th June - 14:45 - SD 715 - Oral Abstract

Prof. Shobhana Madhavan¹

1. University of Westminster, London

Principle 1 of the Rio Declaration says that human beings are at the centre for sustainable development. However this is not reflected in the policy agenda on environmental protection. Environmental problems, notably air pollution, has been at the centre of research, and policies, and much less attention has been paid to human health especially in poor countries. A dilemma for policy makers is whether poverty alleviation must come before environmental protection given the immediacy of committing resources for the production of food and provision of shelter. Perceptions of policy makers differ from people in poverty although poor people are at greater risk of damage from environmental degradation. This paper seeks to examine the issues surrounding the above dilemma and to explore methodologies and research frameworks that will help to provide the bases for policies designed to eradicate both poverty and environmental damage in developing countries.

Collective action and Development in the Colombian South Pacific

Thursday, 15th June - 15:00 - SD 715 - Oral Abstract

Dr. Armando Durán Durán¹

1. Universidad del Rosario

The main purpose of this research is to analyze and interpret contemporary processes of collective action in the Colombian South Pacific and its relationship to possible Local Alternative Approaches to Conventional Development -ELAD (for its acronym in Spanish), in the context of Black Community Process PCN (for its acronym in Spanish), particularly in the experiences of three community councils in the region. The Colombian Pacific has been understood primarily from conventional guidelines of development, i.e. as solicitation territories ready for self-sustained economic growth. Although in recent decades new development initiatives have tried to change this dominant view, the deterioration in the living conditions of the population and the deterioration of strategic natural environments of the region show the crisis of these concerning social life in the region. It is in this context that the research assumes the study of recent collective actions of the locals in order to examine whether these processes of social mobilization are shaping Local Alternative Approaches to Conventional Development - ELAD, this, in response to life conditions of the region. From the theoretical point of view the study departs from the perspective of collective action proposed by Sidney Tarrow, and the concept of Local Alternative Approaches to Conventional Development the author constructs based on the literature reviewed in the study. These two theoretical framework are used to analyze the corpus of data collected in the research process. The study is oriented from a qualitative methodology, inspired by the world of subjective meaning. The process is structured from the review of secondary sources and the organization of group talks and interviews. Perhaps one of the central findings of the inquiry is related to the fact that at present the various processes of collective action in the Colombian South Pacific lead together to a framework of meaning that exalts the sustainability of life in the region. It is circumscribed both in contexts of restriction generated by the armed conflict and in contexts of opportunity and hope to establish the evidence of development anchored to place i.e. those forged from the intercultural, plural and collective character of the region.

Collective action, Development, Colombian South Pacific

Wicked Problem Solvers: Public Libraries, Citizens, and Quality of Life in Bogotá, Colombia

Thursday, 15th June - 14:15 - SD 716 - Oral Abstract

Ms. Juliana Saldarriaga¹, Mr. José Ignacio Caro², Mr. Daniel García², Ms. Gabriela Bruna¹, Mr. Otoniel Castañeda¹, Mrs. Lissette Muñoz¹, Mr. Cristiam Vargas¹

1. School of Architecture and Design, Universidad de los Andes, 2. BibloRed, Secretaría de Cultura, Recreación y Deporte

Sustainable development can be best understood as a holistic approach to improving quality of life, as it takes into account environmental, economic, and social aspects, and the connections that exist between these. Quality of life is a concept that can be explained using Nussbaum's Capabilities' Approach (2011), in which *how free an individual feels to make choices* reveals more about a country's development than economic growth. Governments must therefore provide the right conditions for individuals to feel empowered and choose for themselves, thus becoming problem solvers and agents of change. In this paper we describe a joint effort between the academy and the public sector to understand how Bogotá's cultural institutions could impact quality of life. Our research team worked with the city's **public library network (BibloRed)** in order to understand how the public library institution could prepare and empower current citizens to deal with future local and global problems (50 years from now).

BibloRed is composed of 19 libraries located in different neighborhoods. It is a great institution to work with due to its significant access to a wide array of communities and users (and potential users). Since our research team was composed of anthropologists and designers, we used literature and methods from both disciplines to define our approach. We focused on qualitative research methods such as ethnography, participant observation, interviews, focus groups, and workshops. We also implemented a design thinking methodology (Beckman & Barry, 2007) to transform unclassified and disorganized fieldwork data into a limited number of insights and (afterwards) a prototype. Finally, considering our research was *projective*, we used speculative design theory (Dunne & Raby, 2013) to conceive the local and global problems Bogotá's citizens would have to deal with 50 years from now.

The first thing we concluded was Bogotá's future condition could best be understood as series of *wicked problems* (Briggs, 2007), as its urban and environmental complications 50 years from now would exhibit strong resistance to resolution and threaten quality of life. This meant BibloRed and its libraries had to rethink themselves in order to adequately prepare current citizens for this future scenario. We suggested the city's libraries had be less like static institutions and become more like live beings in two ways: first, they should be able to reach remote places, thus being able to have a greater impact on the citizenship. Second, they should be able to obtain constant feedback from their users. This meant questioning the active-library passive user-paradigm, and suggesting a scenario in which knowledge is collectively constructed and in which nobody is just a teacher or just a student. We materialized these two aspects in our prototype: a mobile or "to-go" library that reached citizens in remote places and obtained constant feedback from them. A more direct and fair interaction with the citizenship was the best way libraries and other cultural institutions could empower individuals to become problem solvers and thus increase their quality of life.

Keywords: quality of life, wicked problems, BibloRed, speculative design, library as live being.

Environmental education as an instrument for increasing resilience in schools: implementation of the eco-school project in Brazilian and Portuguese educational institutions

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

***Mrs. Josiel Da Cunha Silva*¹, *Mrs. Ingrid Tonon*², *Mrs. Carla Alves*³, *Prof. Lenia Silva*⁴, *Prof. Jairo Ceballos*⁵, *Dr. Nilton Santos*⁶**

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Education is the most transformative tool of the individual and of society, although its effects are perceptible only in the medium and long term. Climate change have already changed practices in many sectors of society related to adaptation and mitigation actions and their effects. Among these sectors, education is a nest in which it is possible to foster and develop some adaptive practices that bring positive results. According to the United Nations Office for Disaster Risk Reduction, the term resilience can be understood as “the capacity of a system, community or society exposed to the risks of resisting, absorbing, adapting and recovering from the effects of a hazard in a timely and efficient manner, for instance, through the preservation and restoration of its basic structures and essential functions”. Therefore, it is possible to conclude that education and changing behavior have been intrinsically linked to adaptation and to resilience. Teaching is naturally resilient because of the Brazilian and other countries’ adverse context. Currently in Brazil the contents of high school’s education plan have already included the basic concepts related (Law of Guidelines and Bases - LDB) to environmental education that are now taught as part of some disciplines such as Physics, Chemistry, Geography, among others. Related to Environmental Education, it is necessary to appropriate the concept of resilience of the communities in case of seasonal or of eventual environmental events with the aim to approach issues regarding to resilience in that subject. In other words, to any topics related to adaptation to climate change naturally links to the issue of resilience, although the term resilience itself is not that often applied. In Brazil as in other countries, the perception of resilience included in environmental education is already noticeable. Based on the Eco-school project of the international program “Foundation for Environmental Education”, started in Portugal in 1996 and developed since then, we will provide a practical methodology for the integration of environmental education in Brazilian basic education system, in order to increase resilience to extreme events and to form environmental multipliers agents. Considering this aim, we investigated the Eco-school project by interviewing the workers professionals and being in touch with their main features including weaknesses while executing the project. A comparison was made between the results of the program in a Portuguese and Brazilian school in order to verify in which case the resilience approach was effectively applied or theoretically perceived.

Society-nature relations in the context of mechanized and semi-mechanized illegal gold mining in the Department of Chocó - Colombia.

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Paper

*Ms. Diana Clavijo*¹, *Prof. Marcelo Montaña*²

1. University of São Paulo, School of Engineering of São Carlos, Postgraduate Program in Environmental Engineering Sciences, Environmental Policy Study Group., 2. University of São Paulo, School of Engineering of São Carlos, Department of Hydraulics and Sanitation

The dynamics of the relations between society and environment exposes the success or the lack of effective actions of social sustainability. The continuous and complex relationship of the society (which includes public and private, economic, political and social institutions) and the natural systems reveals the human dimension as one of the key aspects of sustainability, given the different connections developed throughout the development of the social system (cultural, religious, economic, political, amongst others). The aim was to identify to what extent the environmental impacts, as reported in the literature, may constitute potential factors and sources of change, conflict or social impacts. To this, the paper follows the initial stages of Social Impact Assessment – SIA– (scoping and profiling) in context of mechanized and semi-mechanized gold mining of illegal character in the municipality Río Quito - Department of Chocó - Colombia, using literature review and document analysis, identifying the ecosystems that shelter the municipality and determining the effects of environmental impacts on ecosystem services affected through causal - effects matrix. The Department of Chocó is characterized by its natural and ethnic wealth, with 90% of the territory composed by indigenous and afro-descendent communities, recognized by its collective and traditional territories where the artisanal mining is an ancestral practice. Oppositely, this region presents the highest poverty rates in the country in municipality Río Quito, according to official data. In current days, the presence of mechanized and semi-mechanized illegal gold mining is another concerning factor that causing impacts in local communities, in the modification of ecosystems and their services, which are the basis of traditional subsistence and compromise the well-being of these communities. The literature demonstrates a wide range of environmental impacts arising from the illegal mining of gold, such as Mercury pollution, which affects miners and communities through ingestion and inhalation pathways. The research concludes that this type of mining is a driver of changes in the biophysical and social contexts of the municipality of Río Quito, with repercussions on traditional activities, and those considered as part of the foundations of a society: food, access to water and income generation. Based on the outcomes, we suggest that SIA is a tool that exposes changes and impacts that affect the relationship between society-nature, as well as promoting the knowledge of socio-environmental contexts in the proposal of sustainable measures that respond to the realities of communities, increase their social acceptance and the probabilities of being more successful.

Keywords: Society-nature relations, mechanized and semi-mechanized illegal gold mining, Social Impact Assessment, environmental impacts, ecosystem service.

Social entrepreneurship at the Transcarioca Trail (RJ/BR)

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Ms. ANA CAROLINA MARQUES¹, Mrs. Ana Clara Leite¹, Mrs. Patricia Araújo¹, Mr. Flavio Nunes¹, Dr. Camila Rodrigues¹

1. UNIVERSIDADE FEDERAL RURAL DO RIO DE JANEIRO

Transcarioca Trail (Trilha Transcarioca, TT) is a long-distance trail, which original track is approximately 180 km long, passing through seven protected areas in the city of Rio de Janeiro, connecting west, north and south zones. It starts in the Municipal Natural Park of Grumari (Parque Natural Municipal de Grumari) and ends in Sugar Loaf Natural Monument. The implementation of this trail is an opportunity to promote the establishment of touristic enterprises, stimulating the economic development of underprivileged communities surrounding it, associated with nature conservation. The purpose of this study is to develop a methodology for choosing the locations and activities for the promotion of sustainable enterprises in the area of influence of the trail. Interviews and meetings were carried out with the managers of the affected protected areas and the heads of Movimento Trilha Transcarioca, who are responsible for organizing the voluntary efforts for signaling and conservation thereof. Communities that are already offering some touristic service, and also potential communities for the implementation of this type of service, have been identified in the area surrounding Transcarioca Trail. Also, a mapping using Government data in order to identify existing communities up to two kilometers away from TT has been made. The identification of the services to be offered was conducted through the benchmarking about other long-distance trails in the world, and about what services are popular among hikers. Ideal sites for service provision would be those closest to overnight stay points, where TT hikers would be resting after a day's walk. Transcarioca Trail has 17 points for overnight stay and mapping indicated the existence of a total of 114 communities up to two kilometers away from the trail, ranging from 1 to 23 communities in the surroundings of each overnight stay point. The crucial services are: Lodging, meals and transportation of heavy luggage from a hosting to another. A case study was carried out in three communities visited in order to check how these services could be encouraged in each of them. These communities are located in the north, south and west zones of the city. It has been verified that there is great diversity among existing initiatives and each community prospectively selected must be visited and have a specific project in order to promote the touristic services designed. All showed great potential and interest, but the realization of this service provision depends directly on the demand on the part of TT hikers. Fostering the social enterprises focusing on tourism in UC and long-distance trails - focusing on communities in the areas of influence of these sites - is a potential way of promoting social inclusion, associated with nature conservation and sustainability in the development process.

SOCIOECONOMIC ASPECTS OF COOPERATIVE COLLECTORS IN THE STATE OF RIO DE JANEIRO

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Ms. Tatianne Farias¹, Ms. Daniele Custódio¹, Mr. Gabriel Moreira Rodrigues¹

1. UFRRJ/MDP

There is a growing concern in Brazil and in the world about solid urban waste, especially from a sustainability perspective. Due to the accelerated global development in the twentieth century, waste management has great magnitude in the economic, social and environmental spheres. Most of the effective waste management is carried out by recycling and all the sectors included in this process. In the Brazilian reality, the recycling process is facilitated by the recyclable material collectors who participate in the logistics between the collection of the post-consumer waste and its receipt by the recycling industry. Also, even though these collectors are the main responsible for recycling in the country, they are the less benefited in the recycling chain. In addition to the depreciation in their remuneration, they are still the targets of prejudice and lack of recognition for their economic and environmental roles. The federal legislation dealing with waste collectors and recycling cooperatives reinforces the collector's importance and requires the implementation of selective collection programs at the municipal level, and reverse logistics systems by the private sector. However, recycled materials commercialization is hampered by the marginalization of waste collectors, lack of economic valuation of the collected material and non-application of the relevant legislation. In this context, the present study intends to identify the socioeconomic profile of recyclable waste collectors in the state of Rio de Janeiro, Brazil, aiming to provide scientific content and visibility on the subject, as well as to serve as a basis for optimization of the national recycling chain, or countries with similar backgrounds. To do so, during 2016 a structured questionnaire was applied, where qualitative information was gathered from collectors of 9 cooperatives of recyclable materials. From this data, it was detected that the collectors who gathered in cooperatives are workers coming from dumps or from the street and that the average income of cooperatives is R\$5,822.33, being divided by 9 people approximately. It was also detected that 60% of these recyclable material collectors are women and 71% only have incomplete elementary school education. Although all leaderships are practiced by women, gender pay inequality exists and is marked by the fact that men receive an average of R\$ 457.22, while women receive R\$ 435.00. In this way, it has been observed that gender equality is another problem in this social sector. Thus, the present study indicates that the recyclable waste collector's category work under precarious working conditions, with remuneration below the national minimum wage, lack of basic school education, social and gender discrimination. In a nutshell, it is considered fundamental to promote the social insertion and appreciation of these workers improving their working conditions and implementing instruments to guarantee the continuation of the category in the recycling production chain in a dignified way, with educational and professional qualification and in the gender equality matter, under the premise of the Sustainable Development Goals.

IMPACTS OF THE IMPLEMENTATION OF JIRAU AND SANTO ANTÔNIO HYDROELECTRIC POWER PLANTS: IMMIGRATION MOVEMENTS IN THE MUNICIPALITY OF PORTO VELHO

Thursday, 15th June - 14:00 - SD 716 - Oral Abstract

Ms. Ana Carolina Chaves Catolico¹

1. Escola Nacional de Ciências Estatísticas

There is now a growing search for renewable energy sources and less aggressive to the environment. In Brazil, despite the fact that oil and derivatives are the main source in the national energy matrix, the production of renewable energy - mainly hydroelectric - is highlighted. In this context, the Amazon Basin region stands out due its hydroelectric potential, still little explored. In the region of the Amazon River Basin, the “Madeira River Hydroelectric Complex”, is formed by the Jirau and Santo Antônio Hydroelectric Power Plants, in the municipality of Porto Velho (Rondônia). The region, since the licensing and implementation period of the project, has been consolidated as a stage of disputes over the right and forms of use of water resources. The infrastructure and electricity generation projects in the Amazon provided periodic immigration movements, resulting in rapid annual population growth in the implementation periods of the projects. The immigrants that no return to their places of origin generates sociocultural impacts in the municipality of Porto Velho and increases the pressure on the local infrastructure services. The installation of the enterprise established a new form of appropriation of the natural resources and of the arrangement of the territorial functions. In this way, the immigration movements are consolidated as one of the main impacts of the implementation of hydroelectric plants in the Amazon, as they aggravate a series of problems related to social and economic order. The main objective of this research was to characterize and compare the immigration movements and the immigrant profile of the municipality of Porto Velho, in the period before and after the installation of the project through descriptive analysis of the microdata of the Demographics Census 2000-2010. The proposed immigration analysis will be obtained by fixed date, that is, those individuals who reside, at the reference date of the Census, in a place different from the one registered at a previous fixed date, generally 5 years before. The results obtained allowed to characterize the immigrants by sex, state of origin, schooling and main economic activity developed, besides ratifying the Hydroelectric Complex as a new locus of attractiveness. In addition, the impacts of immigration on the provision of basic services and local infrastructure were measured through the following variables: electricity, treated water, garbage collection and sanitation. In Porto Velho it is possible to perceive the construction of a new social dynamic, established in such a way as to favor an occupation of an economicist character which, in turn, does not correspond to the existing social and economic practices. In this sense, the immigration movements of the Madeira Hydroelectric Complex should be viewed from a macro perspective, integrating the role, function and interest of all the actors involved and evidencing the need for projects that present sustainable perspectives inclusive.

Keywords: renewable energy, Amazônia, migration, hidroeletric power plants

Facilitating spaces for co-creating microfinance models in conservation areas.

Thursday, 15th June - 14:45 - SD 716 - Oral Paper

Mr. Santiago de Francisco ¹, Mr. Miguel Navarro-Sanint ¹, Ms. Rosa Torguet ¹

1. Universidad de los Andes - Design Department

As part of the project of the conservation of dry forests, sponsored by the United Nations Development Programme (UNDP) and Fondo Patrimonio Natural we were asked to explore the microfinance practices of a local region in Colombia to define a microfinance model that would help them engage in sustainable practices. Together with seven master's degree students in Design, we traveled to Natagaima, Tolima to spend a week with the inhabitants of Yaví and Pocharco. During the exploration, we used different participatory design tools, such as social cartography and generative sessions. The design team presented three proposals. Trust and solidarity inspired the first one. The second one was a network of local producers that were able to access to information about offer and demand for their products, as well as the reputation of the buyer. The third one is a saving and investment system using animals.

Sustainability literacy in older age groups: on the way to sustainable development

Friday, 16th June - 09:00 - SD 702 - Oral Abstract

Mrs. Patrícia Dolores¹, Prof. Fernando Caetano², Prof. Carla Oliveira²

1. Universidade Aberta, Portugal, 2. Universidade Aberta, Portugal and Centro de Química Estrutural (CQE), Instituto Superior Técnico, Univ. de Lisboa, Portugal

The world is facing sustainability challenges for which actions and results are needed in a 10 to 15 years time frame. Sustainability Literacy or Education has a crucial role for the Sustainable Development and is a set of different forms of education aiming to create economic, social, cultural and environmental conditions for sustainable development. This study looks at Sustainability Literacy or Education for Sustainable Development as a potential tool to empower individuals and communities to make more informed decisions that are aligned with long-term sustainability goals and can produce the short-term results needed. Any Education for Sustainable Development initiative relies and can greatly benefit from a bottom-up approach in local communities. An active participation of individuals in the community initiatives generates more opportunities for formal and non-formal lifelong learning and creates relevance that is engaging for other community members. The traditional approach of investment in Sustainability Literacy focuses on youth. However, while this approach is important in the long run, it may not yield results for current sustainability challenges. Older age groups (i.e. 50 or older), usually overlooked because they are perceived as not being motivated by sustainability or as being too late in their life span to have a significant impact, may play a crucial role in promoting sustainability within communities. Our study addresses the importance of improved sustainability literacy in older age groups (i.e. 50 or older) as a driver for sustainability. Endorsing a new role for senior citizens, by leveraging their last active years for short term sustainability efforts, we also empower them with the knowledge and tools to raise the sustainability literacy in younger generations. This work is being carried out in a Lisbon suburban community of around 12000 people, half of which are over 50 years old, and analyses some reflections on the importance of sustainability literacy within this age group and its effects on other age groups. It should be stressed that this population of 50+ years of age is actively engaged with the local University of the 3rd Age (U3A), where topics are presented and discussed in the classroom, using videos to generate a guided discussion toward the construction of the concepts by the students. The results from a group attending a life science literacy class show that the students experience increased personal satisfaction and wellbeing, are motivated towards learning and knowledge sharing within families and communities, including younger generations. These students also expressed greater understanding of messages from the media, health professionals and care takers, as well as a more positive health self-assessment and a greater treatment adherence. These results, aligned with the targets for good health and well-being sustainable development goal (SDG) suggest that initiatives to increase literacy lead to immediate behavior changes and knowledge dissemination. Further studies are ongoing regarding other SDGs, such as climate action, responsible consumption and production or affordable and clean energy.

Improving access and inclusiveness of low-income communities to healthcare services in Brazil: the role of non-for-profit and commercial organizations

Friday, 16th June - 10:15 - SD 715 - Oral Abstract

*Ms. constance dumalanede*¹, *Prof. Kavita Hamza*², *Prof. Marielle Payaud*¹

1. University of Lyon, 2. University of São Paulo;

This research highlights the processes which are implemented by non-profit organizations (NPO) and for-profit organizations to improve the access of healthcare services to low-income communities of developing countries while enhancing their inclusiveness. The NPO CIES and the company Dr.Consulta in Brazil were analyzed. These initiatives aim to improve access to healthcare services to low-income populations while overcoming the long waiting issue of the Brazilian public healthcare system. Implemented strategies were compared to scrutinize the way they adapt themselves to the social context; while improving the service accessibility and their inclusiveness. The research question is: **How profit and non-profit organizations shape their business model to improve the access and the inclusiveness of healthcare services to low-income communities in Brazil?**

The *Bottom of the Pyramid* population represents people living with less than \$9 a day and restricted access to infrastructures and essential products and services (Prahalad & Hart, 2002). Companies can contribute to improve their living conditions by giving them access to essential products and services. Doing so requires the creation of new business models and strategies which match the BoP populations' needs, expectations, and living conditions. Tailored strategies must be acceptable, affordable, accessible to BoP populations while raising their awareness (London & Hart, 2004; Anderson & Billou, 2007). It is also necessary to build an ecosystem which integrates local communities in the organizations' global value chain (Prahalad, 2004; Karnani, 2007; Casadesus-Masanell & Ricart, 2010) and implies the creation of inclusive business model. Consideration toward inclusiveness is growing up but few used in the BoP literature (Kolk, Rivera-Santos, & Rufin, 2014), especially for healthcare services which are weak in most developing countries (Esposito, Kapoor, & Goyal, 2012).

In Brazil, most NPO adopt a hybrid model, which is considered more flexible to create commercial and social value (Battilana & Dorado, 2010; Tate & Bals, 2016) while combining practices from different types of organization (Doherty, Haugh, & Lyon, 2014; Zahra, Gedajlovic, Neubaum, & Shulman, 2009).

This is why the business models of NPO CIES and the company Dr.Consulta, which both offer healthcare services, were compared. A qualitative approach based on a comparative case study has been used. In 2016, 21 semi-structured interviews were conducted in three neighborhoods in São Paulo, Brazil, with administrative employees, medical staff and patients of each organization.

Results indicate that both kind of organizations have succeed to reach their goal of improving the access and reducing the time-frame of healthcare services to low-income population of Brazil. Nevertheless, their ways of operating and their business models are different. CIES is sustainably offering free services due to its partnerships with the government and its hybrid business model; whereas Dr.Consulta has tailored its business model to meet low-income populations' needs and reach a social goal. These differences seem to affect their way of communicating, their organizational culture, the patients' expectations and their inclusiveness. The profit company struggles to be inclusive while the NPO needs to use business and management techniques from the commercial sector, which can explain the adoption of a hybrid model.

Don't Throw It All Away: Innovative Recycling Solutions to Waste Management in Tourism Communities

Friday, 16th June - 10:30 - SD 715 - Oral Paper

Prof. Mary Little¹

1. School for Field Studies, Center for Sustainable Development

Costa Rica's tropical beaches and seaside towns attract millions of tourists annually, yet increased waste generated by growing tourism threatens to degrade the environments tourists seek. The problem is compounded by local municipalities' inability to manage increased waste and often increased vacation consumption habits. Recycling offers a means of removing large quantities of reusable materials from the waste stream and reducing disposal directly into the environment. While Costa Rican law requires all municipalities to provide trash and recycling collection, remote tourism areas often lack municipal recycling programs. This research looks specifically at the social-environmental interface in relation to waste management solutions in the context of tourism communities on Costa Rica's Nicoya Peninsula. This study argues that social impact assessments can play a key role in evaluating regional development strategies and fostering effective community response. Examination of residents' role in developing waste management solutions indicates that a recycling program will likely mitigate social and environmental risk but use of local skills and knowledge are still largely undefined[ERB1]. A partnership with a socially conscious garment manufacturer to collect and use recovered plastic in apparel may provide a socially agreeable solution in the face of government inaction. However, low levels of bonding among diverse residents and low participation in civil organizations indicates that further investment in social capital formation is necessary to produce positive outcomes.

The climatic disruption

Friday, 16th June - 10:45 - SD 715 - Oral Abstract

Ms. Laura Florez-Urazan¹, Mr. Gustavo Nicolas Paez¹

1. University of Cambridge

The effect of water scarcity and climate events on socio-political stability can be analysed as a triggering element of conflict and displacement, and will become increasingly critical as climate change makes disruptive events more frequent, their consequences more severe, and their extent larger. For this reason, the effectiveness of policy and crisis management in the coming years will depend heavily on how decision-makers understand communities, their environment, and their socio-economic conditions, as a system that reacts in specific ways to climate change disturbances like desertification or rising sea levels. With this aim, this paper analyses the system dynamic behind the case of Syria to understand 1) the differential effect that climate variability has on communities depending on their location, their economic activities, and their socio-economic conditions, 2) what are the dynamics and conditions that determine migration patterns in the affected population, and 3) how social and political tensions can be aggravated by environmental shocks turning into large scale refugee crises. This analysis provides a tool for decision-makers to understand the crucial elements that influence this phenomenon, and the effective leverage points that can be addressed to alleviate the pressure on the system and provide support to countries that are likely to have environmental stresses, such as the approximately 700 million people that may be displaced because of water scarcity by 2030, according to the UN. The case of Syria is compared with the famine in Bangalore in 1943 to show how policy can aggravate an environmental constraint, and with the inefficient crisis management that lead to the agrarian strike in Colombia in 2013, and uses tools for the analysis of system dynamics to reveal elements that are consistently present as common drivers and leverage points. By studying the repeated elements in these case studies, it is possible to understand the role that governmental actions, such as sensible agriculture policies, adaptation plans, or early responses to civil movements, can be decisive in how the social fabric interacts with its ecological and political environment, and how vulnerable it is to the effects of climate change. Therefore, by extracting the structural dynamics that are consistently present in different contexts, and how environmental impacts can potentially catalyse certain socio-political structures into crises, it is possible to develop a model that offers decision-makers a practical tool to face the social challenges of climate-induced disruptions.

Keywords: climate change, refugees, conflict, migration, system dynamic

Waste not, want not: social innovation in the food sector

Friday, 16th June - 11:00 - SD 715 - Oral Paper

Mrs. Mariann Szabó¹, Prof. Jooyoung Park², Dr. Gyula Zilahy¹

1. Budapest University of Technology and Economics, iASK, 2. Universidad de los Andes

The wasteful management of food resources is an important phenomenon characteristic to both developing and developed countries. According to the FAO, about one third of the food produced in the world for human consumption is lost or wasted – approximately 1.3 billion tons, which amounts to roughly USD680 billion in industrialized countries and USD310 billion in developing countries (FAO, 2011). Food wasted in Latin America alone could feed 300 million people. At the same time almost 1 billion people stay undernourished and another 1 billion suffer from hunger [1].

The issue of food waste has relevance from several different perspectives including food security, environmental governance, resource efficiency, hazards to health and equity between different social groups (FUSIONS, 2016). As a result, programs aiming at the reduction of the amount of food waste take many different forms and the Sustainable Development Goals (SDGs) of the United Nations addresses the issue under at least three different domains: poverty, hunger and sustainable consumption and production.

While policymaking has been active around the world in raising awareness and promoting best practices, its success to date has been limited. Meanwhile, the fast development of the information and communication sector has led to the emergence of a number of new, innovative business models, which have the potential to handle social and environmental issues, such as the problem of food waste.

Our research aims at identifying and analyzing innovative economic and social practices in the food sector. An inventory of different approaches to the utilization of food waste will be introduced, as well as the results of an analysis of these initiatives from both a sustainability and business model perspective.

We evaluate private, voluntary and combinatory initiatives based on the experiences of existing recent examples using mainstream management theories (such as the resource based view of the firm and transaction cost theory) to draw conclusions regarding their long term viability. Initiatives such as the Leftover Swap [2] (a smartphone app to help barter or give away food leftovers), Foodsharing.de (established in 2012 in Germany and run with the participation of individuals, supermarkets, restaurants, bakeries, and food stalls, to be closed by Berlin authorities in 2016 [3]), the solidarity fridges [4] in Galdakao, and various global food bank initiatives [5] including one by ABACO (La Asociación de Bancos de Alimentos de Colombia) [6] will be examined regarding their environmental and social impacts. Our research includes both European and Latin American examples and differences and similarities will be pointed out.

Conclusions resulting from the research will cover suggestions for policymakers regarding the promotion of social innovation in the field as well as advice to practitioners based on failure and success stories.

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The impact of the Jirau and Santo Antônio hydroelectric plants on agriculture in the municipality of Porto Velho (RO)

Friday, 16th June - 11:15 - SD 715 - Oral Abstract

Mrs. Amanda Praia¹

1. Universidade de São Paulo

The installation of hydropower has been increasing in the Amazon region of Brazil, similarly have been observed the growth of agricultural occupation in Amazonian soils. The suppression of lands and the alteration of the flow of water from the installation of hydroelectric projects have altered the dynamics of the territories due to diverse aspects such as resettlement, migration, real estate speculation e etc. The focus of this study was to analyze, in a specific way, possible relationships between the extent of floods suffered by hydroelectric power plants and the agricultural production of affected municipalities. For this purpose it was chosen for a case study of the municipality of Porto Velho where the hydropower plants of Jirau and Santo Antônio were installed. The municipality of Porto velho is in the state of Rondônia that is part of the Amazonian territory in Brazil. The site was chosen because both hydroelectric plants have already started operation and the subsidies and incentives provided by the hydroelectric projects are already in the finalization phase. Thus, the semi-structured interviews method was used to understand if the hydroelectric plants had a significant effect on agriculture and whether this effect was positive or negative on the sector. To study the phenomenon were interviewed: the relocated families, representatives of the municipal and state agriculture department, representatives of outsourced companies that worked for the hydroelectric plants and representatives of EMATER (State Technical Assistance and Rural Extension State of Rondônia). From the interviews it was proposed a tabulation of the results that sought to understand if there was any impact on six sessions of the agricultural sector: rural credit supply / access, property register, quantity produced, diversity of products produced, technology and inputs employed and quality of ground. For each group of interviewees there was a script of interviews that contemplated these sessions, and from them was analyzed whether or not there was some change in this context in the municipality of Rondônia. Preliminary analyzes indicate that there is an improvement in the supply of technology and inputs, with the installation of hydroelectric plants, many properties are registered and consequently there is an increase in the supply of rural credit, there is not a significant effect on the diversity of products, but , there is an apparent increase in the amount of production, especially cassava, most of the soils are arable in the municipality, however the soils of families living on the edge of the Madeira River are naturally more fertile. Therefore, it was concluded that the hydroelectric plant brought benefits by investing in technology, inputs and property records, but mobilized people adapted to the production of subsistence for paid agricultural activity, consequently generating a conflict, since the local culture is not yet fully adapted to manage everything the enterprise has provided. Because of this conflict of interest, it can be inferred that the impact of the hydroelectric plant on agriculture in the region may not have been as significant as it could be.

Key words: amazon, hydropower, agriculture

Exponential Massification of Sustainability

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Mr. Norman Arruda Neto¹, Mr. Rodrigo Titon¹

1. ISAE – Instituto Superior de Administração e Economia – Curitiba – Paraná – BRASIL

By means of an theoretical analysis the present study seeks to provoke an reflection on the actions of consumption of humanity against the imminent need for expansion of sustainability concepts for the whole population, in special, in the biggest consumer classes. In this Proposal, is approach the theme of the inclusion of sustainability with a view to enhancing consumption through sustainable products or services.

Approaching the issue of consumption, here characterized by its exaggerated individual acts stemming from global marketing and massification actions, where the population consumes far beyond their needs, buying by impulse, desire, accumulation, status, fear, influence, prestige, anxiety, etc. (LINDSTROM, 2008). This exaggeration accentuates even more the uneven the tripod of sustainability, highlighting the environmental. This way, there is room to work on the influence of demand, through the adoption of global marketing strategies, in an effort between public and private agencies, creating the same desires, status, etc., but in the search for consumption of sustainable products or services, that is, to generate an exponential massification of sustainability, so that it reaches all levels of the population, having as its main objective at that moment, the consumers. The creation of symbols and support of global icons is a path of great impact in the short term, such as working global brands with prominent idols in the media, whether actors, athletes, etc., or use social media as an instrument of mobilization (LETS DO IT!, 2008), with the aim of engaging society. These actions do not conflict with the excellent work that has been developed worldwide in universities, training students, future entrepreneurs and managers in sustainable awareness. But time is scarce in the face of the destruction of our planet (WFN, 2008), it is extremely important to have an impact on the average citizen, who has a direct influence on consumption and is out, at least for now, to have a more direct contact with sustainability. Therefore, it is intended to describe how possible is to generate sustainable paths and actions, and can contribute even more to the implementation process of the **“2030 agenda for sustainable development”** (UN, 2015).

Cultural Values and the Role of Trust in Agents and Technology in Consideration of the Dynamic Prices Electric Grid and Efficiency at Home

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Paper

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Perceptions of societal risks and cultural ideals are expected to partake in attitudes towards the digitalized grid with dynamic prices, whence reliance on automated systems is feasible. Moreover such potential changes in the consumers' lives confront them with environmental, economic, and technological norms and orientations. The aim is to probe Cultural Theory (CT) constructs' usefulness in understanding consumers' trust influence in intention to rely upon dynamic prices to consume off peaks, when presented with several possible auxiliary technologies which could be used at home. CT theory predicates different groups' risk perceptions and polarized attitude to solutions to environmental problems. Trust literature highlights the perception of similarity in values and intentions with other agents. Trust in IT technology literature focuses upon cognition and affect towards specific technologies, acknowledging several orders of factors, such as individual propensities, and perception of societal supporting forces impending upon a particular context. The ensuing picture is that of multiple determination, openness to meanings and viewpoints. Respondents were 571 consumers enrolled in a market firm, were given descriptions of dynamic prices grid and several auxiliary technologies, and answered a questionnaire comprising trust in several targets and intention. The study analyses myths about nature and risks perception, employs these measures to segment the sample, assess differences among clusters in trust in agents, trust technology and intentions of adhering to dynamic tariffs, and estimates predictive models of the latter variable. Willingness to adhere was predicted by different trust phenomena, spanning from expectations about the specific devices, to generalized trust in technology and beliefs about situational societal assurance. Trust in technology emerged as the most important and trust in agents was not represented. Would this outcome change for groups with different cultural orientations? In the sample, perceptions of environmental, economic and social conflicts concerns correlated with myths about nature significantly in an interpretable direction. Segmentation yielded 8 clusters, a few only matched Cultural orientations constructs. Willingness to adhere was lower in one cluster. It had uniform low concerns, and slight endorsement of nature as fragile. Although beliefs about the specific technology featured as the most predictive, the clusters differed in the kind of specific device where trust mattered, from the use of a monitor, to an automated method. Societal support represented by the belief that progress in law and society made it normal this kind of application was significant predictor for some groups. Trust in agents was significant for two groups, but for one it was trust in consumer support organizations and for the other, it was trust in Energy provider. Myths and concerns with risks showed significance in a few clusters, but in differing directions. The significance of the orientations in regard to adhering to dynamic tariffs does not appear to be uniform, and different orders of concerns predict willingness. Thus, groups with different orientations were found to be willing to adhere to dynamic tariffs and consume off peaks.

Realizing subsistence consumers' functionings by mobilizing social capital

Thursday, 15th June - 14:30 - SD 716 - Oral Abstract

***Dr. Cecilia Soler*¹, *Prof. Shainesh G*²**

1. Gothenburg university, 2. IIMB

This article focuses on consumption-induced poverty alleviation in the urban subsistence setting. The increasing urbanization of poverty (Datta, 2006;)—which results in slum growth and increasing vulnerability due to increased costs of living (Boonyabanha and Mitlin, 2012), cuts in income due to unemployment, small incomes and day-to-day survival strategies (De Soto, 2000; Rosa, 2012)—illustrates a commoditization of poverty where income and work are the most important assets (Moser, 1998; Wratten, 1995). The BOP approach to consumption in subsistence communities, which is largely managerial in perspective, is contested because of its focus on individualized poverty alleviation. Income is but one (of many) means to enhance the well-being of the poor (Ansari et al, 2012; Sen, 1985, 1999), and a capability view on poverty alleviation emphasizes the socio-material and structural features of increasing the functionings of the urban poor, i.e., the ability to realize things perceived as valuable. Our interest in capability building among subsistence communities has turned our attention to the bridging opportunities of social capital enhancement in subsistence communities (Ansari et al, 2012). Recent research on business initiatives as generators of bridging social capital acknowledge the social enterprise as a vehicle for capability building and inclusive growth (Azmat et al, 2015) in subsistence communities (George et al., 2012).

The social enterprise, combining resources from business, non-profit or government organizations in novel ways with the aim to create social value (Austin et al., 2006), is particularly interesting as the link to subsistence consumers' access to resources and skills that enable their participation in the formal market. In this paper, we investigate how social enterprises enable the realization of urban subsistence consumers' functionings through bridging social capital. The aim of this paper is to describe (1) functionings in the urban subsistence setting and (2) how they can be met through social enterprise provided bridging social capital.

We draw on a study of (1) the self-reported consumption needs of informal workers belonging to a subsistence urban community in a South Indian city and (2) the offerings of social enterprises in this city. We analyze the functionings of urban subsistence consumers and social enterprise social capital building through the lens of practice theory in terms of elements of material, meaning and competences (Shove and Pantzar, 2005; Shove et al, 2012).

This article extends scholarly knowledge on the interplay of social capital sources for the sake of poverty alleviation in settings where poverty is, to a large extent, commoditized. The specific characteristics of urban subsistence communities, in combination with institutional voids (Mair, 2010), make discussions about formal/transaction-based systems of exchange versus informal/ reciprocity-based market systems instrumental for the contribution of social enterprise to wealth creation in these communities (London et al, 2014). We show how these different systems of exchange can be combined in social enterprise engagements. In particular, we highlight the influence of norms motivating social capital transfer on the realization of consumer-related functionings and how such norms may be an outcome of government programmers that are part of social enterprise bundles of activities.

Policy coherence for sustainable development in developing countries: A South African perspective

Friday, 16th June - 08:00 - SD 716 - Oral Abstract

Prof. Willem Fourie¹

1. University of Pretoria

Background

In Africa, the adoption of the 2030 Agenda's Sustainable Development Goals (SDGs) followed in the wake of the Africa Union's adoption of the aspirations of Agenda 2063. Africa's broad-ranging and ambitious set of development goals was designed with a view to direct national and subregional development in Africa. However, the alignment of the SDGs and Agenda 2063's aspirations remains a challenge, which may impact on development progress in Africa. This is particularly the case when additional alignment with national development plans is factored in.

Research argument

Policy coherence on subnational, national, subregional, regional and global levels is key to ensuring inclusive and sustainable development. However, policy coherence for development remains a perspective applied to the implementation of policies of providers of development assistance. In Africa, the challenges related to aligning and implementing both the SDGs and Agenda 2063's aspirations illustrates the real-life challenges related to policy coherence, and the need to expand the current perspective. This paper investigates correspondence and tensions between the SDGs, Agenda 2063's aspirations and South Africa's National Development Plan – both on theoretical and practical levels. This forms the basis for arguing that research on policy coherence for development can fruitfully be applied to the policies of developing countries.

Aim

The aim of this paper is to illustrate the opportunities and challenges related to applying policy coherence for development to the policies of developing countries. The African Union's Agenda 2063 is the only regional policy instrument of its kind and provides a unique opportunity for investigating the challenges of policy coherence for sustainable development.

Theoretical framework

This paper is qualitative in nature and bases its conclusions on documentary analysis, engagement with key policy-makers, enriched with personal experience. Due to the operative theoretical framework, it will not make use of empirical research. It seeks to present a conceptual argument.

Conclusions

This paper highlights the complexities of policy coherence in developing contexts and suggests implementation-level solutions to challenges. It is argued that the national level remains the level of implementation, which provides national governments with the opportunity to use their own development policies as integrative instruments.

Implications for the conference theme

This paper contributes specifically to the notion of 'engagement' of the conference theme. It is aimed at reflecting on the most effective engagement between multilateral policy-making platforms towards transformative policy coherence.

Keywords 2030 Agenda; Agenda 2063; policy alignment; African Union; South Africa; National Development Plan

Linkages between Capacity and Sustainability of Development Outcomes in Rural Africa: Empirical Evidence from Community-Level Capacity Assessment in Ghana and Malawi

Friday, 16th June - 08:15 - SD 716 - Oral Abstract

*Ms. Yasuko Kusakari*¹

1. The University of Tokyo

Despite Africa's potential, the large amount of funding and various development interventions over the past decades, poverty in Africa has not been abated significantly. To tackle multi-dimensional challenges, past development programs led by central governments or external organizations alone have clearly shown their limitations. Consequently, local capacity development deserves more attention than ever as a means of reducing poverty and promoting sustainable development. However, there has been no clear definition of capacity or capacity assessment framework that can be applied at the community level in the context of rural Africa. Against this backdrop, undertaking a critical assessment is indispensable to examining roles of local capacity and exploring effective and efficient approaches to capacity development to ensure sustainable development outcomes in rural Africa. This study aimed to develop a capacity assessment framework that can: 1) evaluate capacity of rural communities particularly development leaders, 2) examine linkages between local capacity and sustainable development, and 3) identify factors that contribute to levels and qualities of capacity at community level – for recommending feasible capacity development approaches for contributing to long-term sustainable development in rural Africa. For accomplishing these objectives, a series of research activities has been undertaken in six communities in the Wa West District of Ghana and six communities in the Mulanje District of Malawi. The communities were selected based on distribution of geographical and administrative areas and development project history, i.e., existence or non-existence of integrated rural development projects with capacity development components supported by external development partners. Functional capacities, which are soft skills of development leaders for facilitating community-driven development, were examined as a main pillar of this research. Key dimensions of functional capacities examined include “Mutual Accountability”, “Engagement and Participation”, and “Ownership”. The research also examined one selected area of technical capacity as well as communities' perceptions about 16 key development sectors that have been selected based on the context of rural Africa, for comparison with functional capacities. These dimensions have been examined mainly through focus group discussions (FGDs) with separate groups of men, women and development leaders, totaling 568 participants in the 12 communities. Observations and individual interviews were undertaken for crosschecking with the results obtained through FGDs. The capacity assessment revealed: i) critical linkages between functional capacities and sustainable development, ii) external support's limited contributions to functional capacities (despite positive effects on technical capacities and development outcomes to some extent), and iii) crucial roles of local ownership in sustainability of development. The research also affirmed the validity of community-level capacity assessment tools that have been developed through this research as well as potentials of these as a learning tool for facilitating changes in mindset and actions for impacting the sustainability of development outcomes. Based on the results, the research offers some concrete and practical recommendations for putting more emphasis on institutional platforms of development leaders consisting of diverse representatives, functional capacities with long-term perspectives, local ownership, and application of community-level capacity assessment, leading to inclusive sustainability for development, which is the central theme of the conference.

(WHY) DOES AFRICA NEED FEMALE RESEARCHERS?

Friday, 16th June - 09:15 - SD 716 - Oral Abstract

Prof. Margareth Gfrerer¹

1. Education Strategy Center

Gender issues as widely discussed at all political levels mainly manifest female rights and claims. Male issues are rarely covered under this topic except if those refer to males' misconduct. No information could be found that gender issues refer to the value of having female researchers in 'hard core science' in order to bring to research results a female touch without losing international academic recognition and acknowledgement from their research communities. Normally, female researchers active in the gender movement focusing in their research more on gender issues than on research in science, technology engineering or mathematics (STEM). Female researchers in the STEM disciplines are very much in to the topics that they can't bring thoughts to the gender movement. However, female researchers are primarily females with the specific female attitudes of rating relationships higher than rules and norms, thinking through their views of selfishness and responsibility (Preissle, 2006).

Feminist research ethics demonstrate that female researchers are biased in how researchers draft assumptions, design questions, conduct procedures and build on data to reflect to social values. No research could be found, how feminist research ethics impacts research subjects, others than in social sciences.

This research aims to find out the differences between female and male researchers in their research works and to visualize how female and male specifics could be characterized through out their research.

This research is a field research in form of a proposal writing workshop for researchers and graduate students in Ethiopia. In preparation of the workshop indicators for the female research approach will be elaborated in a literature review. All proposals have to address one and the same topic. The submitted proposals will be measured against the set indicators in a first step. In a second step the different sections will be scrutinized against each other and finally analysed on the overall added value.

The findings will contribute to learn about the specifics of female and male approaches in the different sections of a research proposal. The strengths of both, female and male researchers will be captured and amalgamated in a concept to demonstrate how to build strong research teams that are able to focus on the society at large and communicate the results in the female way to citizens, who are rarely interested on research issues.

Overall this research envisages to find the strength of female researchers and make them more visible in sectors, which are primarily dominated by females such as agriculture, education or health. Based on these findings training programmes can be elaborated to encourage females to pursue their carriers as researchers and contribute to improve especially the lives of 'voiceless' African females in the globalized world.

Unintended Consequences of Enforcement in a Cooperative Institution: Experimental Evidence from Tanzanian Fishers

Thursday, 15th June - 08:00 - SD 203 - Oral Abstract

***Prof. Yaniv Stopnitzky*¹, *Prof. Matthew Reimer*², *Dr. Paul Onyango*³, *Mr. Spencer Maccoll*⁴**

1. University of San Francisco, 2. University of Alaska-Anchorage, 3. University of Dar Es Salaam, 4. World Bank

Small-scale fisheries off the coasts of developing countries are a prime example of the important role that institutions (formal or informal) play in creating wealth and shaping development outcomes in rural communities. Small-scale fisheries are known to employ the majority of world fishers and to provide food and livelihoods to a vast number of people living in coastal areas. Approximately 90 percent of the 38 million people recorded by the FAO globally as fishermen are classified as small-scale (FAO, 2008). Yet they frequently suffer from overfishing and institutional reforms that have worked well in many developed countries are poorly suited to institutional contexts characterized by weak state capacity and poor enforcement. Given the need for local monitoring and enforcement combined with relatively weak state institutions, many countries and donor agencies have turned to co-management schemes, which devolve some responsibilities for management from central governments to local communities. As of 2011, an estimated 130 fisheries in 44 countries were co-managed but evidence on the effectiveness of these systems is mixed (Cinner et al., 2012; Gutierrez et al., 2011).

In Tanzania and other Lake Victoria adjacent countries, co-management has been structured around village-level institutions known as beach management units (BMUs). BMUs play a key role in certain management tasks, including monitoring fishing catches, endorsing fishing permits, and administering other national policies on illegal gear. Against this policy backdrop, we study the conditions that foster improved common-pool resource management in small-scale fisheries in rural Tanzania. In particular, we focus on the critical role that BMUs play in monitoring and enforcing the use of only certain types of gear. We design and implement an artefactual field experiment with fishermen in a randomly selected group of BMUs. Groups of five fishers play a dynamic common-pool resource game carefully designed to mirror the real world characteristics of the fishers' lives, including on fish stock size, harvest strategies, and opportunities to engage in illegal behavior. By altering features of the game when played with different groups, we generate experimental variation in the possibility of punishment when engaging in "illegal" behavior and study how this institutional feature affects behavior and fishery-level outcomes. Differing from the existing literature, our results show that participants in the monitoring and enforcement game harvest at significantly higher levels than those in the control group. Fishing groups in the enforcement treatment were 50 percent more likely to completely deplete and collapse the resource. Importantly, these outcomes are not driven either by higher cheating (which is never more than 8 percent in either arm of the experiment) nor by actual punishment (which happens only once in all groups across all villages). Instead, the possibility of enforcement induces individuals to harvest during each round at significantly higher rates than in the comparison group. Our experimental results with actual resource users suggest that institutional reforms that target specific behaviors when agents are simultaneously making multiple self-interested or cooperative choices may result in unintended consequences for both the group of resource users and for the resource itself.

Quality of local governance and sustainable development: a review of normative principles

Thursday, 15th June - 08:15 - SD 203 - Oral Abstract

***Dr. Sara Moreno Pires*¹, *Prof. Filipe Teles*¹, *Dr. Nuno F. da Cruz*²**

1. University of Aveiro, 2. London School of Economics and Political Science

Along with the wealth of research, the many legal protections, international environmental agreements, governance innovations and the transboundary diffusion of new ideas in the field of sustainable development (SD), we have observed an acceleration of human impacts on the planet and few clear messages of how to tackle these through effective problem-solving. On the contrary, many findings point to a clear failure to protect the critical Earth systems that allow for sustainable and thriving human societies and wellbeing. Even when there is an agreement among academics and policy-makers that current governance institutions and practices must be reformed if sustainable outcomes are to be achieved, the way it should be carried out varies immensely. The quality of local institutions is of uttermost importance for the implementation of SD policy instruments at the local level, and ultimately for the prospects of responding to global SD challenges. Local governments can make efforts to facilitate co-operation with multiple actors, using a range of policy instruments designed to either punish or reward, involve, devolve or share responsibilities. This demands a better understanding of complex processes and systems, including the quality of local governance (QoLG) and its capacity to meet SD objectives. Assessing the QoLG is challenging due to this complexity and currently there is neither a roadmap nor a widely accepted tool to do it. Therefore, this paper aims to present a systematic literature review in order to understand two important concerns. The first regards how the conceptualization of the QoLG is discussed in the literature, in order to structure the key comprehensive dimensions that may affect or determine the QoLG, as well as to understand how these dimensions connect to the need to address SD objectives. The second is to understand what assessment tools and methodologies have been proposed in the literature to evaluate the QoLG towards SD. Questions of how to define those concepts, how 'universal' they are, how to design measurement tools to operationalise and assess them, how assessments may mobilize popular and political will or how to foster their use to then improve governance are critical for this research, particularly when this debate is receiving high momentum at the international level. Decisive agreements on the new Post-2015 SD Goals and their financial mobilization, on the new climate change agenda and the new urban agenda (Habitat III) placed an emphasis on transforming governance for SD. Success in responding to these challenges requires reflection on existing local governance frameworks and their capacity to address local-global SD challenges.

Keywords: good local governance; policy instruments; governance practices; evaluation; sustainable development

THE MANAGEMENT OF THE 'ECO-URBANISM AND SUSTAINABLE BUILDING' SCENARIO IN BOGOTA

Thursday, 15th June - 08:30 - SD 203 - Oral Abstract

Mr. José Fernando Cuello¹

1. Secretaría Distrital de Ambiente

At the beginning of the 2000's, the Environmental Agency of Bogota made a management plan by scenarios, which identified a network of people for each of these scenarios and destined small teams of professionals for their management; one of such scenarios was called Eco-urbanism. Today, after many actions by the people involved, the city has a Public 'Eco-urbanism and Sustainable Building' Policy and it is preparing for its implementation. Bogota has almost two decades working for improving its urban environmental sustainability from the urbanism and building perspectives amongst other scenarios for its management. The city has a strategy, whose results are not very well known, but some outstanding elements allow to note some changes. It is necessary to recognise the existing practices, the relationships promoted between different actors and their possible results in order to help the city to redirect its management efforts and allow other cities to compare, review and modify their schemes. The aim of this paper is to offer an overview of the process that has happened in Bogota over the years in terms of environmental urban sustainability using the 'Eco-urbanism and Sustainable Building' scenario. This is done from the perspective of people who have followed such process, who have belonged to the Environmental Agency and who have taken part of the teams in charge of this. The research is done using qualitative research methods such as case studies and participatory observation in order to collect data about the process of environmental urban sustainability in the city. This, with the aim of identifying milestones in such process, analysing opportunities, challenges and their changes and to evaluate if the city had a strategy and has kept it. In addition, it analyses if the management and the benefits of the 'Eco-urbanism and Sustainable Construction' scenario in Bogota have been inclusive.

Institutional Dimensions for Sustainable Development: The Designated National Authority in Brazil and Mexico.

Thursday, 15th June - 11:15 - SD 203 - Oral Abstract

*Dr. Lira Luz Benites Lázaro*¹, *Dr. Neli Ap. De Mello-théry*², *Dr. José Celio Andrade*³

1. University of São Paulo; 2. University of Sao Paolo, 3. Federal University of Bahia

The Designated National Authorities (DNAs) was pivotal for developing countries in achieving sustainable development contributions from Kyoto Protocol's Clean Development Mechanism (CDM). Under the United Nations Framework Convention on Climate Change CDM projects must be approved by the host country, thus, DNAs issues a Letter of Approval certifying that the proposed CDM project activity supports the host country in achieving sustainable development. The focus of the paper is particularly on the role of the DNA, which is a national agency responsible for approving the country's CDM projects. The paper provides a comparative institutional analysis of the DNAs in the two countries. Three dimensions of the DNAs are considered: their structures, their policies and the CDM project market building capacity. The results of the study shows the capacity building to tackle the challenges associated have had some positive impacts to achieve sustainable development. Brazil established five criteria: local environmental sustainability; development of working conditions and net job creation; income distribution; training and technological development; and contribution to regional integration and linkages with other sectors. In Mexico, the DNA's criteria include: compliance with national environmental regulations; contribution to the improvement of the economic and competitive situation of the country (through investments, wealth generation/employment and technology transfer); and contribution to maintaining and improving the quality of life of communities (with permanent jobs that promote equity, improving community health, creating or improving local infrastructure and capacity building). However, in CDM projects there is absence of requirements for monitoring, there is no verification of whether expected sustainable developments benefits are actually achieved, and as sustainable development has no monetary value in the carbon market, the trend has been to prioritize the Certified Emission Reductions. The countries emphasized the economic aspect. We conclude that political and institutional factors, including legal aspects, stimulate different forms of transformation processes of relevance to sustainable development across countries, which could be serve under Paris Agreement.

Keywords: Governance, Institution, Designated National Authority, Clean Development Mechanism, Public Policy, Sustainable Development, Paris Agreement.

Convergence of HDI (Human Development Index), Sustainability and Corruption: sign for a change of gear in capitalism

Thursday, 15th June - 08:45 - SD 203 - Oral Paper

Dr. Rodrigo Casagrande¹, Mr. André Alves¹

1. ISAE - Instituto Superior de Administração e Economia do Mercosul

Looking back within a broad historical perspective, the researchers recognized that the transition to a sustainable capitalism model is a global cultural revolution. Adam Smith, in his 1759 “The Theory of Moral Sentiments” argued that self-interest should be tempered by ethics, so that purely selfish behaviour or exploitation would be the exception rather than the rule in society. The consolidation of capitalism was characterized, though, by profit maximization and the reward of selfish behaviour. However, the capitalist model in which the ends justify the means loses momentum and values, markets, transparency, technology life cycles, long-term/short-term tensions (Elkington, 2012) emerge. Actions to minimize environment damage caused by productive activities and to reduce inequalities with respect to income and access to education and sanitation aim at addressing those socio and environmental problems (Capra, 2005). This kind of inter- and intra-generational pact, nevertheless, coexists with very human characteristics such as self-interest, greed and the wish to accumulate. This happens against the scenario of growth of corporations, capital dilution and control and divorce between ownership and management (Monks & Minow, 2004). In this sense, the present study aims at identifying the possible relationship between the Human Development Index (HDI) - used by the UN since 1990 to analyze the conditions of development and human well-being -, the Environmental Performance Index (EPI) - a Yale University project that measures the environmental performance of various countries, and the Corruption Perception Index (CPI) - created by Transparency International in 1995 it measures the perception of corruption and aims at placing this issue on the international agenda. The researchers will collect HDI, EPI and CPI data between 2005 and 2016. They will analyse each available year through regression analysis in order to assess the correlation of indexes and the existence EPI variation according to HDI and CPI values. The study will contribute to provide theoretical and empirical elements that would allow for more effective analyzes and policies for human, public as well as private environmental and institutional development.

Keywords: Human Development; Environment; Corruption.

Analysis of Government effectiveness and its impact on the human being's development

Thursday, 15th June - 11:30 - SD 203 - Oral Paper

Mr. André Alves¹, Ms. Marcia Hino¹

1. ISAE - Instituto Superior de Administração e Economia do Mercosul

One of the most important government responsibility is to promote the well-being for its population. This can be achieved ensuring that law is fulfilled, order is assured and basic goods and public services are available to everyone. When legitimate laws are not the ones to guide Institutions, they tend to be less capable to deliver public services to population. Responsibility coverage is broad and affects countries in different perspectives and proportions. It is known that many countries fail in their purpose to promote the welfare for their population. According to the UN, corruption affect the Government's ability to provide basic services, feeds inequality and injustice. Thus, the lack of government effectiveness compromises the development of countries. Early 2017 the Transparency International published the ranking of corruption perception in which 2/3 of countries are below 50 on a scale of 0 (highly corrupt) to 100 (very clean). The failure of national governance is pointed for World Bank as the main risk faced for Latin American and Sub-Saharan countries and is considered to be among the top three most likely risk in the Middle East and North Africa, East Asia and Pacific, and Central Asia countries. Due to its relevance, in September/2015, the UN launched the Sustainable Development Goals (SDGs). Such initiatives, also known as Agenda 2030, foresee a series of targets to be implemented until 2030 by countries compromised with the sustainable development that signed Paris Agreement. In a total of 17 goals that cover areas of critical importance for humanity, such as planet, people, peace, prosperity, the highlight goes to SDG 16 entitled "Peace, Justice and Strong Institutions". In this context, the research aims to investigate the government effectiveness and its impact on the human being's development. A quantitative approach was adopted for analysis. The use of HDI index, adopted by UN since 1990 to measure the human-being development in the countries, and World Governance Indicators (WGI), sustained by the World Bank since 1996, support the study. Preliminary results identified the existence of correlation between the government effectiveness and the countries' human-being development. Results also indicate that countries with high levels of government effectiveness tend to have greater human-being development. The main contribution of this research lies on fomenting the debate, bringing actual perspectives on the subject and generating subsidies for the governmental efficiency improvement. The results can be used as a basis for future qualitative research, as well as for orientation of countries, state and municipalities, in the development of more effective tools for human development and efficiency of public power.

Keywords: human development; government effectiveness; sustainable development

The Impacts of Citizen's Engagement in global Governance for Sustainable Development: The Case of Low Carbon City

Friday, 16th June - 08:00 - SD 204 - Oral Abstract

Prof. Juliana Gutierrez Rua ¹, Prof. Alejandro Álvarez ¹

1. EAFIT

SDG, and Paris Agreement, have mark a path for next years. Governments, corporations, academia, international organizations and even cities are desperately looking for alternatives to appropriate the discourse into practices that allow to transform the era of Anthropocene. However, beside the existent institutional framework to address sustainable development there are some questions that still remains unanswered and constitutes a challenge for the current trends of state decentralization. How does global governance affect local behaviors and the way in which citizens mobilize towards sustainability? How to involve citizens in global governance for sustainable development? The lack of answers from institutional side, and the traditional means of operation from NGO, or traditional activist groups, had led to an interesting phenomenon of world wide mobilizations, showing the power of citizens in five areas i) public agenda setting, ii) raising awareness, ii) changing behaviors and contributing to change, iv) connecting globally and triggering changes locally, and v) being at the center of multi-stakeholder work. The case of Low Carbon City, LCC, is the epitome of this Phenomenon. Citizens have come together in a platform that looks to tackle climate change by building collective solutions in cities at global level. Since its creation in 2015, LCC has over 80 ambassador cities, has mobilized roughly 13.000 citizens around the world, has organized more than 150 activities in its network, and has raise the voice of citizens in international venues to discuss sustainable development and climate change. Nevertheless, its impacts have gone beyond global participation. From local focus, the work with academia has been outstanding in agenda setting. I.e. Through the partnership with EAFIT University, LCC have been able to i) promote participation of more citizens in academic conferences, ii) foster the creation of projects and creative ways to communicate the importance of low carbon and sustainable lifestyles and iii) build connections between members of EAFIT community and other national and international players. Some examples are the discussions with decision makers, solutions and prototypes created by undergraduate students to reduce emissions, communication strategies oriented at shifting behaviours to a climate friendly life, and finally, as an example on how far this bottom up approach of governance could go, the work with children, in which they not only receive training and adopt a low carbon life, but also become in message carriers in their communities, and active in politics. In this specific case, after participating in the program, children talked to the City Council for giving advice in the public policy, the World LCC Forum to more than 3000 participants, and they even created their own Manifesto, which is a reference for policymakers. There are abundant examples as LCC which demonstrate that citizens are influenced by global governance and this is a process that occurs in both ways, because from the local experiences global governances is nurturing as well. what is doing LCC is a citizen-led complementary approach on what networks like C40 or Compact of Mayors are doing at local level.

Citizens, global governance, climate change, SDG, Cities

Expectations and experiences in building a socio map in Venezuela, from a vision of sustainability

Friday, 16th June - 08:15 - SD 204 - Oral Abstract

***Prof. FREDDY HERNANDEZ*¹, *Dr. Esmeya Díaz*², *Dr. Maria Angela Flores P*¹, *Dr. RUTH ALVAREZ*³,
*Prof. Roxy Pérez*¹**

1. Universidad de Carabobo. INFACES, 2. Universidad de Cara, 3. Universidad de Carabobo

When addressing the production of goods and services focused on sustainable development services, local management has an important role, mainly based on the vision of endogenous development, given the internal reality of each country and the trends apparent in his environment. In Venezuela, Carabobo has been regarded as a fundamental basis in the process of sustainable development; given its natural resources, geographical location, population, among other factors; It has been key to give the profile of a prosperous region with development prospects. However, figures from the National Statistics Institute (INE) shows that by 2015, the level of poverty still remains a problem situation; And, there is at least 40% of poor households in the Carabobo region; This contrasts with the reality of abundant resources, favorable geographical location and economic and social performance. Among one of the weaknesses that has this region is the lack of targeted geographical statistical information, for which the municipality Valencia Carabobo state, even though it is one of the most important cities of Venezuela has not escaped this situation. Thus generation becomes relevant local statistics, where an interactive map that draw social and productive indicators can be a powerful tool, especially for drawing realities of the lower social classes. Currently, the municipality Valencia Carabobo state - Venezuela, does not have information to infer weakness or strength in the plane of endogenous development, even if it is a priority for the effective targeting of public policies in the social and productive spheres spearhead of the socio-political framed in the Plan of Economic and Social Development of the Nation 2013 - 2019, which are required to contribute to the Millennium Development Goals of drastically reducing poverty and sustainable development. This paper aims to show preliminary results in the participatory development of a map of socio capacity in deprived communities in the municipality of Valencia Carabobo - Venezuela, framed from the sustainable approach. Methodologically it involves field research, no experimental descriptive cross-sectional; at first participatory workshops 12 (step 1) is performed and then a sampling process was applied with the participation of 420 households (step 2). As for the results, experience in communities with participatory workshops proved very valuable in terms of exchange of knowledge in order to recognize and approach to understanding the social and productive done. Furthermore, the results show that the dimensions of the socio capacity in deprived communities bordering three levels: household (individual capacities), the collective (social skills) and public (public building), these three conjugates allow optimal levels a range of opportunities for the most vulnerable for the sake of better utilization of resources for local, social and productive development sectors of the population, showing the real possibility of influencing poverty levels from a sustainable perspective in the municipality Valencia Carabobo state - Venezuela.

FutureTalks: Community Co-Creation for Transformative Urban Sustainability

Friday, 16th June - 09:00 - SD 204 - Oral Abstract

Dr. Tamer El-Diraby¹, Dr. Sara Hughes¹, Dr. John Robinson¹, Ms. Kim Slater¹, Mr. Stephen Williams², Dr. Wendy Wong¹

1. University of Toronto, 2. University of British Columbia

With more than half of the world's population now living in urban areas, co-creating transformative urban sustainability solutions is paramount in the 21st century. Addressing sustainability challenges related to rapid urban growth, social inequality and climate change requires an inclusive approach to sustainability, which means involving citizens, especially those who have been traditionally hard to reach, in conversations about the future. FutureTalks is a five-year research project proposed for Toronto, Canada that will consider the choices and tradeoffs that 100,000 citizens from diverse backgrounds are willing to make in envisioning the sustainable future of their city. The project brings together scholars, non-governmental organizations, and actors from the government and private sectors in a large-scale and interactive co-creation process that harnesses the collective knowledge of the community as a means of generating new understandings and solutions. The aims of the project are to better understand: (1) how a large-scale community co-creation process can be undertaken in a large city; (2) the societal impacts of different means of engagement, visioning, and mobilization around urban sustainability; and (3) how Toronto's experience can be applied in other cities. One of the theoretical frameworks guiding FutureTalks is the emerging literature on co-production and co-creation of research and action (Jasanoff, 2004; Lemos and Morehouse, 2005; Pohl, et al, 2010). Researchers work with colleagues in the private, public, and/or civil society sectors in the articulation of research questions, in the undertaking of the research itself, and interpretation and use of the results (Robinson and Tansey, 2006; Talwar et al, 2011). Another theoretical context for this project is the literature on urban sustainability and climate change governance, which highlights the growing role of cities in addressing global challenges of climate change and sustainability (Bulkeley and Betsill, 2003; Marcotullio et al., 2014; Gore and Robinson 2009). Traditional community engagement processes often exclude underrepresented and equity-seeking groups in cities (Abbott 1996; Agyeman and Evans 2003; Hughes 2013). Meaningful and sustained engagement from the public and other non-state actors can improve policy outcomes, bolster legitimacy, and empower residents (Burch, 2010; Sarzynski, 2015). An important first step for building community and collecting data began in October 2016 at the Minden Symposium, a Toronto-based gathering hosted by the University of Toronto's School of the Environment that convened researchers and community partners who revealed that meaningful and mutually beneficial cross-sector partnerships are crucially important for the success of the project, and continued engagement with attention paid to equality between academic and non-academic partners is vital to build trust. Data collection and analysis would occur through a participatory action research (PAR) approach that uses mixed methods, notably observant participation, in-depth semi-structured interviews and focus groups to produce rich detail regarding the relational and organizational aspects of co-creation processes. During my oral presentation, I will share findings from the Minden Symposium that indicate the kinds of partners and governance mechanisms needed to undertake a large-scale co-creation process like FutureTalks, the role of academia, and opportunities for maintaining a shared vision.

Stakeholder-driven initiatives using sustainability indicators

Friday, 16th June - 10:30 - SD 701 - Oral Abstract

Ms. Ana Rita Domingues¹, Dr. Rodrigo Lozano², Prof. Tomás B. Ramos³

1. CENSE, Center for Environmental and Sustainability Research, Universidade NOVA de Lisboa, **2.** University of Gävle, **3.** CENSE, Centre for Environmental and Sustainability Research, Universidade NOVA de Lisboa

Several authors have highlighted that stakeholders' involvement increases the quality of environmental and sustainability decisions, since such information is then taken into consideration in more comprehensive ways. On numerous occasions stakeholders have been integrated into processes when decisions have already been discussed and decided. New approaches have appeared to integrate stakeholders in environmental and sustainability processes that go beyond passive roles, with many of such initiatives being related to sustainability indicators. Sustainability indicators allow informal and semi-continuous actions of sustainability data collection and evaluation, conducted by stakeholders, covering different phases of the assessment. We aim to provide a review of voluntary and collaborative stakeholder initiatives that use sustainability indicators as evaluation and communication tools. We reviewed scientific and grey literature to analyse worldwide initiatives, including technology-driven examples. These initiatives are from governmental agencies, Non-Governmental Organisations and private companies. Findings show that the integration of stakeholders as active actors enhance social ties, communication grid, the use of a common language, the vision about what was being implemented, co-responsibility of the shared resources and feedback mechanisms. Stakeholders become part of the processes because they feel their opinions are heard in processes that have impacts in their daily lives or that it is important for their community. For instance, they become part of the team that gather environmental indicators to monitor the quality of a water systems. Some examples of indicators used by stakeholders in the development, use and communication are given. Aspects related to the conflict of interests between stakeholders and the possibility of over-representativeness of some groups are also addressed. Finally, we discuss how empowering stakeholders can boost their engagement with sustainability related-aspects and help the transition to more sustainable societies. Thus, this allows integration of new perspectives from the engaged stakeholders as a complementary evaluation to sustainability assessment processes.

Keywords: Sustainability assessment; indicators; voluntary process; collaborative process; interactive participation; stakeholder empowerment

Local democracy initiatives in Sweden: Inclusive or exclusive participatory democracy?

Friday, 16th June - 10:15 - SD 716 - Oral Paper

Dr. Bozena Guziana¹

1. Mälardalen University

Abstract

Participatory democracy emphasizes the importance of the public political participation. Citizen engagement is crucial for advancing sustainable development at local level. Citizen participation initiatives at local level in Sweden include among others civic dialogues in the planning, e-petitions and citizen proposals (CP). While participatory democrats recognize the need for representative democracy they also see the possibility and benefits of more political involvement by the public than is currently practiced. The arguments in favour of enhancing citizen participation focus on its different benefits. In this paper the design and practice of citizen involvement through CP in Sweden is studied. The aspects for analysis are chosen considering the Michels & De Graaf (2010) framework (*inclusion, civic skills, limited deliberation*), as well as the high administrative burden of handling CP and the high level of proposals considering issues already in progress (*effectiveness*). The paper is based on a study of municipal webpages and a case study of CPs in the municipality of Eskilstuna. The amount submitted CP is growing. Still, this initiative for increased public participation in form of CP both in most municipalities having this instrument as well as in Eskilstuna have some shortcomings regarding inclusiveness, development civic skills, limited deliberation and effectiveness. The intentions with the instrument to involve citizens, children, youths and non-electors with foreign background have merely influenced spreading of this measure among Swedish municipalities. Furthermore, the *citizen* based terminology in local democracy initiatives is by nature excluding and should be changed to *resident* based terminology.

Keywords: Citizen proposal, Participatory democracy, Inclusion, Civic skills and virtues, Deliberation

Environmental justice in nuclear power plants and radioactive waste management: Two study cases on public information and participation at Spanish courts

Friday, 16th June - 11:00 - SD 716 - Oral Abstract

***Dr. JORDI PRADES*¹, *Dr. AITANA DE LA VARGA*²**

1. ASTERISC Communication Research Group. UNIVERSITAT ROVIRA I VIRGILI (URV), 2. CEDAT CENTRE FOR ENVIRONMENTAL LAW. UNIVERSITAT ROVIRA I VIRGILI (URV)

Information, public participation and access to justice are key to ensure an effective environmental protection. Through these three pillars of the Aarhus Convention the public should have access to plans, programs and projects that affect the environment. Public information on these policies is necessary to participate in the development of plans, programs and projects and, if necessary, to have access to courts. Ultimately, all the three pillars must serve to demand effective environmental justice.

We describe how have been tried in court the disputes that have taken place in relation to nuclear energy and radioactive waste management in Spain, emphasizing the issues raised on access to information and public participation processes.

We analyze legal proceedings about conflicts between nuclear companies, the Spanish State and NGOs and social movements regarding (A) public information and (B) public participation and access to environmental justice.

A) In relation to public information, differences between actors in conflict —nuclear companies and the Spanish Nuclear Safety Council (CSN)— arise because of the publication on the Internet of information about inspections carried out in the power plants by the CSN (JUR/2008/173166).

B) The building project of the temporary storage of high level radioactive waste (ATC) makes evident the differences between the participatory process promoted by the Spanish Government against the effective public participation mechanisms and practices demanded by social movements and by Greenpeace (ROJ: SAN 431/2012 and ROJ: STS 5149/2013).

We observe how different actors in conflict assessed information and public participation linked to nuclear facilities and concerns, and the different interpretations of what transparency and environmental justice mean. We also found that the Spanish nuclear legislation is archaic and scattered, which complicates the comprehension of the issue by the general public. We conclude that law and courts are prime actors in the construction of meanings about the environmental conflict.

Keywords

Environmental justice, public information, public participation, access to justice, nuclear power

SUSTAINABLE PUBLIC PROCUREMENT IN THE PERCEPTION OF COLLABORATORS RESPONSIBLE FOR THE EFFECTIVENESS OF INSTITUTIONAL CONTRACTING: THE UFRRJ CASE

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Paper

Mrs. Rosalia Santos¹

1. UNIVERSIDADE FEDERAL RURAL DO RIO DE JANEIRO

Actions that impact the natural environment have overcome national barriers and their reflexes can be noticed at the global level. It is thus a duty of national governments to implement policies for sustainable development in the face of the many environmental, social and economic challenges that are mounting. Thus, discussions about environmental protection, eradication of poverty and equitable distribution of income are strengthened. In this context, through public policies, the Brazilian State has sought to stimulate the involvement of civil society and the government itself in favor of sustainable development. In this scenario, the relevance of public contracting stands out.

Taking as a reference the significant purchasing power of the Brazilian government, which represented 20.2% of the Gross Domestic Product (GDP) in 2014 and considering that GDP reached approximately US\$ 1,5 trillion in that year, defining the way in which it will use the public resource, the government has in its hands the power to mobilize an entire productive chain.

Thus, in 2010, the legislation that regulates government hiring has undergone an alteration that determined that the bids made within the scope of the Brazilian public administration must have, for one of its purposes, the promotion of sustainable national development. However, almost a decade after the mentioned change, the data reveal that there are still incipient procurement administrative that consider in their processes the category "sustainability".

Exemplifying the case of the Federal Rural University of Rio de Janeiro (UFRRJ), a public organization located in the State of Rio de Janeiro - Brazil, from 2012 to 2016, 1,752 procurement processes were carried out, however, the percentage of purchases that included the purchase of items not reached 1% of the total. During the same period, 209 contracts were signed, but none contemplated the acquisition of sustainable items. Thus, it is concluded that despite the legal requirement for public contracting to promote national sustainable development, we can see that this initiative still seems very incipient.

Thus, it can be deduced that the category "sustainability" is not consensual and that there may be different interpretations of this reality. Therefore, it is inferred that there are cultural and symbolic boundaries between the institutional actors responsible for such hiring and this can result in a distinct understanding of sustainability in spite of the legislation and regulations in force, thus creating a research opportunity. It should be noted that despite the importance of institutional actors in this process of implementing sustainable public contracting, an inexpressive amount of studies was identified that considered the perception of such actors specifically on the sustainability category.

Thus, the objective is to carry out a qualitative research, characterized as a case study, which is oriented by a sociological and anthropological relational view, and aims to understand the exotic in what is familiar, through the analysis of webs of meanings built by institutional actors responsible for procurement processes at UFRRJ. The methodological resources employed include fieldwork, participant observation, the use of semi-structured interviews and bibliographic research.

Sustainable Development, degrowth and the law: context, connections and challenges

Friday, 16th June - 08:30 - SD 204 - Oral Abstract

Dr. Volker Mauerhofer¹

1. University of Vienna/Meiji University

This contribution assesses in which situations the application of law is a precondition to address degrowth as one goal of a Sustainable Development (SD). It first defines law in a broad sense including binding rules based on formal (written) as well as informal (non-written) sources. In terms of sustainable development the further assessment is conceptionally based on 3-D Sustainability, a recently developed decision support method. The contribution results in the presentation of the contexts between degrowth and the different elements as well as criteria provided by that method and inherent legal principles, such as the precautionary principle. The presentation identifies sufficiency, eco-effectiveness, ecological equity and socio-effectiveness as SD-criteria (of 3D-Sustainability) most relevant to reaching the degrowth goal by means of law. It presents information focused, incentive focused and rule focused instruments as the main, but differentiated tools for multilevel governance towards degrowth within a SD and also indicates the varying availability of these instruments on different geopolitical levels. The presentation further discusses the practical implications of these relationships and gives an outlook on further innovative applications of its results as well as additional challenges for research.

Large scale cooper mining conflict discourses in Ecuador. From neo-constitutionalism to neo-extractivism

Friday, 16th June - 08:45 - SD 204 - Oral Abstract

***Dr. JORDI PRADES*¹, *Dr. AITANA DE LA VARGA*², *Mr. Francisco Delgado*³**

1. ASTERISC. Communication Research Group. UNIVERSITAT ROVIRA I VIRGILI, 2. CEDAT. Centre for Environmental Legal Studies. UNIVERSITAT ROVIRA I VIRGILI, 3. CIEES. Center for Research and Specialized Studies

Thirty years after the concept “sustainable development” was presented and twenty years after mining conflicts in Intag started, Rafael Correa, the Ecuadorian president under whose mandate was passed the Constitution of Sumak Kawsay—which recognizes nature as a subject of law— ends in 2017 its ten years in office.

In last decades, environmental conflicts arisen and sharpen at local and global level. In Ecuador, the neo-extractive model faces the Political Constitution of 2008. This paper analyzes convergences and divergences between discourses around conflicts regarding large scale cooper mining in Ecuador. Discourses are compared and related to weak (extractive), strong (efficient) or super-strong (ecologist) environmental models, and to liberal, cultural and eco-socialist approaches.

To carry out this study, several relevant actors from the principal sectors in dispute (the private, the public, and the social) have been interviewed; the Equatorial legal system (Constitution, legislation, doctrine and jurisprudence) has been analyzed; and a sample of corporate documentation (plans, projects, memories, reports of environmental impacts and corporate social responsibility, etc.) has been consulted. The aim of this communication is, firstly, to identify the undertaken environmental commitments from each part as a starting point, and, secondly, to compare them with the real evolution of the discourses, the legislation, the policies and the practices during this years until today.

The conclusion is that although there is a common ground between the actors, the positions still remain quite a long way apart. That means that in practice the extractive model imposes itself strongly on the ecologist model and even on the efficient model. As a result, the equatorial mining policy is stepping away from the constitutional mandates that call for the sustainability and the Good Living (*buen vivir*), *Sumak Kawsay*.

Keywords:coopermining, discourses, environmental conflict, Sumak Kawsay, Intag.

“Learning it the Hard Way”: Social Safeguard Norms in Chinese-Led Dam Projects in Myanmar, Laos and Cambodia

Friday, 16th June - 10:30 - SD 716 - Oral Abstract

Dr. Julian Kirchherr¹

1. Utre

Chinese dam developers claim to construct at least every second dam worldwide. However, scholarly literature comprehensively investigating the social safeguard norms in these projects is rare. This paper analyses social safeguard norms in Chinese-led dam projects in Myanmar, Laos and Cambodia, hotspots of Chinese-led dam construction. Safeguard norms are defined as shared ideas, expectations and beliefs about what constitutes procedural and distributive social justice in a large dam project with regard to project-affected people. To analyse these norms, 47 semi-structured interviews have been carried out (with access to interviewees mostly gained via snowball sampling) which were triangulated with scholarly writings on the topic as well as news articles and reports. It is found that social safeguard norms adopted have significantly changed in the past 15 years. While Chinese dam developers claimed to adopt standards of the host countries upon the launch of China's Going Out Policy in 2001, with occasional adoption of more demanding Chinese standards, they did not adopt international norms. In recent years, however, they increasingly take into account international norms. It is argued that the root cause for this change is social mobilization, with the suspension of the Myitsone Dam in 2011 as a particular game changer. Enhanced social safeguard legislation in host countries and China, stricter rules of Chinese funders and cooperation of Chinese dam developers with international players have also facilitated this change. The findings suggest that activists can thus be central contributors to inclusive sustainability for development.

A global overview on public participation rights in environmental matters

Friday, 16th June - 10:45 - SD 716 - Oral Abstract

Dr. Volker Mauerhofer¹

1. University of Vienna/Meiji University

This presentation aims to provide a global and comparative overview of procedural rights of Public Participation in Environmental Matters in the sense of the Aarhus convention. The contribution is based on a very recent and current publication titled “Mauerhofer V., 2016. Public Participation in Environmental Matters: Compendium, Challenges and Chances globally, Land Use Policy (Elsevier) 52, 481-491” and in particular presents the results therein related to these procedural rights.

The method applied was an in-depth literature review in particular of research papers, legal documents, policy papers, which was implemented by means of electronic databases (Web of Science, Scopus) as well as by internet research using terms such as public participation, access to information, participation in decision-making and access to justice in combination with continent names.

The results were then analysed according to the five continents Europe, Africa, America, Asia as well as Oceania, and distinguished as well as discussed regarding general aspects, access to information, access to decision-making and access to justice.

The results for the five continents show that

- there exist regionally and nationally large differences within the three pillars access to information, participation in decision-making and access to justice.
- that access to information is widely legally established within all regions on all continents, and
- that access to justice is the one sector of the three mentioned in Principle X of the Rio Declaration which has obtained the least reflection in legislation and implementation so far.

This innovative study provides as far as visible the first time such a transcontinental and comprehensive overview on procedural rights related to Public Participation in Environmental Matters and indicates several further challenges for researchers and politicians.

TERRITORIAL GOVERNANCE AND SUSTAINABLE DEVELOPMENT

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Paper Rejected

Mr. Bartholomeu Rebouças¹

1. UCSAL Universidade Católica do Salvador

Object: Understanding the legitimacy of Territorial Governance actions and their role in Sustainable Development of a geographical region, using research for a doctoral thesis at the Graduate Program in Territorial Planning and Social Development of the Catholic University of Salvador, within the research line of Territoriality, Social Development and Environment.

The research seeks to analyze the perception of the legitimacy of governance actions; to identify the role of local leaders; to validate governance as a democratic management method for institutions; to verify if there is encouragement of citizen participation; to verify the perception of “belonging” among citizens of a region and to characterize territorial governance as an essential component of modern public management.

Intervention site: Municipality of President Tancredo Neves, in the south of Bahia state, in the Northeast of Brazil.

Institution to be researched: The South Bahia Sustainable Development Institute (**IDES**).

Theoretical basis: Colletis (1999); UN (2000); The World Bank (2000); Seyle e King (2014); Pascual Esteve (2015)

The IDES is an organization created in partnership with companies, civil society, representatives from governments and subnational spheres, which devised a strategy to encourage organizational innovation and to apply technological innovations to improving production of cassava flour, heart of palm and fish. It combines social techniques to engage communities by innovating work and production processes. The intervention model follows the ideas of Pedagogy of Alternation (originated in France in 1937) and focuses on young students of rural schools who blend a week of learning at the project’s facilities and two weeks of supervised application of the knowledge gained at family farms.

Phenomenological research: Husserl (1859 – 1938)

The phenomenological method seeks the direct description of the experience as it is. The reality is built socially and extended as what is understood, interpreted and communicated. Thus the reality is not unique: there are as many realities as there are interpretations and communications. The stakeholder/subject is recognizably important in the knowledge building process. The project uses qualitative research, which seeks to study the essential structures of the phenomena that occur in our conscience. It seeks to obtain a critical analysis of the narrative, vying to understand history as it is presented, as well as the relational approach, with the recording of information from the dialectical encounter between the researcher and the survey’s participants, who are designated as co-participants. Such relational approach will be developed through personal contacts between the researcher and the participants, through a non-probabilistic and intentional sample, with a questionnaire/interview script that considers the relevant of subgroups identified in the review of the cognition of interviewees about their governance actions in the municipality of Presidente Tancredo Neves, since the year 2000 to the current year, to consolidate the scenario proposed. aa

Governance in Sustainability and Public Affairs Management

Thursday, 15th June - 09:00 - SD 203 - Oral Abstract

Prof. Diana Trujillo¹

1. Universidad de los Andes

This chapter builds on the collaborative governance literature to elaborate the idea of governance as the mechanisms we use to coordinate collective action at the field level. Debates about governance for sustainable development move between the macro and micro levels of analysis. The more traditional top-down approaches to governance that include the state and the good governance perspectives seem to have failed to govern complex affairs or to remain at the prescriptive level. Other bottom-up, deliberative approaches like the collaborative governance one has began to show some promise in the management of sustainable development issues. The purpose of the chapter is to delve deeper into the collaborative governance literature in different policy areas to provide a conceptual framework to understand governance in this type of arrangements. I find the collaborative governance literature suggests an understanding of the term as: the mechanisms used to govern organizations at the field level to manage common affairs. The mechanisms comprise: formal and informal institutions, processes and structures. I elaborate on the specificities of these three mechanisms and their implications for the collaborative approach to governance. Also, I develop the understanding of the field level and its relationship to collective action and I propose an understanding of the common affairs that includes physical and socially constructed commons. To illustrate the elements of the definition, I use the results of empirical research about Regional Peace and Development Programs which are collaborative governance schemes to promote peace and development in the regions most affected by the armed-conflict in Colombia. I conclude by highlighting the advantages of collaborative governance over other types of governance as identified in empirical research in aspects as varied as: the positive results in promoting institutional change; the flexibility and adaptiveness of the scheme to manage complex, wicked issues and the possibilities to deliberate and negotiate over incommensurable values.

Immersed Engagement: A new approach to collaborative planning in Aotearoa - New Zealand

Thursday, 15th June - 10:15 - SD 203 - Oral Paper

Dr. Maria Rita De Jesus Dionisio McHugh¹, Prof. Simon Kingham¹

1. University of Canterbury

This paper aims to introduce the concept of immersed engagement in urban planning, a engagement technique used to support and enhance collaboration between different organisations and communities involved in processes of urban planning. The need for collaboration, cooperation, and co-creation in urban planning is becoming increasingly recognised in many countries including New Zealand. In recent decades, significant collaborative work has taken place between local government planning authorities and industry, research institutes and universities to engage local communities in broader decision-making processes. Collaboration can take many forms, from information exchange to consultation partnerships, and these often occurs in the urban planning process. However, current engagement and participation frameworks have limitations in integrating information, feedback, and advice from the public into the core of decision-making in urban planning. The concept of immersed engagement emerged in this context, and is aimed at promoting long-lasting, trustworthy and ongoing engagement between government and a range of stakeholders. This paper focuses on the concept of immersed engagement and the potential it offers to advance co-creation and shared decision-making, as an alternative to conventional participatory approaches used in urban planning. Additionally, this paper looks at how best to implement immersed engagement, and examines the benefits of this new engagement technique, through lessons drawn from two research projects in New Zealand. The paper concludes by discussing the implications of advancing this engagement technique in the international context of urban and collaborative planning.

Waste Management Governance in Colombia: the case of National Alliance for Inclusive Recycling

Thursday, 15th June - 10:30 - SD 203 - Oral Paper

Dr. Andrea Ventura¹, Dr. Celio Andrade¹

1. Federal University of Bahia

Waste management is considered to be one of the most important challenges that must be faced by the international sustainable development research community, and also by decision makers responsible for global environmental governance. In Latin American and the Caribbean (LAC) countries this is 4 million waste pickers earn their livelihood by being a part of the recyclables supply chain. Some countries, such as Brazil and Colombia, are adopting pioneering strategies to incorporate these professionals into their waste management models. In Colombia, a collaborative governance arrangement is being developed which involves the government, private companies, waste pickers and society: the Alianza Nacional para el Reciclaje Inclusivo (National Alliance for Inclusive Recycling). This model is obtaining good results not only with recycling, but also with social inclusion. The main purpose of this paper is to comprehend how distinct organizations could work together to build and develop a waste management model that truly includes the waste pickers. The current investigation is being accomplished using a case study research methodology, based on interviews and data analysis. Despite being an ongoing investigation, some initial findings have been determined: (i) the process to Alliance creation had a key stakeholder represented by IRR (Iniciativa Regional para el Reciclaje Inclusivo / Regional Initiative for Inclusive Recycling), that was also formed in a net governance process; (ii) the participation of CEMPRE (Compromiso Empresarial para el Reciclaje / Business Commitment for Recycling) was fundamental to guarantee the pickers empowerment; (iii) the Colombian government was open and receptive to help to design new structures to guarantee inclusiveness in the waste management process in the country; and (iv) there is a necessity for changes in the law and the creation of public policies to make the changes possible. The main conclusion is the necessity of powerful and engaged stakeholders in the governance process having a unified approach to making a difference, involving win-win decision making leading to achievable environmental, social and economic gains.

Key words: Waste Management Governance; National Alliance for Inclusive Recycling; LAC Countries.

The management effectiveness of the Mico-Leão-Dourado Mosaic (Mosaico Mico Leão Dourado). RJ/BR

Thursday, 15th June - 10:45 - SD 203 - Oral Paper

Ms. ANA CAROLINA MARQUES¹, Dr. Camila Rodrigues¹

1. UNIVERSIDADE FEDERAL RURAL DO RIO DE JANEIRO

The Protected Area Mosaics (Mosaicos de Áreas Protegidas, MAP) are formed when there are Protected Areas (PA) in close proximity to each other or overlapped in a same territory, even if they are managed by different governmental or private scopes. They aim to improve the management of PA through ecosystem connectivity and also through an integrated and efficient management of both material and human resources of those areas. MAP are managed by councils formed by governmental and civil society entities from the territory. This study refers to Mico-Leão-Dourado Mosaic (Mosaico Mico-Leão-Dourado, MMLD), which has an area of 209,000 hectares, along 8 municipalities. It is composed by 5 Federal, 1 state and 13 private PA, and it's entirely located in Rio de Janeiro state, in a region of coastal lowland. Once it is the Golden Lion Tamarin habitat, this Mosaic has been formed in order to strengthen the integrated management among PA, in such a way to improve the species preservation. Being an instrument of public politics, it is crucial that the efficiency of Mosaics is analyzed and that the principle of continuous improvement is followed. This work intended to analyze the efficiency of Mico-Leão-Dourado Mosaic management, and such analysis has been performed through a protocol designed to this end. This protocol is qualitative and quantitative, presenting 46 indicators divided into 4 scopes: Governance, Management, Sociodiversity and Biodiversity. Each counselor assigns each indicator a score from 0-3: 0 (non-occurrent), 1 (rarely occurs), 2 (usually occurs), and 3 (occurs a lot). The mean of each indicator is calculated and the T-Test is applied to verify the effectiveness of the indicator, taking into account those with a mean above 2. The number of effective indicators determines the scopes and mosaic effectiveness in a percentage, being 35% Not Effective, 36%-50% Low Effectiveness, 51%-75% Medium Effectiveness, and 76%-100% High Effectiveness. 39 indicators and 2 scopes were considered effective. From this 39 indicators, 19 presented low but effective means according to the T-Test. The two failed areas were Management and Sociodiversity. The indicators ranged from 76%-100%, but the scopes from 36%-50%, so, we have classified MMLD as a MAP with a Medium Effectiveness, which effective areas were Governance and Biodiversity, requiring greater attention to the Management and Sociodiversity of the territory. In order to do so, it is necessary for the Mosaic Management Council to pay more consideration to issues involving local populations, as well as to provide a better dissemination of the MMLD to them and integration with the public management bureaus that influence the territory. MAP are examples of collaborative governance of the territory, integrating the Government and civil society, so, its proper functioning is crucial for the sustainable development of the territory and protection of both local communities and biodiversity. The study shows how a truly integrated work between government and society, with divided responsibilities and decision power is essential to build scenery of efficient collaborative governance.

Collaborative governance and new challenges to forest agenda in Latin America

Thursday, 15th June - 11:00 - SD 203 - Oral Abstract

***Ms. Liviam Cordeiro-Beduschi*¹, *Dr. Evandro Mateus Moretto*²**

1. Institute of Energy and Environment (IEE) - University of Sao Paulo (PROCAM/USP), 2. Institute of Energy and Environment (IEE), School of Arts, Sciences and Humanities (EACH), University of São Paulo (USP)

In the last two decades, new forms of forest governance have been established based on the interaction of different social actors and their varying points of view on the use and conservation of native forests in Latin America. The objective of this paper is to present a discussion about the governance arrangements that support the promotion of the sustainable use of native forests and aim to solve collective problems related to the degradation, loss, and illegal exploitation of forest resources. The study has been carried out in two Latin American countries, where the responsible law enforcement agencies (such as the Native Forests Law in Chile and the Public Forest Management Law in Brazil) face these novel challenges. From the theoretical perspective, the study is based on the analysis of institutions and decision-making processes, guided by theories of sociology and environmental economics. As a method, an analytical framework was established that gathers the indicators of good governance of forests, the characteristics of the governance platforms and the scope of forest governance in each country. The sources for the analysis in this study included official documentation, field evidence as well as interviews with actors involved in the forest agenda at various levels (local, national, and international). The study demonstrates that there is no single model of forest governance, but rather that several governance platforms co-exist and respond in varying ways to the current problems, including the mitigation of climate change and maintenance of the economic value of the native forest. The diversity of governance platforms is also reflected in the collaborative capacity of actors involved in the development of legal rules for the use and management of native forests in Latin America.

Examining Citizen Power in Tanzania

Friday, 16th June - 09:00 - SD 716 - Oral Paper Rejected

Ms. Krystal Dixon¹

1. University of Florida

Upon independence, the government of Tanzania implemented various restrictive policies aimed at suppressing political organization among citizens. In a seemingly contradictory fashion, they also encouraged greater citizen participation at the village and local level and through service-driven organizations, recognizing the role civil society organizations play in meeting development objectives. The concept of citizen engagement and participation in governance as being developmentally valuable - specifically when aiming to increase accountability and responsiveness from public officials and improving the delivery and quality of public services - has been widely accepted among development researchers, practitioners, and organizations internationally. Over the last two decades, the political environment in Tanzania has opened up to allow community service organizations to collaborate with government officials on policy formulation, budgeting, and planning - at the local and central level. Therefore, Tanzanian citizens are in a more advantageous position than ever before to embark on the process of political empowerment through civic engagement and political participation. There is a need to understand what the process of citizen empowerment entails in Tanzania, and how that process is shaped by specific social, economic, and political contexts. This research argues that the prospects for increased citizen empowerment, referred to as the 'Citizen Power' framework, is made greater through an effective combination of three main concepts: citizen participation, social accountability practices/participatory governance, and good local governance. This research aims to identify the factors which facilitate or inhibit the acquisition of 'Citizen Power' in Tanzania. These factors are 1) Political Will, 2) Citizen Will, 3) Socio-economic and Demographic Characteristics, 4) Resources, 5) Institutional Capacity, 6) Administrative and Legal Framework, and 7) Third Party Support. The 'Citizen Power' framework was developed through an analysis of the theoretical literature concerning concepts of citizenship, civic engagement and participation, social accountability, participatory democracy, institutional performance, and local governance. In addition, the concepts were contextualized through an analysis of data presented by Afro Barometer in 2014/2015. Sixteen case studies were also selected after a thorough review of empirical literature and were chosen because they provide in-depth information on specific participatory projects and programs in Tanzania and the conditions that caused them to be successful or limited their success. The seven stated factors were identified through the review of the empirical literature. The findings from the review of the empirical literature and 2014/15 data from Afro-barometer revealed that lack of citizen participation, low trust of public officials, lack of political will at various levels of governance, and lack of 'Citizen Will' are major constraints to the effectiveness of collaborative initiatives, and therefore citizen empowerment. The research concludes that policies and programs implemented in Tanzania should seek to address the citizen-state relationship and foster positive attitudes towards collaborative governance. This should include the objectives of strengthening social capital, particularly trust, between CSOs and the state. Too little focus has been placed on exploring *Citizen Will* empirical studies, and understanding the complexities in citizens' disinterest and their decisions to disengage, or limit their engagement in local and political matters in Tanzania.

Toward Inclusive and Collaborative Climate Change Governance at the Municipal Level in Costa Rica

Friday, 16th June - 08:00 - SD 203 - Oral Paper

***Dr. Sergio A. Molina-Murillo*¹, *Ms. Vanessa Valerio-Hernández*², *Ms. Sonia Arguedas-Quirós*², *Ms. Alina Aguilar-Arguedas*²**

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In 2007 Costa Rica was the first country committing to become carbon neutral. Two years later it developed its National Strategy for Climate Change and has since generated significant efforts aimed to governmental institutions and the private sector; however, advancements at the local level remain scarce, fragmented and poorly supported, particularly limited by the technical and organizational capacity that local governments have in leading mitigation and adaptation strategies within their territories. Since climate change is a multi-level, multi-sector and multi-term challenge, it asks for a different public governance style, with a higher commitment with civil society and the private sector, and with enhanced human capacities for the collective action. Supported by a research and extension project since 2011, several municipalities have been engaging in the development of collaborative and more inclusive climate change strategies within their territories in tune with local businesses, institutions, and civil society. The main purpose of this project is to support and document the process taken by our different case municipalities in developing and implementing their local strategies, and thus, supporting other local governments in developing their own. For this, the research team has been following a participatory action research approach with three local governments over several years, and during 2016 a structured survey was also conducted to the 81 municipalities of the country regarding the incorporation of the climate change topic into their municipal governance. General results are presented with an analysis of the perceptions from the nation-wide survey; then, with the help of the three cases studied, we explain the process taken in the adoption of such strategies and the challenges emerged. We found that in spite of the existing concern about the climate issue, appropriate mechanisms and information are lacking to enable its more efficient adoption in local governance. Therefore, we conclude that in order to adequately address the issue of climate change in an inclusive and sustainable manner, local governments are required to develop both internal and external capacities—beyond good administrative management—to allow a collaborative interaction with the actors involved, in order to generate and maintain their recognition, involvement, and commitment. It is evident that this project supports an alternative collaborative governance model, through the enhancement of individual and social local capacities leading to a more systemic commitment for collective climate action. This action requires transcending voluntary and isolated initiatives, leading the way to planned, and politically supported mitigation and adaptation strategies for inclusive development.

Understanding Governance of Natural Protected Areas Through Social Network Analysis in The National Natural Park Amacayacu, Amazonas Colombia

Friday, 16th June - 08:15 - SD 203 - Oral Abstract

***Mr. Orlando Vargas*¹, *Prof. Masahide Horita*¹, *Ms. María J. Novoa Alvarez*²**

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Colombia has 59 National Parks that represent 11.27% of the continental land. These protected areas are managed by National Parks of Colombia (NPOC), which has the main responsibility of not only to conserve the natural resources of the protected areas, but also to protect the traditional cultures that live inside or surrounding the protected areas, as well as to contribute to their sustainable development. NPOC coordinates with other governmental institutions from local, regional, and national level that have a relation in their territories with protected areas. In this way, NPOC promotes development, and environmental conservation policies, articulated with national, regional, and municipal development plans. However, managing protected areas and its surrounding areas often generates conflicts among institutions since interests and objectives of each institution might be contradictory.

The research focused on the National Natural Park Amacayacu (NNPA) located in the south Colombian amazon, between the jurisdictions of Leticia and Puerto-Nariño. This national park is interesting, since it has overlaps with four indigenous territories from different ethnicities, which have formulated or are in process to formulate their own management plans for their territories. The NNPA administration has developed a Co-Management (CM) strategy for including communities as active subjects of the conservation; strategy that recognizes indigenous traditional use and management of their territories.

Different studies have analyzed this CM process using qualitative analysis, however, none of this research has used a quantitative approach that identifies the structural properties of the CM of the NNPA. This research uses a social network analysis for describing the current network governance structures of the NNPA and establishes three networks that show the sharing and collaboration processes between institutions and indigenous communities. In addition, this research uses quantitative analysis in each identified network for identifying underlying properties of the networks structures and the institutions related to it.

To get the relational data necessary for the social network analysis, 27 interviews were done to institutions related to the NNPA, among which six were to indigenous communities having overlaps or surrounding the NNPA. Three networks related to knowledge, resources and cooperation were identified and analyzed, using the software Pajek. The analysis was carried out in two different levels related to CM. First, at network level to understand overall characteristics of the network, and second, at agent level to understand positions of institutions in the network. In addition, an Exponential Random Graph model was done for understanding the creation of connections among institutions and indigenous communities.

The networks exposed the institutional complexity related to the CM of the NNPA. Each network revealed its own particularities and provided valuable information for identifying structural and agent characteristics. In addition, the analysis revealed that the CM of the NNPA has strengths in the actual collaboration process between indigenous communities with overlaps and the management of the NNPA. In contrast, the analysis also showed some lacks in the governance of the NNPA surrounding areas, since indigenous communities that do not have overlaps with the NNPA are not engaging with resources or knowledge about conservation.

Adopting a place-based approach: community waterway adoption as an iterative approach to the collaborative governance of inland waterways

Friday, 16th June - 08:30 - SD 203 - Oral Abstract

Dr. Alex Franklin¹

1. Coventry University

This paper examines the role of community 'adoption' initiatives as a means to stimulating and sustaining local engagement in the multi-level governance of natural resources. Guided by a critical review of the meaning of community resource adoption in both a public resource setting, and neoliberalist governing context, particular attention is given to the process of learning to govern and care for natural resources as place-specific community assets. The paper takes as its empirical focus the case of inland waterways in England and Wales. It considers how the recent launch of community adoption schemes by the managing authority (the Canal & River Trust) impacts upon and serves to shape the collaborative governance of a national public resource. This includes facilitating the practices of repeat place-based volunteering and inclusive decision-making that community adoptions seemingly have the potential to motivate. However, it also requires sensitivity towards the feelings of local ownership that such initiatives can stimulate, as well as co-ordination of the shared, and on occasion 'bounded', practices of care upon which they depend. The paper reports findings from semi-structured interviews and focus groups undertaken with relevant Trust employees and with a sample of community adoptees. The research suggests that the localized, place-based and participatory nature of waterway adoptions present both challenges and opportunities to existing forms of resource management. Conclusions are drawn on the contribution of adoption schemes to enabling a shared sense of ownership and authority to take root at a local level, but also the challenge of learning to accommodate specifically place-based forms of community interest within the collaborative governance of national environmental resources.

Key words: Governance; community; water; shared practice; adoption

Transcending Hydro-Social Boundaries: The Use of System Thinking Boundary Objects Toward Improved Collaborative Governance in The La Plata River Basin

Friday, 16th June - 08:45 - SD 203 - Oral Abstract

***Mr. Jason Walters*¹, *Ms. Erin Kenzie*², *Mr. Alexander Metzger*³, *Mr. Jesse Baltutis*⁴, *Ms. Kakali Chakrabarti*⁵, *Ms. Shana Hirsch*¹, *Ms. Bethany Laursen*⁶**

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Transboundary collaborations related to international freshwater resources play an integral role in society, as they establish frameworks for shared access to our planet's most fundamental resources. Maps, diagrams, and other constructed visual elements, functioning as boundary objects, are used in transboundary collaboration documents to convey understandings and facilitate discussion across scales about challenges and opportunities from multiple perspectives. Such focal points for discussion are valuable in creating shared, socially-negotiated priorities and integrating diverse and often disparate cultural perspectives that naturally exist in transboundary water resource contexts. They can also promote alignment of mental models related to complex hydro-social cycles and encourage non-linear systems thinking in decision-making, which has been suggested as more appropriate for tackling complex wicked socio-ecological problems in a variety of fields, such as political ecology, engineering, and natural resource management. The La Plata River Basin is a unique case for multi-scale collaboration among the represented states of Argentina, Bolivia, Brazil, Paraguay, and Uruguay, as the socio-economic, political, and biophysical landscapes represent interdependencies at all levels within the over three million square kilometer area. Although early agreements related to water use and governance in the Basin began to be developed over a century ago, the 1969 La Plata Treaty ultimately created the current framework, which is unlike that of other large international transboundary river basins. Instead of a highly centralized management body that may be heavily influenced by upstream or more hegemonic states, the 1969 Treaty established mechanisms for additional bi-lateral and multi-lateral treaties at the regional level within the Basin, and included objectives now recognized in international law, such as reasonable and equitable use, environmental protection, and socio-economic development. Despite the ubiquitous presence of systems thinking boundary objects (STBOs) in transboundary water collaboration documents and their potential for improving decision-making and stakeholder inclusion in development, scientific understanding of their use in this context is limited. In order to address this gap, the specific focus of this research is to identify visual STBOs and how they are being used in transboundary river documents at multiple scales toward inclusive collaboration, conflict resolution, discussion, and understanding across disciplinary, social, cultural, and organizational boundaries within the La Plata Basin. Over 1000 documents were reviewed on the websites of the primary national, bi-national, and multi-national entities formally involved in La Plata River Basin and Sub-Basin collaborations in order to identify 100 data visuals that richly represented hydro-social cycles for further analysis. A mixed-methods approach was developed from the peer-reviewed field literature and applied to analyze the visuals based on the strength of representation of elements of systems thinking and boundary objects, as well as contextual use in the documents. Initial results indicate a range from weak to strong for both systems thinking and boundary object elements and the analyses are currently ongoing.

Keywords: Water Governance, Boundary Objects, Systems Thinking, Mental Models, Collaboration

Governing through a Database

Friday, 16th June - 09:00 - SD 203 - Oral Paper Rejected

***Ms. Josefin Borg*¹, *Dr. Henrikke Baumann*¹, *Dr. Cecilia Gabrielii*¹, *Dr. Hannes von Knorring*²**

1. Chalmers University of Technology, 2. University of Gothenburg

Within the Swedish shipping industry, a collaborative initiative for increased energy efficiency is being established; *Sweship Energy*. It aims to overcome an energy efficiency gap by enabling knowledge sharing between both different actors and different communities of practice. Within the initiative, different activities are being executed; including a network for energy managers, education focusing on onboard personnel, and a database project. Through a PhD project, we study the organization of the initiative, aiming for a better understanding of inter-organizational collaborations for transition towards sustainable development. In the project, we have a qualitative approach. We use empirically grounded, ethnographic methods. The data is collected through observations, interviews and documents. In this paper, we explore the database project's role within the initiative during the earliest establishment phase of the initiative. It was the first project that was initiated when the collaboration was first established. For decades, objects have been included in research aiming to explain collaborations, and have with time gained an increasingly central role in the literature. Much of recent literature apply the concept of *boundary objects*. Boundary objects could be described as objects which form boundaries between different communities of practice in shared spaces. In the literature, databases are examples of boundary objects previously studied. In *Sweship Energy's* database project, the actors involved translated the database project differently; as a project developing a database for decision support for companies, a pedagogic tool at the initiative's workshops, a tool mapping the industry's total energy saving efforts, or a tool for central support from the initiative's secretariat to its members. These translations also changed throughout the project. Despite the lack of a common understanding of what the database meant, all actors involved agreed on a database to be developed. During the database project, several challenges were experienced, and the project's outcome did not meet all expectations. Whether the database project was a failure or a success could be discussed, and depends on what definition of failures being applied. Based on a market definition, a technically functioning database was not created, even though parts of the project's outcome are still being used in other forms. From a social context, several key actors considered the project to be a failure. However, if the aim of the database project was not to create a technical object but rather to contribute to the establishment of a collaboration, then it could be argued that it might have been at least partly a success; as a project, the database project resulted in additional actors becoming involved in *Sweship Energy*.

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ADVANCES IN SUSTAINABLE DEVELOPMENT RESEARCH



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Capacity to associate, subjective wellbeing and perceptions of insecurity: three key variables to understand sustainability in conflictive rural Colombia.

Wednesday, 14th June - 11:30 - SD 701 - Oral Paper

Dr. Eduardo Wills¹, Ms. María Alejandra Rodríguez Duarte¹

1. Universidad de los Andes

Abstract Sustainability is a multidimensional concept that includes environmental, social, economic and cultural dimensions. We propose in this study that the concept of sustainability is closely related to the quality of life of a community. Under this view, the economic, social and environmental systems that support the community should provide a healthy, meaningful and productive life for all the actual and future members of that community. Some of the basic issues that must be considered in relation to quality of life as sustainability include security, the quality of social relationships (social capital) and satisfaction with life as a whole. In this study, we approach the dimension of security as perceptions of insecurity, an individual variable that processes social conflict and violent environments in the minds and emotions of individuals and communities. We also approach social capital as the capacity to associate, trust, reciprocity and belonging to social networks. The relationship between these variables is explored in a rural context that has been affected by a prolonged social conflict and whose intensity has substantially decreased in the last years. We explore the relations of perceptions of quality of life and social capital at different levels, using the second phase of a survey from 1680 rural producers in Colombia. The main findings of the empirical analysis show a positive relation of social capital on sustainability measured as perceptions of wellbeing. At the same time, perceptions of insecurity have a negative effect on both sustainability and social capital. We found regional differences in the measurements of these variables. These results allow policy-makers to strengthen rural sustainability programs and encourage effective processes of post-conflict development.

Protected Areas under Weak Institutions: Evidence from Colombia

Wednesday, 14th June - 11:45 - SD 701 - Oral Paper

*Dr. Leonardo Bonilla Mejia*¹, *Mr. Iván Higuera-Mendieta*¹

1. Banco de la República

This paper assesses the effects of protected areas in Colombia using high-resolution forest loss imagery for the period 2001-2012. We combine two empirical strategies to identify causal effects: Regression discontinuity for protected areas created before 2001 (long-term effects) and difference-in-differences for areas create after 2001 (short-term effects). Results indicate that both natural protected areas (national and regional) and collective lands (Indigenous Reserves and Afro-Colombian lands) have significantly contributed to reducing forest loss. While the short-term effects tend to be larger in remote areas, in the long-term protected areas perform consistently better in densely populated areas and near roads. Given the predominance of illicit activities such as coca crops and gold mining in remote areas, we interpret our findings as suggestive evidence that protected areas are more effective when authorities are able to uphold the rule of law. Keywords:~Protected areas, deforestation, regression discontinuity, Colombia\\

SUSTAINABLE DEVELOPMENT AND STABILITY IN POWER SHARING: THE NORTHERN IRELAND CASE

Wednesday, 14th June - 12:00 - SD 701 - Oral Abstract

***Prof. Paul Walsh*¹, *Prof. John Coakley*²**

1. University College Dublin, 2. Queens University Belfast and University College Dublin

As the year 2017 began, a political crisis in Northern Ireland caused the collapse of the power-sharing administration for which provision had been made in the Belfast Agreement of 1998, and which had been in office for a decade. Previous crises in the power-sharing administration had been sparked by the very issues that the Belfast agreement had been designed to resolve, such as conflict over ethnic symbols, disagreement over the administration of the justice system and disputes over the process of paramilitary disarmament. What is striking about the new crisis is that the central issue was not one that obviously separated the two communities (the Protestant or unionist community, about 50% of the population, and the Catholic or nationalist community, about 45%). It concerned instead the administration of a renewable energy heating scheme, a so-called “cash for ash” arrangement by which participants in the scheme agreed to introduce wood pellet-fired heating systems in return for a subsidy that in effect paid 160% of fuel costs. The irony that the government collapsed over a sustainable energy scheme that apparently cut across the interests of the two communities raises important questions about the tension between sustainable development and the pursuit of settlement in post-conflict societies. Our object in this paper is to explore this tension further in the context of the UN’s Sustainable Development Goal 16, which focuses on “the promotion of peaceful and inclusive societies for sustainable development, the provision of access to justice for all, and building effective, accountable institutions at all levels”. More specifically, certain of the targets associated with this goal have particular relevance here: the reduction of corruption and bribery, the development of effective, accountable and transparent institutions, the encouragement of responsive, inclusive, participatory and representative decision-making, and the promotion and enforcement of non-discriminatory laws and policies for sustainable development. These targets have obvious relevance for a wide range of societies that face the challenge of development, but are particularly important in ethnically divided societies, where one group has typically enjoyed a position of socio-economic, cultural and political dominance, with all the implication this has for corrupt behaviour, absence of transparency, minority exclusion from decision making, and discriminatory practices. It was precisely the monopoly enjoyed by one community in Northern Ireland in these respects that sparked the conflict in Northern Ireland; and the Belfast agreement in 1998 was an effort to rectify this. In this paper we trace the subsequent tensions that indicated imperfect acceptance of these principles, and we assess the continuing salience of Sustainable Development Goal 16 for Northern Ireland’s future evolution. In particular the ability of the power sharing arrangement to introduce policy that induces the necessary economic, social and political transitions needed to achieve a sustainable, inclusive and prosperous society in Northern Ireland. ~

Environmental peace building, deforestation and the peace accord with FARC.

Wednesday, 14th June - 12:15 - SD 701 - Oral Abstract

*Mr. Miguel Alberto Londoño Gómez*¹

1. Universidad de los Andes

This paper proposes a political analysis and a proposal to monitor the impacts of the implementation of the peace process on sectoral policies relevant to forests and the economic activities of the local population. The two key questions are: ¿how will the Havana peace process and the implementation of the agreements affect the sectoral policies relevant to the forests and economic activities of the local population in Colombia? ¿how can the impacts be monitored? This issue arises in a context of the beginning of the implementation of the peace agreements with the FARC, which tangentially and timidly approach environmental sustainability as a transversal criteria. The fundamental issue at hand here is what type of development is sustainable and viable in post-agreement in a country with the high relevance and environmental fragility of Colombia, accentuated in areas where the conflict has historically developed with greater intensity -90% of municipalities with priority in the post-agreement have some form of protection or regulation of their use, some with up to 100% of their area under these figures-. These involves restrictions on the type of economic activities that can be developed, and how they can be done. In addition, it is no secret that ecosystems have been war theaters of this conflict: coca crops, illegal mining, deforestation, potrerización, oil spills. The forest situation is particularly worrying not only because they are strategic ecosystems for climate and water regulation, but because there is an obvious, direct and close relationship between conflict and deforestation. The implementation of peace agreements with FARC entails, rather than juicy environmental dividends, enormous risks and complexities at the environmental level that may even render the peace accord unfeasible. Through a critical review of the environmental provisions contained in the agreements and the dynamics of deforestation in Colombia, it is evident that environmental sustainability is not an accessory, but rather a vital and a strategic aspect for the construction of a durable and sustainable peace. While it is not possible to predict what the impact on the environment and deforestation will be in the post-conflict situation, the enormous risks and complexities are made evident. Consequently, a proposal for a socio-economic monitoring mechanism is laid out, based on the identification of thirty-two (32) plans, programs, policies and strategies relevant to forests, to be carried out by empowered social groups as an exercise of social control that enriches implementation. It is demonstrated that the implementation of the agreements can have multiple and significant impacts on forests and deforestation, and that losing sight of and diminishing the priority of environmental criteria during implementation, can make at least the Integral Rural Reform agreement non-viable, among others. The paper proposes a simple and plausible monitoring system with four indicators initially along with a regional understanding of the drivers of deforestation, so that relevant information is collected by three groups of civil society actors that are already empowered and actually already have an intense environmental agenda for a post-agreement scenario.

Strategies of Successful Anti-Dam-Movements: Evidence from Myanmar and Thailand

Wednesday, 14th June - 11:30 - SD 702 - Oral Abstract

*Dr. Julian Kirchherr*¹

1. *Utre*

Scholars rarely examine anti-dam-movements that result in project suspensions or cancellations since these cases are extremely rare empirically. Yet these movements are central to understand how anti-dam-movements can succeed. This paper analyzes the movements against Myanmar's Myitsone Dam and Thailand's Kaeng Suea Ten Dam, likely the most successful anti-dam-movements in Southeast Asia in recent years achieving suspension over five years and 36 years, respectively. The research is based on 60 semi-structured interviews carried out over a period of eight months (mostly with the various constituents of the respective movements). Leveraging thinking both from the constructionist and structural school within the field of social movement studies, it is found that the framing of the Myitsone Dam as a project threatening the national cultural heritage of Myanmar (in combination with political change in the country in 2010/2011) largely explains the movement's success. Meanwhile, the set of sophisticated tactics (including inter alia demonstrations, *\emph{Thai Baan}*research,24/7-monitoring of the dam site, spiritual activities) was decisive for the anti-Kaeng Suea Ten movement's efficacy. Insights from this research can help anti-dam-movements around the world to enhance their chances of success.\\Keywords: Social movements;~protests; large dams; Myanmar; Thailand\\

Oil palm production and socio-environmental impacts on indigenous lands in the Brazilian Amazon

Wednesday, 14th June - 11:45 - SD 702 - Oral Abstract

***Ms. Sandra Damiani*¹, *Prof. Carlos José Sousa Passos*², *Prof. Sílvia Maria Ferreira Guimarães*³**

1. Centre for Sustainable Development, University of Brasilia, 2. Faculty UnB at Planaltina, University of Brasilia, 3. Social Science Institute, University of Brasilia

The expansion of oil palm crops in the Brazilian Amazon over the last decade seems to be negatively affecting indigenous populations that claim to have been suffering a range of social and ecological problems, resulting from land-use changes and intensive pesticide use around their lands. The State of Pará is the largest Brazilian palm (*Elaeis guineensis*) producer, and since 2010 it has tripled its plantation area, recently reaching 167 thousand hectares. According to the agro-ecologic zoning for this palm, the plantations can occupy 31.8 million hectares of areas of supposed degraded land in Brazil. We currently seek to comprehend, from an indigenous perspective, which social and environmental changes occurred since the palm crop establishment around an indigenous land. We analysed how this form of land-use by a neighbouring local oil palm company has been transforming their territories, and possibly affecting their livelihoods and well-being, by disturbing the natural resources they rely on (e.g., freshwater availability and quality, biodiversity, hunting areas, among others). We aim at analysing water and sediments of small streams for pesticide contamination, and mapping land use changes around an indigenous territory. Our research is focused on the Turé-Mariquita Indigenous Land, located in North-eastern Pará, in the heart of an oil palm production area in the Eastern Brazilian Amazon. With a joint anthropological and ecotoxicological approach, we have conducted participative observation, remote sensing and lab agrochemical determination. Field data show that changes affecting the Tembé people have been perceived throughout distinct phases of the plantations' set up, from the initial stage that comprises land conversion, all the way to the land clearing and plantation itself, and during the growing stages as well. While the immediate problems they describe are related to deforestation of secondary forest, streams' degradation, hunting areas restriction, loss of game species, intensive use of pesticides and health complaints, during the plant growing stage over six years of plantation new impacts were perceived and considered relevant by the indigenous community, along with the ones previously identified, such as climate change at a local scale and proliferation of snakes and insects. Our findings suggest that changes in previous land-use to oil palm monoculture are negatively affecting the Tembé People's livelihoods, and shed light on the need for public policies to adopt more restrict standards of sustainability on agro-industrial plantations close to indigenous communities. In the context of this ongoing study, further inquiries are underway that will allow us to understand this issue better.

Acknowledgments: We are grateful to the field work support graciously provided by colleagues from the Fundação Nacional do Índio (Indigenous National Foundation, Brazil) and from the Evandro Chagas Institute (Health Surveillance Department, Ministry of Health, Brazil). This work has been financially supported by the Brazilian Funding Agencies CAPES and CNPq.

Keywords: sustainability, indigenous land, oil palm, social-environmental impacts, pesticides, deforestation, water degradation

Sustainable renewable energy: towards the energy autonomy of rural communities in developing countries

Wednesday, 14th June - 12:00 - SD 702 - Oral Abstract

***Dr. Catalina Silva-Plata*¹, *Mr. Russell Pepper*¹, *Dr. Brian Garvey*¹, *Prof. Mike Danson*², *Dr. Paul Tuohy*¹, *Prof. Paul Stewart*¹**

1. University of Strathclyde, 2. Herriot-Watt University

Agrarian reform and Quilombola settlements in Brazil are those that have successfully occupied and won the right to work the land on which they now live. Geographic isolation and their 'invisibility' in public decision making, investment schemes and strongly centralised energy infrastructure projects means many are remote from the electricity grid. ~This is an experience of many rural communities where families burn wood for water heating and cooking, putting pressure on scarce resources, or rely on expensive and polluting petrol/diesel generators.~ These have implications for local health and indeed many families cannot afford to use these sources and go without.~ This puts stress on communities reliant on small scale agriculture for their socio-economic reproduction; pumping water for crop irrigation without electricity is impossible, leading to low yields and income.~ There is an interest among these settlements in producing or accessing alternative forms of energy that are more affordable and that can be sourced from locally available natural resources in order to improve energy security and, in turn, improve their own productive capacity. Decentralised renewable energy production has the potential to contribute to addressing significant socio-environmental challenges facing agrarian reform and Quilombola settlements.~ The successful planning and implementation of such projects must take account of social, cultural, environmental and economic dynamics locally.~ This process requires a decentralised, democratised method of knowledge production that transgresses traditional academic, techno-scientific boundaries, is attentive to power differentials between the various actors involved and engages communities in democratising the planning, decision making and implementation of new energy technologies.~ This multidisciplinary research builds upon effective engagement with Brazilian partners over a three-year period to innovate and integrate local assessment for new energy forms.~ It aims to combine the assessment of energy demand and renewable energy potential, the study of environmental feasibility for introduced technologies and creative engagement to: i) Assess potential local sources and sites for renewable energy production; ii) Identify challenges regarding the quality, utilisation, governance of, and access to, local natural resources for renewable energy; iii) Create strategies for renewable energy generation, work and economic benefit from this potential. iv) Produce a new toolkit for integrated assessment of rural and urban spaces for renewable energy towards the standardised, locally engaged approach to installing and governing these projects.~ The pilot research undertaken thus far has involved trialling 40 questionnaires, nine focus groups and four interviews with community leaders to gain a clear picture of three rural communities in Brazil. Initial results show that these communities have challenges regarding water, energy and organisational structure as well as support at governmental level. ~An aspiration towards renewable energy reflects aspirations of social and economic autonomy of the settlements. ~A lack of previous information on the possible technologies and the costs of purchase, however, are among factors prohibiting take up at this stage.~ Furthermore, immediate concerns over water availability and quality across the settlements and the impact on produce outlines the importance of addressing energy challenges alongside community priorities. \textbf{Keywords:}renewable energy, rural communities, sustainability, energy autonomy, agrarian reform

Collective property leads to household investments: Lessons from land titling in afro-colombian communities

Wednesday, 14th June - 12:15 - SD 702 - Oral Abstract

***Dr. Ximena Peña Parga*¹, *Dr. María Alejandra Vélez*¹, *Dr. Juan Cardenas*¹, *Ms. Natalia Perdomo Londoño*², *Mr. Camilo Andres Matajira Gaitan*¹**

1. Universidad de los Andes, 2. Prosperidad Social

In the developing world, after decades of strong rejection, collective land titling has become an important tool for recognizing the historical presence of ethnic communities and safeguarding their rights to occupy and manage their territories. However, little is known about the average impact of these titling processes on the well-being of these communities. In this paper we attempt to estimate the impact of collective land titling in territories inhabited by Afro-descendent communities in Colombia. We compare rural districts in titled areas with rural districts in untitled areas that are similar in all the relevant observable characteristics. We find that the collective titling process in the Chocó region has caused an increase in average household per capita income, a decrease in extreme poverty, larger investments in housing, higher attendance rates among children in primary education, and a decrease in housing overcrowding. Our results suggest that collective land titling creates a more secure natural resource base and a longer time horizon for households in collective territories, which leads to investment in their private physical and human capital.

Building bridges between human cognitive biases and IT-based models in complex decision making contexts with the help of systemic structural constellations in production environments

Wednesday, 14th June - 11:30 - SD 703 - Oral Abstract

Prof. Marlen Arnold¹

1. Technische Universität Chemnitz

Currently, sustainability science is mainly based on conscious information and strongly focused on analytical tools or strategies. Thus, tools, concepts or strategies around sustainability are limited to mainly rational approaches as well as limited in success broadly. Lozano (2015) stresses the need for changes in mental models, behaviour and activities and, thus, rethinking traditional ways and perspectives of discussing and integrating sustainability challenges. Moreover, nowadays, many disciplinary questions cannot be answered or dealt with anymore in a disciplinary context. Many disciplinary questions and challenges become and are interdisciplinary challenges in many ways. So, the increasing complexity and digitalisation in production environments often causes problems in the interaction of cognitive machines and human as well as in the way of handling outcomes of advanced analytics, models and simulations in order to optimise sustainable production processes. This can be caused by cognitive biases – either in decision-making processes or in the assumption and programming structure of simulations and big data analytics – and results in increased production-related costs and reduced sustainability effects. However, unconscious thought theory (Dijksterhuis & Nordgren, 2006) stresses particular advantages of both types of thinking. Nordgren et al. (2011) proofed the combination of both modes of thinking, conscious and unconscious thinking, in complex contexts and decision-taking situations as best. The authors emphasize that unconscious thinking can aggregate plentiful characteristics better than conscious thinking, whereas letter mode avoids rule-violating options better. The new method systemic structural constellations “provide powerful and creative ways to clarifying and resolving complex, possibly intractable issues associated with organisations” (Wade, 2004: 194), systems or social actors. The core idea is that particular foci of complex systems, such as production system, can be represented and simulated through spatial arrangements or physical layout of persons or symbols. It has been shown that these arrangements can be used for manifold issues to reveal so far unknown impact factors and revealed cause-and-effect relationships (Kopp, 2013). So, the guiding research question is “*How can the use of systemic structural constellations improve modelling and IT-based decision-making processes in highly complex and digitalized production environments in order to increase sustainability?*” Based on two constellations workshops with production and logistics managers from industrial practice of steel production, automotive production and machining industry as well as students, the research work shall provide insights concerning: (1) how systemic structural constellations are an appropriate methodology to build bridges between unconscious and conscious knowledge and (2) content-based development for the design of future IT systems and data visualizations. Latter addresses the question how to manage growing complexity and the challenges of digitalisation considering human cognitive biases affecting decision making in production environments in order to secure sustainability effects and the impacts of simulation outcome. Systemic structural constellations open up a new perspective on how to overcome challenges of production systems and make use of the advantages of digitalisation by accepting and managing human biases in a complex environment.

ACCOUNTING FOR SUSTAINABILITY: WHAT NEXT? A RESEARCH AGENDA

Wednesday, 14th June - 11:45 - SD 703 - Oral Paper

***Prof. Gary Cunningham*¹, *Prof. Arne Fagerström*¹, *Prof. Lars Hassel*²**

1. University of Gävle, 2. Umeå University

Abstract: This working paper responds to increasing calls for more and different forms of accounting research involvement in accounting for sustainability. It provides background, clarifies the accounting research issues, and suggests research methods. Background analysis indicates that accounting for sustainability must go beyond supplemental reporting of ecological and social information to include such emerging issues as integrated reporting of sustainability information along with financial reporting. Additional emerging issues are needs of users of sustainability reports, auditing and other assurance of sustainability information, and sustainability implications of financial failure, accounting and auditing failures, and lack of enforcement. Analysis of integrated reporting against traditional financial accounting theory concepts of the purpose of financial reporting and the postulates of going concern, reporting entity, monetary unit, and time period, indicates a need for substantial changes in the traditional financial accounting model if sustainability issues are to be integrated. The agenda concludes with five research issues and methods: - An accounting research framework for sustainability using general systems theory approaches that have been useful for similar emerging issues. - Reporting of sustainability information which has been the focus of most research to date, and the emerging important topic of integrated reporting. - Users of sustainable information, their uses and perceived needs, an area that has been largely neglected in research to date. - Auditing and assurance issues that are taking on greater importance as more users demand assurance for sustainability information. Issues include standards to be used and users' expectations and reactions. - Financial distress and sustainability consequences of accounting and enforcement failures that are just now being recognized as sustainability issues. **Keywords:** accounting for sustainability, integrated reporting, needs of users, audit, assurance

Taller, fatter, older and hungrier: a study of world population, human mass and caloric intake over the past 40 years

Wednesday, 14th June - 12:00 - SD 703 - Oral Abstract

***Mr. Felipe Vásquez*¹, *Mr. Gibran Vita*², *Prof. Daniel Müller*¹**

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Population growth is a major driver for environmental change. Yet, population change has remained as an exogenous variable in most sustainability assessments and methods, playing only a multiplicative function. This is the case of, for instance, the IPAT identity which has governed our understanding of environmental impact for the last 50 years (Chertow, 2000), and where impact (I) is the product of population (P), affluence (A), and technology (T) - $I=PAT$. In this sense, we argue that it is not only the number of individuals that drives the impact and consumption, but also their constantly evolving biological, physical and demographic characteristics. Evidence of this evolution are the worldwide increase in height and weight (Finucane et al., 2011; NCD Risk Factor Collaboration, 2016), and the changes in sex and age structure of societies (Lutz et al, 2014) over the past century. In this paper, we investigate the evolution of the qualities of the human population in terms of changes in human mass and calculate the implications for food-energy requirements over the past 40 years (1975-2014). This study covers the adult population of 186 countries and uses sex disaggregated data on height, for 100 birth cohorts, coupled with annual average body mass index. Theoretical total energy expenditure -the food-energy required to sustain a human- was calculated as a function of weight, age, sex, and physical activity level, following the FAO and WHO guidelines. We found that while the world population increased by a factor of 2.16, the total human mass and the total theoretical food energy expenditure increased by 2.46 and 2.29 respectively. The net increase in mass is explained by a 14% increment in the average weight and a 1.3% increase in average height, resulting in a 6.1% increase of the energy requirements per capita. These numbers indicate a path dependent, positive feedback, where increased food energy intake has allowed for heavier bodies that in turn demand increasingly more calories per person. The total food-energy grew less than the total mass due to a shift in the average age of adults, from of 39.7 to 42.2 years. A person with a constant weight would demand less food energy towards the end of his life. While all countries have increased their average weight, the change ranges between 6% and 33%. Some of largest changes (above 25%) are observed in Mexico, Malaysia and South Korea, while the smallest ones (below 10%) occurred in Japan, North Korea and Zimbabwe, to mention few examples. The phenomena of an increasing human mass and size has broader implications for resource-use beyond food. Other energy and material implications are foreseen in mobility, shelter, furniture, clothing and waste management, e.g. larger living spaces and vehicles. Consequently, the results are discussed in the light of the dynamic qualities of populations as key factors for understanding the anthropocene, particularly in the context of the sustainable development goals 2, 11 and 13 in relation to food security, resource efficiency and climate change.\\ keywords: human mass, population growth, food security, stock dynamics

The Region and Sustainable Development

Wednesday, 14th June - 12:15 - SD 703 - Oral Abstract

Mr. Gustavo Nicolas Paez Salamanca¹

1. University of Cambridge

Sustainable Development is a relatively new academic discipline that aims to understand how human societies interact with the environmental structures. Whereas this topic is fundamental and can be approached from multiple disciplines, it has been quite challenging to define a unit of study that describes the scientific interest in the dynamics between the social and environmental systems. Hence, the purpose of this paper is to promote the concept of “region” as the most appropriate unit of study for the Sustainable Development Science. In the beginning, this word was coined to identify a space. However, given the influence of System’s Theory, many geographers, such as Vallega, modified the concept of region as the interaction of social and environmental systems that take place in a given space and that are in constant interaction among themselves and with other regions. This concept provides two important elements for the development of a Sustainable Development Science: 1) it provides a unit of analysis that shares the same elements as the new science, and 2) it supplies a set of tools from System’s Theory that enhances the research on this area. In order to prove the usefulness of this concept, this paper summarizes a series of seminal cases of study and highlight in each one of them how the concept of the region helps the researcher to have a better understanding of the development problem and which are the properties of a region, based on the System’s Theory approach, that can help understand it in an integral way. In particular, this paper analyses and illustrates six basic properties of a region: 1) bimodularity (the existence of social and environmental systems that are in constant interaction), 2) openness (the fact that a region is not a close unit of analysis but it is in constant interaction with other regions creating horizontal and vertical structures), 3) objectiveness (regions shape themselves around explicit or implicit objectives), 4) evolution (regions are constantly changing based on the interactions among themselves), 5) system dynamics (due to its spatio-temporal behaviour, understanding the time dynamics are fundamental in the concept of sustainability and evolution of a region), and 6) emergence and self-organization (as complex systems, the interactions within and between regions induce synergies that shape the organization of the social and environmental structures on them). From the review of the cases of study, this paper argues not only the relevance of this concept but also how it allows that multiple disciplines have an active role in the study of each of these elements. Hence, by analyzing the concept of a region under a System’s Theory perspective, this paper promotes the usage of a unit of study that is ontologically consistent with the object of study of Sustainable Development and which provides an adequate framework to host multiple academic disciplines in the framework covered by this emerging science. Keywords: System’s Theory, Region, System Dynamics, Complexity

Construction and application of Bayesian networks to support decision-making in the water, sanitation and hygiene sector: A case study of SIASAR initiative in Central America

Wednesday, 14th June - 12:30 - SD 703 - Oral Paper

Prof. Agustí Pérez-Foguet¹, Mr. David Requejo Castro¹, Dr. Ricard Giné Garriga¹, Mr. Gonzalo Martínez Crespo², Mr. Antonio Rodríguez Serrano²

1. Engineering Science and Global Development (EScGD) Research Group, Department of Civil and Environmental Engineering, Civil Engineering School (ETSECCPB), Universitat Politècnica de Catalunya (UPC), Barcelona, 2. Water Global Practice, the World Bank, the World Bank Group, Washington D.C.

The 2030 Agenda includes a dedicated goal on water and sanitation (SDG 6) that sets out to “ensure availability and sustainable management of water and sanitation for all”. SDG 6 expands the MDG focus on drinking water and sanitation to cover the entire water cycle. A clear lesson from the MDGs is that we cannot manage what we do not measure, and there is little doubt about the role of monitoring and evaluation data in providing the evidence base for decision-making. Against this background, a number of composite indicator frameworks have been implemented to make water and sanitation quality services available and accessible to all, particularly to those most in need. Despite their significance in sector monitoring, indicators are not completely adequate to provide an insight into the complex cause and effect relations within water, sanitation and hygiene (WaSH) issues. The flexibility of Bayesian Networks (Bns) have been exploited to integrate multiple and simultaneous cause-effect or dependence relationships and unravel the linkages between poverty and WaSH services. In consequence, Bns have proved to be effective in project planning and monitoring support. Three major weaknesses however hinder a wider use of this monitoring approach in sector planning: i) an increased data demand, ii) software availability to run the networks, and iii) lack of a systematic methodology to deal with networks generation. In this study, open-databases are exploited and free software “R” is applied. One monitoring initiative is selected as initial case study due to its increasing relevance in Latin America in monitoring the WaSH sector: the Rural Water Supply and Sanitation Information System (SIASAR). On the basis of SIASAR’s conceptual framework, a simple Bn model has been applied to reflect the main issues that determine access to WaSH services. Data from Nicaragua is processed and analysed, since the Government has already carried out and completed a national baseline. The paper discusses about i) the proposed methodology to construct the networks, and ii) the potentiality of BNs in terms of evaluation and planning. It concludes that the proposed methodology represents a contribution to facilitate the use of this tool and that Bns are able to accommodate the complexities of WaSH-related issues. Additionally, they emerge as an effective management tool to support decision-makers in formulating and making informed choices between alternative actions. **Keywords:** Bayesian Networks, WaSH, decision-making, planning, SIASAR

Program Indicator Screening Matrix (PRISM): A Composite Score Model

Wednesday, 14th June - 11:30 - SD 704 - Oral Paper

*Mr. Bongs Lainjo*¹

1. CYBERMATIC INTERNATIONAL

Over the last six decades since many low and middle-income countries (LMICs) achieved independence, attempts by multi and bi lateral agencies to provide effective foreign assistance have been met with mixed results. There continues to be a need to strengthen understanding of program dynamics, its synergies and results (both intended and unintended). There is also a pressing need to establish a common ground among these donors, implementing agencies, other stakeholders and potential evaluators. It is in light of the above challenges that the framework: Program Indicator Screening Matrix (PRISM) was designed. The model is defined by six criteria – Specificity, Reliability, Sensitivity, Simplicity, Utility and Affordability. Relevance\Context In an attempt to improve results based management (RBM) in general and intervention data specifically; making foreign aid more focused and strategic with compelling evidence-based results; donors have increasingly teamed up and progressively introduced ubiquitous evaluation processes as an integral component of any program. In course of streamlining program implementation, funding agencies in collaboration with recipient governments and other stakeholders have also promoted the availability and utilization of strategic frameworks (SFs). The current most frequently used SFs are the Logic Framework and the Strategic Objective framework. These frameworks serve as complementary elements of RBM. A critical component that continues to confront many development aid Stakeholders, is the ability to establish equitable, standard and inclusive strategies that include, donors, national governments, implementing agencies, program managers, beneficiaries and oversight systems. Current reviews of existing dynamics continue to be mixed. And hence a compelling need for a paradigm change cannot be adequately emphasized. Informed decisions are only as useful and constructive as the trustworthiness of the relevant data. Objective of PRISM The general objective of this model is to strengthen the knowledge of Implementing Agencies, Program Managers and other key and relevant stakeholders in LMICs; emphasizing sustainable engagement by mitigating indicator redundancies and optimizing results in program management. Framework and Methodology The model comprises a set of deterministic criteria simultaneously applied in an attempt to identify the most effective set of indicators in any thematic program area. At the same time it mitigates many program management nuisances by making indicators and data more trust worthy. The model criteria include: specificity, reliability, sensitivity, simplicity, utility and affordability. Experts are required to conduct the assessment. The working groups of experts use an analytical approach synonymous with the Delphi methodology. Each indicator during the assessment process is assigned binary outcome (0,1) based on its performance with the relevant criterion. The resulting composite scores are evaluated against a “gold-standard” or target established by these experts a priori. As a quality control measure, all the teams’ outcomes are finally evaluated based on the degree of intra-team and inter-team concordance. And it is only after this level of concordance is established that the final indicators are selected. The model is thematically generic with an inclusive target audience. It has been successfully tested in Africa, Pacific Island Countries and the USA. (Key words: Indicator-screening-matrix, Results-based-management, Gold-standard, Concordance, Binary-outcome, Composite-score.)

The Fishery Performance Indicators: A New Instrument for Assessing Sustainability of World Fisheries

Wednesday, 14th June - 11:45 - SD 704 - Oral Abstract

Dr. Diego Valderrama¹

1. Universidad de los Andes

It has been estimated that world fisheries fall short of their potential earnings by US\$50–80 billion a year, with losses resulting not only from foregone catch due to overfishing, but also excessive harvest cost, low processing yields, product waste, and a failure to reach the highest value markets. The result is lost income to small-scale and industrial harvesters and processors, foregone high quality protein to consumers, and reduced food and income security for fishing dependent communities in both developed and developing regions.~ Despite the need to understand how to best manage fisheries to capture the foregone benefits, research on global fisheries performance emphasizes primarily the effects of biological management on stock and ecological conditions. While fisheries cannot be sustainable with degraded target stocks, high stock levels will not necessarily lead to an economically healthy industry that can support the community in which it resides.~ Resolving this social dilemma requires identifying whether and how fisheries are supporting the people who participate in them, and understanding how management influences human outcomes.~ To this end, the Fishery Performance Indicators (FPIs) were developed by a group of U.S. academic economists as a rapid assessment instrument designed to capture how fishery resources are contributing to the wellbeing of the people and communities that depend on them, and to document factors supporting wealth generation.~ It includes 67 measures to assess wealth accumulation on 11 dimensions of stock, harvest industry performance, and post-harvest industry performance; and 54 measures of enabling factors – including management and governance – to associate with variation in outcomes. The researcher's task is to score each measure accurately, but not necessarily precisely, and to track the degree of confidence in each measure's score.~ Each measure is scored on a one-to-five scale using data where possible, but relying primarily on nonquantitative factors that can be scored by experts in any fishery or fishery sector. This feature makes it particularly well suited to applications in data-poor countries or industry sectors.~ Among the questions the FPIs can help answer are: How well is a fisheries management system working?~ What are the key factors influencing success (or failure)?~ What are key investments that should be considered in order to promote successful fisheries management reform?~ Based initially on 61 fishery case studies drawn from industrial and developing countries around the world, the FPI database has expanded to include nearly 120 case studies since the landmark publication was released in May 2015.~ This presentation will provide recent applications of the FPIs that illustrate their potential towards improving the economic, community and ecological sustainability of world fisheries.~

Exploring Spatial Interactive Sustainability Reporting at Community Level: The Case of Manglaralto, Ecuador

Wednesday, 14th June - 12:00 - SD 704 - Oral Abstract

***Dr. Gricelda Herrera Franco*¹, *Prof. Tomás B. Ramos*²**

1. Universidad Peninsula de Santa Elena-UPSE, 2. CENSE, Centre for Environmental and Sustainability Research, Universidade NOVA de Lisboa

It is fundamental to monitor, evaluate and report the state of sustainability at local level, to better implement sustainable development principles and practices. Local sustainability reports should be communicated in an understandable and accessible way for stakeholders, and be supported with its involvement and participation. Despite several initiatives that refer public engagement in sustainability reports, from national to corporate levels, usually the reports are published through the traditional platforms (paper and internet) and participatory approaches are restricted to consultations of stakeholders during the reporting development process. These initiatives do not explore the role that could be played by the physical territory to publish and communicate sustainability reports to local stakeholders. The aim of this research is to develop a framework to support spatial interactive sustainability reports, where stakeholders' involvement will effectively contribute to the (i) planning and conceptualization, (ii) implementation and communication, (iii) operation and action, (iv) follow-up updating and reviewing. The proposed model supports the collaborative development and implementation of an interactive local sustainability report that is presented in the local territorial sustainability hotspots. Different thematic indicators of a sustainability report are physically presented along the local territory, according to the relevant thematic environmental and socioeconomic issues and/or human activity of a certain spatial area. For each set of indicators presented, associated measures of action to be implemented by local stakeholders are similarly presented and proposed, as well as an interactive open board and box to collect stakeholder's suggestions of measures to respond to the sustainability issue covered in that spatial hotspot. The proposed approach was assessed and tested in the Manglaralto Community, located in the Peninsula de Santa Elena, Ecuador. This study showed the importance of a spatial interactive sustainability reporting process, involving local stakeholders. It is concluded that this methodology allows a better understanding of each indicator by the local community and how it could respond to their concerns, aspirations and challenges. It should also help the local decision makers to communicate sustainability data, and receive stakeholders support for the implementation of suitable actions and practices

{Key-words}: sustainability reporting, spatial interactive, indicators, local communities, stakeholder's engagement

Environmental Policies Performance Evaluation in Portugal

Wednesday, 14th June - 12:15 - SD 704 - Oral Paper

Mr. Pedro Mota ¹, Dr. João Joanaz de Melo ²

1. Faculdade de Ciências e Tecnologia, Universidade NOVA de Lisboa, 2. CENSE, Universidade NOVA de Lisboa

Environment is a central aspect in any sustainable future scenario. Environmental policy, despite being relatively recent, is now one of the most regulated aspects of modern societies. Countries develop at different paces, just as their approach to environmental problems does. Portugal, as a member state of the European Union, has made most of its progress with help from external policies. Portuguese legal and regulatory framework is now wide and embraces almost every environmental subject. However, visible outcomes often do not meet expectations. The main goal of this study is to evaluate the performance of Portuguese environmental policies. Ten themes were selected, a combination of environmental domains and economic sectors: water; waste; agriculture and forestry; energy and climate; mobility and transport; industry; biodiversity; cities and territory; oceans; and tourism. A systematic review of environmental goals and targets in national and European policy instruments was conducted. Quantitative indicators were used to verify the evolution of the main environmental aspects, supporting a comparison with the objectives and goals stated in the policy instruments. The causes and consequences of the noted successes and failures were discussed. Results point to divergent evolutions over different environmental themes. Water and waste have had mainly positive performances, although many indicators are below targets. Energy and climate policy have presented mixed outcomes, with mainly negative trends until 2005, when a paradigm shift has begun, with more attention being given to energy efficiency and renewables. Agriculture, industry, tourism, and ocean management also have shown mixed outcomes: often efficiency of resource use improved, but common practice is far from sustainable. Biodiversity and land management have degraded rapidly for decades; they are now more stable, but most negative trends have not inverted. Mobility shows heavily negative trends: increasing overuse of road transport and private cars. A notable priority has been given to infrastructure construction, often not accompanied by adequate planning and management. This partially justifies the successes achieved in water and waste policies, but also the failure of territorial planning, biodiversity and transportation policies. Results of the study are being presented to social stakeholders and policy-makers, to enable well informed and better quality decision making, leading to successful policy implementation.

Envisioning versus realizing products for people in poor communities: The case of Victor Papanek and Nordic designers

Wednesday, 14th June - 11:30 - SD 715 - Oral Paper

Dr. Astrid Skjerven¹

1. Oslo and Akershus University College

An increasing number of people is currently living under poor conditions in enclaves of rapidly growing urban areas. They lack basic equipment for living a healthy and decent life. The products have to be simple, cheap and useable for people with different cultural and geographical backgrounds. Methods to realize the design, production and implementation of such appliances is a matter of urgency. Therefore, the ideas of the Austrian-American designer Victor Papanek (1923-98) have gained new actuality. During the 1960s and 1970s Papanek played a significant role in the international design community. The hot topic was the growing Western affluence and waist in contrast to the so called Third World's increasing poverty. His ideal was the less polluting design traditions of indigenous people, made by simple methods in local materials. His basic idea of design was to create "survival kits" based on local indigenous traditions. He had many supporters among design students in Scandinavia and Finland. Some of them tried to adapt their work practice to his ideology. Design from these countries was reputed for its democratic approach, innovative simplicity and use of natural local materials and handicrafts and constituted a platform for fruitful cooperation. The aim of the paper is to investigate what impact his ideas had on the Nordic design community, and particularly whether it was followed up by stakeholders and eventually reached the target groups. Success factors and failures are displayed and discussed to clarify how the ideas might be utilized in today's situation. The empiric study is based on literary reviews, and additionally of interviews with designers in Denmark, Finland, Norway and Sweden. The investigation shows that Papanek's ideas made a tremendous and lasting impact on designers in the Nordic countries including some of their work. Workshops at the design schools and local communities disengaged great creativity and ideas for products. Still, design and production for indigenous people in least developed countries seldom occurred, as he and his followers refused to interfere with stakeholders like politicians and producers. Therefore, they had little impact on the lives of the target groups. One of the few exceptions was the foundation of the Norwegian organization "Design without Borders", which was mainly financed by the government, i.e. by ways of political decisions. In conclusion, without contact and cooperation with stakeholders, particularly the political and commercial sector, and users in the local communities on the other hand, it is not possible to realize ideas of this kind in the form of products and their use. The paper deals with ideas that directly support a sustainable development, which factors that are necessary to realize it. Considering the new interest that Papanek's ideas newly has gained, it is of vital importance to analyse, present and discuss these factors to secure a fruitful utilization of them in our era and with our set of problems.

Keywords Victor Papanek~ The Nordic countries~ Design for poor communities Indigenous people

Informal settlements and community vulnerability: a multiscale strategy to improve local resilience through waste upcycling

Wednesday, 14th June - 11:45 - SD 715 - Oral Abstract

***Dr. Andrea Cecchin*¹, *Mr. Mathieu Lamour*¹, *Mr. Michael Maks Davis*², *Mr. David Jácome Polit*²**

1. Independent Researcher, 2. Pontifical Catholic University of Ecuador

Informal settlements and informal buildings are a common practice in many Developing Countries: in Ecuador, for instance, more than 70% of constructions are informal. This has implications that often affect the quality of life and the level of resilience of local communities, especially those with a population characterized by high social vulnerability. This research project is an attempt to contribute in improving the resilience of informal settlements, by introducing new practices and technical solutions in the Ecuadorian informal construction sector by using end-of-life tires (ELTs). ELTs are a type of waste that is only partially recycled or reused in Ecuador, despite a national scheme (an Extended Product Responsibility policy) that has been put in place to this extent. Furthermore, ELTs are potentially an available and cheap construction material, which have mechanical properties that could in theory be successfully used in informal settlements to reduce the impact of natural disasters such as earthquakes, landslides and other hydrogeological phenomena. As such, through a more extensive use of ELTs as a raw construction material, the project aims to decrease the physical vulnerability of informal settlements in Ecuador. Additionally, by converting ELTs into a substitute building material, this kind of waste can be incorporated into a value chain with potential beneficial opportunities for micro-businesses in marginalized urban communities. The strategy proposed in the project is a mix of bottom-up and top-down approaches. The research team is working with both local communities and national policymakers to find a multiscale scheme to effectively employing ELTs in the informal construction sector in Ecuador. In order to develop local solutions, two case studies have been selected. The first is an urban area of Quito, while the second is a rural area in the northern coastal region of Ecuador, which was affected gravely by the earthquake of April 16th 2016 and is in the process of reconstructing demolished buildings and infrastructure. To date, the fieldwork with local communities and informal sector builders in the coastal region has highlighted a great potential: resilient construction techniques with ELTs tailored for the informal sector were successfully introduced and disseminated throughout the area. Simultaneously, at national level, actively engaging policy-makers and the other stakeholders involved in ELTs management has enabled a potential policy framework to be identified, where the innovative use of ELTs for informal construction initiatives could be incorporated into the national recovery system.

Analysis of externalities from transportation in Bogota

Wednesday, 14th June - 12:00 - SD 715 - Oral Abstract

***Mrs. Mónica Espinosa*¹, *Prof. Stef Proost*², *Dr. Ángela Inés Cadena Monroy*¹, *Dr. Eduardo Behrentz*¹**

1. Universidad de los Andes, 2. Ku Leuven

Different policies have been implemented in Bogota in the last decades to improve urban mobility. The Bus Rapid Transit system, the car-use restriction and 400 km of bike paths construction are among the examples to be highlighted. Despite these measures, transportation is currently facing different types of problems limiting urban mobility and affecting productivity and quality of life in the city. The growth in motorization rates of private vehicles and motorcycles is associated with more congestion and long travel times. Overcrowding in the mass public transport system during certain periods has negatively affect the quality of the service. And in terms of environmental effects, mobile sources have been identified as the main source of atmospheric emissions. The existence of different kind of externalities, poses an additional challenge, as the solution for one problem can increase other consequences. The aim of this study is to analyze pricing and regulatory options to address traffic congestion and air pollution issues in Bogota. We use a static model to represent the partial equilibrium of the transport market, and evaluate different policies by estimating changes in welfare in comparison with a baseline scenario. Some policy lessons are drawn from the results and analyzed given the local context.

Evaluation of the improvement in thermal comfort with the incorporation of sustainable building materials in the ongoing self-construction processes for housing in the district of Bosa in Bogota

Wednesday, 14th June - 12:15 - SD 715 - Oral Paper

*Prof. Franz Calderon*¹

1. *Universitaria Agustiniana Uniagustiniana*

The use of sustainable materials incorporates environmental benefits, especially for large cities due to the current high pollution rates (Ferrer, 2015). Currently, cement, brick and steel are the most used materials for construction, unfortunately they are the ones that generate more CO₂ emissions in their manufacturing process. The objective is to evaluate the process of incorporating sustainable materials in order to improve the thermal comfort of a group of dwellings with ongoing self-construction processes in the La Libertad neighborhood of Bosa in Bogotá. The Comfort problem in this project was approached as a fundamental condition of housing, if one takes into account that the thermal conditions of the space affect the human metabolism, from this it is derived that temperatures outside the established ranges imply more energy demand For its inhabitants, unfortunately in Colombia, thermal comfort has not yet been incorporated as a variable in the processes of self-construction, the houses respond to a need for habitat understood as the need to have a space of their own regardless of the way in which this space Respond to climatic variables. The project takes place in Bosa, an area of Bogotá, which is located on the south-western border of the city. Its total area is 2394 ha, of which 1885 ha are urban land and 508 ha are protected areas. The methodology was considered a chronological experimental quantitative case study. The response provided by them is that: a) co-variation between the independent variable (materials) and the dependent (s), (existing housing) b) the application of the independent should precede the measurement of the Dependent variable and c) other variables, different from the independent one, have to be discarded as possible explanations of the changes observed in the dependent ones. In the second phase the quantitative approach of the project was initiated, with the diagnosis and beginning of the measurements that determined the thermal comfort of the homes that are part of the case study. The methodology of thermal analysis based on ~ISO 7730~will be used. With the community will begin the incorporation of sustainable materials in the houses under study. Finally, measurements will be made to analyze the thermal comfort of the houses that incorporate the materials. This project is in progress and the conclusions can not yet be presented, however for the presentation some results will already be obtained. The theme of the project is of great relevance for the conference for two aspects, the social one due to the geographical context in which a marginal zone of the city of Bogota is developed and the sustainable aspects that analyze when incorporating the project the study of the thermal comfort in Self-build houses and the use of non-traditional sustainable materials for the improvement of these houses.

The interdependent relationship between organisation identity and sustainable Innovation in the evolution of the firm.

Wednesday, 14th June - 11:30 - SD 716 - Oral Abstract

Dr. Gary Buttriss¹

1. The Australian National University

Smart companies now treat innovation as sustainability's new frontier requiring development of more sustainable products, process and practices, new markets, and new sustainable business models. These innovations are influenced by and influence a firm's identity. While organizational identity is considered to be core, distinctive, and enduring, it may need to change as a result of a misalignment between identity and perceived image of the firm as it is confronted with changes in its environment. Closing the gap requires the firm to innovate. The dynamic between identity and innovation varies depending on whether the innovation is identity-enhancing, identity-stretching, or identity-challenging. An *identity-enhancing* innovation is one where there are minimal changes in the environment and the firm's identity and innovative activities are consistent with each other, resulting in incremental innovations. An innovation is considered *identity-stretching* when the firm faces a continuously shifting landscape that causes significant disruptions across its operations. Radical innovation is required that differs significantly from past practices and principles that have shaped its identity. The strong feedback dynamic between identity and innovative activities results in continuous cycles of enabling innovation and identity reconfiguration. *Identity-challenging* innovation results when a lack of alignment between identity and innovative activities results in significant organizational dysfunction. Such innovations typically occur where the disruption caused by the shifting environment is significant enough to affect the whole network, markets and the economy. This requires firms to engage in deeper, 'systems level' change including technology, and organizational and managerial innovations with affects beyond the firm. Our research focuses on the evolution of identity of Veolia International an environmental solutions provider. Veolia's identity communication was observed through document interpretation of Veolia's annual Sustainability Reports and articles from the press. We found that organizational identity plays a key role in the firm's sustainability orientation and strategy when sustainability is viewed as an integral part of who they are and entails pursuing sustainability as a core strategy direction rather than as a non-core add-on. Veolia progressively moved beyond compliance towards an internalized ideology of commitment towards sustainability, re-examining and re-defining how a sustainability-focused firm should operate, and development of innovative products, services and markets. A sustainability-focused identity, activities and innovation have a synergistic cycle of co-dependence, -influence, and -production. While identity can influence the type and amount of sustainability-oriented innovations the firm engages in, the performance of those innovations and activities feedback evolving the firms identity. Identity does not change holistically or linearly, instead developing inter-dependently over a spatial and temporal landscape along several paths at different speeds, influenced by different events and actions both inside the firm, and with key relationships and within the broader environment. As a result, organisational change can result from innovations that are incremental and identity-enhancing; radical and identity-stretching; and/or transformational and identity-challenging

Keywords: Organisation~identity, process, innovation, sustainability, change}

Sustainable entrepreneurship shaped by design thinking

Wednesday, 14th June - 11:45 - SD 716 - Oral Abstract

Ms. Monica Ramos Mejia¹, Mr. Juan Manuel Jauregui Becker¹

1. University of Twente

Conventionally, opportunity recognition has been the main factor characterising entrepreneurship. This opportunity refers to a gap or a missing link between what people need/want and what is provided to them. Thus, this gap constitutes an opportunity for economic exploitation. This rationale has enabled the emergence of ventures that profit from and reproduce a consumerist and unsustainable society. In this paper we explore to what extent an opportunity-recognition process led by empathy (rather than by economic purposes) alters the outcome of such process. In order to do so, we have conducted our research in two pre-incubator programmes that aim at developing empathy at the first stage of the pre-incubation process. One programme was run in The Netherlands, with the objective to support refugees to rebuild their lives by providing them with the tools and training they need to start their own enterprise. The other programme was run in Colombia, with the objective to support community leaders to create solutions for their own local needs. Both programmes attempt to develop empathy using design thinking as the main tool. Design thinking is characterised by two main elements. First, iteration between the 'problem and solution space'. Second, an ideation process based on 'divergence and convergence'. Throughout these iterative processes, participants are encouraged to develop and practise empathy. We have conducted interviews to the programmes' participants in order to understand in which ways the development of empathy affected the ideation process and the business model they finally developed. Our findings suggest that a strong emphasis on developing empathy (1) transforms conventional business ideas and models into more sustainable ones; (2) promotes business models based on product-service systems, which are believed to be good means for achieving competitiveness and sustainability simultaneously (Tukker, 2004); (3) brings about more sensitive entrepreneurs to the social and environmental challenges their communities face; (4) increases awareness of the role businesses play in developing a more sustainable society. Keywords: sustainable entrepreneurship; design thinking; empathy; pre-incubation

Purchase Behaviour of Sustainable Products: Insights from Big Data

Wednesday, 14th June - 12:00 - SD 716 - Oral Abstract

Dr. Phani Kumar Chintakayala¹, **Prof. William Young**¹, **Dr. Ralf Barkemeyer**², **Dr. Michelle Morris**¹

1. University of Leeds, 2. KEDGE Business School

Our research examines how the demographics and environmental attitudes of retail customers influence their purchasing behaviour of niche and mainstream sustainable products and whether this influence varies by products. We employ actual supermarket sales data from over 300 outlets in England covering 18 million customers, and examine two products that can both be labelled as sustainable but have very different market positions: organic milk as a typical niche product, and free range eggs which (based on market share) can be seen as a mainstream product. Our results partially confirm previous research – which is typically based on self-reported behaviour – identifying both price and deprived catchment areas as barriers but green attitudes as a driver of sustainable purchasing behaviour. Yet, the results clearly indicate that not all sustainable products are considered the same by consumers, and that consumption behaviour varies considerably across sustainable product categories. For organic milk as a niche product, we find more affluent people more likely to be purchasers. What is new is that we also see older families and those aged 25-44 as purchasers. White and Asian ethnic origin are a negative influence. On the other hand, consumption of free range eggs – as a mainstream product – does not seem to be influenced much either by attitudes or by demographics. Comparing our two different products, the impact of socio-demographic factors in particular on purchasing behaviour therefore appears to be fading with increasing market penetration.~ Our results may provide important cues for the ongoing debate on the need to mainstream sustainable consumption. The fact that we observed very different underlying dynamics between niche and mainstream sustainable products raises questions about the current positioning of sustainable (niche) products more generally. Further research needs to be done around the marketing methods retailers have employed for sustainable labelled products. Are they using methods that just appeal to niche green consumers who may not be buying their products from a mainstream retailer anyway? Are these marketing methods putting off mainstream consumers who may buy organic milk but need better marketing that appeals to their mainstream consumer values? This is key as mainstream consumers are used to buying sustainable labelled products but retailers need to change their marketing of these products to mainstream consumers. Keywords: Corporate sustainability strategy; mainstreaming; sustainable products; big data; organic milk; free range eggs

Sustainability understanding and strategies in selective German water companies

Wednesday, 14th June - 12:15 - SD 716 - Oral Abstract

Prof. Marlen Arnold¹

1. Technische Universität Chemnitz

Water is one of the most essential resources of our time. At the same time, sustainable water policy and management is a priority area in the German national sustainability strategy. Since German water supply is characterized by diversity in supply, organization and size, it is of interest how water companies define sustainability activities and integrate sustainability within their strategies. Arnold (2015) stresses: although based on rather stable and far-reaching governmental regulations the water industry needs a change towards sustainability and forward-looking strategic planning. Holistic or integrative sustainability management tools and approaches are underrepresented. There is an imbalance in the application of tools regarding managing tasks and sustainability principles: The implemented tools are mainly focused on general management and participation as well as targeting in particular. There is almost no implementation of the polluter pays', integration, sufficiency & substitution, resilience principle. Based on this investigation it is of interest how the companies describe their sustainability understanding and strategies. During 2015 more than 500 water companies were asked for their sustainability engagement by email. 65 water companies took part in the survey. Three main categories were used: (1) sustainability management, (2) resource water, and (3) characteristics of the company. Only some results are highlighted here: Taking strategic decisions, the preservation of the water quality shows the highest relevance for the organizations (65 %) followed by consumption volumes, new water management laws and existing infrastructure (40%). Consumption patterns and lifestyles are not relevant for decision-making in the sample. Sustainability seems to have a high relevance for the respective companies (82 %), and only 12 percent of the companies state they do not have any sustainability tool implemented. Sustainability water management is mainly securing the water resource as well as the long-term preservation of its quality while respecting given environmental management systems and regulations as well as the ability to regenerate of the water resource. Moreover, addressing transfigurations by media and society, the company representatives state the following attributions as inappropriate for the water resource: tap water has an inferior quality, the price is inflated, water saving is ecologically meaningful and water is an inexhaustible, naturally pure resource.

Adoption of best practice standards by dairy farms in Colombia

Wednesday, 14th June - 11:30 - SD 205 - Oral Abstract

*Ms. Diana Valencia*¹, *Dr. Fu (Jeff) Jia*¹, *Dr. Adrian Bailey*¹, *Mrs. Laura Zuluaga Cardona*¹, *Dr. Mark Van Der Giezen*¹

1. University of Exeter

This work presents a qualitative study conducted in Colombia in the dairy regions of “Antioquia and the coffee corridor” and “región Cundi-boyacense”, focusing on the factors affecting the adoption of the Colombian public standard of best agricultural practices for dairy cattle, ICA-BPG (Buenas Prácticas Ganaderas del Instituto Colombiano Agropecuario ICA). The International Trade Centre ITC currently reports more than 200 private standards worldwide related to sustainable agriculture. Southern countries in an effort to provide more “legitimate” and flexible alternatives have built certification schemes tailor-made to their own food safety, public health standards and policies (Farina, Gutman, Lavarello, Nunes, & Reardon, 2005; Mamine, 2016; Schouten & Bitzer, 2015). Colombia has likewise developed its own best agricultural practice standards for dairy cattle, managed by the Colombian Agricultural Institute ICA, ICA-BPG, in an effort to strengthen the sustainability of the national milk production. Colombia has 494.402 cattle farms between beef and dairy, with most being double-purpose, but only 642 (0.13%) are ICA-BPG certified for dairy and 134 (0.03%) with beef certification, from the time when the law was enacted in 2008 to this day (2016). Considering this low rate of adoption, it is important to gather information on the factors affecting the farmers’ decision-making towards the standards, particularly for small and medium dairy farms, to understand their motivations, concerns and needs in order to reach a successful implementation of the norm. Supported by interviews and visits to both certified and uncertified farms, this multiple case study identified factors affecting the adoption or rejection of the standard implementation. Additionally, it builds the validity of the multiple case study through cross-case analysis and contrasting this with evidence and comparing with factors found in the literature such as certification costs, market demand, land tenure, technical assistance and knowledge (Borges, Oude Lansink, Marques Ribeiro, & Lutke, 2014; Rodriguez, Molnar, Fazio, Sydnor, & Lowe, 2009). The factors identified in Colombia were classified for analysis as economic, institutional and personal: the first refer to the certification bonus in the price of milk, the certification costs, the land tenure and the inputs market; institutional factors identified include technical assistance, rural education, associations, relevance of standards, the audit approach and infrastructure; and finally, personal factors include interest in environmental conservation, resistance to change and other farmers’ attitudes. The ICA-BPG standard initiative is important for the sustainability of a polluting activity such as dairy farming in Colombia, and according to the findings of this study, incentives that are meaningful for farmers need to be strengthened in order to increase the level of adoption that this certification currently has.

Keywords: Standards, dairy certification, Colombia, adoption

Resolution 3585 (20 October 2008)

Sustainable supply chain management in the Colombian agricultural sector

Wednesday, 14th June - 11:45 - SD 205 - Oral Abstract

*Prof. Ximena Rueda*¹, *Mrs. Laura Zuluaga Cardona*², *Dr. Fu (Jeff) Jia*², *Dr. Adrian Bailey*²

1. *Universidad de los Andes*, 2. *University of Exeter*

Civil society organisations and consumers in importing countries have begun pressuring international suppliers to provide products that meet higher social and environmental standards. This has prompted many companies to undertake initiatives to make their supply chain more sustainable. The way in which companies engage with suppliers has been categorised in two general methods: **assessment** (evaluation of suppliers, such as site inspection, CSR audits, certifications requirement) and **collaboration** (working directly with suppliers providing them with visits, training and joint efforts). Some authors argue that assessment itself is not enough and collaborative relationships are needed, especially when working with emerging and developing countries. Sustainable supply chain management (SSCM) is an emerging topic relevant for Colombia because of its rapidly economic growth, and large land assets for agricultural expansion. In recent decades, large national buying companies have collaborated with their agricultural suppliers to introduce sustainable practice. These practices aim to improve supplier's overall competitiveness and sustainability, while securing the supply of raw materials and meeting growing demand for agricultural and agro-industrial products. These partnerships are diverse in terms of the degree of formalization, the governance structure and their ability to share knowledge, practices and value along the supply chain. In this paper, we aim to understand how SSCM practices are incorporated in the production processes of agricultural companies and their suppliers and why some succeed while others fail in the context of an emerging economy. Using a case study methodology, we conducted an analysis of such relationships in one of the biggest dairy processors in Colombia. We explored: i) the motivations for introducing sustainable practices in the value chain ii) barriers or bottlenecks that prevent collaboration between companies to implement sustainable practices iii) the factors that facilitate organizational learning and scaling up of these practices; and iv) the impact on the eco-systemic services and welfare of the actors in the supply chain. These factors are identified separately for buyers and suppliers as they face different challenges in the supply chain, also addressing the lack of supplier's perspective in the academic literature. Internal leadership and two-way communication were found among the most important factors to maintain the alliances. Lack of knowledge and awareness was one of the ex-ante barriers for suppliers to join sustainable programmes. However, that is overcome through the partnership leaving the high economic cost as one of the ex-post barriers to continue with the collaboration and scaling up the programme. This paper contributes to theory by better understanding how these aspects interact in the journey of achieving sustainability along the supply chain through collaborative relationships in emerging economies. **Keywords**: Sustainability, emerging economies, supply chain, agri-food supply chain, collaboration

Biodiversity Conservation through Landscape Level Voluntary Standards

Wednesday, 14th June - 12:00 - SD 205 - Oral Abstract

Mr. Len Blom¹

1. Utrecht University & UNEP-WCMC

In the light of unprecedented global biodiversity loss, due largely to increasing pressures from economic activity, this research aims to study the intersection of economic activity in the shape of international supply chains and biodiversity conservation. Since biodiversity has invaluable functions that underpin our very existence, biodiversity conservation should be increased and improved significantly. International supply chains play a central role in both the problem and solution. Voluntary sustainability standards are a market-based scheme to render these supply chains more sustainable. However, many VSS have neither incorporated biodiversity sufficiently nor appropriately and struggle to address beyond site-specific elements. Over the last few years, the 'landscape approach' has made a comeback in conservation research because of its integrated and holistic scope, its focus on multifunctionality of landscapes and the acknowledgement of the variety and complexity of landscape units that influence biodiversity. In terms of biodiversity conservation, both voluntary standards and landscape approach initiatives have difficulties in proving empirical effectiveness. Additionally, whereas standards have difficulty addressing landscape level elements going beyond site-specificity, landscape approaches have had difficulties engaging essential economic actors in its efforts. This study will explore the feasibility of combining both approaches in a 'landscape level voluntary standard'. This approach has the potential to, according to this study, alleviate an array of current barriers and improve biodiversity conservation considerably in certain areas. In addition, an integrated approach to land management via voluntary standards has specific benefits for (local) communities as well by fundamentally increasing their inclusiveness in the governance process. This eight-months study will entail four phases of explorative research to fill the evident research gap of the juxtaposition of biodiversity conservation, voluntary sustainability standards and landscape approaches, guided by the following research question: 'What are the barriers and opportunities of applying a landscape approach in international supply chain oriented voluntary standards systems for biodiversity conservation, and how could such an approach be practically feasible?' After an exhaustive literature review, a current practice review scopes current biodiversity conservation approaches related to voluntary standards and conservation initiatives. This involves interviews with key experts and stakeholders at organizations such as ISEAL Alliance, UNEP-WCMC, WWF, Flora and Fauna International, FSC and others. The third step presents potential 'ideal' prototypes of a landscape level voluntary standard, based on the barriers and opportunities found in the previous phases and in collaboration with key actors in the field (e.g. ISEAL Alliance, Rainforest Alliance). Finally, a case study in a Colombian biodiversity hotspot explores the feasibility and desirability of such an approach by interviewing key potential implementers and people affected by it. The results present different possible models of landscape level voluntary standards, with varying viability and desirability to improve biodiversity conservation. Based on these models, the results show a clear potential for mainstreaming biodiversity, e.g. by linking national biodiversity targets with landscape management of tropical commodities. Implications and recommendations for policy makers and voluntary standard organizations conclude the research. Keywords: Voluntary sustainability standards, biodiversity conservation, landscape approach

Value mapping: exploring the challenges of sustainable business modelling in the Ecuadorian Amazon

Wednesday, 14th June - 12:15 - SD 205 - Oral Abstract

***Prof. Maria Helena Jaen*¹, *Prof. Nunzia Auletta*²**

1. Universidad de los Andes, 2. IESA

Sustainable Business Model (SBM) has been accepted as a unit of analysis to identify business rationales, structures, tools and “sustainable mindset”(Stubbs & Cocklin, 2008, p.123) that could contribute positively in “improving the quality of life”(Hellstrom et al., p. 2015). Through SBM design and innovation firms may create, deliver and capture value by contributing to the development of the natural environment, human society and economy (Boons and Lüdeke-Freund, 2011; Boons et al., 2013). The SBM value proposition should reflect a business-society dialog which balances economic, ecological and social needs engaging a variety of stakeholders –i.e. suppliers, customers, communities, shareholders, employees and government- into a relationship of mutual need and expectations recognition (Boons & Lüdeke-Freund, 2013, Matos & Silvestre, 2013). To facilitate sustainable business modelling and innovation Bocken et al. (2013) propose a value mapping tool “which introduces three forms of value (value captured, missed/destroyed or wasted, and opportunity) and four major stakeholder groups (environment, society, customer, and network actors)”(Bocken et al., 2013, p.482). This paper focuses in analyzing the business model of Runa Group (a hybrid organization) (www.runa.org) which has developed the *guayusa* (an ancient Amazonian plant) value chain, engaging with the local Kichwa farmers and communities, the Ecuadorian Government and a variety of international stakeholders (ONG’s, mission brand shareholders, Hollywood celebrities, and commercial partners), launching a new category of organic and natural teas and energy drinks into the USA market. Based on the application of the value mapping tool, our main research questions are: What are the types of value that can be identified in a SBM? What are the challenges of sustainable business modelling? Using a single case study methodology, we investigate the “phenomenon in depth, within its real-life context”(Yin, 2009: 14) considering that “the object of study is a specific, unique, bounded system”(Stake, 2008: 443). Our preliminary findings relate to: (1) mapping the SBM value emphasizing the current value proposition, the value missed and destroyed, and the opportunities for value creation; (2) understanding the positive and negative outcomes of the value proposition and the conflicting values from different stakeholders points of view; (3) identifying the main challenges that sustainable business modelling poses as well as the opportunities for business modeling redesign and stakeholders’~realignment to better suit the sustainability vision. **Keywords:** value mapping tool; stakeholder analysis; sustainable business models; value creation; Latin America enterprises

Reviewing the evidence on responsibility in global business and supply chains

Wednesday, 14th June - 12:30 - SD 205 - Oral Abstract

Ms. Valerie Nelson¹

1. University of Greenwich

Rapid processes of economic globalization have led to the development of global value chains and a subsequent rise in responsibility challenges including local and global environmental and community impacts and worker wellbeing and rights. A number of different kinds of voluntary responsible business initiatives have emerged to stimulate greater responsibility in the practice of multi-nationals and small enterprises, and voluntary initiatives articulate with mandatory initiatives. These intermediary responsible business initiatives include, *inter alia*, the Global Reporting Initiative and the UN Global Compact. However, it is not clear how successful the different initiatives may be in achieving greater corporate transparency and disclosure, and whether this leads to actual corporate behaviour change and positive impacts both at an individual corporate level and at a sector or industry level. This paper presents the findings of a comprehensive literature review focused upon empirical evidence of the social and environmental impacts of businesses, which can be specifically linked to corporate reporting. Two key research questions guided the literature review which forms the basis of this study: First, to what extent is corporate reporting effective in changing corporate behaviour, and second, what is the evidence that this leads to positive social and environmental benefits? The academic evidence was reviewed against a theory of change for responsible business. The theory of change is presented for corporate reporting, as well as the inherent assumptions, capturing aspects of existing theory regarding why companies adopt corporate reporting (including internal and external drivers), and the less well theorised role and capacity of external users of corporate reports. The methodology is explained for a review of scientific databases using word search terms, including effectiveness and impact, corporate reporting, and sustainability and the key findings are presented. Four databases were reviewed using eighteen specific search terms and following a screening process, sixty-six articles were selected as being of direct relevance to the topic. The findings are presented with respect to: a) the drivers of uptake of corporate reporting, referring to stakeholder and legitimacy theory; b) the quality of corporate reporting; c) the utility of corporate reporting to stakeholders; d) changes in corporate behaviour; e) impacts of corporate behaviour. The paper presents reflections on the findings of the evidence review and sets out a research agenda on key gaps and priorities, as well as the challenges for researchers in seeking to evaluate private sector performance and sustainability impact. The paper further develops a theoretical framing of corporate reporting but also other types of responsible business initiatives, such as ISEAL, Ethical Trading Initiative and the Workforce Disclosure Project and B-Lab, which all engage with companies to improve their reporting and/or impact-performance, including addressing supply chain sustainability and ISEAL, which is the membership body for sustainability standards. The analysis teases out the similarities and differences in their theories of change to contribute to an understanding of their effectiveness, as well as linking anticipated change to theories of sector-level and landscape transformation.

Sharing Water: Transboundary Water Governance and Management in Southern Africa

Wednesday, 14th June - 14:00 - SD 701 - Oral Paper

Prof. Larry Swatuk¹

1. University of Waterloo

Water falls and flows, while states occupy fixed space: in Southern Africa, with its odd amalgam of colonially defined borders, this is a problem. The organization of the region's states stands at odds with the character of its water resource flows, both in space and in time. If people and ecosystems are to survive and thrive, this natural resource must be managed holistically, i.e. in terms of the hydrological cycle as that cycle changes through time. The historical approach to water management worldwide is the capturing and taming of a fugitive and wild resource – note the language of discipline and control. Where the resource is shared by two or more sovereign states, however, resource capture – physically through the application of various infrastructure and legally through the codification of actions in policy and law – is bound to be problematic: socially, politically, economically, environmentally and possibly militarily. For many years there has been speculation regarding the possibility of water wars in the region, with several basins having been identified to be 'at risk' of violent conflict. Hence the importance of sharing water fairly and sustainably.~ The focus of this paper is on the process and practice of sharing the region's water by Southern African Development Community (SADC) ~member-states. The paper illustrates how Southern Africa serves as a mostly willing subject for global experiments in IWRM and good water governance. SADC's long-standing relationship with the EU and the Nordics, which began in the late 1970s in the struggle against apartheid, ensures an endless stream of money, technology, expertise and comradely good will. The nature of the region's political economy demands fundamental reforms in the way water is used and by whom. But, paradoxically, it is also this political economy which, in the context of neoliberal globalization, encourages decision makers to stay the course: more mines, more cash crops, less deliberate state intervention on behalf of those most in need. So, the 'institutional configurations and orientations' remain centred on the sovereign state, with state governors being the recognized seat of decision-taking authority, and with (often foreign) expert knowledge constituting the scientific and technical basis for action. We remain, unfortunately, a long way from the IWRM/good governance ideal.

Water values, water governance, and public opinion on the Paraguay-Paraná Waterway, Mato Grosso, Brazil

Wednesday, 14th June - 14:15 - SD 701 - Oral Abstract

Mr. Christopher Schulz¹

1. University of Edinburgh

The present paper builds on previous research on water values and water governance in the Upper Paraguay River Basin, Mato Grosso, Brazil, which was presented at the 22nd ISDRS conference in Lisbon, Portugal. It falls into the category of research that aims at investigating links between water values and valuation on the one hand, and water governance processes on the other hand, from an interdisciplinary perspective that is best placed at the interface of political ecology and ecological economics. Specifically, it focuses on the planned construction of the Paraguay-Paraná Waterway through the Pantanal wetland, a controversial infrastructure project that would facilitate agricultural exports from the state's booming soybean sector, but may equally impact one of the world's best conserved wetland ecosystems. From a theoretical point of view, it can be hypothesised that supporters and opponents of the project hold different values, and assign different values to the river and water in question. The research to be presented at the conference reports the results of a quantitative study with a representative sample of members of the general public in the Upper Paraguay River Basin (n = 1067) which tested this hypothesis. In line with a conceptual framework recently proposed by Schulz et al. (2017), it looked specifically at assigned values of water (such as economic, ecological, or cultural values), governance-related values (such as sustainability, economic efficiency or social justice), fundamental or psychological values (such as universalism, security, power, self-direction), and their relationship with survey respondents' support of or opposition to the planned waterway. While the analysis of the data collected is still to be concluded at the time of writing this abstract, early findings indicate that indeed we can identify two different clusters of values, or 'value landscapes', which tend to correlate more with one of the two positions on the waterway. Especially people who score highly on self-transcendent values (i.e. those related to helping and caring about others) are more likely to reject the governments' plans to build a waterway, which is often characterised as an elitist project with little benefit for the local population. While more detailed results will be presented at the conference, the present paper should be seen as an invitation to conduct further research on the linkages between water values and water governance.

Tunjuelo is alive. Community proposals for better water management.

Wednesday, 14th June - 14:30 - SD 701 - Oral Abstract

Dr. Andres Vargas¹

1. Universidad de los Andes

Based on ethnographic research, this paper shows how the communities living in the Tunjuelo river basin have established an alternative way of relating with a river within a peri-urban context. Traditionally, governmental management of the Tunjuelo river basin has been subdued to the needs of Bogotá city. This has led to disastrous consequences for the basin, its water quality and quantity. The river has been heavily polluted and altered through many development projects; from a dam that altered the ecosystem in the early XX century, to mining contracts and a huge landfill built in the last few decades. In the face of this environmental disaster, some communities around the river propose alternative ways of relating with the river. Their proposals are based on a decolonial understanding of nature and science, in which science becomes a language to communicate with a sentient river. They state, that their proposals would lead to environmental justice and a better water management.

Water governance modes and sustainable development approaches in Acacías (Meta, Colombia) between 2000 and 2015.

Wednesday, 14th June - 14:45 - SD 701 - Oral Abstract

*Ms. Diana Muñoz*¹

1. *Universidad de los Andes*

During the last 20 years, Acacías has evidenced Colombian economic reprimarization, characterized by the decrease of industrial and agricultural activity, and the increase natural resources exploitation, in particular oil exploitation, drag mining in rivers' alluvial beds, oil palm agribusiness, in addition to the increase of complementary services to these activities and rapid urban growth. This process, accompanied by a limited municipal institutional capacity to manage, regulate and monitor the environmental impacts of these socio-economic interventions, has enable negative social and environmental externalities that limit the conservation and availability for a sustainable use of Acacías' wide water supply by local actors, arousing socio-environmental conflicts in the municipality This case study addresses the management of water resources in of Acacias' (Meta, Colombia) between 2000 and 2015, through the analytical framework of *\emph{water governance}* and *\emph{approaches to}* *\emph{sustainable development}*. In that way, the paper explores, from a multidimensional perspective, the complex interplay of three governance dimensions: institutional and normative factors; regulation instruments; multiple actors and intermediation spaces, in order to establish the prevailing governance mode that structure certain ways of water resources use. In this context of governance, the paper also explores the prevailing approach of sustainable development in Acacías, acknowledging whether environmental and social capabilities of water resources are guaranteed to endure the local socio- economic activities.\\ According to the analysis, in Acacías prevails a hybrid water governance mode, in which two types of governance coexist in tension: a decentralized and closed mode related to environmental and territorial planning issues and a hierarchical governance associated with mining-energy activities. These tensions are expressed in normative conflicts between the hierarchical mining-energy sector and the decentralized environmental and land planning regulations; power asymmetries that foster tensions between government actors and~encourage grater influence of governmental actors over social stakeholders in the decision-making process; the prevalence of closed and hierarchical actors' intermediation spaces; and rigid and coercive environmental instruments. In this hybrid water governance context, prevails a weak sustainable development approach, given that the water resources' environmental and social capacities of are limited to support the socio-economic activities. The hybrid water governance mode and the weak sustainable development approach acknowledged through the research, highlight the lack of horizontal and vertical articulation between government and social actors; hierarchical power relations that lead to fragmented, sectoral and coercive decision-making process; tensions between the central state and the municipality; limited environmental regulation instruments, and the socio-environmental conflicts proliferation.

Payments for ecosystem services and motivation crowding in the Amazon Piedmont

Wednesday, 14th June - 14:00 - SD 702 - Oral Abstract

Mrs. Lina Moros¹, Dr. María Alejandra Vélez², Dr. Esteve Corbera-Elizalde¹

1. Universidad Autónoma de Barcelona, 2. Universidad de los Andes

Globally, there is an increasing level of funding being targeted to pay ecosystem services providers directly to support positive environmental behavior, and particularly forest conservation, for example through Payment for Ecosystem or Environmental Services (PES) schemes and pilots of Reducing Emissions from Deforestation and forest Degradation (REDD) initiatives. In this context, there is a growing concern about the temporal stability of positive environmental behaviors once economic incentives are introduced or removed. We implemented an innovative research design to test for motivation crowding and to distinguish changes in behaviors from changes in motivations with potential PES recipients in the Colombian Amazon Piedmont. We test for the effect of individual, collective or crop-price premium incentives on motivation crowding, using a forest conservation game and a post-experiment survey on different types of motivations based on Self-Determination Theory to test for changes in motivations. Our findings show that collective payments for ecosystem services not only increase forest conservation levels in the game, but also crowd-in motivations related to peer pressure. Payments that involve crop-price premium reduce forest conservation levels and crowd-out intrinsic and guilt/regret related motivations. This research contributes to disentangling the interaction between incentives, motivations and behaviors in the context of forest conservation and agriculture expansion.

Liquidity Constraint, LPG Stoves and Charcoal Consumption: A Randomized Controlled Trial in Tanzania

Wednesday, 14th June - 14:15 - SD 702 - Oral Paper

***Dr. Yonas Alem*¹, *Dr. Remidius Ruhinduk*², *Prof. Peter Berck*³**

1. University of Gothenburg, 2. University of Dar Es Salaam, 3. University of California Berkeley

The high start-up cost of modern cooking appliances has been shown to be the key factor that hinders transition of households from biomass energy to clean energy in developing countries. We designed a randomised controlled trial to identify the impact of relaxing households' liquidity constraints on LPG stove adoption and charcoal use in urban Tanzania. In collaboration with a local micro-finance institution, we randomly assigned households into a subsidy treatment and a credit treatment, which included different repayment arrangements. We show that, relative to households in the control group, adoption of LPG stoves reduced charcoal use by 47.5% in the treated group. However, providing subsidies for stove purchases resulted in a much larger reduction in charcoal use (54%) than did providing access to credit (41%). We highlight the importance of relaxing households' financial constraints and improving access to credit to encourage urban households to switch to clean energy sources and save the remaining forest resources of Africa.

Negative versus Positive Carbon Leakage: The Role of Forest Management Regimes

Wednesday, 14th June - 14:30 - SD 702 - Oral Abstract

***Dr. Jorge H García*¹, *Dr. Anton Orlov*², *Mr. Asbjorn Aaheim*²**

1. Universidad de los Andes, 2. CICERO - University of Oslo

A model of two regions with a common wood market is introduced. Regions may be of two types, according to their forest management regime, namely managed (M) and unmanaged (U) forests. When regions are of the same type, unilateral forest carbon mitigation and enhancement actions lead to positive carbon leakage. When regions are of different types, such actions result in negative carbon leakage.

Sustainability Knowledge in different Country Contexts: The Role of Media Agenda-Setting

Wednesday, 14th June - 14:00 - SD 703 - Oral Abstract

***Dr. Ralf Barkemeyer*¹, *Dr. Aurelien Decamps*¹, *Dr. Guillaume Barbat*¹**

1. KEDGE Business School

Education can be seen as an integral part of any credible and potentially effective global governance solution in the context of Sustainable Development. Naturally, (higher) education institutions play a key role in this regard, but these are embedded into a specific context with a range of other actors influencing the extent to which learning for Sustainable Development takes place. In this paper, we examine a range of individual, institutional and country-level contextual factors and their roles in learning for Sustainable Development. We are interested in the extent to which the mass media support education for Sustainable Development through (sustainability-related) first-level agenda-setting. Using the theory of planned behaviour (Ajzen & Fishbein, 1980) as the main theoretical framework for our study, we examine the levels of sustainability related knowledge among students from higher education institutions in nine major economies (Brazil, Canada, France, India, Mexico, South Africa, Spain, United Kingdom, United States). For our dependent variable, we turn to a dataset compiled by the Sustainability Literacy Test (SULITEST, 2016), focusing on levels of knowledge in relation to climate change, biodiversity, poverty as well as a number of sustainability-related concepts and theories. The main independent variables included in our multi-level models include cultural, economic, environmental and governance indicators as well as those describing the impact of different higher education institutions and respondents' individual characteristics. We apply a multi-level modelling technique using Mplus to explore the relative importance of individual, institutional and country-level factors in a real-life setting employing a large-scale dataset. The results help us to contribute towards a more nuanced understanding of sustainability-related learning, and in particular to shed light on the role of the wider country-level contexts in triggering and facilitating sustainability-related knowledge generation. Crucially, they also have clear implications for higher education curricula which is the focal point of our discussion. Before concluding, we develop a set of recommendation for policymakers in the field of education for Sustainable Development.

The Role of Data Analytics for Sustainable City Development and the Implications for the Academia

Wednesday, 14th June - 14:15 - SD 703 - Oral Abstract

Ms. Laura Carolina Bernal Parra ¹, Mr. Juan Nicolas Melo Martin ¹, Mr. Juan José Díaz Baquero ¹, Mr. Juan Felipe Franco ¹, Prof. Raha Akhavan-tabatabeai ², Prof. Ivan Mura ¹

1. Universidad de los Andes, 2. Sabanci University

Unprecedented technical capabilities to collect data about physical processes, environmental conditions, industrial practices, transportation flows and citizens' habits and preferences are providing us with the possibility of scrutinizing multiple aspects of our cities and characterizing them with huge size digital footprints. These records offer invaluable opportunities for sustainable management sciences, as they can be used to obtain precious information about current conditions and to build predictive models that can forecast the effects of possible interventions along improvement routes. Though, processing large and diverse data sets to extract meaningful and statistically valid evidences entails challenges from both the conceptual and technical viewpoints, and requires the rigorous and disciplined application of techniques from Data Analytics. Data Analytics includes several processes, all being increasingly supported by the aid of specialized systems and software applications, which implement an end-to-end chain from data acquisition, cleaning and validation, processing for descriptive, predictive and prescriptive purposes, until aggregated value in the form of information is produced and made available to decision-makers. The formalization of the above process steps guarantees that conclusions are drawn about the information already contained in the data, limiting subjective judgement and ensuring repeatability. This work wants to present the experience gained in an on-going data analytics project being carried out at the Universidad de los Andes. A team composed by undergraduate, graduate students and professors has been dealing with the historical dataset of air quality measurements of the city of Bogotá, with the aim of understanding the impacts that air pollution control strategies have had over time. This project offers several themes for consideration. On one side, in the case of Colombia, urban air quality data analysis from public authorities and from the academia have been drawing distinct and sometimes contracting results from the same datasets. It is usual that each study builds on specific and often not defined data processing rules, which turns out in scant reproducibility of results. Under these circumstances, defining agreed baseline measurements and air quality control interventions is a very hard task. On the other side, our research unveils the urgent necessity of establishing scientific collaborations between the academia and environmental and public health authorities, to create stakeholder engagement along synergistic bi-directional exchanges. The academia holds very advanced knowledge about Data Analytics. This opens important opportunities to push forward educational programs that can make up for the data science formation gaps, while promoting its use for decision making towards a sustainable urban development. Finally, the project wants to underline that the combination of the knowledge and expertise of the academia, with the experience in management of the city government, translates into benefits for the citizens, who have tools to be more and better informed.

Continuing professional education for engineering faculty: Transversal integration of Sustainable Human Development in basic engineering sciences courses

Wednesday, 14th June - 14:30 - SD 703 - Oral Abstract

Prof. Agustí Pérez-Foguet¹, Mr. Boris Lazzarini¹

1. Universitat Politècnica de Catalunya

The integration of sustainable development in higher education is increasingly recognised as a priority for a growing number of universities, nonetheless, barriers for change remain and particular attention should be given to the success factors fostering an effective integration. The present contribution analyses the extent to which a professional development programme, aimed at engaging and empowering faculty, has positive effects to integrate sustainable human development principles into existing courses of engineering. Specifically, the research focuses on the effects of the integration of sustainable human development in new teaching modules in a subject of basic engineering science, implemented in regular courses of the first year of the degree in engineering. The methodology includes i) a standardised test to assess sustainability literacy of the students; ii) a focus group conducted with the students of the engineering courses involved in the initiative; and iii) an in-deep interview conducted with the academic coordinator of the subject analysed. The results of the present case study highlight the relevance of professional development programmes addressed to academics with regard to the integration of sustainability principles specifically in formal science disciplines. The conclusions highlight relevant insights from the case study that are useful for supporting further integration of sustainable development in engineering disciplines.

Understanding the role of services in the socioeconomic metabolism: the case of kindergarten education in Norway

Wednesday, 14th June - 14:45 - SD 703 - Oral Abstract

Mr. Felipe Vásquez¹, Mr. Avijit Pandit¹, Ms. Maren Lundhaug¹, Prof. Daniel Müller¹

1. NTNU - Norwegian University of Science and Technology

Services allows us to satisfy some of our basic needs, for instance education, health care, and communication. Services are fundamental part of our socioeconomic metabolism (SEM) and sustainable development. Yet, the role that services play in our SEM, in terms of the demand, use, disposal, and accumulation of resources in the anthroposphere, has remained largely unexplored. For the most part, SEM studies take either an economy-wide approach or a product/infrastructure process-based approach. These approaches are useful in the study of major resources at a national level, or at the level of specific infrastructures, materials and energy cycles throughout the anthroposphere. However, the approaches fail to acknowledge the role of services on resources. While the fields of economics (e.g. human capital and education economics) and demographics (e.g. human capital formation) have been concerned with the study of services. These do not deal with environmental resources implications. Here we present an approach for the study of services and their role in the anthroposphere under a SEM framework, which integrates principles from demographics, economics, and stock-and-flow dynamics. We define a service as a system composed of (i) two demographic stock-elements, demanders and providers, (ii) an infrastructure stock-element, (iii) their links, and (iv) their associated human, infrastructure, material and energy flows. Hence, the planning for the sustainability and optimal provision of services rely on the adequate understanding of their drivers and the stocks-and-flows' dynamics in the system. We use the case of kindergarten education in Norway to illustrate the principles and applicability of the approach. We analyse the situation of the system in 2013 and forecast the evolution of the stocks and some flows towards 2040 with the assistance of a quasi-stationary model. If present national students-to-teacher and area-to-student ratios remain at present levels, the number of students, teachers and square meters are expected to increase by 11.8%, 11.4% and 11.5% respectively in the year 2040 - under a medium-growth demographic scenario. Satisfying these teaching requirements imply that at least 4,705 new teachers and 197,962 new kindergarten-square-meters would be needed. The findings press for opportune planning and action at the policy, academy, and construction levels to prepare for this coming demand, not only at the national and but also at the regional scale. This paper presents a first approximation towards the study and modelling of services under a SEM paradigm. The method can be used for the design and evaluation of policies related to the fourth sustainable development goal, in relation to inclusive and equitable quality education. Other applications are also foreseen in issues connected to health, employment, information technology, and innovation and research. Keywords: Services, socio-economic metabolism SEM, education, kindergartens, Norway

IS THE TARGET FOR IN-LAND CONSERVATION SUGGESTED BY THE CONVENTION ON BIOLOGICAL DIVERSITY (CBD) ADEQUATE FOR COLOMBIA?

Wednesday, 14th June - 14:00 - SD 704 - Oral Paper

Dr. Martha Fandiño - Lozano¹

1. Fundación ARCO

Abstract The persistence of the biota is a fundamental element of sustainable development; it is impossible for us to survive without other species. Natural parks or reserves are fundamental pillars of any conservation strategy. They prevent the complete conversion of natural ecosystems and, in that way, provide intact habitats for wildlife. However, if conservation areas are not selected rigorously, gaps may lead to a species extinction. To be effective, reserves must include viable populations of all the species present in the territory as well as all the ecosystem components and processes that species may require in order to survive and persist. Guaranteeing minimum areas is important as well because of their impact on the size of populations. The Convention on Biological Diversity (CBD) suggested a minimum extent of 17% of in-land ecosystems to be protected and 10% of marine areas. Nevertheless, it did not explain how to achieve these targets. Do these values represent the minimum extent for each ecosystem type? Establishing a general target like this might over or underestimate the real level of conservation needed for each type of ecosystem. Perhaps these values are just meant to be the result of a portfolio of conservation areas selected by applying other targets. In this article, targets are calculated for all in-land ecosystems of Colombia, a gap analysis is done and two portfolios of priorities for conservation are constructed using FOCALIZE: a decision support system that selects groups of spatially related ecosystems using minimum targets calculated based on the requirements of umbrella species. The first scenario considered the existing national parks whereas the second did not include them starting the selection from a hypothetical situation where no parks existed. The results highlight the importance of using effective selection methods including science-based minimum targets. Although the 17% of the in-land territory of Colombia could have been enough to reach the correct size of conservation areas and to cover all the variety of in-land ecosystems, the national parks selected in an *ad hoc* manner in the past overrepresented some ecosystems and added more area than necessary. Now this political target is not enough.~ Keywords: Conservation planning, FOCALIZE, minimum targets, political targets.

LUI – A Land Use Intensity Index to Measure a Driving Force of Biodiversity Loss

Wednesday, 14th June - 14:15 - SD 704 - Oral Abstract

Dr. Joachim H. Spangenberg¹

1. Helmholtz Centre for Environment Research UFZ

Biodiversity loss has been identified as the environmental impact where humankind has been trespassing planetary boundaries most ruthlessly (followed by swelling the nitrogen cycle and climate change - both are main drivers of biodiversity loss). Going beyond the pressures causing damages and analysing their underlying driving forces, a series of drivers can be identified. Systematising them, land use (intensity), material (and substance) flows and energy consumption can be considered key categories, with land use intensity the most important factor. However, they are closely interconnected – for instance, energy consumption based on fuel flows enables additional material flows in agriculture (inputs, mechanisation) contributing to intensification. While aggregate energy flows in ecosystems can be characterised by Net Primary Production NPP and its Human Appropriation HANPP, and substance flows by material flow analysis, no such measure is available yet for land use intensity. Furthermore, statistics for individual components of land use intensity are often lacking, incomplete, with insufficient time series, in particular in developing countries, or are inconsistent. In such cases stakeholder interviews provide a means of identifying land use history as a basis for sustainable land use planning. In particular in countries with relatively weak statistical systems, oral information transfer often plays a high role and is of surprising quality. However, as stakeholders observe rather than measure change, classifying observations requires an ordinal scale approach, with classes wide enough to accommodate the observations but still suitable to characterise land use history. We suggest LUI, a new land use intensity index characterising changes in land use intensity over time, to be used in such cases; such an index does not exist so far (thus this is a conceptual proposal for an index to be tested empirically, with no experimental data available so far). It would be a valuable source of information regarding the dominant driver of biodiversity loss. For the qualitative aspect of ecosystem fragmentation, it can be integrated with the EU's habitat fragmentation index. Combining the fragmentation index and LUI based on the same data sets would allow for a comprehensive assessment of land use intensity; it could also be used for monitoring if land use intensity is indeed reduced. Its simple and intuitively understandable structure makes it suitable for citizens' science applications, and thus for participative monitoring when extensive statistical data gathering is not feasible. **Key words** Biodiversity loss, driving forces, land use intensity, fragmentation, Land Use Intensity index LUI

Biodiversity offsets: case studies in limestone mining sector in Brazil

Wednesday, 14th June - 14:30 - SD 704 - Oral Paper

Mrs. Barbara Souza ¹, Mr. Luis Enrique Sánchez ¹

1. University of São Paulo;

Biodiversity is responsible for maintaining benefits that society obtains from ecosystems. Economic activities such as mining often cause loss and fragmentation of habitat, with consequences for the functioning of ecosystems. In response to the increasing loss of native vegetation and biodiversity, a growing number of countries have adopted “offsetting” policies that seek to balance local habitat destruction by restoring, enhancing and/or protecting. In this context, biodiversity offset is a mechanism that counteracts adverse effects of projects, and is applied to adverse effects that can not be avoided by applying the mitigation hierarchy, as recommended by guidelines such as IFC’s Socioenvironmental Sustainability Performance Standards. Although the offset is already a consolidated instrument in the environmental licensing process in Brazil and in other countries, there are questions about the effectiveness of the compensatory measures regarding the ability to actually offset the losses in terms of biodiversity. Looking to analyse whether the compensation practiced in Brazil is able to compensate losses of biodiversity, three offset projects practiced by limestone mining enterprises, located in the Atlantic Forest domain, in the Southeast of Brazil, are discussed in the light of international recommendations for biodiversity offset to verify the possible adherence or to identify the main gaps regarding the international principles and recommendations of good practices in biodiversity offset. Results suggests that, although Brazilian offset is focused on protection, replacement and restoration of affected habitat, there is some equivalency between compensation and international recommendations for biodiversity offsets. However, improvements are needed in terms of stakeholder participation in offsets design, which could result in gains for the affected beneficiaries of ecosystem services, which were impacted negatively by the project. The results of the research indicate that the offset practiced by the analysed cases do not guarantee the biodiversity loss, because focus only on government determinations, lack of consideration of species richness or monitoring of biodiversity practices.

Integration of habitat quality index with physicochemical and ecological models oriented to the Ecosystem recovery in the Meléndez River, Cali-Colombia

Wednesday, 14th June - 14:45 - SD 704 - Oral Paper

***Mr. alex quintero*¹, *Prof. Javier E. Holguin Gonzalez*¹**

1. Universidad Autónoma de Occidente

The ecological quality of the water of the Meléndez River at the medium and low basin was evaluated through the application of quality and pollution indices in the ecosystem by using physicochemical parameters and its association with aquatic macroinvertebrates. In addition, a pollution control scenario was evaluated by the application of a simplified dissolved oxygen model of Streeter Phelps, in the most critical loads into the river. This study was performed in a period of high-precipitation of the last quarter of the year 2016. The aim of this project was find the actual ecological situation at the river in order to create a baseline study necessary for the future environmental improvement of the city. In general the ecological quality index showed a significant alteration of the riverside forest in the middle basin and an extreme degradation in the low part. On the other hand the physicochemical parameters results showed high dissolved oxygen levels (7.21 mg / L in the middle basin and 6.63 mg / L in the low basin), pH very close to neutrality in all stations, BOD₅ and COD with values that did not exceed 12 mg/L, whereas fecal coliforms presented high levels in the low basin (up to 66000 CFU) showing a certain degree of contamination in the lower river basin. A total of 22041 individuals of macroinvertebrates of 7 different families were obtained by the catching methods which indicates according to the BMWP-Col index that the river presents very polluted waters due to the discharges of domestic wastewaters. The measured physicochemical parameters and the species of macroinvertebrates present good correlations according to the analysis of canonical correspondence where there are strong associations in the X axis with pH (0.940) and OD (0.919), while in the Y axis a strong correlation With the BOD (0.819). This project contributes to explore new issues to discuss about our ecosystem resources and how our environmental authorities can improve their care through the use of ecological indices, models and its correlation with the aquatic macroinvertebrates providing a frequently tracing spatial and temporal in our Rivers. **Keywords:** aquatic macroinvertebrates, ecological quality, sustainability indicators, Streeter Phelps model, Meléndez River.

Participatory mapping of hotspots: where to keep the invaders out?

Wednesday, 14th June - 15:00 - SD 704 - Oral Abstract

***Ms. Jetske Vaas*¹, *Ms. Elizabeth Haber*¹, *Prof. Peter Driessen*¹, *Dr. Mendel Giezen*², *Dr. Frank Van Laerhoven*¹, *Prof. Martin Wassen*¹**

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Invasive species challenge the integrity of ecosystems, especially on islands. Caribbean islands make up one of the world's 25 global biodiversity hotspots, with about 60% of the region's 12,000 plant species being endemic. Utrecht University works in Saba and St. Eustatius to facilitate decision-making regarding the management of invasive alien plant species (IAS), such as Coral vine. Introduced as an ornamental plant, it is regarded as a beautiful flower by some, a threat to nature by others, and an annoying weed in the garden by almost all. Development is both a cause of this invasion, and could be a solution to it. Economic development in the form of the establishment of an oil terminal in St. Eustatius, moved people away from agriculture by providing higher-regarded jobs. Additionally, the economic development it stirred, redirected consumption patterns towards more supermarket-based consumption, compounding the decline in agriculture. Former agricultural fields are a significant share of the area covered in Coral vine, which on St. Eustatius is estimated to be at 15% of the island's surface. Economic development might also harbor solutions to managing the vine, for example when the promotion of tourism generates an urge to improve land management. We try to link economic development and land use management considerations through supporting decision making on IAS management. To that end, we have looked at the valuation of ecosystem services, and employed participatory mapping. ~~~~~ First, to understand how Coral vine's effects on ecosystem services are experienced by stakeholders, we investigated how different ecosystem services are valued. We employed Q methodology to elicit stakeholder groups around ecosystem service discourses, by having participants rate 48 statements on a normal distribution. The statements were based on 4 discursive claims regarding 12 landscape values, adapted to the local context. Factor analysis will derive several discourses from this, which we take to designate stakeholder groups. Those groups will be the basis for next research steps on the potential for management. Second, the presence and valuation of ecosystem services differs spatially, and hence does the impact of Coral vine. Therefore, we employed participatory mapping by having participants choose 5 areas they would like to see free from the vine, as well as explain why. Overlaying the different areas shows a couple of priority areas, which we will compare with maps on the presence of and habitat suitability for Coral vine. On the "hotspots" that appear like this, one could base zoning proposals. ~~~~~ Having identified the different stakeholder groups and hotspot areas we aim to support decision-making on IAS management, by kick-starting dialogue among government, scientists, citizens and nature managers on the islands in a next research step.

RESOURCE DECOUPLING: EMPIRICAL EVIDENCE FROM BRAZIL

Wednesday, 14th June - 14:00 - SD 715 - Oral Abstract

*Ms. Layza Soares*¹, *Mrs. Luciana Almeida*²

1. Universidade Federal Fluminense (UFF), 2. Universidade Estadual Paulista Júlio de Mesquita Filho (UNESP)

In 2008, the United Nations Environment Programme (UNEP) launched the Green Economy Initiative, which comprises a set of recommendations aimed at stimulating economic growth, while simultaneously achieving social inclusion and environmental sustainability. UNEP has been using the key-concept of decoupling for achieving these goals. It means dissociating the economic output of the environmental pressure with the increase of well-being of society. Some developed countries have shown decoupling of economic growth from natural resource consumption and environmental impacts, building a trajectory towards a green economy. However, a portion of this resource decoupling may be related to environmental pressure in developing countries, such as Latin American and Caribbean countries, whose economic development model is intensive in natural resources and based on exports of low value-added products. This article aims to investigate the long-term relationship between economic growth and the environment in Brazil based on resource decoupling indicators. To this end, indicators of resource use according to Material Flow Accounting method (MFA) are measured for all categories of materials (biomass, fossil fuels carriers, non-metallic minerals and metallic minerals) from 1970 to 2013 (these indicators are being updated for more recent years). The results show that there was no resource decoupling in Brazil in the 44 years of this study, due to the increase in resource per capita consumption from 7.8 tons in 1970 to 23.6 tons in 2013. Furthermore, there was an increase of 26% in material intensity. Brazil has a Physical Trade Balance deficit especially caused by exports of biomass (soybean, sugarcane) and metal ores (iron), while it is still dependent on imports of fossil fuels and chemical minerals (fertilizer). Empirical evidence for decoupling in Brazil corroborate the studies on material resources consumption in Latin American and Caribbean countries, indicating that the resource intensive economic development model followed by these economies are directly related to dramatic increase in the natural resources exploitation in the region. Keywords: decoupling indicators; natural resources; economic growth; environmental impacts.

Predicting climate change impacts on vulnerable small farmers in South Africa's Eastern Cape.

Wednesday, 14th June - 14:15 - SD 715 - Oral Paper

Prof. Raymond Auerbach¹

1. Nelson Mandela University

South Africa's Eastern Cape province has extremely high levels of poverty, partly due to the highly variable rainfall; rainfed farming systems are notoriously risky due to poor rainfall distribution, and this results in widespread food insecurity. Two magisterial districts (Sarah Baartman near Port Elizabeth and Amathole near East London) were selected, and large variability of rainfall distribution was noted. Factors implicated in food insecurity were analysed including resilience, biodiversity and productivity, and five climate prediction models were examined to assess their relevance in supporting small scale farmers. Sensitivity of the models to variable data input was assessed. Given that rainfed crop production requires 500 mm of rain during the growing season, that all of the models examined were highly sensitive to variations in rainfall and that rainfall in the sub-districts varies from year to year between 200 and 900 mm per annum, it was concluded that none of the climate change models available would be useful in the Eastern Cape. It was rather decided to use existing rainfall data as an initial predictor of likely drought patterns, as these are already a severe constraint on rainfed crop production. Strategies to assist vulnerable farmers should therefore focus on small livestock production, home gardens with rainwater harvesting and soil management systems which improve soil water holding capacity, such as organic farming and conservation agriculture. **Keywords:** climate change; drought prediction; plant available water; food insecurity, water use efficiency.

Sustainability of the extraction of coal in Colombia

Wednesday, 14th June - 14:30 - SD 715 - Oral Abstract

Prof. Adrian Saldarriaga Isaza¹, Mr. Luis Salas¹

1. Universidad Nacional de Colombia - Sede Medellín

In the last five decades, most of Colombia's exports have been commodity-based. Along this time, coffee ceased its role in the Colombian balance of trade as the largest product commodity; in first decades of the 21st century, non-renewable resources, coal and oil, are among the main goods that Colombia exports to the rest of the world. No matter the price, Colombian government has boosted the extractions of oil and coal. Moreover, recent evidence shows that those departments of Colombia with high economic dependence of minerals and oil, which are also the departments with the lowest levels of per capita GDP, have a higher rate of economic growth. This evidence shows that a high concentration in the mineral and oil sector has had a positive effect on the rate of growth per capita GDP of those departments. Nonetheless, it is still unknown whether this condition and this rate of extraction is sustainable for this country. Using available data for the 2004-2011 period, this paper shows an application of K.G. Maller's Value of Natural Capital method in discrete-time. Maller's method is used to answer the question of whether coal extraction has been sustainable for Colombia. Consumer surplus and producer surplus are computed with the estimation of a demand function for coal in Colombia, and using the financial statements of coal companies in Colombia respectively. The sum of these surpluses is used as a measure of social welfare, which together with the environmental discount rate for Colombia determines the shadow prices under two models of resource allocation (autonomous and non-autonomous). The analysis of results suggests that the extraction of coal in Colombia for this period has shown an unsustainable path.

Keywords: Intergenerational well-being; coal; value of natural capital; shadow price, sustainability.

Climate Change and Vulnerabilities in Colombia

Wednesday, 14th June - 14:45 - SD 715 - Oral Abstract

Mr. Jorge Enrique Gutiérrez¹, Mr. Javier Eduardo Mendoza¹

1. IDEAM - PNUD

Colombia has been strengthening processes and learning regarding the assessment of vulnerability to Climate Change. Starting with the Third National Communication, that will be signed in 2017 to the United Nations Framework Convention, new approaches are presented both to methodologies and to the results of a comprehensive analysis for the national territory. Based on the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), frameworks are proposed that interweave conceptual dialogues between disaster risk approaches and climate risk analysis, including the latter Component of vulnerability. The present paper seeks to highlight the main challenges facing the country, and what the results were based on the methodology that integrates IPCC approaches from the AR5, where social, economic and ecosystemic factors are identified, among others, which have the effect of creating or generating elements that increase or decrease vulnerability to climate change in a territory.

Hydrologic model for predicting drought hazard under Climate Change scenarios

Wednesday, 14th June - 14:00 - SD 716 - Oral Paper

Mr. Juan Velandia¹, Ms. Jessica Bohórquez¹, Dr. Luis Yamín¹

1. Universidad de los Andes

Nowadays climate change is one of the main issues human beings face. Its consequences have been reflected on the modification of recurrent patterns of meteorological existing phenomena in the form of an increasing humidity demand by the atmosphere, due to the rise of superficial earth temperature. One of those phenomena, droughts, have been presenting on a more prolonged way and with heavier impacts on different areas such as agriculture, the ecosystems, and water reservoirs, among others. In consequence, a need has surged to develop tools able to predict the behavior of this hazard, thus take the necessary measures in order to reduce the vulnerability of the exposed elements in anticipation of a drought event. This project proposes a methodology in relation with the Latin-American setting based on the most recent probabilistic and geographical system information developments in the subject of drought hazard prediction. The proposal consists in fitting probabilistic curves to the characteristics of drought events: severity define as the total impact of the anomaly, duration as the total extent and intensity as the maximum impact. These three characteristics are derived by the employment of indexes, which are obtained from meteorological data such as precipitation and temperature of the area of interest. From this point, the procedure lies in the use of the fit probabilistic curves with the aim of calculating the frequency and the numerical values of the different drought characteristics; in addition of curves and maps that are tools with the ability of summarize in a visual way all the stochastic information of the hazard in the study location. In this way, the result is a model with the ability of showing in a graphical and numerical manner the expected behavior of future events; thereby decision makers could take actions on this aspect by proposing ways to prevent and mitigate the associated damages. The methodology was tested and ratified in a South American basin. For the tested region the conclusions forecast more extensive drought events with lower intensities. In a general aspect, the implemented process and the application yielded satisfactory results which shown the multiple applications that the model can blend for decision making and a subsequent risk analysis. This type of analysis implies a more inclusive government by making easier and possible to decide the target zones that require special attention. This implies a more equitable society in which all regions are better prepared to the future upcoming threats. \textbf{Keywords:} Drought, Methodology, Forecasting, Decision, Hazard

Tool for riskassessment and risk reduction

Wednesday, 14th June - 14:15 - SD 716 - Oral Abstract

Prof. Yvonne Andersson Skoeld (in Swedish it reads Sköld)¹, Dr. Lars Nyberg², Mr. Göran Davidsson³

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According to climate scenarios the global mean temperature will increase by up to 5 C, the nearest 50 to 100 year. Dry areas will become drier and humid areas will become more humid. Regional climate scenarios for Northern Europe show increases in annual precipitation and heavy rain events in most parts of Sweden and large part of Northern Europe. Accordingly, the risks for flooding will increase. Also, the risks of erosion and landslides are expected to increase. Natural events such as floods and landslides already today can cause severe consequences and costly damages. The risks are expected to increase, not only as a consequence of climate change but also due to increased vulnerabilities, especially in urban areas. Although preventive measures are often cost-effective, some measures are beneficial to certain values, while some may have negative impacts on other values. In order to counteract this, methods for risk assessment and impact assessments of risk reduction measures are being developed. Here methods applied for risk analyses in Gothenburg and a method for impact assessment of risk reduction measures will be presented. The assessment tool for risk reduction aims to contribute to a more transparent and sustainable risk management process by assessing strategies and interventions with respect to both short- and long-term perspectives, including local impacts and wider environmental impacts caused by climate change, for example. The tools also cover social and economic aspects. The assessment tools provide checklists that can be applied in the local spatial planning and climate adaption process as a support for decision, thus allowing for more transparent decisions.~~ Key Words: climate change adaptation, flooding, risk assessment, risk reduction assessment, short and long term,~decision support~~

Assesment of Rural Household's Vulnerability to Climate Change and Its Extremes - Ourika Watershed, Morocco

Wednesday, 14th June - 14:30 - SD 716 - Oral Abstract

***Prof. Abdellatif Khattabi*¹, *Ms. Sara Benbrahim*², *Prof. Lahssini Said*²**

1. Ecole Nationale Forestière d'Ingénieurs, Salé, 2. Ecole Nationale Forestière d'Ingénieurs

The natural variability of climate has always been a challenge for communities' livelihoods. Climate change has given a new and complex dimension to this challenge. Evidence shows that the natural variability of climate, exacerbated by climate change, will undermine communities' livelihoods, particularly in the rural areas of developing countries that lack sufficient capacity to adapt. The manifestations of climate change and its impacts vary locally as well as are adaptive capacities and strategies to cope with these impacts. Those, effective planning of adaptation programs requires an assessment of local vulnerabilities. The livelihoods framework can be adapted to the assessment of vulnerability at a local level and adaptive capacity through analysis of the state of five active assets: financial, human, social, physical and natural. This framework has been applied to study the contextual and multidimensional nature of vulnerability in the watershed of Ourika, Morocco, exposed to floods and droughts. This Climate Vulnerability Index (VCI) adopted a bottom-up approach to recognize climate change effects and the social and natural vulnerabilities in five distinct rural communities. The index is composed of household parameters for the three dimensions of vulnerability such as exposure, sensitivity and adaptive capacity. Exposure is defined by natural disasters and climate variability. Sensitivity is expressed through Health, Food and Water. Adaptive capacity is defined by the socio-demographic profile, subsistence strategies and social networks. These parameters were assessed through observation and survey of 120 households randomly selected from the five communities. The results obtained showed strong but differentiated vulnerabilities according to the communities studied. These results imply that the exposure of a locality to the long-term evolution of climate hazards is the most important element in determining the overall vulnerability of a community. Of the three components of vulnerability, adaptive capacity is the component with direct implications related to the management modes and strategies followed by decision-makers at the territorial level. Improving adaptive capacity has indirect implications for improving the sensitivity of a community. The comparison of the results of vulnerabilities obtained shows that, despite having the capacity of adaptation higher, this capacity cannot be entirely realized in front of a higher exposure. The analysis of the vulnerability components shows that most vulnerable households are those with the lowest adaptive capacity and are faced with the highest exposure independently of the locality. Improving the adaptive capacity of these vulnerable households will reduce their sensitivity and finally reduce their overall vulnerability. Among the various components of adaptive capacity, the main emphasis should be placed on local policies to create opportunities for non-farm livelihood options, which will not only improve the income of the Community, but also to reduce their dependence on natural resources.

SUSTAINABLE DEVELOPMENT CO-BENEFITS OF WIND POWER CDM PROJECTS IN NORTHEAST BRAZIL

Wednesday, 14th June - 14:45 - SD 716 - Oral Abstract

*Ms. Maria de Fátima Barbosa Góes*¹, *Dr. Celio Andrade*², *Dr. Marcelo Santana Silva*³, *Ms. Augusta Coelho Santana*²

1. Bahia State University, 2. Federal University of Bahia, 3. Federal Institute of Bahia

Clean Development Mechanism (CDM) projects prompted by the Kyoto Protocol allow developed countries to finance GHG emissions reduction in developing countries. The energy sector plays a critical role in successfully reducing GHG emissions and facing climate change. Worldwide, according to the International Energy Agency (IEA), use of low-carbon energy sources is expanding rapidly, with renewable energy accounting for almost half of all new generation capacity in 2014. There has also been increasing investment in the wind power sector in recent years in Brazil. At the end of 2014, Brazil ranked 10th in the world ranking of wind power generation. Brazilian potential for wind power generation is quite large, especially in the Northeast Region. Data from the Brazilian Wind Energy Association (ABEEólica) show that 78% of wind power installed capacity in Brazil at the beginning of November 2015 was concentrated in Northeastern states, mainly Rio Grande do Norte, Bahia and Ceará. In addition to the main objective of reducing GHG emissions, CDM projects should have as a secondary objective the promotion of sustainable development co-benefits. Given the role of renewable energy in consolidating a low-carbon economy, the purpose of this paper is to analyze the sustainable development co-benefits of wind power CDM projects in Northeast Brazil. In order to achieve this aim, a desktop analysis of 47 Project Design Documents (PDDs) of all the wind power projects in Northeast Brazil registered by the CDM Executive Board until May 2016 was carried out. During the desktop analysis, size, location, actors, organizations, annual estimation of emission reductions in tons of CO₂e, crediting period and declared co-benefits for sustainable development were identified. Preliminary results show that approximately half of the projects are located in the state of Rio Grande do Norte; about 70% rely on less than 40 wind turbines; and around 60% estimate an average annual GHG reduction of up to 100,000 tons of CO₂ equivalent. In regard to sustainable development co-benefits, the most cited environmental co-benefit was, as expected, the improvement in air quality. As for the social co-benefits, the generation of new employment opportunities was the main one listed. At last, the most cited economic co-benefits were the stimulus of regional economy, the promotion of sustainable energy use and the introduction and diffusion of imported technology. Finally, some suggestions are made in order to increase the sustainable development co-benefits of the wind power CDM projects in Northeast Brazil.

Keywords: Sustainable Development Co-benefits, CDM projects, Wind Power, Brazil.

Adaptive Strategies for Urban Rainwater Drainage Systems in Climate Change Scenarios

Wednesday, 14th June - 15:00 - SD 716 - Oral Paper

***Prof. Juan Saldarriaga*¹, *Ms. Jessica Bohórquez*¹, *Prof. Maria Cunha*², *Prof. Pedro Iglesias*³, *Prof. Javier Martínez*³, *Dr. Inés Camilloni*⁴, *Dr. Nicanor Quijano*¹, *Dr. Carlos Ocampo*⁵, *Mr. David Celeita*¹**

1. Universidad de los Andes, 2. Universidade de Coimbra, 3. Universidad Politécnica de Valencia, 4. Universidad de Buenos Aires, 5. Universidad Politécnica de Cataluña

Significant changes in the rainwater regime are amongst climate change's most noticeable consequences. Urban flooding occurs because of drainage systems' inability to transport all the runoff that is generated. Because of urban floods, cities may present several economic, social and health issues. In this research we attempted to minimize these effects by adapting and not replacing cities' current drainage infrastructure to the new hydrology conditions. The main objective was to determine the feasibility of implementing temporary storage structures in any big city, regardless of its geographical and socioeconomic context, to reduce rainfall peak flow rates and avoid urban flooding events. This project was developed in cooperation with universities from Colombia, Spain, Portugal and Argentina, and allowed us to create a methodology to optimize the location and volume of these tanks to adapt cities to climate change conditions. Additionally, this project tested a methodology to calculate future rain intensities, so cities can be better prepared to face future challenges. Finally, regarding sustainable development, we concluded that future urban drainage systems should try to imitate the natural drainage that existed in the basin long before cities were built. This is important since human intervention has distanced itself from natural drainage, which is a mistake since natural drainage is more effective than what we have done in the cities as urban drainage.

Keywords: Climate Change, Urban Floods, Storm Tanks, Urban Drainage, SUDS.

Identifying change agents for Corporate Sustainability integration

Wednesday, 14th June - 14:00 - SD 205 - Oral Abstract

Dr. Sjors Witjes¹, Mr. Michiel Zijp², Ms. Jennifer van den Berg¹, Dr. Walter J.V. Vermeulen³

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CS change agents play an important role for companies when integrating Corporate Sustainability into their business activities. While change agents can be differentiated by their worldviews, little is known about the contextual factors influencing their success in supporting CS integration. By presenting and illustrating a framework based on contextual factors of CS integration and change agents' worldviews, this paper contributes to the understanding of their influence on CS integration. We conclude that CS integration can be characterized by different types of context, with CS change agents holding a worldview profile instead of only one worldview. Consequently, different situations within one organisation require change agents with different worldview profiles. The framework enables the understanding of the individual and group level of CS integration. When discussed with company representatives, the outcomes enable an improvement in the selection of key individuals to support CS integration activities.

Voluntary Environmental Programmes for organisational learning: A Colombian experience

Wednesday, 14th June - 14:15 - SD 205 - Oral Paper

Mrs. Juanita Duque-Hernández¹, Prof. Bart van Hoof¹

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This article discusses voluntary environmental programmes (VEPs) as mechanisms that encourage better social and environmental performance in companies. The research aims to study why firms, in an emerging market context, join VEPs and what they learn from their participation. The conceptual framework combines literature on organisational learning and voluntary programmes. The research method is quantitative, using empirical longitudinal data from 54 facilities that participated in the first 2 editions of an environmental disclosure programme in Colombia (RACES – Reconocimiento Ambiental CAR a Empresas Sostenibles). The main findings evidence a mismatch between firms' ex ante motivations to join RACES and their ex post assessment of the benefits obtained from participating. Firms manifest their main driver to join RACES is reputational, however the most valued benefit from participating is capacity-building. In fact, facilities participating in RACES achieve diverse levels of organisational learning regardless of their economic sector. Larger firms tend to achieve higher levels of organisational learning than micro and small companies. The significant organisational learning achieved by RACES firms can also be influenced by the programme's design features and by the fact that the facilities are early entrants in the first two editions of the programme. Academic contributions are made by integrating two bodies of literature to understand the organisational dynamics of companies participating in voluntary disclosure programmes. Recommendations to practitioners involve how to participate in VEPs and the recognition of VEPs as tools for capacity-building in environmental management. Possible implications offered for the design of public policy and voluntary mechanisms that complement command and control and generate organisational learning.

How networks of innovative sustainability technology producers deal with the dilemma of collaboration versus competition

Wednesday, 14th June - 14:30 - SD 205 - Oral Abstract

***Mrs. Julia Planko*¹, *Dr. Maryse Chappin*¹, *Prof. Jacqueline Cramer*², *Prof. Marko Hekkert*¹**

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To increase chances of market success of their innovative sustainability technologies, firms can strategically build-up an innovation system or business ecosystem around their innovative technology. Transition literature refers to this process as ‘collective system-building’. Firms collaborate in networks, which can include public and private actors, to optimize their technology, create a new market and trigger socio-economic changes. When engaging in collective system-building, firms face a profound dilemma that may hamper collaboration: should they invest their limited resources into collaboratively building up the innovation system, or should they invest them into competing against their rivals for market share? Firms have to carefully weigh the advantages and disadvantages of collaboration versus competition when engaging in collective system-building. We examined how firms who collaborate on developing and implementing a new technology deal with the dilemma of competition versus collaboration in system-building. The transition literature has not addressed this dilemma yet. To fill this gap in the transition literature, we use insights from the cooptition literature. The cooptition literature addresses the issue of simultaneously competing and collaborating with a partner. To make cooptition strategies more effective, it is important to manage cooptition processes at both the firm-level and the network-level. So far, little research exists on cooptition management at the network-level. In this paper, we examine how actors in networks deal with the benefits and risks of cooptition, and how they manage these. Our empirical case is the Dutch smart grids sector. We conducted a multiple-case study on the six important system-building networks in this sector. Semi-structured interviews have been conducted with key actors of these networks. We found that system-building actors use coping strategies to minimize the risks inherent in cooptition. But moreover, they already prevent risks from the start, by setting up mechanisms that reduce risks and increase benefits. They try to reduce the dilemma of competition versus collaboration upfront. Key words: sustainability technologies; innovation systems; cooptition strategy; collaboration; system-building

Innovative business models: sustainable or not?

Wednesday, 14th June - 14:45 - SD 205 - Oral Paper

Ms. Petra Soltész¹, Dr. Gyula Zilahy¹

1. Budapest University of Technology and Economics

Sustainability practices characteristic of most contemporary business organizations foster incremental change by product, process and management innovation. While this is very important, incremental improvements neglect a number of larger opportunities associated with new forms of doing business and ‘the underserved markets at the bottom of the economic pyramid’ (Hart and Milstein, 2003, p. 65). A growing number of experts recognise this and emphasize the role of more radical change to be brought about by innovative business models. According to Schaltegger et al. ‘the business model perspective is particularly interesting in the context of sustainability because it highlights the value creation logic of an organization and its effects and potentially allows (and calls) for new governance forms such as cooperatives, public private partnerships, or social businesses, thus helping transcend narrow for-profit and profit-maximizing models’ (Schaltegger et al., 2015). However, research on business models and their various impacts on sustainable development is still in its infancy and the majority of existing documents dealing with business models takes a pragmatic approach describing the basic characteristics of product-service systems, the sharing economy, the collaborative enterprise, innovative financing solutions, etc. from a practitioner’s point of view. Apart from a lack of deeper understanding of these innovative business models their environmental and social impacts have not been uncovered yet. For this reason, research efforts at the Budapest University of Technology and Economics concentrate on the collection of empirical evidence relating to the fast spread of the sharing economy. Which social groups are affected by sharing economy businesses and how? How do lifestyles change as a result of their fast growth? What are their negative and positive environmental impacts and what is their net effect on natural ecosystems? The aim of the empirical research to be introduced at the 23rd ISDRS Conference is to provide answers to these questions through the practical experiences of a regional sharing economy business, which has been operating in the transportation sector for several years. Data gathered as a result of the operations of the net based company reveal tendencies during its growth and its actual and potential effects on society and the environment. Early findings of the research suggest that the fast growth of the sector require the attention of policy makers who do not have the necessary data and understanding yet to make informed decisions (Zilahy, 2016). Research findings may also contribute to the development of an assessment framework of new business solutions and as a result, to policy recommendations with regard to their development and support.

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End-of-life tire management in Colombia

Wednesday, 14th June - 14:00 - SD 206 - Oral Abstract

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Extended producer responsibility (EPR) is a policy tool that extends the responsibility of the producers to cover the management of their end-of-life products. By shifting the burden of end-of-life management costs from municipalities to producers, it aims to provide incentives for producers to internalize the environmental costs, such as through produce design changes, throughout the life cycle of their products. In 2005, Colombia adopted the principle of extended producer responsibility into its first national policy on hazardous waste management (Decree 4741). Since 2007, Colombian EPR regulations had entered into force covering waste streams such as pesticide packaging, pharmaceutical waste, car and small batteries, used tires, light bulbs and computers. Seven waste streams are currently subject to the EPR regulations and additional waste electrical and electronic equipment and packaging waste are expected to be added to the EPR programs. While Colombian EPR systems have expanded with regards to the number of covered waste, participating organizations, collection points and the level of collection, these systems have also faced significant challenges in the context of emerging markets. In this study, we examined the evolution and current states of the tire EPR system in Colombia to analyze the system's performance and challenges. In Colombia, the used tires had increasingly posed significant concerns related to the inappropriate disposal and burning. For the proper management of end-of-life tires, the Resolution 1457 of 2010 established the financial and performance obligations on about 220 producers and importers of tires. In response to this Resolution and its EPR responsibilities, four collective and eight individual EPR programs has established. Particularly, the Rueda Verde, a collective EPR program that covers 91% of the tire market, has led the development of a tire EPR system by establishing 179 collection points and 760 institutional partnerships, achieving 35% of the collection goal in 2015. About 27% of the collected tires were retreaded, while the rest were mainly crushed into 1-4 mm of granulated rubber for further reuse. However, despite such advancement, significant challenges remain. One of the biggest issues is a low demand for recycled tire products such as rubber pellets and associated burden and operational difficulties for waste management companies. Other issues include weak regulatory control, non-compliance and free riders, no link to product innovation, unrealistic collection targets, lack of commitment or incentives for consumers and retailers, and lack of cooperation among actors and/or EPR programs. These observed challenges point that the Colombian EPR regulations adopted foreign experiences without a full adjustment and proper contextualization.~

The circular economy: New or Refurbished as CE 3.0? – Exploring Controversies in the Conceptualisation of the Circular Economy through a Focus on History and Resource Retention Options

Wednesday, 14th June - 14:15 - SD 206 - Oral Abstract

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The concept of the ‘circular economy’ (CE) is receiving growing attention on various levels, among them policy making, advocacy and consultancy, and science. Critical voices have questioned the potential ascribed to CE. Existing controversies are reflected in academic output and diverging perspectives affecting policy making, stakeholders and CE implementation. Set aside the views of proponents and critics, both camps have so far largely overlooked that it is the current dominant framing of the CE which jeopardizes its potential impact. This paper explores the revival of CE as a controversial concept through a focus on its history and the key concept of value retention~options (ROs) in the form of a ROs-hierarchy. We argue that it is the framing and conceptualisation of CE which has reincarnated various times while its basic thoughts can be found back in other sustainability sub-concepts. Realisation of CE seems to imply an extended notion of collaboration – among businesses as well as between businesses and other key stakeholders, most notably end-consumers, - wherefore the development of a common language on CE is needed to enable the integration of CE into the organisational systems of all these participating stakeholders. In this process, the typology of the different ROs~can serve as a guideline. The outcomes of pilot projects on collaboration for CE show lower ROs~prevail at an expense of higher value ROs which are~identified in literature. Although it is often difficult to state that one RO is better than the other, thinking in terms of ROs~helps for developing a shared understanding of organisational processes required for CE implementation and can assist in defining clear goals and~making first assessments. Whereas systematic efforts continue to foster mainly~the lower value ROs, we argue for inducing a change in the conceptualisation of CE that places emphasis on the strive for the higher level ROs, i.e. creation of closed-loop supply chains through short loops, including repair and remanufacturing, rather than through the more established long loops. In order to attain~higher forms of reuse we also call for a clear measurement system of the different~options. We suggest that politics carry a key responsibility to foster enabling mechanisms for implementation of higher level ROs, amongst others public procurement is critical in incurring efforts to seriously measure the sustainability impacts to show viability, increase legitimacy and thereby scalability of the CE. In the end, CE is principally an environmental concept but it is through the collaboration between humans that a contribution to the sustainable development of wider society can be attained.

Co-producing a Vision and Approach for the Transition towards a Circular Economy: Perspectives from Government Partners

Wednesday, 14th June - 14:30 - SD 206 - Oral Abstract

Dr. Anne Velenturf¹, Prof. Phil Purnell¹, Dr. Kenneth O'Callaghan², Mr. Mike Tregent³, Mr. John Ferguson⁴, Mr. Andrew Woodend⁵, Dr. Lee Davies⁵, Mr. Arjan Geveke⁶, Ms. Louise McGregor⁷, Dr. Helen Jamieson⁵, Dr. Caroline Spencer⁵, Mr. Andrew Dickson⁷, Mr. Alan Holmes⁸

1. University of Leeds, 2. Ablephraser (current), Department for Environment, Food and Rural Affairs (former), 3. Environment Agency, 4. EcoideaM (current), Scottish Environment Protection Agency (former), 5. Department for Environment, Food and Rural Affairs, 6. Department for Business, Energy and Industrial Strategy, 7. Zero Waste Scotland, 8. Independent (current), Environment Agency (former)

Since the mid-20th century, people have changed ecosystems at a speed and scale incomparable to any other developments during the existence of the human species. Ecosystem change is primarily driven by the increasing demand for food, water, timber, fibre and fuel i.e. growing resource use. On top of that, the supporting infrastructure for these resource flows and the discharge of waste and pollutants drives further environmental changes. While the growing resource economy has generally increased welfare over time, important negative impacts have emerged which could impede the long-term well-being of people as well as the resilience of the biophysical environment. Moreover, we are increasingly faced with growing resource scarcity. Hence we argue that a transition towards a circular economy *\emph{that contributes to a resilient environment and human well-being}* is necessary. Such radical transition in our society will require changes from a wide array of actors, such as government, industry and the general public. We argue that academia has a moral obligation to play an active role in facilitating the transition process. The Resource Recovery from Waste programme (RRfW) developed an extensive engagement strategy based on principles of participatory governance, a form of collaborative governance. With the participation process, RRfW aims to create a shared vision and approach to realise more sustainable waste and resource management in the UK. Through engagement of key actors in the co-production of research focus, methods, results and dissemination of outcomes, we strive to create a sense of ownership and commitment to use research results, in support of tangible changes in management of wastes and resources as well as contributing to a mentality change. In our presentation we will focus on the engagement of government partners. We present our approach to identify and engage key actors, share the co-produced results on key themes for sustainable waste and resource management as well as policy and regulatory approaches, and reflect on our experiences in the facilitation of social learning between academia and government in the transition towards a sustainable and increasingly circular economy. Keywords: Waste and Resource Management, Collaborative governance, Participation processes, Co-creation, Social learning.

Sustainable usage of circular economy principles applied to self-made rocket stoves design as innovation on communities near wildlife conservation areas

Wednesday, 14th June - 14:45 - SD 206 - Oral Abstract

***Mr. Edgard David Rincón Quijano*¹, *Mr. Luis Miguel Gómez Cuentas*¹**

1. Universidad del Norte

Dramatic deforestation of tropical dry forest (TDF) of the Colombian Caribbean, clearcutting for charcoal obtainment and illegal traffic of wild species, made the Cotton-Top Tamarins (*Saguinus oedipus*) declared in Critically Endangered by the International Union for Conservation of Nature (IUCN). For communities near to natural reserves don't have access to all basic services, electricity supply is unstable, and they get water from wells and streams, and mostly cooked in three points wood-burning stoves because they don't have access to gas. This project focus on two specific problems linked to mitigate threats: TDF conservation, habitat Cotton-Top Tamarins, through reducing firewood consumption for cooking or charcoal generation; and the reduction of human pressures on the species as hunting for illegal trade through awareness of coexistence with wildlife species. By Providing an option for young men in the community and reduce the cutting of native trees for firewood consumption and reduce the illegal trade of species through the implementation of workshops and community intervention based on the principle of facilitating circular economy the self-efficient and healthy stoves, firewood stocked for fast growing species in a controlled domestic cultivation. Universidad del Norte and Fundación Proyecto Tití work mainly with men who hunt and sell the Tití of the Colorado and Hobo communities in the department of Bolivar, to raise community awareness of the meaning of coexistence between species; achieved by reducing the firewood consumption for food cooking, through building and using of more efficient self-made stoves under circular economy principles. During the process of research tend to articulate international testing procedures for use and talk aloud techniques for rocket stove construction according to cultural use and feeding tradition. The different designs proposed end up giving, from their specification requirements, a deep understanding of the main challenges for "Do it Yourself" (DIY) stoves as empowering tool for communities facing direct impact on endangered species conservation and first outcomes to circular economy application by the acceptance of a controlled domestic supply plantation of fast growing trees. New designs may replicate the principles used in this project to enhance performance of the synergy needed between DIY artifacts and their supplies given a specific conservation issue related to nearby communities.

Comprehensive Village Development Programme: 'One Village One Cooperative' Approach in Rural Development in Bangladesh

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

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1. Universidad Austral de Chile

Bangladesh is a small country having 147570 square kilometers area with 94% rural area where 76% of the total population live. These rural population mostly depends on agriculture which contributed 40% of GDP during 1980-81 after the independence of Bangladesh. So, rural development is the key element of the country development. On the contrast, rural people live with poverty, unemployment and other socio-economic challenges. After being an independent state in 1971, poverty alleviation and rural development initiatives were foreign aided. Rural poor depended on foreign aids. The then government of Bangladesh tried to focus on poverty alleviation and rural development through cooperative approach giving importance on the role of local government and local level planning. Bangladesh Academy for Rural Development (BARD) initiated a research based 'Total Village Development Programme' in 1975 with the view of 'One village, one organization' to establish rural cooperatives for own socio-economic development and to avoid foreign aids and carried out the project with own resources in a limited scale until 1983.~ The project was inserted in the Third Five Year Plan as 'Comprehensive Village Development Programme' and accepted in Annual Development Plan in 1988-89 to implement in 80 villages primarily. After the success of the rural development model, it has been implementing throughout the country in 4375 villages. Thus 'Comprehensive Village Development Programme (CVDP)' is a rural development model that aims to promote overall development of a village through self-help and self-effort by bringing all inhabitants under a single cooperative society. Until December, 2015, about 164500 jobless people are self-employed after getting trade-based trainings from different nation departments and micro-credits from respective cooperative societies in 4375 villages. The paper intends to review the 'Comprehensive village development Programme'. The paper also focus on effectiveness of this rural development model through analyzing its successes and shortcomings. The research-data has been collected from both primary and secondary data sources such as key-informants interviews, project manuals and reports, journal articles etc.~The researcher used discourse analysis of relevant policy papers to attain the objectives. The research found that the CVDP is highly successful in rural economic development, self employment generation, social and environmental quality enhancement, poverty reduction, public participation enhancement and women empowerment. However, the study identified some shortcomings of CVDP that includes corruption in cooperative governance, illiteracy, poor leadership quality in villages, lack of cooperative values etc. \emph{Key words: Rural Development,~Comprehensive Village Development Programme (CVDP), Cooperative approach}

Social and environmental balance as an instrument of environmental public policy in Brazil

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

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1. Universidade de São Paulo (USP)

The Brazilian Environmental Policy finds in the environmental licensing the most effective instrument for its implementation (OLIVEIRA, 2008), mainly because this is a complex administrative procedure, through which the environmental agency evaluates and authorizes the location, installation, expansion and operation of activities considered effective or potentially polluting. However, since this is a mechanism that promotes the interface between the entrepreneur and the State (FARIAS, 2010), the social participation and information in the mentioned procedure is very limited indeed. The public hearing and the public discussion of the environmental impact report are only required by law for the enterprises capable of causing significant environmental degradation. That is, a public discussion only occurs about those activities susceptible of causing great environmental impact on the licensing of these ventures, even before their deployment. Although the participation and the social information are part of the environmental policy guidelines in Brazil, there are gaps of legal instruments which promote the interface between the companies and society. Nevertheless, gradually more companies spontaneously disclose their results in this field and show themselves as sustainable businesses. The change is due to the evolution of the perception of corporations about their role in society, about the attitudes of consumers, as well as the institutional image and intangible values that add to their patrimony, with this issue taking a strategic position within the organizations (GONÇALVES DIAS, TEODOSIO 2011), exceeding the mere fulfilment of legal obligations. Thus, the social and environmental balance has been constituted in a tool that has been increasingly used by Brazilian companies. Once accomplished, that balance becomes the concrete expression of a business decision, subjecting it to the control of society and laws. Therefore, the review of all legislation on the social balance can be justified, to search for the command and control mechanisms applicable. However, despite its strategic importance and enabling potential of information and questioning for society, the social and environmental balance is not mandatory in Brazil, neither there is a legal provision of a minimum content, or penalties for its erroneous or fraudulent disclosure. At this pace, it is worth evaluating the guidelines of the Federal Constitution and the main laws that reflect the environmental public policies on corporate communication, in particular via social balance. The study aims to point out challenges and opportunities for the improvement of public policies and corporate management, suggesting the regulation of social and environmental balance through rules that provide for its minimum content. It also intends to discuss cases in which its elaboration and disclosure must be mandatory, as well as the penalties for the breach of its precepts. Whereas the sustainability tripod must be harmoniously conformed, in virtue of the environmental, social and economic aspect, the express contemplation of social and environmental balance for companies that are obliged to demonstrate their economic results periodically would be legal action that would contribute to the advancement of sustainable development in Brazil. Keywords: social and environmental balance, environmental public policies, Brazilian environmental law.\

ANALYSIS OF THE SOLID WASTE DISPOSAL OF THE PETROLEUM SECTOR UNDER THE NATIONAL SOLID WASTE POLICY

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

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1. Escola Nacional de Ciências Estatísticas, 2. Universidade Federal

Over the years, oil activity has gained an important strategic position in world economy and politics, and has established oil as the main source of global energy. However, it is characterized as highly polluting and aggressive to the environment, which comes in opposition to the new changes in the paradigm of relations between society and the environment. Globally, environmental variables are now included in the system of planning and management of companies, as well as in official regulatory bodies. In this context, there is reflection of the responsibility of the petroleum sector with the environment and the individuals impacted by its activities. One of the environmental problems is the generation of waste from offshore activities that can directly impact on the terrestrial infrastructure. In Brazil, it is expected that, with the guidelines proposed by the National Solid Waste Policy, companies in the sector adopt measures for an efficient management of the waste generated and landed along the Brazilian coast. Thus, this article adopted the Campos Basin as the object of study, as well as the final disposal capacity of solid waste from the states of Rio de Janeiro, São Paulo, Minas Gerais, Espírito Santo and the waste management system implemented by the facilities Offshore. Throughout the work, it is discussed the importance of an efficient solid waste management and ways of environmentally safe disposal. It was studied how the solid waste management throughout the Southeast Region has been applied, as this consists of the states directly affected by the waste arising from the oil activities in the Campos Basin. It was concluded that the states of Rio de Janeiro and São Paulo are the most affected by the offshore solid waste final disposal from the Campos Basin. Furthermore, the amount of petroleum residues landed (Class I and Class IIA) is insignificant when compared to the daily amount generated by the states of the Southeast Region. The results allowed the observation of the intensification of solid waste generation by the sector, to identify the main faults and to follow in an integrated way the waste management by the sector. In addition, they assist in the implementation of the National Solid Waste Policy and in the Inventory of Industrial Solid Waste, especially if we are considering a horizon of expansion of production due to the exploitation of new reserves. The importance of keep monitoring the evaluation of the environmental impacts of existing and planned petroleum projects is highlighted. Therefore, it is necessary that the companies of the sector adopt measures that allow and prioritize the reuse of the generated waste and, consequently, the extension of its life cycle. It is necessary to cooperate between the stages of the oil industry's production chain, seeking the optimization of consumption, generation, treatment and proper final destination of solid waste. In this way, it would be possible to implement sustainable, inclusive projects that would allow an efficient synergy between the stakeholders, the government and other actors in the chain. Keywords: Solid waste, petroleum, policy.

Dynamic of some services ecosystem associated to the capital natural of the soil: The case of socio-ecological systems in basins hydrographic of half montana, Colombia.

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Ms. Linda Berrío¹, Dr. Clara Villegas¹, Dr. Santiago Arango-Aramburo¹

1. Universidad Nacional de Colombia - Sede Medellín

The researches on the processes of land use and land cover change are at the center of attention of the current environmental research, because their implications in relation to the loss of habitat, biodiversity, environmental services and productive capacity of ecosystems; as well as being recognized as one of the most important factors of global change and representing the second anthropogenic source of CO₂ into the atmosphere. The characteristics of land use are the result of the interrelationship between physical or natural factors and cultural and human factors. Hence, the balance between natural habitat and man-made landscape could determine the future of biodiversity conservation, the provision of ecosystem services and the sustaining of productive activities in large areas of the planet. Understanding these complex processes and quantifying the degree of human conversion of natural ecosystems is very important, therefore the socio-ecological systems approach represents a support for the holistic analysis between systems since allows the formation of an integrated and unitary system. Although research in modeling has been carried out under this approach, little attention has been paid to the inclusion of the endogenization (in double via) of their relations between the social and natural systems. Natural and social systems have usually been linked together in only one direction ignoring the feedback between them. This research aims at generating a model of simulation that allows the analysis of the dynamic of some services ecosystem associated to the natural capital of the soil in a basin hydrographic of half mountain Colombian under the of social-ecological system approach. The methodological stage is composed of four phases Phase 1: Definition of parameters, endogenous and exogenous variables. This phase comprises activities such as describing the processes to be modeled, as well as the interaction between them and other processes, in addition to defining the modeling tool (s) to be used to achieve the purpose. The agent-based model and system dynamics are the most commonly used tools in the literature. However, it is necessary to evaluate the advantages and the requirements of each one and the possibility of coupling them. Phase 2. Conceptualization of the theoretical model.~In this phase, the dynamic system hypothesis is formulated using causal diagrams. Phase 3. Design of the computational model. The activities that are included are: Designing the graphic representation of the configurations that are included in the model, and building the formal model with mathematical description. Phase 4. Consolidation of the computational model. Activities such as model validation and model application are included. The application will be able to simulate the dynamics of the ecosystem services in the future under land use change scenarios. ~ This research is the doctoral proposal which attempts at contributing to~acknowledge some of the challenges that are in force in the modeling of socio-ecological systems. Besides, it also aims at generating a tool that allows to understand the dynamics of the services and their management, since they are input for decision-making processes.

FEASIBILITY OF REPLACEMENT OF THE WATER BY VINASSE FOR THE MANUFACTURE OF CONCRETE

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Ms. Thaise Moser Teixeira ¹, Ms. Jéssica Baggio Soares ¹

1. UNICESUMAR

The construction area is an activity that consumes a high amount of natural resources, being a constant search for solutions to absorb the waste generated, often in the work itself. The consumption of resources extracted from the environment by construction varies from 15% to 50%, besides its products are large consumers of energy, and it takes most of the alternative materials that attend to this activity. Thus, a construction industry becomes a recipient of large amounts of solid waste that in another situation would be sources of pollution. In the context and in order to reduce the impacts generated in the process, several researches were analyzed as introduction of new materials in the concrete production. The present work had as objective to analyze the viability of the use of the liquid vineyard, effluent generated in the production of sugar from the sugarcane, in the confection of concrete. Sugar is used as raw material in construction, since the product contains more malleability to the concrete and more resistant is used correctly. During a cure, the concrete dries and loses water, which leads to the appearance of cracks and fissures, as well as a mixture with sugar slows the process of evaporation of the water, which can often even totally inhibit a loss of water. The vinasse was used in substitution of water, aiming to contribute to the decrease of the discharge of this residue in the nature, besides the search for economic and efficient forms of recycling. The work analyzes the mechanical strength of concrete specimens, produced in a conventional way and with vinasse. The results show that the concrete with vinasse showed satisfactory effects, being its use feasible for works with non-structural islands. Its resistance was compared to the conventional one, making it a propitious product for use and a sustainable alternative for sugar and alcohol industries as a by-product of the process. KEY WORDS: Concrete; Agricultural residue; Sustainability.

Visualizing Adaptation Scenarios for Climate Change and Human Population Stress through System Dynamics Modeling in the Biobío River Basin, Chile

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

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Climate change, population dynamics, and globalization can work in tandem with other internal stressors to constrain or even degrade the development status of states, especially when natural resources exports constitute a large proportion of the GDP. Additional research is needed to better understand the impacts of these stressors on resource-dependent countries that are positioned near either side of the boundary between developing and developed. This research examines hydro-social cycles in an irrigated agricultural zone in the Biobío Region of Chile, which became the first South American member of the Organization of Economic Cooperation and Development (OECD) in 2010. The primary focus is the sustainable water and crop management for agricultural production along the Biobío River. The economic production in the region is partially dominated by agricultural exports, thus the behavior of both domestic and international markets combine with climate stressors when considering individual and societal decision-making. Internal stressors to the water supply in this area also include hydropower production at upstream dam operations, natural disasters, labor shortages, and push-pull dynamics with nearby cities. Thus, the Biobío River Basin (BRB) serves as a “natural laboratory” for studying adaptation strategies to impacts of climate change and population dynamics on socio-economic, ecological, and physical systems, especially given the importance of the BRB to the Regional and National economies. Investigating the interactions and feedbacks of these overlapping systems is critical for decision-making and the development of proactive adaptation strategies in the BRB. The goal of this research is to develop a system dynamics model that captures the complex biophysical, economic, social, and cultural interactions and simulates the overall behavior of the system in response to external and internal stressors. Biophysical data from government and academic sources are being combined with interviews with farmers and other stakeholders to provide the basis for modeling the relationships and feedbacks. An internet-based version of the model will also serve as a decision tool for irrigators, administrators, practitioners, and policy-makers to facilitate dispute resolution and support scenario planning. Both the process and products will contribute to several tracks of sustainability science. Keywords: Water Resources, Agriculture, Climate Change, System Dynamics, and Sustainability Science.

DISPOSAL MILK: A HEALTH AND ENVIRONMENTAL PROBLEM

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

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The Brazilian dairy production is in increasing expansion due to the evident improvement in the productive capacity of the herd of cattle. However, many dairy farmers face health problems in their herds, such as mastitis, hull problems, parasitic sadness, among others, that require pharmacological treatments. The result of the institution of these treatments is the presence of residues of drugs in milk, a fact that prevents their consumption by humans, because they constituted a health risk. This milk, known as disposal milk, is non-marketable milk which has been rejected by the industry either for diseases such as mastitis or for other reasons for antibiotic treatment or for health problems such as poor hygiene. The objective of this research was to characterize the main ways of destination of disposal milk from dairy farms in southern Brazil. The methodology consist a data collection in 26 dairy farms on the destination of disposal milk: supply for calves, supply to other animals, dumped into the environment or others. The data were tabulated and the forms used were evaluated. The results showed that most of the properties provide untreated disposal milk for calves, showing that producers have limited knowledge about the health, production and environmental consequences of this form of destination. This action represents a serious economic loss for the producer and these practices are not sustainable from the economic, sanitary and environmental point of view. Provision of milk containing residues of antibiotics to calves can lead problems such as increased risk of bacterial resistance and transmission the mastitis bacteria to growing heifers. The literature recommends caution with the use of this milk as not providing it to calves in the first days of life, not using it if it has visual changes such as presence of blood, aqueous milk or excess of lumps, dilute the milk of the first milking after antibiotic treatment in milk without antibiotics or pasteurizing the milk to be used for breastfeeding the calves. These actions prevent their disposal in the environment as well as allow their use in a safe way. It becomes evident guide and disseminate relevant information about the correct destination of disposal milk, seeking to contribute to the milk production chain, making it more economically, sanitary and environmentally sustainable. Key words: milk with antibiotic, sustainable agriculture, dairy cattle.

Environmental Management Systems in the wine industry: identification of best practices toward a Circular Economy

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Paper

Dr. Alessia Acampora¹, Dr. michele preziosi¹, Prof. Roberto Merli¹, Prof. Maria Claudia Lucchetti¹

1. Roma Tre University

Over the last decades, great attention has been paid to sustainability issues in the wine industry. Thus, many sustainability practices are spreading and at the same time many efforts have been carried out to spread them. In pursuing sustainability, a great number of wine firms have also implemented Environmental Management Systems (EMSs), in compliance with international standards for EMS as ISO 14001 and EMAS (Eco-Management and Audit Scheme). Furthermore, in recent years also the concept of circular economy (CE) has become widely diffused. The transition from the dominant “take-make-dispose” economic model towards a circular economy is engaging governments, institutions and researchers around the world, with the goal of achieving a more sustainable society. Limited natural resources and environmental issues related to production are the main drivers of this revolution. Indeed, several national policies, businesses and consumers are gradually adapting to this new approach. Different tools have been proposed to enhance the process circularity in different sectors, including the EMAS Regulation. The aim of the present paper is to examine the potential contribution of the Environmental Management System, defined by the European Regulation EMAS, toward a circular economy and society. In particular, it explores the potential application of EMAS environmental indicators as a baseline for the implementation of specific CE indicators. It also evaluates the role of EMAS for the dissemination of good practices and the identification of indicators for CE in wine industry. Starting from the analysis of indicators defined by the EMAS European Regulation, we have identified how these indicators can capture the 3R principles of CE. Even though they can describe companies’ efforts in terms of input material and output waste streams reductions, they lack in measuring reuse and recycling practices that are core activities in a CE approach. Nevertheless, these indicators are a starting point to evaluate circular processes that fully embrace the logic of the “closed loop” production. As the paper has shown, the micro-level CE indicators that have been developed till now might be integrated together with EMAS indicators developed in the wine industry to create common metrics to measure CE progress in the wine sector.

Conceptual framework for indicator selection in Water Resources Planning and Strategic Environmental Assessments

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

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Indicators are increasingly used tools to support assessment and communication in planning processes. Water resources plans and their strategic environmental assessments are instruments that could be supported by indicators to characterize the baseline situation, assess the status of resources and implications of planning options, monitor the implementation of the proposed measures and communicate this information to stakeholders. Despite the relevant amount of works on sustainability indicators and water resources planning and assessment, there is still a lack of research on the indicator selection stage. Indicator selection is usually conducted by planners and other experts, and little information is reported about how to design and implement this practice. The main aim of this research is to develop a conceptual model to select suitable indicators for water resources plans and respective environmental assessments. The proposed framework is supported by a participatory oriented approach, assuming that effective stakeholder's engagement improves the accuracy and effectiveness of this stage. To put the proposed framework into practice, a set of different steps and procedures is proposed for adoption in a national case study - the Portuguese water resources planning and SEA processes - and the usefulness of this methodology is demonstrated. The tool developed could support future indicator implementation for water resources planning initiatives, allowing greater guidance, objectivity and transparency in these processes.

ACTION RESEARCH: APPLICATION OF THE INDICATOR RATE OF PROCESSING OF MEALS AS A TOOL FOR SUSTAINABLE MANAGEMENT IN RESTAURANTS

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

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1. UNICESUMAR

The sector of restaurants, for questions of practicality and cost, walks for the contrary way of commodity current for a more healthful and sustainable feeding, substituting foods in natura or minimum processed by processed foods. In this context, this study evaluated the efficiency of the index of processing of the meals (INPR) as indicating of partner-ambient sustainability for restaurants by means of a study of initial case and a research action for intervention of the productive processes of foods. For in such a way, one after became fulfilled two analyses of the calculation of INPR one before the intervention (INPR1) and another one interventions in the menu and list of purchases in the unit (INPR2). The Pointer developed for Matuk 2015 was calculated through the acquisition of foods of the restaurant during one month of functioning. The foods had been classified by the new Alimentary Guide for Brazilian Population and for accomplishment of I calculate it transformed into unit of measure standard, pounds. The first collection of data supplied the INPR of 1,34, inferior index to the acceptable one of 3, what it indicated that the restaurant used superior amounts of processed and multiprocessed foods in relation to foods in natura. After the application of the INPR1, became fulfilled it research action presenting the data to the management of the establishment in brainstorming for changes in the menu and the list of purchases aiming at to use the possible minimum of substances processed cousins. The result found in the analysis of the INPR2 was distinct of first analysis INPR1. After interventions the restaurant presented levels of 3,77 that they are adjusted for sustainability in accordance with the pointer. Based in this research action, we can conclude that the INPR is a pointer of viable sustainability and easy use in restaurants when added it interventions in the menu by means of reduction of ingredients processed in plates. The partner-ambient INPR as manager inferred directly in the nutritional quality of foods, as well as reduced the generation of residues as packings (boxes, glasses, plastics\dots) exciting the concepts of the sustainability. KEY WORDS: \emph{Processed foods; Pointers; Ambient impact}

HIP — a Happier Index for the Planet?

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Paper

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1. Lappeenranta University of Technology

Measuring complex and rather intuitive qualities such as sustainability requires combining variety of measures together. The resulting composite indicator depends not only on the component sub-indices but also on the way they are combined together. We are considering the Happy Planet Index (HPI) as an example of a composite sustainability indicator that aggregates information on positive qualities like life-expectancy and human well-being with negative ones like ecological footprint to rank countries according to their sustainability state. However, since component indices are often mutually correlated and feature quite different distributions of entities ranked, elaborate rules are used in the process of combination. As a result, the resulting composite index may look somewhat contrived and its rankings may depend heavily on subjective parameters in the combination process. We propose a geometrically motivated parameter-free method for combining indices with contrasting effects together. The method is independent of the number of sub-indices to be combined and eliminates mutual correlation between component indices by using Singular Value Decomposition (SVD) analysis. By applying our methodology, we reconstruct the latest Happy Planet Index results (2016) and prove the feasibility of the proposed approach. As a result we conclude that altering the measures of life expectancy and well-being with the inequality adjustments improves the objectivity of the sustainable wellbeing assessment. **Keywords:** Sustainability indicators, Composite indicator, Singular value decomposition, Happy Planet Index

Human development classification from environmental indicators using LDA

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

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1. Universidade de Franca, 2. UNESP/Jaboticabal, 3. Universidade Estadual de Minas Gerais

The Sustainable Development Goals (SDG) can be monitored through statistical evaluation of indicators of interest. These indicators might measure social and environmental issues. But there is a lack of studies that assess the association between human development and environmental performance through the use of modern statistical learning techniques. The aim of this study was to estimate the association and a predictive model of the human development index from environmental performance indicators by the means of Linear Discriminant Analysis (LDA) and cross-validation (CV). The dataset was built merging the 2015 United Nations Human Development Index (HDI) and the 2016 Yale's Environment Performance Index (EPI) datasets by country. It consisted of 76 observations of the following selected environmental indicators: population lacking access to sanitation (unitless), tree cover loss (%), health risk from household air quality (unitless), health risk from PM2.5 exposure (unitless), wastewater treatment level (%), exposure to unsafe water quality (%) and population lacking access to drinking water (unitless). A LDA was conducted considering the HDI classification as a response variable and the selected environmental indicators as explanatory variables. The Leave-One-Out-Cross-Validation (LOOCV) technique was used to evaluate the predictive ability of the model. All analyses were conducted using the R Software v.3.3.1. The first two estimated linear discriminant functions showed a cumulated explained variance equal to 97%. The built LDA model was able to correctly predict 84% of the sample observations. Considering the LOOCV technique was used, this results suggest there is a strong association between the well-being of a population and its environmental performance. This means that changes in the studied environmental indicators are linked with changes in a population's well-being. It also suggests the model can predict with high accuracy the well-being of a nation from environmental variables. This tool can help scientists, politicians and managers to monitor and improve the performance of sustainability indicators.

Embedding Education for Sustainable Development in the curriculum: an example from Manchester Metropolitan University

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Dr. Hannah Matthews¹, Mrs. Valeria Ruiz Vargas¹

1. Manchester Metropolitan University

There is a growing number of national and international drivers to embed Education for Sustainable Development (ESD) in Higher Education. Through ESD, universities have the potential to educate future leaders, policy makers, business owners and media on issues related to Sustainable Development e.g. climate change adaptation and mitigation. However, research shows that current levels of knowledge and skills amongst university lecturers present a barrier to embedding ESD in the curriculum. This poster provides an overview of a project to review the comprehension and uptake of ESD in the School of Science and the Environment at Manchester Metropolitan University. Stage one of the process involved the development of a new auditing tool to assess the current inclusivity of ESD themes within curricula. Stage two involved an assessment of the 'success' of units in relation to student progression/ number of good honours and the teaching of ESD across a range of subject areas. Development of the auditing tool involved documenting of a range of Sustainable Development 'themes', notably 'keywords' employed in teaching. This included a systematic literature review where phrases reflecting the breadth of related social, economic, and environmental issues and skills were codified. The identified themes were then reviewed and supplemented where appropriate, through a further discipline-specific iterative process. Piloting of the audit tool consisted of two stages; a keyword search of curriculum documentation at the School of Science and the Environment (MMU) and semi structured interviews with unit leaders to test the accuracy of the tool against actual unit content. The second stage involved a series of semi-structured interviews with teaching teams to assess interdisciplinary support for ESD across the School. Levels of inclusion (audit results) and support for ESD were then analysed in conjunction with individual unit success metrics (progression/ number of good honours). Overall, the tool piloted well with 67% of unit coordinators either agreeing or strongly agreeing that the results were representative of the content of their units (25% disagreed). From the thematic analysis of the data, findings included an overall positive response to the tool but a question in terms of which part of the unit documentation (e.g. unit specifications, unit handbooks) is more suitable to evaluate ESD content. Perceptions of the need to embed ESD ranged from ESD being a distraction for students, to it being core to teaching. Similar to other studies, this study also found that individual knowledge or lack thereof, posed a barrier to the incorporation of ESD in taught content. It is recommended that integrating ESD across an interdisciplinary curriculum requires bespoke and individual approaches.

CDIO usage to design a Master in Development Practice

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

***Prof. José Carlos Quadrado*¹, *Prof. Eduarda Pinto Ferreira*¹, *Prof. Angelo Martins*¹**

1. Instituto Superior de Engenharia do Porto

The Master in Development Practice (MDP) intends to be an interdisciplinary master degree program that prepares students to better identify and address the challenges of sustainable development. Integrating the core areas of the health, natural, social and management sciences, the MDP program provides students with the substantive knowledge and practical skills required to analyze and diagnose the multi-dimensional challenges of sustainable development such as extreme poverty, climate change and infectious diseases. By involving faculty members from 8 different schools, from Engineering to Performing Arts, it was a challenge to design a program with so many different people involved, so we resorted to CDIO (Conceive Design Implement Operate) to provide the framework for program design and operation. Though it is not an engineering program, the core of MDP is a problem solving and project development process, i.e CDIO. Therefore the full stack of CDIO standards was applied in the MDP design. Even the CDIO syllabus v2.0 was used. In this paper, it will be provided a short description of the program and its objectives and it will be explained how CDIO was used in the program's design process. The CDIO Initiative is an educational framework stressing engineering fundamentals set in the context of conceiving, designing, implementing and operating real-world systems and products.

Genetics Resources of Wheat – Way Back or Promising Future in Sustainable Development of Organic Farming

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Paper

***Dr. Ondrej Vlasek*¹, *Dr. Petr Konvalina*¹, *Dr. Karel Suchy*¹**

1. University of South Bohemia in Ceske Budejovice

Approximately seven thousand plant species have been cultivated and one hundred and twenty of them have retained their importance in national economic systems. The selection of varieties has been crucial in the breeding of cultured forms from wild ones - the varieties have adapted to environmental conditions (Evans, 1981). Therefore, the previous landraces were very varied and stable. The modern forms have been bred over a short period and they have made important progress; nevertheless, they have not respected local environmental conditions. The varieties are usually adapted to farming technologies and they are not able to respond to unfavourable environmental conditions (drought, weed and disease pressure, etc.) (Lammerts van Bueren, 2002). In case of genetic resources of cereals is important to be adapt to changing environmental conditions. Therefore, the most valuable varieties should be conserve by the on-farm method which assures a dynamic process (Laliberté et al., 2000). Such a method of conservation of genetic resources is carried out in nature-friendly farming systems and it may bring interesting market opportunities. Our results are composed from more studies made in organic farming system from 2006 till now. We have been working with more than ten neglected wheat species. Evaluation of landraces was oriented to analysis of morphological, biological and economic characteristics. The most important part was oriented to evaluation of technological and nutritional quality of grain. Our results show potential of some landraces of neglected wheat species to be grown in organic farming system. In many case was main advantage high resistance to common wheat diseases (eq. *Triticum monococcum* L., *Triticum Timopheevi* L. or *Triticum diccicum* Schrank). On the other hand – resistance was crucial problem of some species (eq. *Triticum sphaerococcum* L.). A lot of landraces had a higher competition ability against weed plant in case of non chemical weed management. Interesting findings also came from evaluation of yield. Generally – landraces had lower yield potential than modern varieties of *Triticum aestivum* L. Different situation was on less quality soils or very low nutrition of field. In this example could be in some landraces yield higher than modern varieties (eq. *Triticum spelta* L.). But the main advantage of landraces was quality of grain. There was very high protein content (einkorn or emmer we found accesions with more than 20% of protein). However, the diploid and tetraploid landraces may be difficult to use for common baking (low Gluten index and sedimentation value). Advantage was also high share of nutritionally valuable Albumins+Globulins and Unsoluble rest protein fractions in comparrison with modern control varieties of bread wheat. We found more unique quality parameters in grain of different wheat species. Landraces have potential to be grown in organic farming and used for the preparation of local high quality products. In this case there will be combination of two important aspects – unique value of genetics resources and added value of organic growing methods.

Mining impact on potable water and on Zika epidemic development in the Department of Meta, Colombia in 2016.

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

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1. Universidad de los Andes

Justification of the research / research argument In Colombia mining is a strategic sector ~for its development and is also a business that trades several millions each year. In the Department of Meta, 65.51% of the 29 municipalities practice opencast mining, which consumes huge amounts of water and benefits the transmission of Zika and other vector-borne diseases, due to the lack of potable water in both urban and rural areas. Aim / purpose To identify a possible association between the presence of mining, potable water and presence of Zika's epidemic in the Department of Meta-Colombia. Methods / approach / theoretical framework Descriptive study of mining characterization in the Department of Meta, its impact on the potable water and Zika's epidemic. A study was conducted in order to map mining areas in the Department and to track Zika's risks behaviors in the 27 municipalities with high risks of transmission. In the extraction processes of different minerals, the impacts on human health and on environment are several. Mining usually has a triple direct impact on water in the territories in which it is developed. First, mining consumes water. Second, mining pollutes water. Third, mining destroys water sources. Findings / results / conclusions; In the Department of Meta 65.51% of the 29 municipalities practice illegal mining in open areas which consumes water and causes a deep impact in front of Zika's epidemic due to the lack of availability of water in both urban and rural areas. Municipalities with presence of mining and potable water coverage less than 30% had a higher prevalence of Zika. 55% of the municipalities in the Department of Meta record mining activity, opencast mining and drilling of wells affecting water sources in both urban and rural areas. Keywords: Mining Water Environmental pollution Implications or relation with the central theme of the conference: including Sustainability for~Development. The presence of legal and illegal mining in Colombia is affecting the availability of potable water, impacting public health, due to higher prevalence of vector-borne diseases such as Zika. It is necessary that the practice of mining reinforces controls on the sustainability of drinking water.

Green Hydrogen and Lithium sources: toward Green Brazil

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Dr. Corinne Arrouvel¹

1. *Universidade federal de São Carlos*

The human population is today of 7.5 billion and is still dramatically growing with a high demand for access to technology and transportation. In Brazil, the fossil fuel extraction is still taking a high part of the internal demand to expand the transport industry but the world oil reserves are expected to end in about 46 years. Other primary sources are also economically competitive such as sugar cane producing ethanol. However, the use of such energy sources contributes to high levels of greenhouse gas emissions. Brazilian industries are slowly converting their researches in offering other alternatives thanks to governmental pressures and international directives to decrease gas emissions. Electricity from hydraulic or nuclear plants coupled to lithium batteries offers such an alternative, nevertheless environmental impacts and safety problems are still important. In European countries, nuclear centrals are being dismantled and sustainable programs become the priority. In order to reach a sustainable form of transport, fuel cells based on hydrogen are a promising substitute. Rich and poor countries can benefit from the revolutionary technology. Recent discoveries indicated that there are natural hydrogen sources in Brazil; they could potentially become a green solution to generate energy (1)~(following the example of the village of Bourakebougou in Mali (2)) and to develop non pollutant vehicles at a larger scale. Some improvements on nanotechnology in order to safely store hydrogen and lithium (3,4) are under progress. This work presents then an economical aspect and the technology of fuel cells and lithium-batteries to reduce considerably GHS emissions. (1) Alain Prinzhofer and Eric Deville. *Hydrogène naturel. La prochaine révolution énergétique ?*, Ed. Belin, 2015. (2) <http://africa-me.com/hydrogen-ldots> (3) C. Arrouvel, S. C. Parker and M. S. Islam, "Lithium insertion and transport in the TiO₂-B anode material: a computational study", *Chemistry of Materials*, 20, 4778-4783 (2009). (4) C. Arrouvel, T. R. Peixoto, M. E. G. Valerio S. C. Parker, "Lithium migration at low concentration in TiO₂ polymorphs", *Computational and Theoretical Chemistry*, 1072, 43-51 (2015). ~ Keywords:~fuel cells, natural hydrogen, lithium batteries, zero gas emissions
Acknowledgment: CA would like to thank Anthony Le Viavant and Hervé Toulhoat for fruitful discussions.

Introducing an Appropriate Financial Support System to Cope with Post-disaster Risks in Agriculture: A Study in North-eastern Haor Region, Bangladesh

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

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1. Universidad Austral de Chile

Bangladesh is a disaster prone country due to its geographical location. North-eastern Haor region in Bangladesh is susceptible to flash flood and high waves. The people living in Haor region are helpless to the Mother Nature. They have to cope with natural calamity to harvest crops, to acquire food security, livelihood security even to protect their tiny homestead. Flash flood occurs in Haor region in mid-April when farmers wait to harvest *boro* crops. Flash flood causes huge damages to dry season *boro* crops just before harvesting. As a result, farmers lose their all properties for the whole year. It is estimated that about 4% (1.2 million hectors of rice, 7300 hector of jute, and 7000 hector of other crop area) of total cropped area was damaged due to flash flood from 1993 to 2010. From 1993 to 2010, farmers could not harvest about 2.44 million tons of rice, 64000 tons of jute and 40000 tons of other crops because of the flash flood hazard. Possibility of early flash flood causes extensive damage of crops that leads farmers to starvation. Thus, the disaster events make these poor people poorer. They need financial support to cope with post-disaster shocks. The research intends to identify the appropriate financial support system for the people of *haor* region so that they can withstand through securing food and livelihood. To attain the objective, the researcher has collected data both from primary and secondary source. The researcher carried out a discourse analysis of existing financial support systems after a flash flood heat in the case study. Relevant policy papers, journal articles are studied for analyzing the existing financial support system for poor farmers in haor Region. The researcher has also taken some semi-structured telephone interviews of government officials who are involved in financial support provision to validate the data collected from secondary sources. The research found out the local adaptive strategies to cope with disaster risks in agricultural sector at the case study area. The study also found the existing financial support system in haor region such as crop-insurance, Social Safety Net Program, community based financial institutes. After analyzing each financial support system the researcher has come to a conclusion that, cooperative societies as a financial institutes can play the most sustainable role to support haor-people so that they can cope with the sudden shocks induced by natural disaster in agricultural sector. The study findings can be replicated to other parts of the country as Bangladesh is a country living with floods and farmers lose their crops very often due to annual floods and flash floods.

Key-words: Haor, climate change and flash flood, food security, adaptation strategies

Extreme rainfall, poverty and poor sanitation associated to leptospirosis, a climate sensitive disease in Brazil

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

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1. Pontifícia Universidade Católica de Goiás, 2. Universidade Estadual de Minas Gerais, 3. Universidade de Franca

There are numerous transmissible diseases that are climate-sensitive and associated to lack of treated water and sewage. It may be aggravated by the occurrence of extreme hydrological events, such as droughts or excessive rainfall, leading to water shortages or floods. These waters when contaminated lead to the emergence of cases of leptospirosis. The aim of this study was to describe the spatial distribution and incidence of leptospirosis in the Brazilian capitals from 2005 to 2014; to identify the epidemiological profile; to verify if there was an association between the incidence of leptospirosis and precipitation patterns, and between the incidence of leptospirosis and socioeconomic variables in the period of this study. This is a descriptive and exploratory study that used exploratory analysis to treat data on the reporting cases of leptospirosis in the Brazilian capitals obtained at SINAN (Information System of Notification of Grievences). Rainfall data were obtained from INMET (National Meteorology Institute), and the environmental and socioeconomic data from Atlas Brazil, and demographic data from IBGE (Brazilian Institute of Geography and Statistics). The results showed that Leptospirosis had high incidence in the North and South regions of Brazil. Among the Brazilian capitals, Rio Branco and Amapá had the highest incidence rate. The most affected age group are males in productive phase of life. The most frequent environment of transmission are urban area. Leptospirosis is related to the low level of schooling in the country places and Capitals. There is a positive and statistically significant correlation (at 1%) between rainfall and leptospirosis incidence. An increase of 10 mm³ in the average rainfall of the Brazilian capitals increases the incidence of leptospirosis by 2%. We concluded that cases of leptospirosis occur more frequently in periods of extreme rainfall, however are also associated with poverty and poor sanitation. Predicting rainfall thresholds can be useful to prevent flooding and leptospirosis cases. ~ ~

INFLUENCE OF ASH DEPOSITION ON MICROBIOTA OF AGRICULTURAL LAND

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

*Dr. Edison Schmidt Filho*¹, *Ms. Aparecida De Fátima Cracco Rodrigues*¹, *Ms. Thaise Moser Teixeira*¹,
*Dr. Francielli Gasparotto*¹, *Dr. Ednéia Aparecida De Souza Paccola*¹

1. UNICESUMAR

Boiler ash from ethanol plants can be used as an agricultural fertilizer, because it is considered a source of nutrient and soil corrective, due to its alkalinity. The nutrients found in the soil are transformed and accumulated by microorganisms, favoring the development of the plants. The objective of this work was to investigate the influence of ash on the development of bacterial colonies found in the agricultural soil. The emergence of colonies of bacteria, cultivated in Petri dishes, in BDA culture medium (potato, dextrose, agar) was quantitatively evaluated. In the laboratory boiler ash was added to the soil and incubated for 15 days in colorless plastic bags, following the treatments of 0 g kg⁻¹ soil; 10 g kg⁻¹ soil, 20 g kg⁻¹ soil and 30 g kg⁻¹ soil, three replicates were performed for each treatment. The results showed that ash influenced positively the appearance of bacterial colonies for a period of seven days after incubation in the treatment of 20 g kg⁻¹ soil. The treatment of 10 g kg⁻¹ did not show significant alteration and the 30 g kg⁻¹ alone promoted an increase in the appearance of bacterial colonies upon reaching 15 days of soil incubation. The results showed that the boiler ash of the ethanol industry can positively influence the development of the soil microbiota due to the nutrients present in this by-product. The treatments tested in the incubated soil showed that the addition of low quantities of boiler ash in the agricultural soil did not influence the reproduction of the bacterial colonies. However the 40 ton dose Ha⁻¹ of ash applied to the incubated soil promoted the greater development of colonies of active bacteria when compared to the control soil. Therefore an alternative of destination of this boiler residue can be its use as fertilizer of the agricultural soil. Since properly employed according to agronomic recommendations not to alter the natural development of colonies of bacteria found in the soil. ~\textbf{Keywords:} Bacteria. Bagasse. Cane sugar. Microorganism

THE POTASSIUM RATE INFLUENCE ON PERCOLATED WATER BY USE OF PURE VINASSE AND TREATED ALKALINE PROCESSES AS AGRICULTURAL FERTILIZER

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

*Ms. Thaise Moser Teixeira*¹, *Dr. Jurandir Pereira Filho*², *Dr. Edison Schmidt Filho*¹

1. UNICESUMAR, 2. Univali

The vinasse can be considered the main wastes of the sugar and alcohol industry, being produced thirteen times more than the ethanol. Today, this wastes is deposal in soils, because according to studies the vinasse promotes the increase of the fertility of the soil when applied respecting the retention capacity of ions. If this capacity is not respected, the process of leaching of several of these ions, especially potassium, can be move to the sub-surface water. Our objective was evaluate the presence of potassium in the percolated water and the contamination possibilities of this element resulting from the addition of different forms of vinasse on the soil surfasse as a fertilizer. The vinasse was used under four differents forms, beeng a pure vinasse, three kinds of vinasse treated by the alcaline processes and one more tratmente as a comercial fertilizer made with N, P and K . That three kinds of vinasse treted by the alkaline processes, the first consist only of the alkalinization of the vinasse by the addition of alkaline material until the mixture reached pH 12. The others two kinds consist in a incorporation of ash boiler, another wastes from the ethanol manufacturing process. In this case, the decrease of the moisture content and subsequent adjustment of the pH with the addition of alkaline material in different proportions. The treatments were applied on the surface and in each column was cultivated wheat (*Triticum aestivum*). For 70 days, distilled water was added as controlled irrigation, and the volume recorded was recorded in order to guarantee that all the material percolated and resulted only from the treatments. Each treatment received the next volumes: vinasse, $25\text{m}^3 \cdot \text{ha}^{-1}$; Vinasse pH12, $10\text{m}^3 \cdot \text{ha}^{-1}$; Treated vinasse + ash + 25\% alkalisizer, $8\text{m}^3 \cdot \text{ha}^{-1}$ and treated vinasse + ash + 50\% alkalizing, $6\text{m}^3 \cdot \text{ha}^{-1}$. It should be noted that the volume of vinasse applied was based on the values allowed by the Brazilian standard and the other treatments based on the soil need. It was observed that at thirty-five days of percolation the potassium content in the water reached the maximum value of $1.0 \text{ml} \cdot \text{ha}^{-1}$ for comercial fertilizer (NPK) treatments, vinasse + ash + 50\%, vinasse + ash + 25\% and vinasse pH12. It was concluded that the alkalized vinasse can influence the potassium contents present in the superficial water percolated after 35 days of its superficial application to the soil. KEY WORDS: Agricultural wastes; Sustainability; ethanol industry

Sustainable urban development: the case of São Sebastião, a municipality on São Paulo's coastal region

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Paper

Mrs. Isabella Azul¹

1. Universidade Presbiteriana Mackenzie

São Sebastião is one of the municipalities located on the northeast coast of São Paulo, Brazil. The surface relief in this region is formed by the Serra do Mar, a system of mountain ranges and the current vegetation is the Atlantic rainforest, where an endemic ecosystem can be found. Part of the territory belongs to an environmental protection zone called Serra do Mar State Park, which is the largest continuous reserve of Atlantic rainforest in the country. Inside the protection zone, constructions are forbidden by law in order to preserve nature and due to the risk of landslide from the mountains, which is recurrent in summer when heavy rains are more frequent. Informal housing has become common in those risk areas. The high real estate prices found in sites closer to the beach made them unaffordable to locals, for this reason, luxury condominiums were built for vacation homes, where most of the perennial inhabitants carry out their economic activities as service providers. This problematic background demands an urban intervention whose guidelines take into account the environmental issues and social inclusion of residents. São Paulo's state government has been responsible for the program Sustainable Development Project of the São Paulo's Coast since 2007, which intends the regional development in municipalities along the coast to provide better living conditions for the entire population in a balanced way with the environment. Thereby, the families residing in the risk areas will be removed and reallocated to social housing units. The *Companhia de Desenvolvimento Habitacional e Urbano (CDHU)* is the public body that promotes the construction of social housing at the state level, including this case. The aim of the present paper is to evaluate the relation between the current urban public interventions in São Sebastião and the actual sustainable development of this municipality. The method used combines the analysis of primary and secondary data. The primary data were collected and observed in visits made on September 19th and October 20th, 2015 to the community including the irregular settlement called Vila Sahy, whose part is within a risk area. The secondary data are publicly provided by official Brazilian institutions, such as the urban diagnosis accomplished by the *Pólis Institute*, the socioeconomic censuses promoted by the Brazilian Institute of Geography and Statistics (*IBGE*) and theoretical references on the subject. A Regional Agenda for Sustainable Development was developed by the program. The main guidelines involve resettlement, provision of infrastructure and sanitation, as well as recovery, conservation and enforcement actions for environmental protection. The *CDHU* foresees commercial and institutional use in social housing projects to relocate the inhabitants. The mixed use instigates the emergence of new urban centralities, which consequently weakens the fact that the local population depends economically on the summer houses. Therefore, the interventions have the potential to leverage the sustainable urban development of *São Sebastião*.

Keywords: risk areas, social housing, sustainable development

The role of railway for sustainable mobility in Algarve, Portugal

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Paper

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The railway line of Algarve in southern Portugal was built between the late nineteenth century and early twentieth century. Although the line has driven the development of the region at the time, now it is not adjusted to the needs of the population and the region; the stations are removed from some of the main tourist areas and other major traffic nexus. Public transportation modes are not well linked to each other, so private cars are the main transportation means. Car traffic is the largest energy consumer and air polluter, including greenhouse gas emissions. Inter-modal public transport is crucial to fostering more sustainable mobility in urban areas. The goal of this research was to analyze the effects of redevelopment of the Algarve railway and the role it may have in the development model for the region. Three topics of research are reported: an analysis of current shortcomings of the system, based on historical data and a survey to the municipalities; the development of a model to refit the old railway; and an analysis of effects of the proposed model on sustainability indicators in the region. The simulations carried out on various railway-refitting scenarios indicate a qualitative improvement of sustainable development indicators. Better rail service will increase quality, reliability and efficiency in regional mobility, along with an incentive for better land use management. Even modest investments in the railway will cause significant improvements in air quality, road congestion, road safety and accidents, noise and CO₂ emissions. Conservative best-case scenarios suggest reductions of up to 24% in overall transport-related CO₂ emissions in the region, plus interesting results in other environmental and socio-economic indicators. In short, a shift to rail will contribute significantly to a more sustainable development of the region.

Keywords: Algarve Railway Line; railway mobility; Algarve; Sustainable mobility

MOBILITY THROUGH BICYCLE: ALTERNATIVE OF SUSTAINABLE INCLUSION IN THE CITY OF VALENCIA, VENEZUELA.

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

***Prof. Roxy Pérez*¹, *Dr. Esmeya Díaz*², *Dr. Maria Angela Flores P*¹, *Prof. Carmen Andara*³, *Mr. Raúl Paiva*⁴**

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The bicycle is a vehicle that fulfills a social function, promotes a model city through the health and environmental, economic and social contributions. It is characteristic of sustainable cities developing programs to mitigate the effects of climate change. In this context, the city of Valencia has a population of 2,494,810 inhabitants, and is recognized as an important industrial and automotive park for the country; However, it lacks a sustainable and inclusive public transport system. The research seeks to propose the key elements for planning and sustainable mobility for Valencia, with the bicycle as a means of transport. The methodology is descriptive, and the way to gather the information is field, with the support in the document, as well as the purpose of the feasibility, how to solve problems, requirements and needs of social groups. It is developed in three phases: diagnosis, through the profile of the urban cyclist, by means of a questionnaire to cycling users in the city; The sample was of the participants in a regional event to celebrate National Bicycle Day. Second: review, on the road conditions of cyclists in the city, through visual inspection. Third: proposal, which establishes elements to be developed by key stakeholders in the management and development of sustainable mobility. As for the profile of the urban cyclist in Valencia, young sons, in the range of 18 to 40 years, the male gender in more than 80 percent, uses the bicycle as a means of transport for work in the first option, as well as sports discipline, Frequently used daily; In terms of perception, they identify the bicycle with words such as freedom, companionship and health. While the conditions are not favorable, because there are no laws at regional and national level to regulate the mobility of bicycles in the city. In addition, the bikes do not cover the whole city, it lacks maintenance and it has no connection with other means of transport like the subway. Finally, the keys to the development of mobility are: regulation, investment in infrastructure for urban cycling, dissemination and educational promotion of benefits and monitoring of mobility indicators. It is recommended a census of urban cyclists, the integration of civil society and government entities, education programs for pedestrians and motorized. Keywords: sustainability, mobility, city, inclusion, bicycle.

DEVELOPMENT OF THE WEBSITE OF THE UNIVERSITY PARK FOUNDATION AS A LEVERAGE FOR THE PROTECTION AND IMPROVEMENT OF ECOPARQUE UC IN THE FRAMEWORK OF SUSTAINABILIDAD

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

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The Internet has become a powerful medium of communication and recently a tool for financing. Internet penetration in Venezuela stands at 37.7% of the population, placing these consumers slightly above the average in Latin America. In Venezuela, news sites lead clearly, however there is another group of web pages focused on e-commerce and entertainment. This navigation behavior of Venezuelan users, shows the challenge of positioning the institutional pages. In this context, the University Park Foundation of the University of Carabobo, established within its objectives to inform and disseminate to the community the projects under development, especially Ecoparque, using the principles of marketing, economic management and sustainable development, in order to familiarize users with this concept and to demonstrate the required change in people's attitudes and actions, as well as to obtain financial resources for their development. The objective of the research was to develop the website of University Park Foundation with multiple purposes, related to the promotion of Ecoparque, its potentialities; Institutional capacities for self-management, as well as promoting the concept of sustainable development. The research was developed under the modality of feasible project, using as methodology Extreme Programming for the development of the web. The study contemplates five phases 1. Preliminary project, 2. Project planning: definition of the team of specialists, user stories with the client and the incremental delivery plan, 3. Project design, 4. Iterative and incremental development of the website And 5. Tests of designs made. The result obtained is a dynamic, self-managing website with applications and web design functionalities aligned to the needs of the Foundation. The integration of art, technology, scientific information and the application of financial strategies was achieved. The overall quality, based on the formal structure and contents, visibility and image projected towards the outside, facilitates the objective of improving the institutional diffusion and the channels of communication of the same using social networks. We used a series of elements, such as accessibility, usability, fidelity, content adequacy, among other aspects, in the context of Web Information. Within the final considerations, Extreme Programming, which is oriented towards the end user of the system, reduces the cost of change in all stages of the system life cycle, and combines best practices to develop software. In terms of financial self-management strategies, Crowdfunding as used, understood as the financing of small enterprises, which in this opportunity are linked to Ecoparque activities and the provision of conservation and training projects in companies, within the framework of Corporate social responsibility. The website encourages an understanding of the concept of sustainable development through the appropriate use of resources, educational means and programs, creating a formal, non-formal and informal learning space; Invites you to know more and act in favor of the conservation of the environment and improvement of the quality of life. In this modality there are important expectations regarding its applicability in the Venezuelan market via the Internet. Research fosters the sustainable use of biological diversity in communities ~Keywords:Website, ecoparque, extreme programming, financing of microprojects, Crowdfunding, sustainable development\\

Evaluation of biodiesel co-products in petroleum wells drilling fluids

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

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The increase of environmental pressures and efforts to build a sustainable world encouraged the emergence of international policies for the use of biodiesel, which contributed to the consolidation of this fuel as an important energy source. The use of biodiesel has a number of benefits over fossil fuels such as: more complete burning, which reduces the emission of polluting gases, greater safety in handling and storage, renewable character and biodegradability. Although biodiesel and petroleum are in the same market niche, with different characteristics and intentions, both fuels can share and dilute the energy matrix. The increased participation of biodiesel in the Brazilian energy matrix has resulted in the growing production of its co-product: glycerin. The high supply, along with the low cost of glycerin has driven the development of several products from this raw material. The search for new drilling fluids that are increasingly suited to environmental and cost-benefit constraints foster a range of new additives research. In this context, the application of glycerin in drilling fluids presents as a promising alternative. Biodiesel is produced from transesterification reactions of vegetable oils with methanol (or ethanol). In the reaction, biodiesel, which consists of methyl esters (or ethyl esters) of fatty acids, is formed together with glycerin (glycerol). However, products of the incomplete reaction, such as mono and diglycerides, can be formed, even if on a small scale, as part of the glycerin phase. Thus, the objective of this work is to use the glycerin from the production of biodiesel from frying soybean oil as a lubricant in aqueous based drilling fluids. Two samples of methyl biodiesel were produced, one from frying oil and the other from commercial soybean oil. At the end of the reaction, there was separation of phases, being the upper constituted of biodiesel and the inferior one of glycerin. Various fluids containing frying oil glycerin, commercial soybean oil glycerin and a commercial lubricant (DP400) were formulated. The obtained fluids were evaluated through rheology, weight, hot-rolling, filtration and lubricity performance tests. It has been verified that the glycerin from biodiesel production has considerable lubricating activity, representing a significantly feasible alternative, low-cost and environmentally friendly additive alternative for aqueous-based drilling fluids. Generally, the frying glycerin obtained results comparable to those obtained with the available commercial lubricant. It can be concluded that the use of frying glycerin as an additive for drilling fluids presents significant advantages, since it is a co-product of the production of biodiesel, which in turn is produced from a waste, in this case frying oil. In this way, the importance of integration among different productive sectors and government policies for practices and development of sustainable technologies is highlighted. Keywords: biodiesel, glycerin, drilling fluids

Improve material efficiency through an assessment and mapping tool

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Paper

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Material efficiency in manufacturing results directly in cost and energy savings in fabrication, transformation, transportation and disposal, as well as reduced greenhouse gas emissions through increases success rates of waste management initiatives. Previous sustainability related studies on manufacturing companies indicated several barriers towards material efficiency and circular economy, including lack of a suitable tool for environmental initiatives, limited environmental motivation and engagement, lack of effective measures to evaluate sustainability, poor visualization and limited intra-organisational interaction. This paper aims to adjoin this functional gap via simplified Environmental Value Stream Maps (EVSM) to evaluate, measure and visualize material/waste flows of a limited operation in manufacturing. Two case studies were performed on (1) productive material flow (2) auxiliary material flows. Applying EVSM proved to be a practical solution to engage different organizational functions in material efficiency improvement, to visualize material and waste streams, to realize the value of wasted material and costs associated to waste handling and treatment, to define or update relevant KPIs and to support lean principles such as “go to gemba”. This paper contributes to the area of lean and green and circular economy through aiding manufacturing companies to better manage, measure and visualize industrial waste and material consumption in order to go up the waste hierarchy, reduce waste and material consumption.

Environmental education as an instrument for increasing resilience in schools: implementation of the eco-school project in Brazilian and Portuguese educational institutions

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

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Education is the most transformative tool of the individual and of society, although its effects are perceptible only in the medium and long term. Climate change have already changed practices in many sectors of society related to adaptation and mitigation actions and their effects. Among these sectors, education is a nest in which it is possible to foster and develop some adaptive practices that bring positive results. According to the United Nations Office for Disaster Risk Reduction, the term resilience can be understood as “the capacity of a system, community or society exposed to the risks of resisting, absorbing, adapting and recovering from the effects of a hazard in a timely and efficient manner, for instance, through the preservation and restoration of its basic structures and essential functions”. Therefore, it is possible to conclude that education and changing behavior have been intrinsically linked to adaptation and to resilience. Teaching is naturally resilient because of the Brazilian and other countries’ adverse context. Currently in Brazil the contents of high school’s education plan have already included the basic concepts related (Law of Guidelines and Bases - LDB) to environmental education that are now taught as part of some disciplines such as Physics, Chemistry, Geography, among others. Related to Environmental Education, it is necessary to appropriate the concept of resilience of the communities in case of seasonal or of eventual environmental events with the aim to approach issues regarding to resilience in that subject. In other words, to any topics related to adaptation to climate change naturally links to the issue of resilience, although the term resilience itself is not that often applied. In Brazil as in other countries, the perception of resilience included in environmental education is already noticeable. Based on the Eco-school project of the international program “Foundation for Environmental Education”, started in Portugal in 1996 and developed since then, we will provide a practical methodology for the integration of environmental education in Brazilian basic education system, in order to increase resilience to extreme events and to form environmental multipliers agents. Considering this aim, we investigated the Eco-school project by interviewing the workers professionals and being in touch with their main features including weaknesses while executing the project. A comparison was made between the results of the program in a Portuguese and Brazilian school in order to verify in which case the resilience approach was effectively applied or theoretically perceived.

Society-nature relations in the context of mechanized and semi-mechanized illegal gold mining in the Department of Chocó - Colombia.

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Paper

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The dynamics of the relations between society and environment exposes the success or the lack of effective actions of social sustainability. The continuous and complex relationship of the society (which includes public and private, economic, political and social institutions) and the natural systems reveals the human dimension as one of the key aspects of sustainability, given the different connections developed throughout the development of the social system (cultural, religious, economic, political, amongst others). The aim was to identify to what extent the environmental impacts, as reported in the literature, may constitute potential factors and sources of change, conflict or social impacts. To this, the paper follows the initial stages of Social Impact Assessment – SIA– (scoping and profiling) in context of mechanized and semi-mechanized gold mining of illegal character in the municipality Río Quito - Department of Chocó - Colombia, using literature review and document analysis, identifying the ecosystems that shelter the municipality and determining the effects of environmental impacts on ecosystem services affected through causal - effects matrix. The Department of Chocó is characterized by its natural and ethnic wealth, with 90% of the territory composed by indigenous and afro-descendent communities, recognized by its collective and traditional territories where the artisanal mining is an ancestral practice. Oppositely, this region presents the highest poverty rates in the country in municipality Río Quito, according to official data. In current days, the presence of mechanized and semi-mechanized illegal gold mining is another concerning factor that causing impacts in local communities, in the modification of ecosystems and their services, which are the basis of traditional subsistence and compromise the well-being of these communities. The literature demonstrates a wide range of environmental impacts arising from the illegal mining of gold, such as Mercury pollution, which affects miners and communities through ingestion and inhalation pathways. The research concludes that this type of mining is a driver of changes in the biophysical and social contexts of the municipality of Río Quito, with repercussions on traditional activities, and those considered as part of the foundations of a society: food, access to water and income generation. Based on the outcomes, we suggest that SIA is a tool that exposes changes and impacts that affect the relationship between society-nature, as well as promoting the knowledge of socio-environmental contexts in the proposal of sustainable measures that respond to the realities of communities, increase their social acceptance and the probabilities of being more successful. **Keywords:** Society-nature relations, mechanized and semi-mechanized illegal gold mining, Social Impact Assessment, environmental impacts, ecosystem service.

Social entrepreneurship at the Transcarioca Trail (RJ/BR)

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

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1. UNIVERSIDADE FEDERAL RURAL DO RIO DE JANEIRO

Transcarioca Trail (Trilha Transcarioca, TT) is a long-distance trail, which original track is approximately 180 km long, passing through seven protected areas in the city of Rio de Janeiro, connecting west, north and south zones. It starts in the Municipal Natural Park of Grumari (Parque Natural Municipal de Grumari) and ends in Sugar Loaf Natural Monument. The implementation of this trail is an opportunity to promote the establishment of touristic enterprises, stimulating the economic development of underprivileged communities surrounding it, associated with nature conservation. The purpose of this study is to develop a methodology for choosing the locations and activities for the promotion of sustainable enterprises in the area of influence of the trail. Interviews and meetings were carried out with the managers of the affected protected areas and the heads of Movimento Trilha Transcarioca, who are responsible for organizing the voluntary efforts for signaling and conservation thereof. Communities that are already offering some touristic service, and also potential communities for the implementation of this type of service, have been identified in the area surrounding Transcarioca Trail. Also, a mapping using Government data in order to identify existing communities up to two kilometers away from TT has been made. The identification of the services to be offered was conducted through the benchmarking about other long-distance trails in the world, and about what services are popular among hikers. Ideal sites for service provision would be those closest to overnight stay points, where TT hikers would be resting after a day's walk. Transcarioca Trail has 17 points for overnight stay and mapping indicated the existence of a total of 114 communities up to two kilometers away from the trail, ranging from 1 to 23 communities in the surroundings of each overnight stay point. The crucial services are: Lodging, meals and transportation of heavy luggage from a hosting to another. A case study was carried out in three communities visited in order to check how these services could be encouraged in each of them. These communities are located in the north, south and west zones of the city. It has been verified that there is great diversity among existing initiatives and each community prospectively selected must be visited and have a specific project in order to promote the touristic services designed. All showed great potential and interest, but the realization of this service provision depends directly on the demand on the part of TT hikers. Fostering the social enterprises focusing on tourism in UC and long-distance trails - focusing on communities in the areas of influence of these sites - is a potential way of promoting social inclusion, associated with nature conservation and sustainability in the development process.

SOCIOECONOMIC ASPECTS OF COOPERATIVE COLLECTORS IN THE STATE OF RIO DE JANEIRO

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

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1. UFRRJ/MDP

There is a growing concern in Brazil and in the world about solid urban waste, especially from a sustainability perspective. Due to the accelerated global development in the twentieth century, waste management has great magnitude in the economic, social and environmental spheres. Most of the effective waste management is carried out by recycling and all the sectors included in this process. In the Brazilian reality, the recycling process is facilitated by the recyclable material collectors who participate in the logistics between the collection of the post-consumer waste and its receipt by the recycling industry. Also, even though these collectors are the main responsible for recycling in the country, they are the less benefited in the recycling chain. In addition to the depreciation in their remuneration, they are still the targets of prejudice and lack of recognition for their economic and environmental roles. The federal legislation dealing with waste collectors and recycling cooperatives reinforces the collector's importance and requires the implementation of selective collection programs at the municipal level, and reverse logistics systems by the private sector. However, recycled materials commercialization is hampered by the marginalization of waste collectors, lack of economic valuation of the collected material and non-application of the relevant legislation. In this context, the present study intends to identify the socioeconomic profile of recyclable waste collectors in the state of Rio de Janeiro, Brazil, aiming to provide scientific content and visibility on the subject, as well as to serve as a basis for optimization of the national recycling chain, or countries with similar backgrounds. To do so, during 2016 a structured questionnaire was applied, where qualitative information was gathered from collectors of 9 cooperatives of recyclable materials. From this data, it was detected that the collectors who gathered in cooperatives are workers coming from dumps or from the street and that the average income of cooperatives is R\$5,822.33, being divided by 9 people approximately. It was also detected that 60% of these recyclable material collectors are women and 71% only have incomplete elementary school education. Although all leaderships are practiced by women, gender pay inequality exists and is marked by the fact that men receive an average of R\$ 457.22, while women receive R\$ 435.00. In this way, it has been observed that gender equality is another problem in this social sector. Thus, the present study indicates that the recyclable waste collector's category work under precarious working conditions, with remuneration below the national minimum wage, lack of basic school education, social and gender discrimination. In a nutshell, it is considered fundamental to promote the social insertion and appreciation of these workers improving their working conditions and implementing instruments to guarantee the continuation of the category in the recycling production chain in a dignified way, with educational and professional qualification and in the gender equality matter, under the premise of the Sustainable Development Goals.

Exponential Massification of Sustainability

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

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1. ISAE – Instituto Superior de Administração e Economia – Curitiba – Paraná - BRASIL

By means of an theoretical analysis the present study seeks to provoke an reflection on the actions of consumption of humanity against the imminent need for expansion of sustainability concepts for the whole population, in special, in the biggest consumer classes. In this Proposal, is approach the theme of the inclusion of sustainability with a view to enhancing consumption through sustainable products or services. Approaching the issue of consumption, here characterized by its exaggerated individual acts stemming from global marketing and massification actions, where the population consumes far beyond their needs, buying by impulse, desire, accumulation, status, fear, influence, prestige, anxiety, etc. (LINDSTROM, 2008). This exaggeration accentuates even more the uneven the tripod of sustainability, highlighting the environmental. This way, there is room to work on the influence of demand, through the adoption of global marketing strategies, in an effort between public and private agencies, creating the same desires, status, etc., but in the search for consumption of sustainable products or services, that is, to generate an exponential massification of sustainability, so that it reaches all levels of the population, having as its main objective at that moment, the consumers. The creation of symbols and support of global icons is a path of great impact in the short term, such as working global brands with prominent idols in the media, whether actors, athletes, etc., or use social media as an instrument of mobilization (LETS DO IT!, 2008), with the aim of engaging society. These actions do not conflict with the excellent work that has been developed worldwide in universities, training students, future entrepreneurs and managers in sustainable awareness. But time is scarce in the face of the destruction of our planet (WFN, 2008), it is extremely important to have an impact on the average citizen, who has a direct influence on consumption and is out, at least for now, to have a more direct contact with sustainability. Therefore, it is intended to describe how possible is to generate sustainable paths and actions, and can contribute even more to the implementation process of the \textbf{“2030 agenda for sustainable development” (UN, 2015).} \textbf{}

Cultural Values and the Role of Trust in Agents and Technology in Consideration of the Dynamic Prices Electric Grid and Efficiency at Home

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Paper

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Perceptions of societal risks and cultural ideals are expected to partake in attitudes towards the digitalized grid with dynamic prices, whence reliance on automated systems is feasible. Moreover such potential changes in the consumers' lives confront them with environmental, economic, and technological norms and orientations. The aim is to probe Cultural Theory (CT) constructs' usefulness in understanding consumers' trust influence in intention to rely upon dynamic prices to consume off peaks, when presented with several possible auxiliary technologies which could be used at home. CT theory predicates different groups' risk perceptions and polarized attitude to solutions to environmental problems. Trust literature highlights the perception of similarity in values and intentions with other agents. Trust in IT technology literature focuses upon cognition and affect towards specific technologies, acknowledging several orders of factors, such as individual propensities, and perception of societal supporting forces impending upon a particular context. The ensuing picture is that of multiple determination, openness to meanings and viewpoints. Respondents were 571 consumers enrolled in a market firm, were given descriptions of dynamic prices grid and several auxiliary technologies, and answered a questionnaire comprising trust in several targets and intention. The study analyses myths about nature and risks perception, employs these measures to segment the sample, assess differences among clusters in trust in agents, trust technology and intentions of adhering to dynamic tariffs, and estimates predictive models of the latter variable. Willingness to adhere was predicted by different trust phenomena, spanning from expectations about the specific devices, to generalized trust in technology and beliefs about situational societal assurance. Trust in technology emerged as the most important and trust in agents was not represented. Would this outcome change for groups with different cultural orientations? In the sample, perceptions of environmental, economic and social conflicts concerns correlated with myths about nature significantly in an interpretable direction. Segmentation yielded 8 clusters, a few only matched Cultural orientations constructs. Willingness to adhere was lower in one cluster. It had uniform low concerns, and slight endorsement of nature as fragile. Although beliefs about the specific technology featured as the most predictive, the clusters differed in the kind of specific device where trust mattered, from the use of a monitor, to an automated method. Societal support represented by the belief that progress in law and society made it normal this kind of application was significant predictor for some groups. Trust in agents was significant for two groups, but for one it was trust in consumer support organizations and for the other, it was trust in Energy provider. Myths and concerns with risks showed significance in a few clusters, but in differing directions. The significance of the orientations in regard to adhering to dynamic tariffs does not appear to be uniform, and different orders of concerns predict willingness. Thus, groups with different orientations were found to be willing to adhere to dynamic tariffs and consume off peaks.

SUSTAINABLE PUBLIC PROCUREMENT IN THE PERCEPTION OF COLLABORATORS RESPONSIBLE FOR THE EFFECTIVENESS OF INSTITUTIONAL CONTRACTING: THE UFRRJ CASE

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Paper

Mrs. Rosalia Santos¹

1. UNIVERSIDADE FEDERAL RURAL DO RIO DE JANEIRO

Actions that impact the natural environment have overcome national barriers and their reflexes can be noticed at the global level. It is thus a duty of national governments to implement policies for sustainable development in the face of the many environmental, social and economic challenges that are mounting. Thus, discussions about environmental protection, eradication of poverty and equitable distribution of income are strengthened. In this context, through public policies, the Brazilian State has sought to stimulate the involvement of civil society and the government itself in favor of sustainable development. In this scenario, the relevance of public contracting stands out. Taking as a reference the significant purchasing power of the Brazilian government, which represented 20.2% of the Gross Domestic Product (GDP) in 2014 and considering that GDP reached approximately U\$~1,5 trillion in that year, defining the way in which it will use the public resource, the government has in its hands the power to mobilize an entire productive chain. Thus, in 2010, the legislation that regulates government hiring has undergone an alteration that determined that the bids made within the scope of the Brazilian public administration must have, for one of its purposes, the promotion of sustainable national development. However, almost a decade after the mentioned change, the data reveal that there are still incipient procurement administrative that consider in their processes the category "sustainability". Exemplifying the case of the Federal Rural University of Rio de Janeiro (UFRRJ), a public organization located in the State of Rio de Janeiro - Brazil, from 2012 to 2016, 1,752 procurement processes were carried out, however, the percentage of purchases that included the purchase of items not reached 1% of the total. During the same period, 209 contracts were signed, but none contemplated the acquisition of sustainable items. Thus, it is concluded that despite the legal requirement for public contracting to promote national sustainable development, we can see that this initiative still seems very incipient. Thus, it can be deduced that the category "sustainability" is not consensual and that there may be different interpretations of this reality. Therefore, it is inferred that there are cultural and symbolic boundaries between the institutional actors responsible for such hiring and this can result in a distinct understanding of sustainability in spite of the legislation and regulations in force, thus creating a research opportunity. It should be noted that despite the importance of institutional actors in this process of implementing sustainable public contracting, an inexpressive amount of studies was identified that considered the perception of such actors specifically on the sustainability category. Thus, the objective is to carry out a qualitative research, characterized as a case study, which is oriented by a sociological and anthropological relational view, and aims to understand the exotic in what is familiar, through the analysis of webs of meanings built by institutional actors responsible for procurement processes at UFRRJ. The methodological resources employed include fieldwork, participant observation, the use of semi-structured interviews and bibliographic research.

Bio inspired design: when sun and wind are there to help

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

*Dr. Francesco Pomponi*¹, *Ms. Liliana Medina Campos*², *Dr. Alice Moncaster*¹

1. University of Cambridge, 2. ManCo Ltda

Colombia is increasingly acknowledging the role that bioclimatic design of buildings can play within both environmental sustainability — through reductions in energy consumption and GHG emissions — and social sustainability — through the promotion of vernacular architecture and the reconnection of citizens with their surrounding environment. Façades, at the interface separating the internal and external environments, have the role of regulating the heat and air transfers between the two. In developed countries ventilated façades are a well-understood and widely-used technology to reduce energy consumption whilst providing indoor comfort. While there is little knowledge of how they would perform in climates such as that of Colombia, some initial comparative studies have shown promising results. The peculiarity of several Latin-American countries (with Colombia and Brazil *\emph{in primis}*) is that they are so diverse that one single climate is insufficient to characterise them. Indeed, in July 2015, the Colombian Government, through resolution No. 549, defined four separate climatic areas for building design. This paper reports on the findings of a funded project based on a real building in the District Capital city of Bogota', which is a mixed purpose 19-storey building, with the first two floors of commercial space, two floors of car parking, and residential space for the remaining 15 floors. The building includes a ventilated façade which was developed based on dynamic energy modelling and general design guidelines. Its performance has been monitored in partnership with Colombian academics and compared with predictions to assess the potential of this technology in new contexts such as Colombia. This research is therefore relevant to monetary/energy savings and economic development as well as people's health and well-being. As such, it relates to several UN SDGs; specifically, No.3 (health and well-being), No.4 (clean energy), No.8 (economic growth), No.9 (innovation), No.11 (sustainable cities), and No.13 (climate action).

Perspectives on the environmental impacts caused by the silver rain in Santa Cruz, Rio de Janeiro city, and adjacencies under the optical at Environmental Justice.

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Ms. Irineia Rosa ¹, Mr. Polyana Souza ¹, Mr. Mariana Murakami ¹, Mr. Paolo Belfiore ¹, Mr. Vagner Luiz Cardoso De Medeiros Cunha ¹, Prof. Fabiola Garrido ¹

1. UNIVERSIDADE FEDERAL RURAL DO RIO DE JANEIRO

The present article presents a reflection on the transformations in the conception of nature and the socio-economic, political and cultural changes that occurred after the installation of the Tyssenkrupp Steel Company - Companhia Siderúrgica do Atlântico (CSA) in Santa Cruz, Sepetiba Bay, West Zone City of Rio de Janeiro, Brazil. A series of impacts on human health and citizenship, as well as events related to the installation and operation of this company were analyzed. The methodology used in this study involved the collection of information disseminated in print and digital media between the years 2010 to 2016, and literature review. Air pollution caused by the operation of the blast furnace with continuous explosions and silver soot launched into the air was observed. The company started operations in 2010, with the operation of the blast furnace without adequate environmental licensing, facing popular manifestoes opposed to the project and concerned about the pollution and the quality of life of the local population. Immediately after the start of operations, surrounding neighborhoods and neighboring cities, such as the City of Itaguaí and City of Mangaratiba, were covered with a bright dust, which the population called “silver rain”. This dust is composed of silver particles and has caused problems in public health. Aerial pollution is also accompanied by the destruction of a mangrove area of Sepetiba Bay, with dredging of deepening of the Port of Itaguaí, access Channel used for Motorboats and boat traffic and the contamination of the waters with untreated effluent discharge have prevented fishing on the spot. The population has gathered and demonstrated through the written and televised media, so that the Brazilian authorities adopt preventive measures against environmental impacts with a reflection on the health of the population surrounding the project and the neighboring Cities. Nowadays, the population is characterized by situations of Environmental Injustice, environmental protection agencies have allowed the Company to operate through a Term of Adjustment of Conduct (TAC), without the Operating License, which is leading to environmental damage and Public health; It is important to emphasize that it is a universal right to a healthy environment, in the Federal Constitution of Brazil of 1988, where Article 196 states that “health is the right of everyone and the duty of the State, guaranteed by social and economic policies aimed at reducing Risk of disease, and universal and equal access to actions and services for the promotion, protection and recovery of the population’s health including the environment”. Although Brazilian laws are well drafted, environmental protection agencies do not apply the law as they should, Favoring to Entrepreneurs to the detriment of the population, that gets sick in the territory in which they live breathing the silver dust.~The Public Prosecution Office of the State of Rio de Janeiro has denounced TKCSA and its directors for atmospheric contamination at “levels capable of causing harm to human health”, based on studies showing an average increase of 600\% in iron concentration. Keywords: Environmental License, public hearing, silver rains, public health, Environmental Justice.

TERRITORIAL GOVERNANCE AND SUSTAINABLE DEVELOPMENT

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Paper Rejected

Mr. Bartholomeu Rebouças¹

1. UCSAL Universidade Católica do Salvador

Object: Understanding the legitimacy of Territorial Governance actions and their role in Sustainable Development of a geographical region, using research for a doctoral thesis at the Graduate Program in Territorial Planning and Social Development of the Catholic University of Salvador, within the research line of Territoriality, Social Development and Environment. The research seeks to analyze the perception of the legitimacy of governance actions; to identify the role of local leaders; to validate governance as a democratic management method for institutions; to verify if there is encouragement of citizen participation; to verify the perception of “belonging” among citizens of a region and to characterize territorial governance as an essential component of modern public management.

Intervention site: Municipality of President Tancredo Neves, in the south of Bahia state, in the Northeast of Brazil.

Institution to be researched: The South Bahia Sustainable Development Institute (IDES).

Theoretical basis: Colletis (1999); UN (2000); The World Bank (2000); Seyle e King (2014); Pascual Esteve (2015)

The IDES is an organization created in partnership with companies, civil society, representatives from governments and subnational spheres, which devised a strategy to encourage organizational innovation and to apply technological innovations to improving production of cassava flour, heart of palm and fish. It combines social techniques to engage communities by innovating work and production processes. The intervention model follows the ideas of Pedagogy of Alternation (originated in France in 1937) and focuses on young students of rural schools who blend a week of learning at the project’s facilities and two weeks of supervised application of the knowledge gained at family farms.

Phenomenological research: Husserl (1859 – 1938) The phenomenological method seeks the direct description of the experience as it is. The reality is built socially and extended as what is understood, interpreted and communicated. Thus the reality is not unique: there are as many realities as there are interpretations and communications. The stakeholder/subject is recognizably important in the knowledge building process. The project uses qualitative research, which seeks to study the essential structures of the phenomena that occur in our conscience. It seeks to obtain a critical analysis of the narrative, vying to understand history as it is presented, as well as the relational approach, with the recording of information from the dialectical encounter between the researcher and the survey’s participants, who are designated as co-participants. Such relational approach will be developed through personal contacts between the researcher and the participants, through a non-probabilistic and intentional sample, with a questionnaire/interview script that considers the relevant of subgroups identified in the review of the cognition of interviewees about their governance actions in the municipality of Presidente Tancredo Neves, since the year 2000 to the current year, to consolidate the scenario proposed.

Conservation Units in urban areas and popular participation: the socio environmental situation and the relevance of the protected areas of São Gonçalo (Rio de Janeiro, Brazil)

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Ms. Julia de Marins Costa¹

1. Programa de Pós-Graduação em Práticas em Desenvolvimento Sustentável da Universidade Federal Rural do Rio de Janeiro (PPGPDS-UFRRJ)

Conservation Units (CUs) are fundamental in the protection of biological diversity. In Brazil, they have the function of guaranteeing the sustainable use of the biomes, such as the Atlantic Forest. With only 12% of forest remnants of its original coverage, it shelters the largest Brazilian urban centers, which, in some cases, share space with important protected areas. In the state of Rio de Janeiro, the city of São Gonçalo is one of the dormitory towns that support the state capital, but suffers with structural precariousness. With more than one million inhabitants, it has a history of disorderly population growth that has generated serious basic infrastructure problems that remain to this day, such as lack of access to water and sewage treatment. In this context, the aim of this research was to document the structural and ecological situation of the Conservation Units of São Gonçalo under local government administration and, mainly, the population's perception about those spaces and their use for educational purposes. For this, interviews were conducted with the administration of the CUs, in addition to visits to the areas and interview with the only employee of the units. In result, data were collected regarding the history, characteristics and community involvement related to the Units. Founded in 1991, Engenho Pequeno's Environmental Protection Area (EPA) was created based on a popular initiative to prevent its 13 km² of Atlantic Forest remnants from being transformed into a dumping ground. Ten years later, part of its territory was destined to the creation of the Municipal Natural Park of São Gonçalo. Both areas are administered by the town hall and have almost zero visit rates. Furthermore, according to the official CUs' registration, they do not have a management plan or educational program, although they are described as reserved spaces for conservation activities and academic studies based on Sustainable Development and Environmental Education (EE). Without appropriated security, the CUs become easy targets for depredation. In some forests, irregular constructions threaten the ecosystem balance. At the headquarters, there is only one employee working, and the biology laboratory, with data and samples collected in the Units, is totally abandoned. In conclusion, this study found that the lack of public investment and educational actions on the Conservation Units of São Gonçalo directly implies the difficulty of protecting those spaces. Therefore, access to information about the ecological and social relevance of protected areas is an essential strategy to bring the community closer to environmental issues, as well as to engage it in the protection of the municipality's natural patrimony. Moreover, the data of this work may encourage the local government to plan public actions centered on the protection and occupation of the CUs on the work for a sustainable city. The theoretical references considered in this work were the researches of: Carlos Frederico Loureiro on EE and participatory management of CUs; Michele Sato and collaborators on Environmental Education; Jesus Martín-Barbero on Communication and Education; and Paulo Freire on Pedagogy. Keywords: urban forests; environmental education; communication; sustainable management.

Inclusive sustainability: using mindfulness education to reach disadvantaged youth

Wednesday, 14th June - 17:45 - ML Calle del Saber - Poster Abstract

Prof. Raymond Auerbach¹, Mrs. Christina Auerbach¹

1. Nelson Mandela University

When young people are fully engaged, all of them are potentially brilliant. A recent study examined the use of mindfulness with disadvantaged young people in South Africa's southern Cape, where students were able to improve their social integration as well as their academic performance. Another study looked at the impact of home vegetable gardens, where diversity of food choices increased but understanding of climate change and the importance of organic food production practices did not improve. The studies both point to the effectiveness of interventions using mindfulness in empowering young people from marginal communities, but also to the need for critical mass in these interventions, which cannot be applied as an add-on but need to be given sufficient space and resources before they will have transformative effects on the opportunities available to young people from disadvantaged backgrounds. A new food security education and research programme is described based at the Garden Route Environmental Education Centre in the southern Cape to assist natural science scholars and farmers with mindful scientific observation. Keywords: mindfulness, agro-ecology, environmental education.\\

An innovation strategy for the governance of a sustainable and territorial peace in Colombia

Thursday, 15th June - 08:00 - SD 701 - Oral Abstract

***Dr. Manuel Perez*¹, *Dr. Eduardo Wills*², *Mr. Andres Bravo*³**

1. IESE/CSIC, 2. Universidad de los Andes, 3. Goberna America Latina -Fundación Ortega Marañón

Colombia is facing a huge challenge of creating the conditions for a sustainable and inclusive peace in the short run. A collaborative effort between the state, communities and private sector is needed. It is necessary to foster a process of economic, social and institutional development for the regions and territories that have suffered a prolonged armed conflict. These new forms of governance require the existence of particular institutional framework, incentives as well as the formulation of public policy on new premises. This process of social construction needs to reverse the historical conditions of abandonment that have biased the development effort in the country in favor for the urban and modern sectors against the rural areas and peasant and indigenous populations. An innovative process that guarantees the conditions for a stronger social cohesion of rural societies is needed. As has been said, peace in Colombia needs to be territorial or otherwise it will not be achieved. In this paper the authors formulate an innovation strategy for territorial and sustainable peace in Colombia based on the following premises: i-) to consolidate a territorial policy that includes issues of distribution of income between the different levels of government as well as territorial ordering as a state policy that has continuity in its implementation over the duration of short-term oriented governments, ii-) the formulation and implementation of the territorial policy is a coresponsibility between state, private sector and communities that operate at the local levels, iii-) the normalization of the institutional framework and the monitoring of risks against institutions at the local and regional levels, including risks of corruption and capture by local illegal groups of state apparatus, iv-) the creation of a new agency for territorial development, v-) the active participation of local action groups, as in the case of the Leader strategy, as main agents of the reconstruction effort. The feasibility and risks of this strategy is discussed and policy recommendations are issued.

Challenges of international cooperation in Colombian post-conflict

Thursday, 15th June - 08:15 - SD 701 - Oral Abstract

Prof. Juana García¹

1. Universidad de los Andes

ODA allocations to middle-income countries are scarcer than those earmarked for LICs. Strong institutions and robust economic growth are summoned to develop societies among MICs. However, countries like Colombia still perceive ODA resources, donor's reasons for their support lay mainly to back local authorities with internal conflict and the 2016 peace agreement reached between the parties sets a challenge for donors and local bodies to build peace in areas forgotten by the state until recently. Through deep interviews and information gathered from sixteen DAC donors present in Colombia about their current peacebuilding projects, this article summarizes the behaviour of the main donors and the characteristics of their aid before the post-conflict period in Colombia. Few donors realize the need of a humanitarian-development-peacebuilding link on the ground since their short-term projects are generally described as humanitarian or development-related initiatives, standing against academic and practitioners view. Also, echoing the literature review, most donors in MICs work with local institutions and a mix of up-bottom and bottom-up projects is noted. Final remarks emphasise on the definition of the role of aid to MICs as assistance that should be based on knowledge-transfer, donor coordination, and government support to reinforce its presence without politicising aid.\

Tourism, Peace and Coexistence process: public - community strategy for sustainable development in the post – conflict in Colombia - Study of the outcomes

Thursday, 15th June - 08:30 - SD 701 - Oral Paper

*Mrs. Diana Puerta*¹, *Mrs. Karol Fajardo*¹

1. *Universidad de los Andes*

“Peace and tourism is what we have been doing in the rural territories, it was the engine in the middle of despair, conflict and inequality” (Josefina Klinger - leader of ecotourism in Colombia) “With over one billion tourists travelling the world every year, tourism has become a worldwide social and cultural phenomenon that engages people from all nations as both hosts and guests. The fundamental experience of tourism - visiting a new place and meeting its people and culture – is a transformative aspect that defines tourism’s role as an agent of peace” (Center for Peace Research and Peace Education of the Klagenfurt University / Austria in cooperation with the World Tourism Organization (UNWTO), 2014). Tourism sector can contribute to peace and coexistence in territories that have been affected by the armed conflict in Colombia, territories with natural wealth and cultural diversity. These territories have been consistently increasing their income through this sector in recent years (more than 10%), even above growth rates in Latin America (5%) and the world (4%) (Lacouture, 2017). With the aim of exploring the potential of tourism in peacebuilding in Colombia, this study designed a research-action-participation methodology to analyze the results of the design of the community strategy for peace and coexistence in Colombia. This study shows how the members of the tourism chain, and local public institutions of four regions with potential in tourism and peace, and the Vice Ministry of Tourism, built together a sustainable tourism strategy. The main hypothesis of the process is that these territories can replace the illegal and arms industry by tourism as an option for sustainable development, that is, economic growth, equitable and socially participatory and with environmental sustainability. These regions are: *La Macarena* in the Meta Department; *Valle del Sibundoy* and *Mocoa* in the Putumayo Department; *Camino Teyuna* in the District of Santa Marta; and the *Gulf of Urabá* in Chocó and Antioquia Departments. The results were analyzed through a specific set of 15 indicators among these categories: *Social equity* *Environmental sustainability* *Positioning of each destination as a tourism, peace and coexistence region* *Satisfaction of tourists* *Quality and formalization* The strategy’s approach and governance scheme are collaborative, co-responsible and community-based. According Bruce Poon Tip, Managing Director of G Adventures: “for tourism to be an instrument of peace it is necessary to include communities, provide decent work and build capacities”. Increased investment in human capital and social capital is the key to the contemporary practice of tourism as a tool for development, which implies dynamic creation, exchange and knowledge management, supported by the fundamental role of institutions and governance (Fayos, 2014). Centre for Peace Research and Peace Education of the Klagenfurt University / UNWTO (2014). *International Handbook on Tourism and Peace.* Austria: Drava. Lacouture, M. (14 de Enero de 2017). El turismo puede crecer por encima del 10%. (P. E. Tiempo, Entrevistador) Fayos, E. S. (2014). *Tourism as an instrument for development : a theoretical and practical study.* Department of Hospitality and Tourism, University of Wisconsin-Stout.

Forests and Conflict in Colombia

Thursday, 15th June - 08:45 - SD 701 - Oral Paper

Dr. Rafael Isidro Parra-Peña S. ¹

1. Centro de Estudios Regionales Cafeteros y Empresariales | Center for Coffee, Regional and Business Studies | CRECE

- This paper offers evidence on the relationship between armed conflicts and their environmental impacts. For the case of Colombia, using a unique yearly municipality panel dataset (from 2004 to 2012) and an instrumental variable approach to control for possible endogeneity between forest cover and forced displacement, there is evidence that the armed conflict is a force of forest protection and growth.~ In particular, the alignment between rural underdevelopment and the rural–urban migration as a result of the violence, along with the presence and control of the illegal-armed groups of some zones contributed to protect forests. However, this effect is negligible. For example, the estimated effect suggests that one person displaced per 1,000 inhabitants increase the share of the municipality covered by forest by 0.013 percentage points at the municipality level. Forest cover changes are also likely to be driven by other factors difficult to measure such as illegal mining, the conversion of forest areas into pastures, illegal logging and forest fires.\\ The Revolutionary Armed Forces of Colombia (FARC) began engaging in discussions with the national government in 2012 to attempt to end Latin America’s longest-running internal conflict, which endured for more than half a century Forest degradation often increases in post-war situations.~ In conclusion, this paper advocates for an appropriate conservation strategy when peace arrives in Colombia. The government will need to be ready to deploy conservation policies in those areas that are currently under control of the guerrilla. In the past, the protected zones by the state helped in reducing settlements and illegal drug activity. However, this might not be enough in the future.\\ Enforcement of conservation of currently protected regions and areas previously under a “gunpoint conservation” regime by the guerrillas will be fundamental. Rain forests and their watersheds support the lives of humankind, therefore, their protection and conservation is indispensable. These findings spotlight a need for increased protection of Colombia’s forests.\\

Rural Sustainability through Production-Conservation corridors with Colombian dry-forest Campesino communities

Thursday, 15th June - 08:00 - SD 702 - Oral Paper

Ms. Ines Cavalier¹

1. Fondo Patrimonio Natural

Colombia's usual approach to conservation establishes people only as a driver of ecosystem degradation and proposes the constitution of restricted-use isolated areas possessing exceptional natural values, but leaves aside the social aspects and cultural values guiding the relationship between people and the natural resources in a territory. For instance, the tropical dry forest (TDF), an ecosystem facing extinction, only has a 6.4% representation within the National System of Protected Areas. Additionally, the restrictive conservation status given to these areas have not completely benefited endangered ecosystems; instead, protected areas have caused estrangement between communities and their territory. This breach has inevitably resulted in additional pressure on biodiversity assets, the increase of illegality in the procurement of key natural resources and the displacement of vulnerable communities. It is known that biodiversity contributes to ecosystem goods and services which support human well-being. The long term perspective, has to take into account those cultural and social values affecting nature and human opportunities in a negative or positive way, to enhance benefits and minimize impacts through conscious actions applied as everyday practice. The Conservation Landscapes Program was designed to improve conservation and livelihoods, while strengthening social capital and participation. This paper will focus on how the local values and perceptions of nature and production, as well as the social capital were important to motivate actions ensuring the sustainable management of their territories. Also, it will explain how innovation, through external ideas and practices, entered into this dialogue to achieve the program's objectives, that is, aligning the means and the ends. Other topics emerged, such as the situation and agency of women in conflict and displacement situations, in relation with conservation activities, food security and sovereignty. The project shows that conservation can be aligned with other societal goals, minimizing tradeoffs, and creating "win-wins" for communities and nature, while promoting better institutions at different levels. For the pilot phase Patrimonio Natural (NGO) introduced the conservation-production corridors as the strategic approach to plan and conserve the TDF with 300 Campesino families in 7 Nodes in the Colombian Caribbean region. The team used human centered design methods and mapping tools such as participatory territorial planning, action-based Conservation agreements and the application of landscape management tools to work along Campesino families in reframing their relationship with the forest. This approach allowed rural communities to decide over their territory with key information at hand and to generate a valuable relationship. This new relationship enhanced productivity and biodiversity recovery bringing new products to the market and securing basic needs. Also, the recovery of techniques and the introduction of technology, gave Campesinos the necessary tools to improve their health and well-being. Ninety kilometers of production-conservation corridors were created, in collaboration with Campesino communities, improving their quality of life and income and protecting biodiversity. Economic, social and environmental sustainability are starting to be achieved on a small scale, but escalating calls for the involvement of all stakeholders including policy makers.

The creativity of everyday life in crafting resilient food systems: A framework and case from the Atlantic Forest Coast of Brazil

Thursday, 15th June - 08:15 - SD 702 - Oral Abstract

*Dr. Iain J. Davidson-hunt*¹, *Dr. Carlos Julián Idrobo*², *Dr. Katherine Turner*¹

1. University of Manitoba, 2. Universidad de los Andes

We introduce an approach to consider the role of agency in our understanding of social-ecological resilience in the context of remote indigenous and other rural communities. We introduce biocultural creativity as the everyday actions of harvesters in utilizing biological materials to respond to the challenges they face as actors within dynamic social-ecological systems. We focus on food systems and draw upon that literature to develop an approach that traces the flows of biological materials from the environment and through its transformation, exchange and consumption phases. This approach allows us to systematically locate challenges within a food system to which harvesters respond through everyday choices that lead to transformations of the food system over time. We present a case study from Ponta Negra, Brazil, to illustrate food system resilience as a process of crafting through everyday creativity and the challenges to this process when access to key components of the food system are lost. While much work has focused on the emptying of rural and remote regions emphasizing those who have left, we focus on those who have stayed, or come back, and the actions they undertake to fashion these spaces as meaningful places to work and live. Our goal in doing so is to bring the creativity of everyday life into the broader discussion of the role of agency within resilience thinking.

Changes in Traditional Ecological Knowledge teach us adaptive strategies to manage sustainably the tropical rainforest: lessons learnt from the Colombian Amazon

Thursday, 15th June - 08:30 - SD 702 - Oral Abstract

Mr. Sebastian Restrepo Calle¹, Ms. Valentina Fonseca¹, Mr. Camilo Alejo¹, Mr. carlos hernandez¹

1. Pontificia Universidad Javeriana

Evaluating the effects of cultural and socioeconomic driving forces on local production and harvesting systems is crucial for the proper understanding of social-ecological dynamics of tropical rainforests in the Amazon region. Current and historical changes in Traditional Ecological Knowledge (TEK) linked with livelihoods of indigenous peoples reveal useful contributions to promote pathways for sustainable social-ecological transformations. Based on six case studies carried out in the Amazon region in Colombia, we described how TEK attributes have changed in the last forty years (1976-2016), and how these changes have modified the management of the rainforest. We present a descriptive and comparative analysis of TEK attributes linked to indigenous production and harvesting systems, taking into account classification methods, land and resource management practices, institutional arrangements, and worldviews of seven indigenous peoples. Additionally, we assessed the implications of these changes in social-ecological dynamics of the rainforest and found general lessons towards sustainability. Results showed some differences in knowledge attributes of different ethnic groups associated with certain historical events. Tracked changes pointed out variations between attributes and change of key variables which strongly drive social-ecological transformations. Our approach to TEK and related shifts brings relevant information about the sustainable use of the rainforest and contributes to the understanding of adaptive strategies developed by indigenous peoples to navigate global change. Keywords: Traditional Ecological Knowledge, TEK, Tropical Rainforest, Amazon Region, Colombia, Qualitative Comparative Analysis

Revising the Ontological Status of Traditional Modes of Living: the concepts and their practical consequences in Sustainability issues in China, Kenya, Colombia and Sweden

Thursday, 15th June - 08:45 - SD 702 - Oral Abstract

***Prof. Frank Birkin*¹, *Mrs. Mónica Ramos*², *Mr. Collins Makunda*³, *Dr. John Margerison*⁴, *Prof. Thomas Polesie*⁵, *Mr. Alejandro Balanzo*²**

1. University of Sheffield, 2. University of Twente, 3. The Oslo School of Architecture and Design, 4. DeMontfort University, 5. University of Gothenburg

Abstract We inhabit a world dominated by aspects of Modernity which has rejected traditions as an aid to development in favour of a Rationalism that since the Enlightenment has emphasised a “politics of reason” centred upon~rational choice and utilitarianism to underpin the neoclassical economic syntheses that today direct development. This paper considers that Modernity and its derivatives are a direct cause of unsustainable forms of development. To overcome such problematics, the epistemic analysis of Michel Foucault and the Modes of Existence study of Bruno Latour are used to reject Modernity, Rationalism and the neoclassical economic synthesis in favour of a pragmatic empiricism. After summarising the scientific justification for this radical approach, this paper revises the status of enduring traditions to that of ontologically distinct Modes of Existence that are fully independent of Modernity and its consequential economic theories and practices. By linking those aspects of traditions that resonate well with the science identified in this paper, it becomes possible to identify, strengthen and use traditions to support everyday sustainable activities that engage local communities with their own, enhanced concepts and terminology to avoid the technical jargon and abstractions of sustainability. In addition, this kind of transition in effect heralds a new civilisation and that has wide implications for all, including urban communities. Indeed it is only by revising the generic goals and processes of development for all that the full utility of the approach taken in this paper can be beneficial for those groups now marginalised by Modernity. Some of the practical consequences of the approach are explored in this paper which uses short case studies ~from Colombia, Kenya, China and Sweden respectively

A New Conceptual Perspective on Circular Economy: preliminarily confirmation of the 7R Principle by a descriptive Case Study in Eastern China

Thursday, 15th June - 08:00 - SD 703 - Oral Paper

Mr. Jicheng Xing¹, Prof. J. M. Vilas-Boas da Silva², Prof. Isabel Duarte de Almeida³

1. ISCTE-IUL, BRU-IUL, Wuhan Qingquan University, 2. ISCTE-IUL, BRU-IUL, 3. ISCTE-IUL, Universidade Lusíada

The purpose of this study is to outline and demonstrate an innovative conceptual framework on circular economy. Research questions arise from the background literature review and are further developed into the proposed 7R principle model. Its preliminary confirmation is pursued by a descriptive case study of Suzhou Industrial Park (SIP) in Eastern China, which is located neighbouring to Shanghai and extensively recognized as one of the most initial Eco-Industry Parks (EIP) in China and as one of the most successful EIP. To begin with, traditional 3R principle is introduced and, then, the evolvement into 5R is discussed. After that, a proposal for a conceptual framework promoting a 7R principle is put forward. Its components are reduce, reuse, recycle, recover, rethink, resilience and regulate. The descriptive case study based on secondary data provides instances to illustrate that every aspect of the 7R framework is properly embodied by a serial of SIP practices.

DILEMMAS AND RETURNS OF SUSTAINABILITY PROJECTS IN THE LIGHT OF THE SCIENCE OF SUSTAINABILITY

Thursday, 15th June - 08:15 - SD 703 - Oral Abstract

Prof. idalina dias sardinha¹

1. Universidade de Lisboa/ISEG-Lisbon School of Economics & Management/SOCIUS-CSG, Researcher Centre in Economic and Organizational Sociology

In the debate on sustainable development there is still a concern about the contribution of science to the construction of environmentally and socially sustainable communities. Its impact depends on scientific discipline, the way it is shaped and how it interacts with society and politics. The social sciences and humanities (SSH) are decisive for both knowledge and development. In particular when it comes to challenges associated with socially relevant problems in which scientific knowledge must overcome the traditional boundaries of the discipline and engage in inter and transdisciplinary efforts. In this sense, it is assumed that the potential of sustainability-science lies in focusing on solutions, creating transdisciplinary collaborative research contexts, and reducing institutional barriers beyond understanding the changes that have occurred in the nature-society relationship, creating conditions for the involvement of people in the decisions that affect their lives and their environment. But the development of sustainability-science projects can be an arduous path, producing dilemmas, antagonisms and societal conflicts, requiring time, and having a limited influence on the political decision, reducing the potentiality of its results. This article first elaborates on the valuation of the SSH for the sustainability-science, proceeding in the adaptation of the model of Arnim Wiek *et al.* (2012) on evaluation of sustainability-science projects. This model allows the analysis and appraisal of sustainability projects in order to understand how concretely a project contributed to the transformation towards the sustainability of the systems in question. The work intends to illustrate the difficulties and benefits that arise of these projects where various scientific disciplines are applied and the communities are involved. Two projects developed in Portugal will be analyzed, one on the valorization of a brownfield, and another on the valuation of intangible archaeological knowledge of a region. The projects arose from the need for socioeconomic and environmental long-term sustainable returns to the stakeholders from the effects of the use of local resources. In both projects the approach listening to stakeholders. In the project of brownfield valorization several disciplines and methods were used: from stakeholder's analysis, auscultation and participation to life cycle assessment, contingent valuation and multi-criteria analysis. During the project a collaborative plan for brownfield sustainable (re)development was issued. The project on the valuation of intangible knowledge involved the auscultation of the stakeholders and a contingent valuation analysis. A conceptual creative tourism cluster model was found adequate. It was verified in both projects that the organized involvement in the search for sustainable solutions and the integration of interdisciplinary results, benefited the follow-up activities accordingly with sustainability principles. The approach potentiated focal points of action and continuously dialog with growing transformations towards the sustainability of the sites. However in both cases the transformations are of different value, of small scale, of reduced visibility and slow progress. In these two cases, the financial and political barriers commonly associated with the development of sustainability projects are confirmed. May also limitations such as "lack of advanced stakeholder involvement" (Arnim Wiek *et al.*, 2012) were found. The project evaluation process is still under way.

Action and Decision-oriented Studies as a fieldwork methodology in Germany, Brazil and Mozambique

Thursday, 15th June - 08:30 - SD 703 - Oral Abstract

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Climate change adaptation, food security, disaster prevention, rural development, natural resource protection – the global community is searching for strategies and instruments that will guarantee both dignified and viable development for the future. Young specialists and managers have to learn how to create context-specific solutions to the challenges facing society and universities are called upon to take central stage. Trilateral cooperation between universities in Berlin (Humboldt-Universität), Maputo (University of Eduardo Mondlane - Mozambique) and Rio de Janeiro (Federal Rural University of Rio de Janeiro - UFRRJ) is one of the core projects of curriculum development and knowledge exchange in the area of sustainable development. Field studies are the centerpiece of the student training program of the three universities. In them, students put into practice all that they have learned throughout the program, both the general understanding of international cooperation and the various instruments of this area, such as the methodology of analysis, planning and monitoring, group work, presentation and moderation. In order for the field study to be carried out satisfactorily and within the stipulated time, it is necessary to use a systematic and coherent research concept. The preparation phase, called Action and Decision-oriented Studies (ADS), aims to contribute to the development of an appropriate concept. ADS has for many years used a research methodology known as action and decision-oriented studies. This innovative tool, which combines scientific knowledge with user orientation and hands-on practicability, is applied to study assignments from development organizations. Through the ADS methodology the groups of students should elaborate a research concept that: Clearly state the objectives of the study, Clarify the thematic dimension of the study, Develop a methodological procedure appropriate to the topic and Establish a realistic work plan for the entire period of the study. The methodology is divided into three parts: Phase I - Clarification of the mission: identifying the objectives and potential users of the results, formulate key questions, discuss negative side effects and forms of communication. Phase II Definition of the content: define the key topics and thematic areas of the research, the questions to analyze, identify sources of information and define hypotheses and indicators and Phase III - Selection of methods: select the research units and sample, describe the set of methodological tools to be used to achieve the results and the procedure for the analysis. The group organizes the study and continuously updates the work plan afterwards. This methodology has been successfully applied for three years in interdisciplinary fieldwork in Mozambique and Brazil. It is possible to note the improvement in the organization of activities, responsibilities and deadlines, generating more effective results in learning, financial costs and quality of the final product. We believe that this methodology is suitable for application in different scenarios of fieldworks, generating sustainable products that meet innovative needs on local scale, concretizing intervention projects and changing the reality of poor communities, thus being aligned with the philosophy of the Masters in Sustainable Development Practice.

BALANCED and SUSTAINABLE TERRITORIAL DEVELOPMENT (STD). New Geographical criteria and tools to address complexity, change and uncertainty in the 21 century

Thursday, 15th June - 08:45 - SD 703 - Oral Abstract

***Dr. Carlos Hildebrando Fonseca Zarate*¹, *Mrs. Francy Rocío Castellanos Oviedo*²,
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1. Corporación Simbiosis / Universidad del Sinú Extensión Bogotá, 2. Universidad ECCI / Corporación Simbiosis, 3. Universidad Nacional de Colombia, 4. Universidad del Sinú Extensión Bogotá, 5. Universidad de los Andes / Corporación Simbiosis, 6. Corporación Simbiosis / Editor Principal Revista Gestión

Sustainability goes beyond protecting nature for future generations; current generation and many other aspects must be considered and included, as well as their balanced relationship and possible synergies. Similarly, complete peace is not just the absence of violent confrontation to settle differences, but the harmonic confluence of justice, fairness, freedom, opportunity, inclusion, presence and transparency of the state to avoid factors and seminal risks of conflict and violence. An increasingly preoccupying paradox is that an important part of the territories being abandoned by FARC, are under fight between ELN, BACRIM and the Government to occupy and control them. Current prevailing view of development over-emphasizes unlimited economic growth and private economic accumulation; True development is a complex and multidimensional process of permanent construction of individuals, communities, territories, nations towards a better world and a “better life” for all. Based in this latter logic, we built the Sustainable Territorial Development Index, STD If and apply it to all municipalities and departments of Colombia to test its validity. The index expresses the sum of five “wealths” or richness (human, intellectual, public, private and Natural / Environmental), which should exist in each municipality and territory and interact synergistically. Statistical processing of data provides interesting results: 1) Colombia is growing at the expense of natural resources and ecosystems and of increasing risk of its population; 2) As the value of STD if grows, its variance increases, meaning the distance between the five wealth increases, towards a greater imbalance between them. 3) The difference between the actual values of the five wealth is very large, meaning a high unbalance, which requires reducing the distance between them as soon as possible of more sustainability is sought. PCA, Principal Components Analysis, Moran index for “clustering”) and regression analysis, with some geographic Control variables (Physical distance to capitals and ports, presence of illicit crops, illegal mining and climate preference) confirmed “remoteness” of the Municipalities in reference to the “decision centers” of the country. A fast and effective presence of state is needed in these territories, especially in the municipalities where FARC-EP is leaving their armed presence. Another planning tool for sustainable development, called PEPET, “Prospective Strategic Planning with Triaxial Scenarios”, (Planeación Estratégica Prospectiva con Escenarios Triaxiales, in Spanish) is presented, as a pertinent tool for more participatory and regionally differentiated decision-making. Delphi method is used for conducting queries to face panels about the most important issues at national level; then, massive online consultations are conducted to regional experts in order to choose the most relevant of these issues to their regions in their areas of expertise, and a synthesis of responses under two opposed scenarios are obtained. The results of two national consultations, one on science and technology and other to public administration professionals about their training requirements for post-agreement of peace era, demonstrate the pertinence and validity of the method and signal the importance of areas such as risk management and environmental and natural resource protection.

Sustainable Program Management: Hierarchical Causal Systems

Thursday, 15th June - 09:00 - SD 703 - Oral Paper

Mr. Bongs Lainjo¹

1. CYBERMATIC INTERNATIONAL

Keywords: Pyramid, Causality, Systems, Sustainable, Program and Management. \\Problem Statement:\\Donors, Multi and Bi-lateral agencies charged with distribution of development funds to primarily low and medium income countries (LMICs) have been guided by universally accepted goals, agreements and conventions. In a significant number of cases, adherence remains inadequate. Effective sustainable program management systems remain inadequate. These limitations call for a need to design an inclusive and standardized program management framework. \\Hierarchical Causal Systems:\\Aim and Methodology:\\To Strengthen and Standardize Program Management Protocols and mitigate nuances, duplication and redundancies.\\Seven components that facilitate the achievement of sustainable management of development program are embodied in a conceptual framework the 'CARROT-BUS' model. CARROT is for Capacity, Accountability, Resources, Results, Ownership and Transparency – all driven by an enabling environment and BUS stands for 'Bottom Up Strategy'. The holistic, inclusive pragmatic and causality model is conceptually synonymous with Abraham Maslow's Hierarchy of needs. In this framework, each step of the ladder has a well-defined description including a corresponding, comprehensive and relevant strategy and case study to facilitate user understanding. \\Findings:\\Many beneficiaries continue to live in squalid conditions; poverty remains ubiquitous despite reports to the contrary and improved quality of life in vulnerable populations remains a distant dream. Above all, Western countries have woefully failed to meet their own pledges of donating 0.7 % of their GDP to (LMICs). Only four countries have achieved this objective.\\Conclusion:\\Designing and implementing sustainable development programs remains complex. The systems presented in this abstract are a way of addressing these complexities. They serve as an option aimed at mitigating gaps and nuances that are an integral component of development aid. An urgent need for a streamlined and effective paradigm shift is required. CARROT-BUS is one attempt to fill these gaps.

Land requirements for Mediterranean diet: standard agriculture vs new agroecology

Thursday, 15th June - 08:00 - SD 204 - Oral Abstract

Dr. Francesco Spanò¹

1. Royal Holloway University of London

The transition towards sustainable human interaction with the surrounding ecosystem requires a change in the fundamental aspects of its behaviour. Food production is at the cornerstone of our survival and consequently it has the highest priority in the face of declining resources, increasing pollution and population. Understanding the parameters to judge and quantify methods of food production alternative to the present mono-cultural, energy intensive and mechanized agricultural system is crucial to support, develop and improve new techniques and practices to transition to. Land surface use is one of the important parameters to derive for any given food system. The surface required for food production has strong impact on the care for the ecosystem (avoid soil erosion, impose energy and water efficient usage, set up balance with other living vegetable and animal species, close cycles, set up urban food schemes) and it is correlated with resource usage and feasibility of alternative approaches to deliver nutrition to communities.~ The first goal of this study is to determine the typical land surface required in central and southern-Europe to produce the basic elements of the typical Mediterranean diet defined by the Italian Food Pyramid (www.piramideItaliana.it) in a few scenarios combining different diets, techniques and regions. The scenarios will range from food production for an omnivore diet to a vegetarian diet, both including or excluding typical cereal-based food and obtained by using both standard mechanized agriculture and examples of alternative agroecological techniques in specific regions (bio-intense, synergic, organic..). The second goal is to compare land surfaces obtained in the different scenarios.~ The analysis method is to use the yields per surface and per year available in the FAOSTAT public database for food products and derive a robust estimate for surface yield for each product by averaging over space (production in central and southern Europe countries) and time (over about 10 years of production data). Similar yields for alternative agroecological will be obtained by literature, small scale experimental setups and local organizations (particularly obtained from the center of Italy). Such yields derived for different techniques and regions will be combined with the different dietary requirements to provide the land surfaces to be compared.~ The scenario comparisons allows to determine a first immediate, easily visualizable sustainability parameter to correlate with food production organization in communities and with the associated resource basis (fuel, fertilizer, water..).~

The Nature Sports Chart of Arrábida: promoting sustainable visitation of a sensitive area

Thursday, 15th June - 08:15 - SD 204 - Oral Paper

Dr. João Joanaz de Melo¹, Mr. António Galvão¹, Ms. Maria João Flôxo Sousa¹

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The coastal mountain range of Arrábida is a limestone massif with a Mediterranean microclimate exposed to the open Atlantic, located 30 km south of Lisbon. It was one of the natural warmer sanctuaries during the Ice Ages and has been used by Humankind since Palaeolithic times. This setting created a unique and diverse mosaic of natural and cultural landscapes, biodiversity and geodiversity, a place of outstanding beauty. This combination of factors led to the creation of the Nature Park of Arrábida covering 170 km², including 50 km² of a Marine Park). The area is subject to great pressure for tourism and recreation, because Arrábida is one of the few near-natural territories inside the Metropolitan Area of Lisbon. This paper reports on the development of the Nature Sports Chart of Arrábida. The goal of the project was to regulate visiting in the more sensitive areas of the Park, especially by outdoors enthusiasts: trekking, trail running, mountain biking, horse riding, rock climbing, caving, coastering, bird- and dolphin-watching, snorkelling, scuba diving, kayaking, sailing, hang gliding and paragliding. The underlying philosophy is that a near-natural area subject to many pressures is best protected by people who love and live in it; hence, we must create conditions for low-impact visitation and the education of visitors, with some benefit for local inhabitants. Our methodology comprehended: literature review of best practice of outdoor sports in sensitive areas; identification and quantification of outdoor activities in Arrábida; identification of stakeholders (municipalities, nature sports clubs, federations who organize competitions, active tourism business, landowners, local inhabitants, official agencies like the maritime authority and the regional tourism office); personal meetings with key stakeholders; systematic review of actual and potential conflicts, both between users and with nature conservation restrictions; construction of an online platform and georeferenced data base; definition of preferred sites for outdoor activities based on best practice, careful management of conflicts and available public access. The most difficult task was the definition of trekking routes, because 90% of Arrábida is privately owned. Our strategy, put to practice with the willing cooperation of many stakeholders, was successful: we were able to generate a notable consensus, and the Nature Sports Chart is now ready for implementation, pending legal procedures. The Chart is one tool among a complex set of tools that includes land use planning, financing sources, fiscalization, and Nature conservation policy. Keywords: Arrábida, outdoor sports, Nature conservation

Multi-criteria methods for prioritizing wetland restoration and creation sites based on ecological, biophysical and socio-economic factors

Thursday, 15th June - 08:30 - SD 204 - Oral Paper

***Prof. Francisco A. Comín Sebastián¹, Dr. Nadia Darwiche², Mr. Ricardo Sorando², Dr. Juan Jiménez²,
Dr. José-Manuel Nicolau³, Dr. Rocio Lopez³***

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Wetland restoration and creation has been recognized as a useful tool for improving water quality and land use planning. Many studies have focused on developing strategies and models to optimize wetland performance. However, some important wetland placement characteristics have not been taken into account. Due to the importance of integrating environmental, biophysical and socio-economic factors in wetland restoration projects, a comparison of two multi-criteria methods (a suitability model and a greedy algorithm) was conducted. With nitrate removal as the main goal, the suitability model was applied considering the “terrain slope”, “proximity to watercourses” and “soil permeability”. The greedy algorithm was executed based on the “availability of public lands” and the “wetland restoration project costs”. These factors were chosen based on the Eu Life-CREAM Agua Flumen River project and provide a more effective and comprehensive site selection via comparison of the two methods. Both the suitability model and the greedy algorithm provided critical information for siting a wetland and demonstrated the effectiveness of both approaches. The suitability model described the priority sub-basins for wetlands restoration using biophysical criteria, and the greedy algorithm reported the availability of public lands or the tasks to be performed. This research and its possible adaptations can be used by decision makers to improve water quality using social and economic criteria, resulting in the efficient implementation of ecological-restoration projects. This approach can be useful for land-use offsetting practices which are highly demanded in intensively and extensively used territories searching for more sustainable land use. However specific criteria should be used for each type of territory.

BIOCLIMATIC CLASSIFICATION FOR THE MUNICIPALITIES OF CUNDINAMARCA-COLOMBIA

Thursday, 15th June - 08:45 - SD 204 - Oral Abstract

***Prof. Martin Perea*¹, *Prof. Liliana Medina*¹, *Prof. James Ortega Morales*¹**

1. Universidad Colegio Mayor de Cundinamarca

Urban and environmental policies are structured to contribute to the conservation and improvement of human health, to solve structural problems of cities, to promote inclusive cities and the appropriate use of natural resources in the buildings, in order to take advantage of environmental conditions, optimize the use of materials and their waste and generate more and better solutions on the built environment. In this sense, Resolution 0549 of 2015 of the Ministry of Housing, City and Territory, "The Guide to Sustainable Construction for saving water and energy in buildings", classified the country in four climates: warm dry, warm wet, temperate and cold to establish the percentage of water and energy to save, according to the specific conditions of each municipality. However, this classification in general ignores some particularities of the weather of municipalities, that can provide specific information to develop better sustainable buildings. Therefore, the objective of this research was to propose a bioclimatic classification that includes the climate and at the same time the human comfort, since they are the reason for the consumption of water and energy. The research was descriptive, at an exploratory level, with a documentary and correlational design based on secondary information. For the information survey of each municipality, the coordinates was taken of Google Earth. With these coordinates, we obtained the climatological data from Meteonorm software and the recommended bioclimatic strategies from Climate Consultant software, which were consolidated in a database and analyzed with MS Excel to relate variables. This allowed, to propose a Bioclimatic Classification System with seven bioclimatic zones, based on the Caldas-Lang classification. A system recognized in Colombia that allowed to designate as bioclimatic indicators, for Cundinamarca State, altitude, temperature, precipitation, relative humidity and solar brightness. Variables such as relative humidity, wind speed, predominant wind direction, and solar radiation were found to be homogeneous for the entire territory of Cundinamarca studied. Thus, it was possible to individualize each municipality and establish a normative based on an analysis that considered the environmental context of the municipalities, which offers the opportunity to impact regulation and local public policies, which makes the proposed bioclimatic classification a tool of social inclusion.

Assessing Nodality in Neighbourhoods of Transformation: a Concept of Sustainable Urban Form. The Case Study Of Rahue Bajo, Osorno, Chile.

Thursday, 15th June - 08:00 - SD 704 - Oral Abstract

Ms. Jilan Hosni¹, Dr. antonio zumelzu¹

1. Universidad Austral de Chile

The transformation of Chilean cities has followed the same pattern change as observed in European and North American state of affairs everywhere in consumption of energy as well as land. More demand on the possession of individual housing units and automobiles was a subject of the decade. From individuals to communities, social relations has been in a decreasing observed manner following the individualistic family model. Consequently, this way of living has reflected its features on the morphological function of the city; forming new residential structures, changing the city scale and hence provoking numerous environmental debates on sustainability. In recognition of city patterns at different scales, neighbourhoods are identified as the basic unit of sustainable urban form (SUF) in which socio-urbanistic concepts are rather tangible. By looking critically at the unfolding of urbanisation process and the change of social relations, neighbourhoods are under threat to lose their vitality and identity. Vitality of neighbourhoods is a concept that was termed both by some urbanists on vibrant urbanities expressing the presence of communities in public areas. In turn, public spaces in neighbourhoods represent the hub of social control over territories. The current notion is observed in public outdoor areas deserted of people, although some others are seen to be congested. Accordingly, this shows the gap that appears in the urban design practice that has spiralled out of control. Despite the misleading debate about sustainable city concepts, professionals have agreed upon the necessity of acting locally since generalizing statements added up more difficulties for applying theories into practice. In order to analyse the SUF, five dimensions were set by researchers as: accessibility, connectivity, density, diversity and nodality. These criteria have been applied successfully in a number of cities for the construction of urban regeneration program areas. By applying nodality in neighbourhoods as a strategy to comply with the current transformation, the city scale can be redefined. Like many cities in the Patagonian region, Osorno is passing through a dramatic transformation phase. The research aims to evaluate the quality of public spaces in Rauhe Bajo, according to how users perceive them. Through cartography, the neighbourhood is re-organized with a new hierarchical map that is defined by nodes of social interaction. The research follows an empirical case study approach with a qualitative analysis of urban space. Furthermore, the research interprets the new map that is confronted with the normative map that is prepared by the municipality. Despite its technical depth, it gives a new perspective of the collaboration between academia and municipalities to help officials advance with new methods and analytical tools and accordingly achieve better design results. This can be seen as a step forward towards more inclusive city development and can expose the discussion of new management systems, since the results are based on user-oriented design mind-set, illustrating people's behaviour in space.

Urban-rural development: Small towns in the strategic Altillanura region, Colombia

Thursday, 15th June - 08:15 - SD 704 - Oral Abstract

Ms. Maria Fernanda Romero¹

1. Universidad Austral de Chile

The Altillanura region is a low tableland located between the departments of Meta and Vichada, in Colombia. This area has an extension of 92.500 km²; nearly a quarter of Germany's size. The predominant ecosystem in the region is dry and seasonal savanna, characterized by soils with poor nutrient content, strong acidity, low cation exchange capacity, extreme poverty in phosphorus and aluminum levels approaching toxicity for the vegetation. These conditions have imposed several constraints on the use and occupation of this territory. The region covers seven municipalities: Mapiripan; Puerto Lopez y Puerto Gaitan in Meta county; and Santa Rosalia, Cumaribo, Primavera y Puerto Carreno in Vichada county. This region concentrates a high incidence of poverty: 90.5%, on average. Overall, it has one of the lowest population densities of the country: 0.47 inhabitants/km², in contrast to the national average of 39.5 inhabitants/km². The total population is estimated in 143,000 inhabitants; one third of them belongs to indigenous ethnic groups. Moreover, 44.1% of total inhabitants are concentrated in urban areas while 55.9% remains in rural areas. Additionally, the distances between the urban centres and the country's capital city, Bogota, range from 194 to 860 km, which highlights the wide extension of this territory and the implications of geographical dispersion. In the recent decade, the Altillanura region has been referred to as the last agriculture and livestock frontier. The national government has decided to promote its productive transformation through inserting it into the national and international markets based on an export-oriented large-scale agricultural production, with several implications in environmental, economic and social terms. This document is an attempt to provide an analysis small towns' role in the Altillanura region towards an integral urban-rural development framework and, is supported by a review of relevant literature, official statistics and other previous studies done about the region. This study highlights the need for spatial planning approaches in sparsely populated territories with high environmental significance and prevalence of poverty because of high-density city model or classical urbanization path (concentration/agglomeration) is not feasible in this region. These new approaches should bring suitable options for the resources management and good and services delivery, ecologically friendly and economically viable in order to achieve a balance territorial development.

Innovation and knowledge exchange systems for sustainability: The case of urban agriculture in Maputo

Thursday, 15th June - 08:30 - SD 704 - Oral Abstract

Ms. Anja Schelchen¹, Ms. Nicole Paganini¹

1. Humboldt-Universität zu Berlin

The international community set the goal “Zero Hunger” as one priority in its global commitment of achieving the Sustainable Development Goals by 2030. One priority is also given to urban areas; cities are growing fast but economically highly unequal and access to safe and healthy food remain problematic for urban disadvantaged groups. Recent studies have shown that particular in Sub Saharan Africa urban agriculture can play a pivotal role contributing to income generation and food and nutrition security if adopted adequately. In this context, agroecological practices are widely recognized as a key for the production of healthier and safer food. Urban Agriculture in Maputo, Mozambique is an income source for more than 10% of the population and has two main functions: commercialization and subsistence, still, 1300 ha are used for agricultural activities. Main challenges are on production as it is characterized by weak diversification and harmful use of inputs with impacts on human and environmental health. In the last six years, just 79 out of 11.000 organized farmers adopted agroecological innovations such as the use of plant protection product and diversification in crop production. For better marketing options, farmers got certified by the newly introduced Participatory Guarantee System (PGS). The aim of the study is to investigate innovation and knowledge exchange systems to identify successful ways of dissemination. For this purpose, we use the Innovation System Approach, where we look at all involved stakeholders in the innovation process, their role, networks and applied knowledge exchange mechanisms. Our special focus is on the introduction of agroecological techniques applied by urban farmers and PGS quality assurance for associations. Using an action research approach and based on qualitative and quantitative data obtained from the urban farmers and main stakeholders, the study looks at the type of agroecological practices, challenges and constrains of production and commercialization. We also expect to find out what the reasons and motivations are for farmers to adopt agroecological practices. The assessment of the innovation and knowledge exchange system allows us to identify drivers and barriers for a successful dissemination. Based on the results, a multiplication strategy can be developed and results could be transferred to policy makers and urban planners. Considering the vision of making Maputo’s green zones more sustainable, this can contribute to urban food and nutrition security on the one hand, and on the other hand to a more sustainable city in terms of environmental friendly areas with benefits for the community.

Using land readjustment in rebuilding the earthquake-damaged city of Bhuj, India

Thursday, 15th June - 08:45 - SD 704 - Oral Abstract

***Dr. Sweta Byahut*¹, *Dr. Jay Mittal*¹**

1. Auburn University

Major earthquakes cause large scale devastation disrupting life, destroying homes, damaging properties and vital community infrastructure. Such events also offer opportunities for reorganizing neighborhoods and rebuilding disaster resilient communities. This article presents the case of reconstruction of Bhuj City in India following its devastation in the 2001 Gujarat earthquake, and showcases how consultative and planned intervention can rebuild better cities after a natural disaster. The land readjustment (LR) process was applied in reconstruction of a densely built, historically significant inner city area of Bhuj to transform it into a safer community resilient to disaster. LR, a micro-area planning technique, is characterized as a strategy to carve out private lot sizes to create adequate public land for widening and straightening of streets, accommodating parks and amenities, and planning land lots and urban blocks with access to public infrastructure. Bhuj is one of the rare cities outside of Japan where the land readjustment technique was successfully implemented for post-earthquake planning. This article provides insights on the challenges and opportunities that land readjustment implementation offers for post-disaster reconstruction. This paper is of value for planners and policy makers who are interested in disaster planning and building back better. It is also of interest for land use planners interested in understanding the application of land readjustment as a versatile tool for planning and land reconstitution, infrastructure provision, and building community resiliency. This paper has been published in the *Journal of Urban Planning and Development* in July 2016, and may be cited as follows: **Byahut, S.** and **J. Mittal**. 2016. "Using land readjustment in rebuilding the earthquake-damaged city of Bhuj, India". *Journal of Urban Planning and Development*, Vol. 143, No. 1.

To the search for sustainability: ecosystem integration, rail and University.

Thursday, 15th June - 09:00 - SD 704 - Oral Abstract

Dr. Esmeya Díaz¹, Dr. Maria Angela Flores P¹, Prof. Arnaldo Briceño², Prof. Roxy Pérez¹, Prof. FREDDY HERNANDEZ¹, Prof. Rafael Rodríguez³

1. Universidad de Carabobo. INFACES, 2. Universidad de Carabobo. DMAI, 3. Universidad de Carabobo. FACYT

The study is conducted on the campus of the University of Carabobo, Venezuela. In the university area there are three natural ecosystems with high biodiversity: wetlands, savanna and gallery forest. The development plan of the national railway system impacts the university campus an environmental service alters ecosystems. The research is justified by the need to reconcile the conservation of ecosystems, the importance of rail for regional development and the equity value of the university. The aim is to describe the process of negotiation between the University of Carabobo and the Instituto de Ferrocarriles del Estado to build the stretch of the railway. The method is descriptive, a case study is performed. Activities since 1996-2015 are analyzed. The information is obtained through the review of projects, reports, environmental legal framework, field, photographic records, etc. are analyzed. The study is divided into four phases: 1. Preliminary University Master Plan. 2. Analysis of the environmental impact. 3. Identification of measures and institutional arrangements. 4. Start of work. Among the results are: a) There was a project of a university park linked to academic activities, b) As for the studies of environmental and sociocultural impact, gallery forest and wetlands they are the most affected. The forest is a relict of the vegetation of the San Esteban National Park. This ecosystem regulates temperature and keeps the local river flow Cabriales. The wetland is a reservoir of vulnerable species and habitats of local and migratory birds. As for cultural impact, noise and disruption of campus landscape are the most important elements. c) An impact matrix was developed ecosystem and work phase of the work and selected 16 key measures: preventive, corrective, and compensatory mitigation. d) An interinstitutional agreement between the parties was signed. This required the development of specific projects for each ecosystem, where impacts and the required measures were considered. The projects were annexed to the interinstitutional agreement. e) To the beginning of the work it was necessary Environmental Monitoring Plan and the authorization for the involvement of Natural Resources, both requirements of the legal framework. It concludes: 1. The impact of the work of the railway at the University of Carabobo is significant and alters the natural and cultural environment of the institution, requiring the modification of the Master Plan. 2. The base study and environmental impact assessments online, they provided critical to the ecological and social value of the area information. 3. It was necessary to establish an interagency committee with experts from different areas of expertise, to monitor environmental impact reports and the selection of the required measures.~The contribution of the university community in drafting the agreement was through the constitution of a commission that presented a preliminary document with preventive, corrective, mitigating and compensatory measures.~4. Meet the legal framework and the agreement signed is fundamental to the process of negotiation and execution of the work premise. ~ Keywords: ecosystem, rail impact, university, negotiation, sustainability.

Assessing the Impact of Triple Helix Intermediaries within Circular Economy Oriented Protected Space Networks: A Methodological Overview

Thursday, 15th June - 08:00 - SD 715 - Oral Abstract

***Mr. Jack Barrie*¹, *Dr. Girma Zawdie*¹, *Dr. Elsa Joao*¹**

1. University of Strathclyde

The transition to circular economy offers a solution to the challenges of rapid population growth, economic stagnation and environmental degradation. A promising policy tool for accelerating such a transition is Strategic Niche Management (SNM), the central tenet of which is the formation of 'protected space' networks to support the growth of sustainable innovation. Studies have demonstrated that current top-down policy approaches to governing protected spaces have led to the unintended consequences of network tensions, low quality learning processes and low innovation adoption rates outside protected spaces. This limits the impact of SNM as a transition tool. This paper introduces a novel devolved governance framework for protected spaces in the context of transition to circular economy. The framework addresses current limitations of SNM by acknowledging the synergistic relationship with the triple helix innovation system; and innovation intermediation. In order to empirically assess the outcome of such a policy framework, a case study on the Scottish industrial biotechnology protected space was undertaken between September 2016 and May 2017. The aim of this paper is to outline the novel methodological technique developed to assess the impact of triple helix intermediaries within circular economy protected space networks. The methodology involves a combination of a complete social network analysis of the network and a novel technique to measure the impact a triple helix intermediary has had on the network with regards to its alignment with the circular economy trajectory. The proposed methodology is sought to shed more light on the complexities of innovation networks than traditional methods and offers a useful monitoring tool for policy makers to empirically assess the effects of policy interventions on innovation networks. By doing so, the proposed methodology lays bare the salient features of transition to a circular economy which is likely to involve the strengthening, nurturing and empowering of multiple circular economy oriented protected spaces.

Key Words: Circular Economy, Strategic Niche Management, Triple Helix, Social Network Analysis

Practice work: What it takes to lead transitions to sustainability

Thursday, 15th June - 08:15 - SD 715 - Oral Abstract

Ms. Monica Ramos Mejia¹, Dr. Alejandro Balanzó¹

1. University of Twente

It has been argued that sustainability transitions research should pay attention to sustainability experiments in developing countries, because they represent alternative opportunities for reshaping socio-technical regimes that could lead to sustainable production-consumption systems in these regions (Berkhout *et al.*, 2010). Despite a few exceptions (Ghosh *et al.*, 2016), little attention has been paid to the role of actors involved in these experiments, i.e. change agents that aspire to lead sustainability transitions within contexts of market imperfection, clientelist and social exclusive communities, patriarchal households and patrimonial and/or marketized states (Wood and Gough, 2006). This paper aims at contributing to fill this gap, by discussing an experiment for developing eco-social business models in Colombia. Conceptually, the paper explores two complementary aspects. The first aspect refers to agency. Leading transitions to sustainability requires specific forms of agency from actors, distinctive from other kinds of agency. The paper discusses literature on change agents and social innovators to give more detail about the features of these specific entrepreneurial facets. The second conceptual aspect refers to the way change agency relates to practice. In this case, the creation or maintenance of emerging sustainable fields of practice. Here the paper discusses the notion of practice work, a conceptual approach useful for addressing the layered ways in which an actor 'goes about' practice in the attempt to create change (Balanzo, 2016). Empirically, we have followed the activities of community leaders in Santa Rosa del Sur, a small town in the rural area of Bolívar in northern Colombia. This region exhibits great sustainability challenges: main economic activities include coca plantations and gold mining in river banks, which bring about environmental degradation and biodiversity loss (because of large deforestation and heavy-chemical pollution), and negative social consequences such as informal jobs, violence and short-term mentality. These leaders have promoted other economic activities based on environmental protection and restoration and community development. Following an interpretive approach, we documented the activities of four actors, from April 2015 until April 2016, who actively participated in an experiment for developing eco-social business models. By paying attention to both narratives (expressions of sense-making) and practices (shared behavioural routines), we have found evidence of what it takes for actors to negotiate and tinker changes for sustainability. This agency-based approach constitutes a contribution to the understanding of more diverse and somehow messy processes of sustainable socio-technical changes in the developing world (as it has been previously suggested by Smith and Raven, 2012). Overall, the paper argues that leading transitions to sustainability implies actors' active involvement in various fields and, as such, the deployment of multiple identities (Downey, 1992) relating various entrepreneurial repertoires (Balanzo, 2016). These many facets cohere along a specific take on practice work, by means of which actors manoeuvre to bring about change and strive to sustain it.

Comparing cleaner production potential in Colombian and Mexican SMEs

Thursday, 15th June - 08:30 - SD 715 - Oral Abstract

Prof. Bart van Hoof¹, Mrs. Juanita Duque-Hernández²

1. Universidad de los Andes, 2. Universidad de l

The adoption of sustainability practices in small and medium enterprises (SME) has been an issue of growing importance given SMEs predominance and contribution to environmental degradation, particularly in emerging markets. This research analyses differential performance in cleaner production dissemination among small and medium-sized enterprises operating in emerging markets such as Colombia and Mexico. In both countries, a similar sustainable supply network mechanism was applied, to disseminate cleaner production in a significant group of SMEs. Cost-benefits analysis regarding economic and environmental gain is performed to review differences on system levels such as project types, firm categories, network types and country contexts. The methodology used is based on the models applied by van Hoof & Lyon to establish cost-benefit analysis for CP projects designed and implemented by SMEs in Mexico. The main findings suggest that the firms participating in the program in Mexico (PLAC) achieved better economic benefits than those participating in the Colombian program (RedES-CAR). However, in terms of environmental benefits Colombian firms surpassed Mexican ones achieving higher reductions in water consumption, energy usage, and waste generation. Both programs had broad participation of micro, small and medium enterprises, although RedES-CAR had greater participation of micro and small firms than PLAC, which presented higher involvement of medium-sized firms. PLAC gathered solely industrial networks, whereas RedES-CAR assembled networks composed of firms in the agriculture, livestock, construction, services and industry sectors. This study uses empirical, longitudinal evidence to deepen on the understanding of country, company and project characteristics that may influence outcomes of cleaner production implementation. Moreover, it provides a broader, multi-country comparison of the potential economic and environmental benefits of sustainable supply initiatives in emerging markets. The paper has possible implications that can contribute towards a broader implementation of innovation for sustainable development.

HARNESSING THE POWER OF STUDENTS TO CHANGE HOW INNOVATION IS LEARNED AND PRACTICED IN A UNIVERSITY: THE CASE OF THE UNIANDES SOLAR DECATHLON 2015 TEAM.

Thursday, 15th June - 08:45 - SD 715 - Oral Abstract

Mr. Rafael Vesga¹, Prof. Jorge Hernandez¹

1. Universidad de los Andes

This paper examines how a university and a corporate partner worked together in a substantial project with an ambitious sustainability goal and how, in the process, the university discovered new methods to achieve its own objectives as an innovative academic institution, capable of providing its students with knowledge and experiences that turn them into more innovative and socially responsible individuals. The focus of the research is the use of an extracurricular, non-graded activity to renovate an environments where innovative thinking is learned and practiced. The research examines the experience of the Universidad de los Andes (Uniandes) team in the Solar Decathlon 2015 competition. The Solar Decathlon is an international university competition that was created in 2002 by the US State Department of Energy (DOE). Students are challenged to design and operate a full-scale, innovative and sustainable accommodation that uses solar energy. Projects are evaluated according to ten criteria in the fields of urban planning, architecture, engineering and construction, energy efficacy, communication and social awareness, innovation, house functionality, energy consumption and house comfort. The participation of Uniandes in the competition happened through an alliance with Codensa, electric utility company in Bogotá (Colombia). Coached by one of the coauthors of this paper, a multidisciplinary team of 40 students, which set~ its own rules and practices for work, was able to harness support from their professors across the university and also from private sponsoring firms.~ Students went through an intense, 18-month process, in which they were able to design, build and set up a sustainable house that complied with the demands of the competition. This paper applies a qualitative approach where detailed interviews were performed with the students after the competition was finished. The responses were classified and clustered with the purpose of discovering patterns of behavior, collaboration and learning among the students. The analysis of the experience shows that, within a context of autonomy and self-regulation, and faced with an ambitious goal that captures the imagination and inspires individuals, a team of students can work with scant resources and find creative solutions that may seem to lay well outside the realm of possibility. The process is described using the conceptual tools proposed by the theory of effectuation (Sarasvathy, 2001), where individuals recognize who they are, what are their resources and who they know, and generate a dynamic that takes over in unpredictable ways and generates results. The study identifies that the process was punctuated by clear crisis events, which put the whole enterprise at risk and forced individuals to take a grip on their innermost innovative capabilities. The paper is relevant in the ISDR conference as it shows how a university-industry alliance, called upon to make a contribution to an international competition on sustainability, served as a fruitful environment for a process which contributed to enhance a missional objective of the university, that of forming more innovative and responsible graduates, and revealed how it is possible to summon unpredictable resources that exist among the stakeholders of the university-industry ecosystem.

Diversity of eco-innovations in the context of emerging economies

Thursday, 15th June - 09:00 - SD 715 - Oral Abstract

***. Fernando J. Diaz Lopez*¹, *Dr. Javier Carrillo-Hermosilla*², *Dr. Pablo Del Rio Gonzalez*³, *Dr. Totti Könnölä*⁴**

1. Netherlands Organisation for Applied Scientific Research TNO & Stellenbosch University, 2. Universidad de Alcalá, 3. Instituto de Políticas y Bienes Públicos, Consejo Superior de Investigaciones Científicas, 4. Impetu Solutions

Eco-innovations are commonly related to innovations that contribute towards environmental objectives of sustainable development (Rennings, 2020). Scholars often assume that (companies in) developing and emerging economies have lesser degree of environmental performance and are less profitable {[]c.f. Horbach, in press{[]}. However, recent evidence challenges the dominant status quo by showing examples of frontrunner companies in those latitudes offering profitable, environmentally sound, green(er) products. Available evidence reports a positive result in terms of knowledge accumulation in material efficiency strategies in emerging economies, above the average in Europe and the USA. To cite an example, UNEP (2014) reports a dozen of companies in emerging economies producing eco-innovative products and leading to growth rates between 10 to 40% in markets where incumbent companies may suffer stagnation. This paper attempts to fill a theoretical gap in the literature by providing a first approximation to dimensions for eco-innovation in the context of selected cases from emerging economies. The authors of this paper depart from the hypothesis that the higher degree of specialisation in emerging economies and its companies upstream the value chain shapes different features or dimensions explaining eco-innovation. Next, it is also proposed that the perceived effect of internal and external drivers to eco-innovation may depend on the framework conditions where companies operate, in developed or emerging economies. More concretely, the lesser external pressures (e.g. regulatory, social norms, etc.) the more the expected effect of internal drivers for eco-innovation (c.f. Montalvo 2002). For example, available studies (based on econometric evidence) have proposed that an international orientation of companies in Europe, say by having export markets or collaborating with foreign suppliers, have no positive effect on their environmental innovation activities (del Río et al., 2013, Chiarvesio et al., 2014). Counter-intuitively, such findings may be interpreted as if local markets (in Europe) are more suitable for eco-innovators, irrespectively of the country of origin of the company. A higher degree of formalization of institutions and better functioning of innovation systems is often used to explain such findings (c.f. Chaminade et al 2014; Villavicencio 2012). More over, empirical studies from countries such as Mexico or Brazil have reported that export activities and more stringent regulation is often perceived as a significant driver of eco-innovation (Dalcomuni, 1997, Diaz Lopez 2009). The above is partly explained by process of trade liberalization and enhanced regulatory frameworks leading to an eventual capability gap (c.f. Truffer et al 2012). In order to provide a first validation of the assumptions above described, this article presents a qualitative validation of cases of eco-innovations in particular emerging economies, namely Brazil, Mexico, and South Africa and Small Island States, e.g. Aruba. Using secondary sources of information three cases are evaluated using the eco-innovation framework proposed in Carrillo et al (2010). Furthermore, the authors of this paper focus on produce, service or product-service eco-innovations showing different maturity levels and degrees of disruption (incremental versus radical eco-innovation), which have faced several barriers to their development/adoption and are affected by different policies.

Eco-certification: A stepping stone towards upgrading? Evidence from the cacao sector in Ecuador

Thursday, 15th June - 08:00 - SD 716 - Oral Abstract

***Prof. Ximena Rueda*¹, *Ms. Romaike Middendorp*², *Mr. Sergio Puerto*³**

1. Universidad de los Andes, 2. U.C. Louvain, 3. Universidad de los A

World cocoa production faces crucial challenges. The demand for cocoa is rapidly and steadily growing, driven by higher incomes across emerging economies, urbanization and the westernization of diets (Reardon et al., 2009; Rueda y Lambin, 2014). But current cocoa production is marked by a combination of low productivity, high price volatility and high concentration of value in the lower links of the supply chain. This has limited production capacity and impoverished socioeconomic conditions of about 5 million small farmers worldwide. A number of public and private initiatives to mitigate such effects have been established. Eco-certifications and other privately-driven instruments attempt to enhance environmental protection, improve labor conditions, increase social capital, reduce the reputational risk of companies, and generate more income for small producers. This could eventually help cocoa farmers to insert them in more valuable supply chains. Most studies evaluating impacts of certification focus on the economic effects; studies on environmental performance and sustainability are scant. Using the Global Value Chain Approach we aim at evaluating the effects of voluntary certifications on upgrading. We look at upgrading from three perspectives: social, economic, and environmental. Upgrading is defined by farmers' ability to enhance their position in the value chain, producing and capturing a higher portion of the value created by means of higher bargaining power, better contract agreements, larger appropriation of (tacit) knowledge about quality, technologies, and market outlets and improvement on natural assets. This work is based in 207 surveys and field transects conducted in four provinces in the west coast of Ecuador. A first round of surveys was conducted at the end of 2013 in Guayas, Los Rios, Manabí. The second round conducted in the Esmeraldas province was conducted in mid-2015 as an extension of the first round study to include the northern region of the coast. We compared the ability of certified and non-certified farmers to join higher value chains as well as the environmental and land practices derived from their type of market insertion (i.e., for mainstream, certified or high-quality cocoa).

The emergence of inter-firm collaboration: Two case studies from a Colombian sustainable supply chain initiative

Thursday, 15th June - 08:15 - SD 716 - Oral Abstract

Dr. Santiago Mejía¹, Prof. Jooyoung Park¹, Prof. Bart van Hoof¹

1. Universidad de los Andes

Inter-firm collaboration has been considered a central element of sustainable supply networks. It involves a complex dynamic process in which actors engage in synergistic activities such as joint technological innovation or dissemination of sustainability strategies to reduce environmental impacts as a whole along the entire supply chain. To enhance environmental performance of a supply network through collaboration, it is important to improve our understanding about what drives and determines collaborative activities. The sustainable supply chain literature highlights various enablers of collaboration activities, including stakeholder pressure, pressure from a buyer, the role of external agents (e.g., consultants, trainers, and brokers), changes in legislation, and risk-sharing. Our study examined two cases of inter-firm collaboration in a sustainable supply chain initiative in Colombia (called RedES-CAR), with the intention to find what drove and influenced the emergence of such collaborations. The RedES-CAR program was initiated in 2013, with the objective to promote environmental improvements by disseminating cleaner production practices throughout the participating companies' supply networks. The initiative brings together academia, industry, and government. Participating companies are required to design projects aiming to improve their environmental performance. We conducted semi-structured interviews with the companies to explore overall processes and influencing factors. We found that external agents who led the workshops and assisted the company's development of cleaner production projects had little influence on the development of collaborative projects, which led to the rejection of our initial hypotheses. Instead, we observed the following characteristics in the two cases of collaboration: \begin{itemize} \itemsep1pt\parskip0pt\parsep0pt \item Companies engaged in collaboration activities have had long-term relationships with their collaboration partners (which reflects the trust they have built with time and is required for collaboration to emerge). \item In both cases, companies that agreed to cooperate with those who proposed the project did not mention a particular economic benefit. However, they agreed to collaborate to reinforce the business relationship, and because their operations were not affected by the changes resulting from the collaborative projects. \item The main driver was the recognition from the environmental authority (and the perceived increase in reputation), which led to more support from the companies' top management. \end{itemize} This study contributes to literature on sustainable supply chain management, with a special focus on environmental collaboration, a relatively new area that still lacks solid empirical studies.

Food product return management and food waste prevention for manufacturing and retail companies: case studies in Colombia

Thursday, 15th June - 08:30 - SD 716 - Oral Abstract

*Ms. Vivian Rangel*¹, *Ms. Daniela Florez*¹, *Mrs. Isabel Agudelo*¹

1. Center for Latin American Logistics Innovation, LOGYCA / RESEARCH

It is estimated that annually, one-third of the food produced in the world is wasted. In Colombia, this figure represents more than 9 million tons (approximately 450 pounds per person), which could feed more than 8 million people. This situation entails wasted natural resources disposed in landfills, an increase in solid waste and a contribution to climate change. Social impacts related to hunger are intensified as well. Food waste and undernourishment are primarily related to logistics inefficiencies across supply chains, where 21% of the food waste is linked to distribution and commercialization. The present study analyses return management processes from one retailer and two manufacturers, in a joint work with the Association of Food Banks of Colombia - ABACO. A fieldwork-based method to prevent product losses was designed to assess critical aspects, gaps and best practices for businesses. Thus, three main opportunities were identified: 1. Product handling and storage: knowledge and abilities of back store operators on issues like cross-contamination, cold chain and quality standards are vital for proper handling and storage of returned products. 2. Decision making processes: classification and separation of returned products do not make part of the traditional core operations of retailer operators, so there is lack of attention to these activities. 3. Cost and legal issues: donating product returns that are still suitable for human consumption can mitigate food waste and give access to tax benefits. Finally, this study proposes establishing food banks as logistic operators to support product return management processes for manufacturing and retail companies. **Keywords:** Reverse logistics, food banks, food, waste, supply chain, returns, and food security.

Evaluation of the social impacts of the salmon ASC certification system from the local community' perspective in the Aysen Province. Contributions to understand local-global interactions within the salmon governance.

Thursday, 15th June - 08:45 - SD 716 - Oral Abstract

***Mrs. Aurelia Guasch Antúnez*¹, *Mrs. Irina Montenegro*²**

1. Universidad Austral de Chile, 2. WWF Chile

Chile is the second largest producer of farmed salmon in the world, covering 30% of the global demand. However, after the infectious anemia virus (ISA) crisis (between 2007 and 2010) and its multiple economic, social and environmental losses, was revealed that despite this economic activity brought socioeconomic benefits (Infante, 2007), also had detrimental effects on people and natural resources such as precarious conditions regarding work, health, and safety of the labor force (Barret & Caniggia, 2002); transformation of traditional cultural practices -based on traditional ways of using the coastal areas- to become a salaried dependent population (Sunkel & Infante, 2009; Muñoz Gomá, 2009); and the dispute over the use of natural marine resources, which is still the traditional source of livelihood for some local and indigenous communities (Barret & Caniggia, 2002). Therefore, to mitigate the impacts of aquaculture, WWF Chile implements since 2011, the Strategy for the Promotion of the ASC Certification System that seeks to reduce the ecological and social footprint of this activity through social and environmental standards and good practices. Since 2013, 40 farms have been certified in Chile, representing over the 10% of the national salmon production. The studies for assessing the environmental and social impacts of the ASC adoption are being developed by WWF since 2016. In the case of assessing the social impacts, the question is whether the requirements for certification are sufficient for decreasing the negative social impacts of salmon farming by translating them into good practices perceived by the local community -associated to free access to natural resources, conflict resolution, and governance- in order to clarify the social impacts of the ASC certification. This study case will help to clarify whether there are changes in the salmon industry's practices as a result of the adoption of the ASC certification according to the local community' perception as well as understanding the local-global relations -based on the certified salmon farming centers located in the Aysen Province. The whole research, which includes at least 3 evaluations, is extremely relevant to understand the effectiveness of the ASC certification and to improve it if necessary. The research will be developed through a *qualitative case study* (Yin, 1989) of two towns located in the Chiloense Marine Eco-Region of Chile (Aysen Province), a worldwide prior biodiversity site populated by indigenous and Chilean communities. The fieldwork will be developed in February and the results and conclusions will be handled in May 2017. The study is directly related with the central topic of the conference since it seeks to contribute to develop a salmon certification which ensures social sustainability at the local level, including aspects of human, social, and cultural life such as equity, public participation in decision making, protection of the indigenous peoples rights, and cultural autonomy (see Apostle et al., 1998; Bernstein, Crow, & Johnson, 1992; Chambers, 1987 in Barret 2002). **Key words:** salmon farming, ASC certification, governance, social impacts, local community.

Unintended Consequences of Enforcement in a Cooperative Institution: Experimental Evidence from Tanzanian Fishers

Thursday, 15th June - 08:00 - SD 203 - Oral Abstract

***Prof. Yaniv Stopnitzky*¹, *Prof. Matthew Reimer*², *Dr. Paul Onyango*³, *Mr. Spencer Maccoll*⁴**

1. University of San Francisco, 2. University of Alaska-Anchorage, 3. University of Dar Es Salaam, 4. World Bank

Small-scale fisheries off the coasts of developing countries are a prime example of the important role that institutions (formal or informal) play in creating wealth and shaping development outcomes in rural communities. Small-scale fisheries are known to employ the majority of world fishers and to provide food and livelihoods to a vast number of people living in coastal areas. Approximately 90 percent of the 38 million people recorded by the FAO globally as fishermen are classified as small-scale (FAO, 2008). Yet they frequently suffer from overfishing and institutional reforms that have worked well in many developed countries are poorly suited to institutional contexts characterized by weak state capacity and poor enforcement. Given the need for local monitoring and enforcement combined with relatively weak state institutions, many countries and donor agencies have turned to co-management schemes, which devolve some responsibilities for management from central governments to local communities. As of 2011, an estimated 130 fisheries in 44 countries were co-managed but evidence on the effectiveness of these systems is mixed (Cinner et al., 2012; Gutierrez et al., 2011). In Tanzania and other Lake Victoria adjacent countries, co-management has been structured around village-level institutions known as beach management units (BMUs). BMUs play a key role in certain management tasks, including monitoring fishing catches, endorsing fishing permits, and administering other national policies on illegal gear. Against this policy backdrop, we study the conditions that foster improved common-pool resource management in small-scale fisheries in rural Tanzania. In particular, we focus on the critical role that BMUs play in monitoring and enforcing the use of only certain types of gear. We design and implement an artefactual field experiment with fishermen in a randomly selected group of BMUs. Groups of five fishers play a dynamic common-pool resource game carefully designed to mirror the real world characteristics of the fishers' lives, including on fish stock size, harvest strategies, and opportunities to engage in illegal behavior. By altering features of the game when played with different groups, we generate experimental variation in the possibility of punishment when engaging in "illegal" behavior and study how this institutional feature affects behavior and fishery-level outcomes. Differing from the existing literature, our results show that participants in the monitoring and enforcement game harvest at significantly higher levels than those in the control group. Fishing groups in the enforcement treatment were 50 percent more likely to completely deplete and collapse the resource. Importantly, these outcomes are not driven either by higher cheating (which is never more than 8 percent in either arm of the experiment) nor by actual punishment (which happens only once in all groups across all villages). Instead, the possibility of enforcement induces individuals to harvest during each round at significantly higher rates than in the comparison group. Our experimental results with actual resource users suggest that institutional reforms that target specific behaviors when agents are simultaneously making multiple self-interested or cooperative choices may result in unintended consequences for both the group of resource users and for the resource itself.

Quality of local governance and sustainable development: a review of normative principles

Thursday, 15th June - 08:15 - SD 203 - Oral Abstract

***Dr. Sara Moreno Pires*¹, *Prof. Filipe Teles*¹, *Dr. Nuno F. da Cruz*²**

1. University of Aveiro, 2. London School of Economics and Political Science

Along with the wealth of research, the many legal protections, international environmental agreements, governance innovations and the transboundary diffusion of new ideas in the field of sustainable development (SD), we have observed an acceleration of human impacts on the planet and few clear messages of how to tackle these through effective problem-solving. On the contrary, many findings point to a clear failure to protect the critical Earth systems that allow for sustainable and thriving human societies and wellbeing. Even when there is an agreement among academics and policy-makers that current governance institutions and practices must be reformed if sustainable outcomes are to be achieved, the way it should be carried out varies immensely. The quality of local institutions is of uttermost importance for the implementation of SD policy instruments at the local level, and ultimately for the prospects of responding to global SD challenges. Local governments can make efforts to facilitate co-operation with multiple actors, using a range of policy instruments designed to either punish or reward, involve, devolve or share responsibilities. This demands a better understanding of complex processes and systems, including the quality of local governance (QoLG) and its capacity to meet SD objectives. Assessing the QoLG is challenging due to this complexity and currently there is neither a roadmap nor a widely accepted tool to do it. Therefore, this paper aims to present a systematic literature review in order to understand two important concerns. The first regards how the conceptualization of the QoLG is discussed in the literature, in order to structure the key comprehensive dimensions that may affect or determine the QoLG, as well as to understand how these dimensions connect to the need to address SD objectives. The second is to understand what assessment tools and methodologies have been proposed in the literature to evaluate the QoLG towards SD. Questions of how to define those concepts, how 'universal' they are, how to design measurement tools to operationalise and assess them, how assessments may mobilize popular and political will or how to foster their use to then improve governance are critical for this research, particularly when this debate is receiving high momentum at the international level. Decisive agreements on the new Post-2015 SD Goals and their financial mobilization, on the new climate change agenda and the new urban agenda (Habitat III) placed an emphasis on transforming governance for SD. Success in responding to these challenges requires reflection on existing local governance frameworks and their capacity to address local-global SD challenges.

Keywords: good local governance; policy instruments; governance practices; evaluation; sustainable development

THE MANAGEMENT OF THE 'ECO-URBANISM AND SUSTAINABLE BUILDING' SCENARIO IN BOGOTA

Thursday, 15th June - 08:30 - SD 203 - Oral Abstract

Mr. José Fernando Cuello¹

1. Secretaría Distrital de Ambiente

At the beginning of the 2000's, the Environmental Agency of Bogota made a management plan by scenarios, which identified a network of people for each of these scenarios and destined small teams of professionals for their management; one of such scenarios was called Eco-urbanism. Today, after many actions by the people involved, the city has a Public 'Eco-urbanism and Sustainable Building' Policy and it is preparing for its implementation. Bogota has almost two decades working for improving its urban environmental sustainability from the urbanism and building perspectives amongst other scenarios for its management. The city has a strategy, whose results are not very well known, but some outstanding elements allow to note some changes. It is necessary to recognise the existing practices, the relationships promoted between different actors and their possible results in order to help the city to redirect its management efforts and allow other cities to compare, review and modify their schemes. The aim of this paper is to offer an overview of the process that has happened in Bogota over the years in terms of environmental urban sustainability using the 'Eco-urbanism and Sustainable Building' scenario. This is done from the perspective of people who have followed such process, who have belonged to the Environmental Agency and who have taken part of the teams in charge of this. The research is done using qualitative research methods such as case studies and participatory observation in order to collect data about the process of environmental urban sustainability in the city. This, with the aim of identifying milestones in such process, analysing opportunities, challenges and their changes and to evaluate if the city had a strategy and has kept it. In addition, it analyses if the management and the benefits of the 'Eco-urbanism and Sustainable Construction' scenario in Bogota have been inclusive.

Convergence of HDI (Human Development Index), Sustainability and Corruption: sign for a change of gear in capitalism

Thursday, 15th June - 08:45 - SD 203 - Oral Paper

Dr. Rodrigo Casagrande¹, Mr. André Alves¹

1. ISAE - Instituto Superior de Administração e Economia do Mercosul

Looking back within a broad historical perspective, the researchers recognized that the transition to a sustainable capitalism model is a global cultural revolution. Adam Smith, in his 1759 “The Theory of Moral Sentiments” argued that self-interest should be tempered by ethics, so that purely selfish behaviour or exploitation would be the exception rather than the rule in society. The consolidation of capitalism was characterized, though, by profit maximization and the reward of selfish behaviour. However, the capitalist model in which the ends justify the means loses momentum and values, markets, transparency, technology life cycles, long-term/short-term tensions (Elkington, 2012) emerge. Actions to minimize environment damage caused by productive activities and to reduce inequalities with respect to income and access to education and sanitation aim at addressing those socio and environmental problems (Capra, 2005). This kind of inter- and intra-generational pact, nevertheless, coexists with very human characteristics such as self-interest, greed and the wish to accumulate. This happens against the scenario of growth of corporations, capital dilution and control and divorce between ownership and management (Monks & Minow, 2004). In this sense, the present study aims at identifying the possible relationship between the Human Development Index (HDI) - used by the UN since 1990 to analyze the conditions of development and human well-being -, the Environmental Performance Index (EPI) - a Yale University project that measures the environmental performance of various countries, and the Corruption Perception Index (CPI) - created by Transparency International in 1995 it measures the perception of corruption and aims at placing this issue on the international agenda. The researchers will collect HDI, EPI and CPI data between 2005 and 2016. They will analyse each available year through regression analysis in order to assess the correlation of indexes and the existence EPI variation according to HDI and CPI values. The study will contribute to provide theoretical and empirical elements that would allow for more effective analyzes and policies for human, public as well as private environmental and institutional development. Keywords: Human Development; Environment; Corruption.

Governance in Sustainability and Public Affairs Management

Thursday, 15th June - 09:00 - SD 203 - Oral Abstract

Prof. Diana Trujillo¹

1. Universidad de los Andes

This chapter builds on the collaborative governance literature to elaborate the idea of governance as the mechanisms we use to coordinate collective action at the field level. Debates about governance for sustainable development move between the macro and micro levels of analysis.~ The more traditional top-down approaches to governance that include the state and the good governance perspectives seem to have failed to govern complex affairs or to remain at the prescriptive level.~ Other bottom-up, deliberative approaches like the collaborative governance one has began to show some promise in the management of sustainable development issues.~ ~The purpose of the chapter is to delve deeper into the collaborative governance literature in different policy areas to provide a conceptual framework to understand governance in this type of arrangements.~ I find the collaborative governance literature suggests an understanding of the term as: the mechanisms used to govern organizations at the field level to manage common affairs.~ The mechanisms comprise: formal and informal institutions, processes and structures.~ I elaborate on the specificities of these three mechanisms and their implications for the collaborative approach to governance.~ Also, I develop the understanding of the field level and its relationship to collective action and I propose an understanding of the common affairs that includes physical and socially constructed commons.~ ~To illustrate the elements of the definition, I use the results of empirical research about Regional Peace and Development Programs which are collaborative governance schemes to promote peace and development in the regions most affected by the armed-conflict in Colombia.~ I conclude by highlighting the advantages of collaborative governance over other types of governance as identified in empirical research in aspects as varied as: the positive results in promoting institutional change; the flexibility and adaptiveness of the scheme to manage complex, wicked issues and ~the possibilities to deliberate and negotiate over incommensurable values.

Fostering political participation for better water services: evidence from three cities in India

Thursday, 15th June - 10:15 - SD 701 - Oral Paper

Mr. Francesco M. Gimelli¹, Dr. Briony C. Rogers¹, Dr. Joannette J. Bos¹

1. Monash University

Evidence indicates that the delivery of urban water services in a manner that fosters secure lives among the marginalised is impacted by individuals' ability to meaningfully engage in political processes that govern water. In many cities in the Global South the marginalised are peripheral participants in the political process, either being used as vote-banks or lacking the confidence to engage in the political process. This reality leaves the lived needs and realities of the marginalised outside of decision-making processes, while reducing the transparency and accountability of water governance in the Global South. There is a need to understand how the capacity of political participation among the marginalised can be strengthened in a manner that leads to the delivery of water services that addresses their lived realities and meets their needs and aspirations. This paper draws on interviews with forty-two community members and water development professionals in Faridabad, Delhi and Mumbai, India, to explore their experiences with the political processes impacting on the delivery of water services to slum areas. It identifies five political barriers impeding the ability of individuals to access - and improve their access to - water services, and discusses how these can be addressed by explicitly incorporating a strategy of fostering political participation as a component of urban water development initiatives.

Groundwater Governance and the role of the private sector

Thursday, 15th June - 10:30 - SD 701 - Oral Abstract

Dr. Catalina Silva-Plata¹

1. Universidad de los Andes

Groundwater is a public shared resource interlinked with many areas in the society such as food, energy, water supply, industry and the environment. There is more freshwater underground than on the surface of the planet and it is a critical resource for societies worldwide, and yet its understanding, governance and management have often been overlooked. The Groundwater Governance Global Framework for Action in its third theme identifies that connections with other sectors, such as the private sector, need to be systematically made. Effective groundwater governance is essential for groundwater management and it is only achievable with stakeholder participation. The private sector, and especially the food industry, constitutes a key stakeholder in this process as agriculture accounts for 70% of the global water withdrawals and industry for 20%. This paper discusses the role of this sector by first outlining the reasons why they should work towards a better groundwater management. Furthermore, it suggests ways in which businesses can contribute to an improved groundwater management and governance. In addition, it argues the reasons why an emphasis should be made on the food sector and finalises with suggestions for future avenues for research and practice. Keywords: groundwater, water, governance, businesses, private sector

The Ecological Efficiency and Funding Performance from Water Charges: the Experience from São Paulo State, Brazil

Thursday, 15th June - 10:45 - SD 701 - Oral Abstract

Mr. Guilherme da Silva¹

1. Universidade Estadual Paulista Júlio de Mesquita Filho (UNESP)

São Paulo's state is considered a reference of hydric resources management in Brazil, becoming the pioneer on adopting a system based on the decentralized french model of basin committees, whom would become generalized across the country at the end of the 1990s decade. One of the main economic instruments from this system, collaborating with its funding and at the same time stimulating the rational use of the water, is the charge for the use of hydric resources. It's based on a mix from the polluter pay principle and the user pay principle, using differentiated values depending of the kind of use of the resources. This article valuate the impacts from the implementation of this charge on the first three hydrographic basins that adopted it (all located at industrial areas) on São Paulo, who went through a severe period of hydric crisis between 2013 and 2015, highlighting the non prepare for the situation and leading to critics to the politics and instruments adopted until that time. First, is made a bibliographic revision on the theoretical fundamentals behind the charge and a short bibliographic revision on the Brazilian and Paulista law of hydric resources, besides some examples of international cases of implementation. Then is made an evaluation of the additional funding that the charge brought to the basin committees and its ecologic efficiency between 2007 and 2015. The used data come from the annual basin committee reports and from the Agência Nacional de Águas. The indicators constructed with the data are about the variability of the funding at the period, the funding differences from each basin and the difference between the charged and the funded values, which affects the financial capacity of public investments. The ecological efficiency indicators show the variations from the Índice de Qualidade de Água (IQA), a synthetic index, composed by many parameters such as dissolved oxygen and water turbidity, offering a general point of view about the water quality. The results about funding show a substantial increase of resources for the basin committees, generally stabilizing after some years with very few variations. During the first years is also normal to have a major difference between what is charged and what is funded, because regional administration gives exemptions and other advantages to the companies in order to give them more time to incorporate the new costs on their operations. The ecological efficiency results show there is a constant increase of the water quality, however this can't just be attributed to this instrument and the actuation of regional committees, but also to state and federal legislation changes and productive process innovations. The article concludes that the use of water charges is positive to the hydrographic basins that adopt it, but that is necessary a policy mix to constantly improve results. The correct management of hydric resources at areas with irregular rain regimes is vital to assure inclusive sustainability and economic development is only possible where there is a safe water management to both the population and the productive sectors.

TRENDS IN UK DAIRY FARMS FROM 2001 TO 2014: EVIDENCE OF SUSTAINABLE INTENSIFICATION?

Thursday, 15th June - 10:15 - SD 702 - Oral Abstract

*Dr. Alejandra Gonzalez Mejia*¹, *Dr. James Gibbons*¹, *Dr. David Styles*¹

1. Bangor University

The UK dairy sector exemplifies a consolidation trend widespread across more economically developed countries (MEDC). Between 2005 and 2015, the number of dairy farms fell in the UK by one third, whilst average annual milk yield per cow increased from 7,000 kg to almost 8,000 kg. This study employs Farm Business Survey (FBS) data for England and Wales from 2001 to 2014 to see whether the observed intensification trend has increased sustainability at the individual farm level. 16 metrics were derived from FBS data to characterise farm production and intensification of production. Further, a model based cluster analysis was used on these metrics to classify exemplar farm types over the study period. This approach allows identification of distinct intensification pathways, which may be obscured by aggregation at the sector level. Principal component analysis (PCA) showed that while there was considerable change in the dairy sector over time, the relationship among metrics was constant over this period suggesting that they had identified fundamental farm properties. Results of this trend analysis show that in the earlier years of the study there were three and four types of dairy farms that were consolidated into two main typologies in 2014. These two main types of dairy farming share the same dairy density (1.4 cows/ha) and revenue milk price ratio (1 £/litre/£/litre). The first one is characterised by high milk yield (7,500 l/cow), concentrate-based feed (1.5 tonne/livestock units), high ratio of maize grass area for feed (0.2 ha/ha), low labour intensity (60 hours/ha), and lower utilisation of the agricultural area (UAA) for grazing animals (0.7 grass area/ UAA). The second farm type is a grass-based system (1 grass area/ UAA) with lower milk yield (6,835 l/cow) and lower dependency on concentrates (1.3 tonnes/ livestock units) but higher labour intensity (68 hours/ha). This consolidation shows that financial margins per litre of milk were achieved equally by both intensive grass-based systems and indoor housing concentrated based systems, but the productivity in terms of milk yield was higher with less labour intensity for the later type. Intensification is reflected in the increase of milk yield and decrease in labour intensity from 2001 to 2014, nonetheless the goal of sustainable intensification is to raise productivity and social welfare while reducing environmental impacts. In this context, these results can be used to model scenarios with different management practices, such that a farm type represents a sustainable system, which takes into account the equilibrium among the social aspects (e.g., labour intensity), the economic components (e.g., revenue milk price ratio), and the environmental impacts (e.g., land change use) of dairy farming.

Organic agriculture in Russia: social, economic drivers for development

Thursday, 15th June - 10:30 - SD 702 - Oral Abstract

*Mrs. Natalia Nesterenko*¹, *Mrs. Nadezda Pakhomova*¹

1. Saint-Petersburg State University

Follow the increasing consumer demand and environmental consciousness of people organic agriculture demonstrates a stable growth. To estimate this new agricultural model, it is reasonable to take into account the social and economic dimensions more thoroughly. It cannot be ignored numerous examples of violating the law on minimum wage by eco-farmers to ensure their price competitiveness with conventional farms. Agriculture in Russian Federation is faced today with the challenges of growth in the domestic demand of the population for food. Moreover, agriculture must ensure reducing the burden on the environment in terms of greenhouse gas emissions~with accordance to decisions taken at the conference in Paris-2015. Lack of mineral fertilizers on the fields for many years is a significant advantage for the development of the organic agriculture. Furthermore, the demand on the organic products grows today. Moreover, a launch of organic farms could be a driver for social and economic development in rural areas. As a result of the analysis, it was identified promising areas. Analysis of promising areas was done in terms of production potential. We analyzed the unemployment rate and the area of unused land, because it needs agricultural land without mural fertilizers and a large number of labor. Thus, we have identified regions of Russia in which the development of organic agriculture has the greatest prospects. In addition, the choice of the development region depends on the strategy of organic production: fresh products, raw materials for the food industry or~for other industries. The demand for fresh organic products is concentrated mainly in large cities, where the incomes of the population are higher. So the organic farms of this niche should be located near major cities. We conducted a survey among farmers to estimate awareness and attractiveness of organic farming in Russia. About a hundred farmers filled out questionnaires. The attractiveness of organic production among farmers is not high enough. This is due to limited demand and higher risks and costs of production. Nevertheless, according to a survey of farmers, about a third plan to move to the standards of organic production in the future. Organic agriculture is an innovation intensive, so the development needs a cooperation between business and science. At the same time, more producers are not ready to go to principles of organic agriculture. The reasons are in lack of market of such products, lack of organic technologies and high risks in production processes. Moreover farmers need investment for soil cleaning. Factors of limiting the development of organic agriculture: insufficient popularity of organic products among the population, high production risks. In addition, it requires the formation of a system for marketing of organic products: shops, restaurants, processing enterprises. The lack of development of certification organizations due to the lack of a legislative base complicates the procedure for switching to organic standards. At the same time, it should be noted that the awareness of producers is growing, non-governmental organizations are engaged in promoting organic products in the minds of consumers. ~

A comparison between organic and conventional farming systems in South Africa's southern Cape.

Thursday, 15th June - 10:45 - SD 702 - Oral Abstract

Prof. Raymond Auerbach¹

1. Nelson Mandela University

Abstract: Track 2b: Food sovereignty and sustainable agriculture. Long term comparative organic farming systems research trials have been running for four years, comparing organic and conventional, rotation and mono-cropping, biological and chemical pest and disease control and water use efficiency in cabbage, sweet potato and cowpea crops.~ In Africa the high cost and limited availability of agricultural inputs make agro-ecological approaches attractive, as they are practically possible and improve carbon sequestration and food quality.~ The research will show whether the improvements which organic farming brings about (higher soil organic matter, lower acidity, better soil biology, aerobic soil conditions, greater water use efficiency, better food quality) make up for the sometimes lower yields of organic farming systems.~ The trials will run for ten years, and are laid out as a complete randomised block experiment with four replications, split for farming system, with ten treatments.~ Four studies examine yield components, soil fertility changes, food quality and water use efficiency (using capacitance probes to 1.1 m depth, and theta probes for surface and mulch moisture content determinations).~ Results from the first three years are presented, showing how the conventional system has raised available soil phosphate levels more than the organic, but caused some acidification of soils.~ The organic system has raised soil organic matter and dropped acidity and this has made more potassium available in the soil.~ As with other long term trials, there is still a yield gap, with organic systems yielding twenty to thirty percent less than conventional, largely due to lower available soil phosphate.~ This problem is now being corrected using rock phosphate.~ The challenges for viable organic farming systems are thus seen to include: improving soil fertility, controlling pests and diseases and convincing consumers of the quality of organic products.~ Benefits include: higher soil water retention, sequestration of soil carbon, improved soil micro-biology, better agro-biodiversity and elimination of poisons from the food chain. Raymond.auerbach@nmmu.ac.za Key-words: organic farming systems; soil fertility; water use efficiency.

The Mapping of Resources and Development Potentials of Food-Secure Region in Kupang District, Province of Nusa Tenggara Timur

Thursday, 15th June - 11:00 - SD 702 - Oral Paper

***Dr. Ambar Pertiwinigrum*¹, *Prof. Cahyono Agus*¹, *Mrs. Supriadi Supriadi*², *Dr. Agung Setianto*¹, *Mr. Akhmad Arief Fahmi*¹, *Mr. Yudistira Soeherman*¹**

1. Universitas Gadjah Mada, Yogyakarta, 2. Ministry of Village, Development of Disadvantaged Areas and Transmigration

Indonesia Food Sustainability and Vulnerability Assessment (FSVA) 2015 by the World Food Programme (WFP) classified the Province of Nusa Tenggara Timur as Priority 1, a highly vulnerable region should be improved. The aim of this program was to develop partial and spatial map of current condition, problems, threats, potentials, and strategic policies to develop food security in this area. The program was focused on Kupang district, Province of Nusa Tenggara Timur, through: 1) literature study; 2) identification and mapping of natural resources; 3) Focus Group Discussion; 4) field trip and data collection; 5) data analysis; 6) development of program; 7) workshop. Kupang district has three sub-districts of the most vulnerable to food insecurity or Priority 1, namely Semau, South Semau, and Takari. The determining factors of vulnerability to food-insecurity are: (1) high poverty rate, (2) high prevalence of underweight among children, and (3) low access to clean water. The characteristics of the hilly areas in Kupang are arid-karst-dry-land with very low land productivity. The limiting factors are low rainfall, low water availability, high temperature, low moisture and low fertility. Livestock were still raised traditionally on natural pastures. Some of the programs needed to build resilience to enhance food-security in Tanini village are: (1) Improvement of land productivity, including infrastructure, facilities for intensive livestock systems, and optimization of dry land's potential; (2) Water management through the development of water reservoirs and the preservation of watershed and groundwater basins; (3) Capacity building for communities including farmers, the education on food consumption and processing, society empowerment by improving soft skills and hard skills. The analysis and estimation of WFP showed that after intervention, the composite score of Kupang district changed from 91.18 (priority 3) to 66.54 (priority 5). The food-insecurity map was ideal as a reference in planning an effective and efficient program.

Propagating Success? The Incredible Edible model of community food development

Thursday, 15th June - 11:15 - SD 702 - Oral Abstract

Dr. Adrian Morley¹

1. Manchester Metropolitan University

The Incredible Edible model of community food development originated in the small post-industrial town of Todmorden in the UK nearly a decade ago. With a focus on growing edible plants on underutilised small pieces of land, developing skills and supporting local businesses, the IE model is widely perceived to have played a key role in transforming the town both through economic uplift and by improving everyday living environments. Moreover, this has been achieved largely without the help of existing political / civil society structures or external resources, instead relying on volunteers living within the town. Its success has stimulated the establishment of hundreds of other Incredible Edible groups across the UK and overseas who pursue the same goals, inspired by the achievements in Todmorden. ~ The Incredible Edible approach directly tackles issues of food sovereignty by developing growing and cooking skills and an awareness of the productive capacity of their locality and the impact of food consumption on the environment and human health. The model also addresses community capacities to act by stressing the importance of action rather than words and not waiting for permission, funding or recognition. An inclusive, holistic approach is illustrated by the guiding principle 'if you eat, you are in'. This paper will report on recent research that set out to elucidate the Incredible Edible model, as pursued in Todmorden, and critically assess its potential as a community-led framework for improving social, economic and environmental wellbeing. In particular, it explores how the model is conceptualised and communicated by the group, how this compares with actual practice and some of the factors mediating variance from the model. In addition, the study develops both practical policy recommendations to support self-starting food oriented community groups and seeks to contribute to our understanding of the unique role of food as a substantive focus for community development. The study uses a participatory mixed methods approach, incorporating both qualitative approaches (interviews, focus groups) and quantitative methods (a community survey, a social return on investment study) to derive a holistic account of the evolution of the model and its impact in the town, incorporating a theory of change and narrative based analysis. The paper concludes by setting out a longer-term research trajectory that aims to develop a comparative approach between Incredible Edible groups and between the model and other similar grassroots approaches to food production, for example those embodied within La Via Campesina movement.

Renewable Energy Integration into the Japanese Electricity Grid: Dealing with Intermittency through Smoothing and Ocean Energy

Thursday, 15th June - 10:15 - SD 703 - Oral Abstract

***Dr. Miguel Esteban*¹, *Dr. Jeremy Bricker*², *Dr. Ben Mclellan*³, *Dr. Keiichi Ishihara*³, *Dr. Hiroshi Takagi*⁴, *Dr. Joana Portugal-pereira*⁵, *Dr. Volker Roeber*⁶**

1. The U, 2. Delft University of Technology, 3. Kyoto University, 4. Tokyo University of Technology, 5. Universidade Federal do Rio de Janeiro, 6. Tohoku University

Following the 2011 Fukushima nuclear disaster, Japan is having to re-think its overall energy policy, as the country has been increasingly reliant on imported fossil fuels, though it will eventually have to decrease the amount of greenhouse gases emitted into the atmosphere under the COP21 climate pledges. Increasingly, renewable energy sources such as solar and wind are seen as being destined to play a major role in the power generation mix. However, detractors of intermittent energy sources often claim that they cannot be used to reliably power a country, given that there are times of the day when little solar or wind power is generated at a given point. Essentially, these intermittent generation sources can only really work if integrated over a large grid, where an excess of production in one region can compensate for adverse weather in another area, an effect known as smoothing. However, to date comparatively little work has been done on developing actual realistic simulations of how such a system would work, which require the input of hourly meteorological data to calculate how much electricity would be produced, and whether this could meet demand. Essentially, smoothing becomes more pronounced as more types of renewable energy are introduced into the mix. In the present paper the authors have built a grid-simulation tool that simulates the hourly future electricity production based on wind, solar, wave and tidal data. The system uses pump-up storage and electric batteries to balance the daily fluctuations in supply and demand, essentially demonstrating how a viable system can be created in the middle to long term. The results have import implications at the policy making level, as they shows how such a system is technically able to increase the share of renewables in Japan up to 100%, guaranteeing a stable and reliable supply.

Portugal – A pathway towards 100\% renewable electricity

Thursday, 15th June - 10:30 - SD 703 - Oral Abstract

Prof. Francisco Ferreira¹

1. CENSE, Centre for Environmental and Sustainability Research, Universidade NOVA de Lisboa

In the last Conference of the Parties of the United Nations Framework Convention on Climate Change in Marrakech, Portugal stated the objective of becoming carbon neutral by 2050, as a form to fulfil the Paris Agreement objectives. One crucial area in relation with this goal is the transition to 100\% renewable energy, which should initially take place during the decade of 2030 for electricity. In 2016, 64\% of the electricity consumption in Portugal was assured by renewable energy sources and the country bet a record of 107 continuous hours, almost 5 days, of consumption fully supplied from renewables. The research focused on the specific characteristics of the electric management system and the particular circumstances that enabled this event during that period. At the same time, and under a long-term perspective, it is important to identify the major economic, environmental and technical obstacles to increase renewable electricity production, such as the higher consumption forecasted due to electric vehicles, the increasing role of solar power with a higher seasonal variation like hydroelectricity, the storage management capacity in dams particularly with pump-storage capabilities, and the role of interconnections between countries at the Iberian and European level. Data from electricity demand forecasting models developed by different institutions were used to interpret different possible pathways and to evaluate how to achieve the current long-term challenges of full net renewable electricity sources and carbon neutrality. Also, near-future political decisions aspects currently being discussed at the European level under the energy winter package from late 2016, such as regional cooperation, market rules, and state-aid are included in the analysis. It is concluded that a major increase in solar power up to 9 GW (currently at approximately 500 MW) with a complementary increase of both wind (up to 8 GW) and hydropower (up to 8,2 GW) is required to assure the 100\% renewable electricity goal. Energy efficiency measure will be crucial also for attaining the objective. This pathway will be fundamental for climate change mitigation. However, negative environmental consequences, such as the large occupation of land by energy infrastructures, will have to be considered along the next decades. Price and market considerations were not evaluated in sufficient depth due to uncertainties under the future rules of the carbon and electricity market within Europe.

Modelling renewable energies in macroeconomic energy-climate models

Thursday, 15th June - 10:45 - SD 703 - Oral Abstract

*Ms. Ganna Gladkykh*¹, *Ms. Nathalie Spittler*²

1. University of Clermont Auvergne, 2. University of Iceland

The currently operating fossil-fuel-based energy system has proven to be one of the main drivers of earth system change. It has become to be the main driver for climate change. The transition from the fossil-fuel-based energy system to a renewable-based energy system is one of the widely advocated and modelled solution pathways for achieving long-term sustainable development and climate change mitigation. However, results regarding their contribution to climate change mitigation and sustainable development are dependent on the assumptions made with regards to renewable energies. Therefore, the study deals with the following research question: **How to model renewable energies in macroeconomic energy-climate models?** To answer this question, we analyse renewable energies and their technological, environmental and economic characteristics in a disaggregated manner. This is followed by an overview of current macroeconomic energy-climate models, where we describe different approaches applied to model renewable energies and discuss simulation results. Based on the review of current practices of modelling renewable energies and contrasting it with other research in the energy field (e.g. resource limitations on harvesting technologies, impact of climate change on renewable energy), we explore the gap between the current knowledge on renewable energy potentials and modelling practices. Thereby, we challenge the assumptions of many models that renewable energies are unlimited and that their relation to climate change is unidirectional. To support this argument and to present a possible advanced way of modelling renewable energies, we built a model structure that starts from the existing model structures regarding renewables but also allows to incorporate the necessary environmental, technological and economic characteristics found in the relevant literature of renewable energy on a global and local scales. The method applied to build this model structure is System Dynamics. There are two main goal of our modelling effort: (1) gaining insights into how different assumptions on renewables can affect model results and (2) identifying the most relevant characteristics to be considered in order to draw the right conclusions on how renewable energies can contribute to climate change mitigation, and how long-term sustainable energy system can be designed. **Keywords:** energy, climate change, renewables, resource limits

Assessing the impact of a wind farm in the Colombian Power System

Thursday, 15th June - 11:00 - SD 703 - Oral Paper

***Mr. Alejandro Piñeros*¹, *Mr. Javier José González Ruiz*¹, *Dr. Ángela Inés Cadena Monroy*¹, *Mr. Javier Rodríguez*¹, *Mr. Luis Posada*², *Mr. Álvaro Ramírez*²**

1. Universidad de los Andes, 2. Isagén

The wind energy potential in La Guajira region and its complementarity with the hydrological regimes justify the current interest in Colombia on this source and technology. The power production potential is estimated up to 18 GW, enough to satisfy in excess the current peak demand of the system. The market spot price could be reduced due to the low variable costs of these generation technologies. Also wind energy could help to preserve water reservoirs in a system with a large participation of hydro plants during extended droughts, like the ones caused by El Niño phenomenon. Lastly, the inclusion of renewable generation in the Colombian mix can be viewed as a climate change mitigation option since it could replace energy generated using thermal plants, and therefore reduce greenhouse gas emissions. In this study, the impact of a hypothetical 376.2 MW wind park located in La Guajira region on the Colombian electrical system is evaluated. A retrospective analysis is performed to evaluate hypothetical changes due to the operation of this park during the period 2006 – 2016 in: i) market clearing prices and energy marginal costs, ii) levels of the aggregated reservoir through time and iii) carbon emissions due to electrical generation. Two different methodologies are used to assess those impacts: a reconstruction of the spot market supply curve by using historic economic dispatches and including the new plant, and a full long-run simulations of the marginal cost curves of the ‘new’ power system by using SDDP (hydrothermal dispatch model, based on stochastic dual dynamic programming). Wind park generation is calculated by using data from weather stations located in the selected region and a park model that includes wake effect for a given layout. The demand to be attended is represented in different scenarios. Results showed reductions of the spot price and energy marginal cost, increases in the level of the aggregated reservoir and reductions in emissions due to the operation of the wind park. \textbf{Keywords:} Wind energy, Renewable impact, Merit Order Effect, Colombia, La Guajira.

Methodological considerations for the Life Cycle Assessment of clay masonry

Thursday, 15th June - 11:15 - SD 703 - Oral Paper

Prof. Sergio Ballén¹, Prof. Liliana Medina¹, Prof. Adriana Cubides¹, Prof. Luz Amparo Hinestrosa¹, Prof. James Ortega Morales¹

1. Universidad Colegio Mayor de Cundinamarca

This paper presents the progress of an investigation developed in 2016, whose general objective was to set a methodology for the life cycle assessment of clay masonry in Cundinamarca State, based on the evaluation of energy resources consumption. Recently, progress in the study of energy efficiency in the production of the brick industry in Cundinamarca State have been developed, taking into account the equipment of combustion and / or fuel injection, as well as the combustion process and its proper functioning. On the other hand, regardless of the development of eco-labels methodologies type I, the LCA in this industry does not constitute an element that leads to an eco-label type III regulated by ISO 14040: 2006. This data could be an input for national and local sustainable construction policies, energy efficiency, low-carbon growth, environmental product declaration, and also, makes it as easy to deploy of standards under the Colombian Environmental Seal of the Ministry of Environment, and whose main goal is to minimize greenhouse gas emissions and improve energy efficiency from the construction industry and the brick industry.

Sustainable business models: The case of Hybrytec, a Colombian solar-energy start-up

Thursday, 15th June - 10:15 - SD 704 - Oral Abstract

Dr. Nathalia Franco¹, **Mr. David Schnarch**²

1. Universidad, 2. Universidad de los Andes

In Colombia, two million people and approximately 66% of the country's territory does not have access to the electrical grid. Peasants, indigenous, and Afro-descendant communities, who live without grid, usually satisfy their needs by using diesel generators. Communities have to pay high costs for the fuel and 99% of them have less than 6 hours of service a day (Florez, et al., 2009). Colombian situation is a mirror of what is happening globally. According to United Nations, in 2015 about "2.8 billion people had no access to modern energy services and over 1.1 billion do not have electricity" (UN, 2015). Discussion about renewal energy has grown in the past decades. The FAO of the United Nations, for example, promotes the generation of electricity from photovoltaic solutions as a possible vehicle for agricultural and rural development (van Campen et al., 2000). However, in many contexts, the success of such efforts is limited due technical limitations, lack of basic skills in the management of solar solutions, and limited financial support. The aim of this article is to analyze the transformations and adaptations needed to develop a business model in order to provide affordable and manageable solar energy solutions to vulnerable population in isolated rural areas. Specially, the article highlights how to incorporate a sustainable approach (social, financial, and environmental value generation) to consider a wide range of stakeholder interests, including environment and society. It also shows how to develop such an approach from the early development of start-ups. To do so, we examined the experience of Hybrytec, a solar-energy Colombian start-up that strengthened its business model to include a triple bottom approach (balance among economic, social and environmental issues). Helped by ECOS group, a Swiss investment fund, the business practices evolved and new management practices were implemented. A qualitative approach was taken. In-depth interviews with several stakeholders of the company were conducted (CEO, employees, local distributors and clients). Categorization and analysis of the data was conducted and validated with secondary sources (triangulation process). Hybrytec, in a short period of time, became leader of its segment with 23% of the market share, providing basic electricity needs for 43.400+ people. Its business model was re-configured to create social and environmental value. For one of its business lines (which represents 40% of the revenue), Hybrytec developed a network of distributors. The network includes over 200 rural small entrepreneurs that receive training to design and distribute solar energy projects in remote areas. A second business-line is related to social impact projects. These projects -normally financed by public and international cooperation resources- are aimed to impact vulnerable or isolated communities by providing them with electricity, water pumping systems, and cooling through solar energy. The third line develops large projects with private companies to reduce their CO2 emissions. The evidence of the case shows that through a profit-making initiative it is possible to develop a business model that creates social and environmental value by empowering low-income populations, and lowering barriers to access to safe, affordable and clean energy.

CORPORATE SOCIAL PERFORMANCE IN FAMILY-CONTROLLED BUSINESSES

Thursday, 15th June - 10:30 - SD 704 - Oral Abstract

Dr. Luis Diaz-Matajira¹

1. Universidad de los Andes

Family-controlled businesses (FCB) are the predominant organizational form around the world (La Porta, Lopez-de-Silanes, & Shleifer, 1999). I define a Family-Controlled Business as “*a business that is governed and/or managed by two or more members of the same family with significant ownership by those and possibly other members of that family and with the intent to pass the ownership and management of the firm on to the next generation*”. FCBs seem to outperform non-family businesses, especially over the long run (Miller & Le Breton-Miller, 2005). In recent years, scholars have been writing on stakeholders, ethics and social responsibility in the context of family firms (Berrone, Cruz, & Gomez-Mejia, 2014; Cennamo, Berrone, Cruz, & Gomez-Mejia, 2012b; Dyer & Whetten, 2006; Zellweger & Nason, 2008). This literature also suggests that family involvement is a critical issue to comprehend when asking why FCBs may be more socially responsible than non-FCBs. Following this trend, my paper attempts to contribute to this emerging literature by analyzing the relationship between the constructs of familiness and corporate social performance (CSP), thus exploring if FCBs promote sustainable management practices. I use the following definition of CSP as a “*business organization’s configuration of principles of social responsibility, processes of social responsiveness, and policies, programs, and observable outcomes as they relate to the firm’s societal relationships*” (Wood, 1991: 693). My paper focus on private FCBs and follow the case survey methodology (Larsson, 1993) as it allows to combine quantitative analysis with qualitative data. I survey, analyze and compare a sample of 30 longitudinal in-depth private family-firm case studies from all over the world. Cases were theoretically sampled out of the STEP case pool which consists of more than 100 case studies (Sieger, Zellweger, Nason, & Clinton, 2011). Preliminary evidence also indicate that family involvement correlates with social initiatives towards external stakeholders (local communities and the environment), while internal being neglected. FCBs tend to prioritize relationships over transactions with regards to their stakeholder management (Le Breton-Miller & Miller, 2011). Thus, FCBs are prone to connect with the broader community, making contributions to the causes they believe in. Results suggest that FCBs are heterogeneous and that different dimensions of familiness (especially family involvement in governance) appear to explain some of this variation. Family involvement seems to be a complex phenomenon that may explain why some FCBs can behave in a socially responsible way and work towards sustainability, while others do not. Moreover, results open lines for further research.

THE PROCESS IS THE KEY: FINANCIAL PROFITABILITY WITHOUT EXCLUSION OF SOCIAL AND ENVIRONMENTAL PERFORMANCE THROUGH IMPACT INVESTMENT.

Thursday, 15th June - 10:45 - SD 704 - Oral Abstract

Prof. ANDRES GUERRERO¹

1. School of Management at Universidad de los Andes

The Impact Investment is the investment made in companies with the intention of generating financial returns and positive environmental and social impacts at the same time. The concept was coined ten years ago. Some authors associate this kind of investment with an evolution of the “Socially Responsible Investment”, and others to a diversification of investment portfolios in the face of the financial crisis of 2008.~ Anyway, the Impact Investment has had an important growth in the last years, from US \$ 4 billion in 2011 to US \$ 60 billion estimated for 2015 worldwide; in Latin America it has developed significantly in Mexico, Brazil, Colombia and Peru, these four countries would reach 8.5% of the total Impact Investment globally by 2015. ~This fast process of growth implies that, compared to traditional investment, the actors involved in the impact investment are newcomers in this kind of investment. Investment funds, invested companies and support organizations, such as incubators and accelerators, have little experience in jointly managing the key elements of impact investment: financial returns and social returns, including environmental return. ~The accelerated growth of an investment model that includes new dimensions to traditional investments, social and environmental, makes the management of the organizations involved in these processes a challenge so that their management really contributes to sustainability.~ The value promise in the sector is a positive return in financial, social and environmental dimensions.~This paper explores the question of how to find an “appropriate positive return” on impact investment, using the results of investment processes supported by the New Ventures Colombia Program, operated by the School of Management at Universidad de los Andes, between 2008 and 2014. ~The investment process becomes the mechanism to determine the possibility of return required on the investment impact, which goes beyond the financial profitability of the investment. ~ IMPACT INVESTING, IMPACT INVESTMENT, FINANCIAL AND SOCIAL BENEFITS

What can Industrial Change Agents Teach us Corporate Sustainability Theorists?

Thursday, 15th June - 11:00 - SD 704 - Oral Abstract

Ms. Kyra Weerts¹, Dr. Sjors Witjes¹, Dr. Walter J.V. Vermeulen²

1. Copernicus Institute of Sustainable Development, Utrecht University, 2. ISDRS & Utrecht University

Companies need to address their impacts on the sustainability of society to achieving long-term success. To satisfy current demands while simultaneously being prepared for tomorrow's developments entails a dynamic capability and management of organisational change. In the implementation~process of Corporate Sustainability (CS), physical and social dynamics of business activities play an important role. Scientific research however generally focuses on optimizing~physical dynamics in the CS implementation process, discarding the influence of the created and affected social dynamics. This article therefore focuses on optimizing~ social dynamics in the CS implementation process. Three literature analyses were carried out, analysing to what extent the propositions made by scientists to optimize~ social intervention dynamics in the CS implementation process correspond with literature written by successful CS change agents from the industry and what lessons can be drawn from this comparison~. It is found that firstly, a leader centred approach~ seems to be most successful when initiating the corporate cultural change necessary to optimize~the social dynamics within the company. Leaders can mould a corporate culture for it to help optimize the social intervention dynamics resulting from the CS implementation process. For companies that did not start from a CS perspective it is observed that the corporate culture needs strong leader centred guidance to enable and establish cultural change for a longer period of time. Habits need to be broken and employees need to be convinced of the new vision, which takes more dedication and effort of a leader than when a company starts from a CS perspective, and the leader can simply recruit people that fit to the vision. Once, the moulding process of the corporate culture has matured the leader can take a step back and become more observing, trusting his employees to have enhanced the corporate values and to be capable of acting within the set vision. Depending on the level of risk that is considered acceptable, a leader can either guide corporate cultural change through channelling or accepting ambiguity. Channelling ambiguity entails that there are several value dimensions on which everyone within the company agrees. Here, cultural change happens as a result from different cultural backgrounds of employees. Accepting ambiguity means a lot of innovative freedom is granted to employees by keeping evaluation criteria vague.

Key strategies to implement circular economy in SMEs

Thursday, 15th June - 10:15 - SD 715 - Oral Paper

***Mrs. Vanessa Prieto-Sandoval*¹, *Prof. Carmen Jaca*¹, *Prof. Marta Ormazabal*¹, *Prof. Javier Santos*¹**

1. University of Navarra

Circular Economy (CE) is fast becoming a matter of high importance for researchers, governments, and firms, to pursue social prosperity and to increase the resilience level of the natural environment. In this context, Small and Medium Enterprises (SMEs) has an important role because they represent some of the most important motors of development and progress. Thus, the main objective of this study is to identify the key strategies which may favor the CE paradigm in SMEs. Moreover, these key strategies should encourage the eco-innovation to build competitive advantage and create value in coherence with nature. Regarding the purpose of this study, we used a mixed methodological approach, based on a literature review and a focus group to gather qualitative data. This focus group has been carried out via experts such as researchers and practitioners from recognized universities, sustainable SMEs, and consultancy firms in Spain. As a result, this study proposes a kit of strategies that could help SMEs to mature and orient their corporate strategy towards the circular economy and build a competitive advantage in the market. Moreover, this study proposes a group of internal and external factors that should support the implementation of the kit of strategies. Finally, some useful dynamic capabilities are defined to undertake the CE in the business performance. This research is part of the EcoPyme project which has been sponsored by the Spanish National Program for Fostering Excellence in Scientific and Technical Research and The European Regional Development Fund: DPI2015-70832-R (MINECO/FEDER). \textbf{Keywords:} Circular Economy, SMEs, competitive advantage, environmental management, dynamic capabilities\

Adaptation of a Zero Waste System into the Circular Economy's ReSOLVE framework: potential and barriers in a retail store in Mexico City

Thursday, 15th June - 10:30 - SD 715 - Oral Abstract

*Mr. John Rincon*¹, *Dr. Maria-Laura Franco-garcia*¹, *Mr. Jorge Carlos Carpio-aguilar*²

1. University of Twente, 2. Tecnológico de Monterrey

At different stages (from harvest to consumption) the food is thrown away even if it is still edible. This fact is having significant impact on the current food system posing many uncertainties on environmental liabilities as in many countries organic waste is buried in landfill locations. As an example of this situation, Mexico reported that about 96% of the Municipal Solid Waste (MSW) is still disposed of in landfills. 50% of the total of the disposed MSW is attributed to organic components. Thus, Mexico's current waste management system is considerably lagging in recycling, energy recovery and offers little regulatory incentive to avoid food being disposed of. In that sense, some companies are concerned about their impacts throughout the value chain as well as their corporate reputation facing the consumer. Trying to address the above-mentioned problematic, this study aims to elucidate a framework that can improve the organic waste management in a Mexican retail corporation by combining a circular business model and a Zero Waste system. This was done by integrating the Zero Waste philosophy into the ReSOLVE framework proposed by the Ellen MacArthur Foundation (2013), as the conceptual framework method employed towards a circular business model. As a result, the recorded information in the retail store identified two main groups of food waste at the organic end-of-life chain: 1) fruits and vegetables; and 2) bakery and pastry. Approximately 95% of the food waste stream were fruits and vegetables. The remaining of the food waste stream were mainly cakes, bread and crackers. Afterwards, the Zero Waste principles~applied to this type of organic materials were translated to four management streams: (i) reduction, (ii) donation, (iii) animal feeding, and (iv) anaerobic digestion. Later, all of them were incorporated into a circular business model for the case study in hand. After applying these framework, findings showed that most of the food considered as waste can be recovered through different stages. It also showed the benefits of managing the food waste by saving about 40% of the food waste management costs through 3 business actions associated to those recovery stages. Potentials for this type of integrative managerial approach are foreseen optimistic as it can motivate the development of circular business models/actions for other type of discharged materials from the technical loops (MacArthur, 2013) e.g. clothing, electronics, among others. The barriers for this study to be implemented in a short-term are related mainly to financial constraints and Mexican current legislation. Although, the key concepts and benefits of the Zero Waste system and Circular Economy principles have been available for many years, very often the technical-environment-financial relationship are misaligned which have resulted in not circular systems, so far. Therefore, the results of this study contribute to raising awareness among different stakeholders regarding not only the economic losses associated to food waste but also to address the ethical dilemma posed by just simply throwing away food that might be returned in the value chain.~

Material, energy, and carbon footprints of the residential construction in Colombia: scenarios to 2050

Thursday, 15th June - 10:45 - SD 715 - Oral Abstract

Mr. Felipe Vásquez¹, Dr. Yris Olaya²

1. NTNU - Norwegian University of Science and Technology, 2. Universidad Nacional de Colombia - Sede Medellín

Almost 60 per cent of the world's population will live in urban areas by 2030, with 95% of urban growth expected to occur in the developing world. Yet, the developing world currently has vast unsatisfied housing needs characterised by rising numbers of people living in slums, inadequate dwellings, deficient access to basic sanitation and water, and constrained and inefficient use of resources like construction materials, land, and energy. Solving these housing issues is at the core of the Sustainable Development Goals (SDGs) 9, 11 and 12, however, the expected urban population growth reinforces concerns about sustainability of cities and challenges both urban planning and the achievement of the SDGs. Hence, fostering a transformation towards sustainable and resilient human settlements requires of an adequate understanding of the drivers and patterns of the urbanisation process and the implications for resources - materials and energy - and the environment. Industrial Ecology tools, particularly those in the areas of socioeconomic metabolism (SEM) and material flow analysis (MFA), can assist the formulation and evaluation of housing policies by favouring the understanding of the long term evolution and dynamics, past and future, of housing and construction under different socioeconomic development scenarios. A dynamic MFA stock-driven model that integrates demographic, economic, lifestyle and technological components is developed and applied to the case of Colombia in order to assess major construction materials demand (cement, steel, gravel, sand, brick), and indirect energy consumption and CO₂ emissions from materials between 2016 and 2050. The model illustrates the use of Industrial Ecology methods to assess sustainable development policies and goals in developing countries in relation to the residential sector. Material, energy and carbon emissions are analyzed for different development paths that incorporate changes in demographic and economic conditions, construction techniques, policies targeting housing deficit, as well as lifestyle-related preferences for type of dwelling. Discussion and conclusion will focus on policy information towards the achievement of the SDGs 9, 11 and 12, particularly related to sustainable resource management, resilient infrastructure development, upgrade of slums, and provision of adequate, safe and affordable housing and basic services for all population.

Circularity assessment in companies: conceptual elements for developing assessment tools

Thursday, 15th June - 11:00 - SD 715 - Oral Paper

*Ms. Juana Camacho Otero*¹, *Ms. Isabel Ordoñez*²

1. NTNU - Norwegian University of Science and Technology, 2. Chalmers University of Technology

Circularity assessment is a relatively new term that started to be used by organisations promoting the circular economy, but that has not been adequately defined in the scientific literature yet. Different actors have recently developed proposals for circularity assessment at the company level. Having an assessment tool that could be used as a measuring stick has been suggested as the first step in the transition towards a circular economy. Existing proposals for circularity assessment tools have different approaches to what should be evaluated, risking their potential for meaningful comparisons. To contribute to minimise the gap between tools, this paper provides a general framework of what a circularity assessment at the company level should include, based on input from expert sources. The framework was used to evaluate four existing circularity assessment proposals at the company level developed by four (4) stakeholders, Circle Economy and PGGM, Ellen Macarthur Foundation, Viktoria Swedish ICT and VBDO, resulting in the identification of alignments and misalignments. From this examination, it is possible to conclude that the main disagreements relate to what principles and criteria of circularity are used in the proposals, while scale and purpose of the assessment are the most agreed upon elements. Our results suggest that there is still room for improvement of existing circularity assessment tools for companies if they aim at supporting the implementation of a comprehensive circular economy strategy.

Initiating resource partnerships for industrial symbiosis

Thursday, 15th June - 11:15 - SD 715 - Oral Abstract

Dr. Anne Velenturf¹

1. University of Leeds

Industrial symbiosis is a strategy to limit carbon emissions whilst promoting resource efficiency and business development. This study interprets industrial symbiosis as waste-to-resource innovation. Understanding how these innovations are actually realised, and hence how they can be promoted by public and private partners, is still limited. Particularly initiating resource partnerships for waste-to-resource innovations in the absence of a government-funded facilitator, such as previously the National Industrial Symbiosis Programme in the UK, has remained underexplored. This presentation will explore how companies identify potential resource partners in terms of a) network and b) geographic distances. Based on case studies of waste-to-resource innovation in the Humber region, UK, this study concludes that a) companies identify resource partners among/ through their direct contacts that are involved in resource management themselves and b) that ca. 73% of these connections are located within a 75 miles radius. Furthermore, various new types of 'facilitators' were identified, demonstrating the need for a refined government approach to facilitate industrial symbiosis as part of the wider transition towards the circular economy. **Keywords:** Self-organised industrial symbiosis; Networks; Geographic proximity;~ Circular bio-economy; Business strategies

Value creation and distribution through sustainable enterprises

Thursday, 15th June - 10:15 - SD 716 - Oral Abstract

Dr. Roberto Gutierrez Poveda ¹, Dr. Ezequiel Reficco ¹

1. Universidad de los Andes

Sustainable enterprises, to a large extent, are created to redress undesirable imbalances between people, profits and planet –to catalyse positive change around them. Thus, while innovation in traditional business models is primarily focused in maximizing value capture by the organization, in sustainable business models innovations should be geared towards maximizing benefits for society and the environment (Schaltegger et al., 2012). In sum, sustainable enterprises exist to bring about a more fair and balanced distribution of the value created along their value systems. If the distribution of value created by sustainable enterprises were not different from that created by mainstream commercial enterprises, the concept of sustainable enterprise would be mostly devoid of meaning. To date, few studies have sought to measure the value created by sustainable enterprises. Published work on the subject has been conceptual and exploratory. In this paper, we seek to explore in systematic way how sustainable enterprises go about the creation of value, and how that surplus is appropriated along its value system. Our study is a multiple case study; the sample is composed of five companies that are profitable, dynamic and regarded as having successfully engrained sustainability in their business models. All firms relied entirely on low-income communities as providers of commodities. An in-depth review of the business models of sampled companies was carried out, with a focus on those innovations that impacted value creation and capture along the entire value system. We assessed value-creation through a value-based approach (Brandenburger and Stuart, 1996), looking at how these value propositions drove a wedge between buyers' willingness to pay and suppliers' cost of opportunity. Once value is created, the available surplus is then divided between suppliers, producer and buyers. To analyse the distribution of value along the value system, we used gross margins per unit: the ratio between the product's gross profit (wholesale price – COGS) to wholesale price. Gross profit has been found an appropriate metric to assess value capture in a product-specific level of analysis, as it leaves aside administrative efficiencies (reflected in operating profit) and non-production factors (Dedrick et al., 2010). To put the impact of the innovation in context, we then compared the distribution of value in each of these sustainable enterprises, with their counterparts in mainstream commercial value systems. Findings suggest a distinct pattern of value-distribution in sampled organizations, one that departs from their mainstream counterparts. The study also identified mechanisms through which sustainable business models created more equitable and environmentally sustainable value systems. The study contributes to theory by developing a set of metrics to measure the creation of value through sustainable innovation in value systems, and to assess how it is distributed between a company, the environment and society.~

Transitory paths to a more sustainable textile value chain

Thursday, 15th June - 10:30 - SD 716 - Oral Abstract

Dr. André Matthes ¹, Prof. Marlen Arnold ¹, Prof. Holger Cebulla ¹

1. Technische Universität Chemnitz

For more than ten years, the concept of sustainable development has changed the textile industry worldwide and its business models, indeed partly, current more fundamentally. At the same time, a comprehensive and integrative sustainable textile chain is not within reach (Aridov et al., 2015; Gjerdrum et al., 2015; Pedersen and Gwozdz, 2014; Ricchetti, 2016; Pedersen and Andersen, 2015). Thus, the following challenges are still unsolved:

- **A lack of an overview of all chemicals:** Which chemicals are used for which raw materials and processing substances at which process and value-added stages of the textile chain to be used and possibly to act in humans and in ecology?
- **The label jungle:** Uncertainty about the certification standards that refer to which chemicals, industrial technologies and processes as well as the sustainability area in the entire textile value chain. No certification standard pursues the integrative approach of sustainability universally for all products of the textile chain.
- **Sustainable consumption:** How can end-users and purchaser or retailer be informed about the non-sustainability and toxicity of the textiles, and how can transparency be created in the whole textile chain?

These challenges are addressed by new and ongoing research to develop recommendations for the next steps towards a holistically more sustainable textile chain regarding to economy, ecology and social issues for each of the three pillars of a society, civil society organisations, politics and the economy. So, the aim is to generate graphics (e.g. of potential path changes) as well as the use in industry, trade and education in order to enable greater transparency along the textile value chain. The comparison of different textile process chains, the use of chemicals and their sustainability content can be used for recommendations of alternative paths and technology-chemical combinations as well as to develop adequate training materials. In addition to the analytical-integrative approach, workshops with selected practice partners discussing new diffusion and consumption patterns are a transdisciplinary component of the research in order to be able to better understand sustainability-related changes in consumer patterns of different milieu groups with regard to textiles and to form adequate incentives and structures. In addition, a feasibility analysis should be carried out to identify possible regional and international real-life laboratories to realize an essential contribution to the strengthening of sustainable development. The combination of textile value chain, use of chemicals, analysis of laboratories, sustainability requirements as well as economic, consumption-based and political recommendations follow an holistic approach. By means of discussion forums (companies, consumers and politics), the intention is to identify the paths of awareness and action, and to discuss alternative value-added paths and / or new forms of regional economic forums (e.g. cooperative alternatives or regional economic communities) and political control mechanisms. Diverse and innovative diffusion methods, like summer school, digital training materials, interactive publications enable the entrance into the textile reality. All at once lead to real transition to sustainability in textile chain from fibre to garment. Keywords: textile chain, laboratories of reality, chemicals, digital trainings, regional economic forums

Corporate sustainability: A simulation model to evaluate its feasibility

Thursday, 15th June - 10:45 - SD 716 - Oral Abstract

***Prof. Juan Pablo Soto*¹, *Dr. Andrés Link*², *Dr. Nathalia Franco*³**

1. Universidad de los Andes, 2. Uni, 3. Universidad

Given the Sustainable Development Goal agenda defined by United Nations in 2015, there is a new trend to create new business models looking for the social, environmental and economic equilibrium. Business models are “concerned with how the firm defines its competitive strategy, through the design of the product or service it offers to its market, how it charges for it, what it costs to produce, how it differentiates itself from other firms by the value proposition, and how the firm integrates its own value chain with those of other firm’s in a value network” (Rasmussen, 2007). On the other hand, Sustainable Business Models (SBM) “incorporate the triple bottom line approach and change of stakeholders interests including environment and society” (Bocken et al, 2013). They are important to incorporate and evaluate sustainable innovation and development within business, and used to understand the way in which firms incorporate sustainable innovations, considering dynamics within the internal firm and with the environment surrounding the firm. Bocken et al. 2014, define nine types of SBM archetypes. Those models were obtained from the observation and classification of different business models observed in practice. Those archetypes can determine different strategies that organizations can use in order to improve their sustainability. However, for a certain firm or industry, it still difficult to evaluate which of those archetypes fits better with the current company situation in order to become more sustainable. Sustainable development concepts and applications have been receiving growing attention in management literature and practice during the last 20 years (Hahn, T., Figge, F., Pinkse, J. and Preuss, L.; 2010). Currently there still several challenges in terms of finding scenarios and conditions in which economic, social and environmental fields are in harmony. For a given ecosystem (e.g. company, industry, geography) is it possible to find which are the common areas where they can coexist? Or at least is it possible to better understand how trade-offs are present?. This paper contributes both to literature and to practice by introducing a new conceptual framework to model ecosystems and analyze how the trade-offs between social, economic and environmental wellbeing are present and if there are viable conditions in which the three of them can be in equilibrium. The model states that there are different rates that shape the environmental, economic and social dynamics: $\{\}1\{\}$ The rate of natural processes defined as the rate at which biological systems can recover from disturbances, such as natural disasters or anthropogenic resource extraction; $\{\}2\{\}$ the rate of corporate processes defined as the minimum rate at which goods and services are produced to guarantee financial viability, and $\{\}3\{\}$ the rate of social processes defined as the need of societies to growing and develop, with the satisfaction of the needs of society. This conceptual framework is tested with a simulation model where some of the archetypes introduced by Bocken et al. 2014, are used to evaluate the different tradeoffs between the economic, social and environmental areas and how they reconcile with the concept of sustainable development.

Cracking the Base of the Pyramid nut: How a MNC implemented a scalable and profitable BoP program in Latin America

Thursday, 15th June - 11:00 - SD 716 - Oral Abstract

***Dr. Ezequiel Reficco*¹, *Dr. Roberto Gutierrez Poveda*², *Dr. Veneta Andonova*¹**

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In the last decade, the so-called BoP —acronym that stands for Base (or Bottom) of the Pyramid—consolidated as a strand of research and practice that approaches the poor not as objects of charity, but as active economic agents (Márquez, Reficco, & Berger, 2009). However, increased interest on the subject has not been accompanied by a surge in lucrative BoP ventures; on the contrary, those “still are the exception, not the rule” (Jenkins & Ishikawa, 2010, p. 4). To the extent that successful experiences with the BoP have been documented, those were *not* led by large established corporations, but by NGO’s or SMEs (Márquez & Reficco, 2007; Reficco & Gutiérrez, 2016). “Despite enthusiastic advocacy by prominent management scholars and endorsement by large multinationals, BoP has failed to deliver its promise of a market-driven solution to poverty” (AoM, 2011). Such a performance deficit is regrettable, as large corporations have the scale, the financial muscle, the R&D capabilities and the global reach to potentially have the most positive impact on the lives of the poor (Prahalad, 2005). The scarcity of success stories makes the publication of case studies of prosperous BoP ventures by large MNC all the more valuable, as “empirical research on the profitability of market-based initiatives involving low-income sectors (LIS) remains scarce” (Bruni Celli & González, 2010, p. 229). The crux of the matter in this literature is showing *real* profitability, as many MNC have succumbed to the temptation of bragging about unprofitable ventures with the poor, that were actually little more than disguised philanthropic or public relations programs, aimed at boosting reputation or social goodwill, not shareholder value (Bruni Celli, González, & Gómez Samper, 2009, p. 52). This paper seeks to contribute to filling that gap. We document in detail a commercial initiative carried out by Nestlé, a Swiss multinational, in the Dominican Republic. This is a mature initiative, that has been running for over a decade, which has achieved scale and solid performance results, both on the business and on the social sides. Those attributes make the experience a *rara avis* in the field, a succulent “information-rich” case “from which one can learn a great deal about matters of importance and therefore worthy of in-depth study” (Patton, 2002, p. 242). Nestlé’s BoP venture focused downstream, with an innovative “micro-franchise” scheme that engaged the company mainstream distributors and community organizations. This novel approach has been termed “inclusive distribution” (Observatorio SCALA, 2016), and published academic cases studies on the subject are virtually non-existent.~ In this study, we show how this value network has created the incentives for all parties involved to scale up. Preliminary results suggest that venture growth and community betterment did not come about through the redistribution of value from one pocket to another. On the contrary, the BoP appears to have succeeded in creating value, or “expanding the pie” of the value system (Brandenburger & Stuart, 1996; Nalebuff, 1997), with all parties operating at or above cost of opportunity.~

Immersed Engagement: A new approach to collaborative planning in Aotearoa - New Zealand

Thursday, 15th June - 10:15 - SD 203 - Oral Paper

Dr. Maria Rita De Jesus Dionisio McHugh¹, Prof. Simon Kingham¹

1. University of Canterbury

This paper aims to introduce the concept of immersed engagement in urban planning, a engagement technique used to support and enhance collaboration between different organisations and communities involved in processes of urban planning. The need for collaboration, cooperation, and co-creation in urban planning is becoming increasingly recognised in many countries including New Zealand. In recent decades, significant collaborative work has taken place between local government planning authorities and industry, research institutes and universities to engage local communities in broader decision-making processes. Collaboration can take many forms, from information exchange to consultation partnerships, and these often occurs in the urban planning process. However, current engagement and participation frameworks have limitations in integrating information, feedback, and advice from the public into the core of decision-making in urban planning. The concept of immersed engagement emerged in this context, and is aimed at promoting long-lasting, trustworthy and ongoing engagement between government and a range of stakeholders. This paper focuses on the concept of immersed engagement and the potential it offers to advance co-creation and shared decision-making, as an alternative to conventional participatory approaches used in urban planning. Additionally, this paper looks at how best to implement immersed engagement, and examines the benefits of this new engagement technique, through lessons drawn from two research projects in New Zealand. The paper concludes by discussing the implications of advancing this engagement technique in the international context of urban and collaborative planning.

Waste Management Governance in Colombia: the case of National Alliance for Inclusive Recycling

Thursday, 15th June - 10:30 - SD 203 - Oral Paper

*Dr. Andrea Ventura*¹, *Dr. Celio Andrade*¹

1. Federal University of Bahia

Waste management is considered to be one of the most important challenges that must be faced by the international sustainable development research community, and also by decision makers responsible for global environmental governance. In Latin American and the Caribbean (LAC) countries this is 4 million waste pickers earn their livelihood by being a part of the recyclables supply chain. Some countries, such as Brazil and Colombia, are adopting pioneering strategies to incorporate these professionals into their waste management models.~ In Colombia, a collaborative governance arrangement is being developed which involves the government, private companies, waste pickers and society: the Alianza Nacional para el Reciclaje Inclusivo (National Alliance for Inclusive Recycling).~ This model is obtaining good results not only with recycling, but also with social inclusion. The main purpose of this paper is to comprehend how distinct organizations could work together to build and develop a waste management model that truly includes the waste pickers. The current investigation is being accomplished using a case study research methodology, based on interviews and data analysis. Despite being an ongoing investigation, some initial findings have been determined: (i) the process to Alliance creation had a key stakeholder represented by IRR (Iniciativa Regional para el Reciclaje Inclusivo / Regional Initiative for Inclusive Recycling), that was also formed in a net governance process; (ii) the participation of CEMPRE (Compromiso Empresarial para el Reciclaje / Business Commitment for Recycling) was fundamental to guarantee the pickers empowerment; (iii) the Colombian government was open and receptive to help to design new structures to guarantee inclusiveness in the waste management process in the country; and (iv) there is a necessity for changes in the law and the creation of public policies to make the changes possible. The main conclusion is the necessity of powerful and engaged stakeholders in the governance process having a unified approach to making a difference, involving win-win decision making leading to achievable environmental, social and economic gains.~ \textbf{Key words:} Waste Management Governance; National Alliance for Inclusive Recycling; LAC Countries.

The management effectiveness of the Mico-Leão-Dourado Mosaic (Mosaico Mico Leão Dourado). RJ/BR

Thursday, 15th June - 10:45 - SD 203 - Oral Paper

Ms. ANA CAROLINA MARQUES¹, Dr. Camila Rodrigues¹

1. UNIVERSIDADE FEDERAL RURAL DO RIO DE JANEIRO

The Protected Area Mosaics (Mosaicos de Áreas Protegidas, MAP) are formed when there are Protected Areas (PA) in close proximity to each other or overlapped in a same territory, even if they are managed by different governmental or private scopes. They aim to improve the management of PA through ecosystem connectivity and also through an integrated and efficient management of both material and human resources of those areas. MAP are managed by councils formed by governmental and civil society entities from the territory. This study refers to Mico-Leão-Dourado Mosaic (Mosaico Mico-Leão-Dourado, MMLD), which has an area of 209,000 hectares, along 8 municipalities. It is composed by 5 Federal, 1 state and 13 private PA, and it's entirely located in Rio de Janeiro state, in a region of coastal lowland. Once it is the Golden Lion Tamarin habitat, this Mosaic has been formed in order to strengthen the integrated management among PA, in such a way to improve the species preservation. Being an instrument of public politics, it is crucial that the efficiency of Mosaics is analyzed and that the principle of continuous improvement is followed. This work intended to analyze the efficiency of Mico-Leão-Dourado Mosaic management, and such analysis has been performed through a protocol designed to this end. This protocol is qualitative and quantitative, presenting 46 indicators divided into 4 scopes: Governance, Management, Sociodiversity and Biodiversity. Each counselor assigns each indicator a score from 0-3: 0 (non-occurrent), 1 (rarely occurs), 2 (usually occurs), and 3 (occurs a lot). The mean of each indicator is calculated and the T-Test is applied to verify the effectiveness of the indicator, taking into account those with a mean above 2. The number of effective indicators determines the scopes and mosaic effectiveness in a percentage, being 35% Not Effective, 36%-50% Low Effectiveness, 51%-75% Medium Effectiveness, and 76%-100% High Effectiveness. 39 indicators and 2 scopes were considered effective. From this 39 indicators, 19 presented low but effective means according to the T-Test. The two failed areas were Management and Sociodiversity. The indicators ranged from 76%-100%, but the scopes from 36%-50%, so, we have classified MMLD as a MAP with a Medium Effectiveness, which effective areas were Governance and Biodiversity, requiring greater attention to the Management and Sociodiversity of the territory. In order to do so, it is necessary for the Mosaic Management Council to pay more consideration to issues involving local populations, as well as to provide a better dissemination of the MMLD to them and integration with the public management bureaus that influence the territory. MAP are examples of collaborative governance of the territory, integrating the Government and civil society, so, its proper functioning is crucial for the sustainable development of the territory and protection of both local communities and biodiversity. The study shows how a truly integrated work between government and society, with divided responsibilities and decision power is essential to build scenery of efficient collaborative governance.

Collaborative governance and new challenges to forest agenda in Latin America

Thursday, 15th June - 11:00 - SD 203 - Oral Abstract

***Ms. Liviam Cordeiro-Beduschi*¹, *Dr. Evandro Mateus Moretto*²**

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In the last two decades, new forms of forest governance have been established based on the interaction of different social actors and their varying points of view on the use and conservation of native forests in Latin America. The objective of this paper is to present a discussion about the governance arrangements that support the promotion of the sustainable use of native forests and aim to solve collective problems related to the degradation, loss, and illegal exploitation of forest resources. The study has been carried out in two Latin American countries, where the responsible law enforcement agencies (such as the Native Forests Law in Chile and the Public Forest Management Law in Brazil) face these novel challenges. From the theoretical perspective, the study is based on the analysis of institutions and decision-making processes, guided by theories of sociology and environmental economics. As a method, an analytical framework was established that gathers the indicators of good governance of forests, the characteristics of the governance platforms and the scope of forest governance in each country. The sources for the analysis in this study included official documentation, field evidence as well as interviews with actors involved in the forest agenda at various levels (local, national, and international). The study demonstrates that there is no single model of forest governance, but rather that several governance platforms co-exist and respond in varying ways to the current problems, including the mitigation of climate change and maintenance of the economic value of the native forest. The diversity of governance platforms is also reflected in the collaborative capacity of actors involved in the development of legal rules for the use and management of native forests in Latin America.

Institutional Dimensions for Sustainable Development: The Designated National Authority in Brazil and Mexico.

Thursday, 15th June - 11:15 - SD 203 - Oral Abstract

***Dr. Lira Luz Benites Lázaro*¹, *Dr. Neli Ap. De Mello-théry*², *Dr. José Celio Andrade*³**

1. University of São Paulo; 2. University of Sao Paolo, 3. Federal University of Bahia

The Designated National Authorities (DNAs) was pivotal for developing countries in achieving sustainable development contributions from Kyoto Protocol's Clean Development Mechanism (CDM). Under the United Nations Framework Convention on Climate Change CDM projects must be approved by the host country, thus, DNAs issues a Letter of Approval certifying that the proposed CDM project activity supports the host country in achieving sustainable development. The focus of the paper is particularly on the role of the DNA, which is a national agency responsible for approving the country's CDM projects. The paper provides a comparative institutional analysis of the DNAs in the two countries. Three dimensions of the DNAs are considered: their structures, their policies and the CDM project market building capacity. The results of the study shows the capacity building to tackle the challenges associated have had some positive impacts to achieve sustainable development. Brazil established five criteria: local environmental sustainability; development of working conditions and net job creation; income distribution; training and technological development; and contribution to regional integration and linkages with other sectors. In Mexico, the DNA's criteria include: compliance with national environmental regulations; contribution to the improvement of the economic and competitive situation of the country (through investments, wealth generation/employment and technology transfer); and contribution to maintaining and improving the quality of life of communities (with permanent jobs that promote equity, improving community health, creating or improving local infrastructure and capacity building). However, in CDM projects there is absence of requirements for monitoring, there is no verification of whether expected sustainable developments benefits are actually achieved, and as sustainable development has no monetary value in the carbon market, the trend has been to prioritize the Certified Emission Reductions. The countries emphasized the economic aspect. We conclude that political and institutional factors, including legal aspects, stimulate different forms of transformation processes of relevance to sustainable development across countries, which could be serve under Paris Agreement. **Keywords:** Governance, Institution, Designated National Authority, Clean Development Mechanism, Public Policy, Sustainable Development, Paris Agreement.

Analysis of Government effectiveness and its impact on the human being's development

Thursday, 15th June - 11:30 - SD 203 - Oral Paper

Mr. André Alves¹, Ms. Marcia Hino¹

1. ISAE - Instituto Superior de Administração e Economia do Mercosul

One of the most important government responsibility is to promote the well-being for its population. This can be achieved ensuring that law is fulfilled, order is assured and basic goods and public services are available to everyone. When legitimate laws are not the ones to guide Institutions, they tend to be less capable to deliver public services to population. Responsibility coverage is broad and affects countries in different perspectives and proportions. It is known that many countries fail in their purpose to promote the welfare for their population. According to the UN, corruption affect the Government's ability to provide basic services, feeds inequality and injustice. Thus, the lack of government effectiveness compromises the development of countries. Early 2017 the Transparency International published the ranking of corruption perception in which 2/3 of countries are below 50 on a scale of 0 (highly corrupt) to 100 (very clean). The failure of national governance is pointed for World Bank as the main risk faced for Latin American and Sub-Saharan countries and is considered to be among the top three most likely risk in the Middle East and North Africa, East Asia and Pacific, and Central Asia countries. Due to its relevance, in September/2015, the UN launched the Sustainable Development Goals (SDGs). Such initiatives, also known as Agenda 2030, foresee a series of targets to be implemented until 2030 by countries compromised with the sustainable development that signed Paris Agreement. In a total of 17 goals that cover areas of critical importance for humanity, such as planet, people, peace, prosperity, the highlight goes to SDG 16 entitled "Peace, Justice and Strong Institutions". In this context, the research aims to investigate the government effectiveness and its impact on the human being's development. A quantitative approach was adopted for analysis. The use of HDI index, adopted by UN since 1990 to measure the human-being development in the countries, and World Governance Indicators (WGI), sustained by the World Bank since 1996, support the study. Preliminary results identified the existence of correlation between the government effectiveness and the countries' human-being development. Results also indicate that countries with high levels of government effectiveness tend to have greater human-being development. The main contribution of this research lies on fomenting the debate, bringing actual perspectives on the subject and generating subsidies for the governmental efficiency improvement. The results can be used as a basis for future qualitative research, as well as for orientation of countries, state and municipalities, in the development of more effective tools for human development and efficiency of public power. Keywords: human development; government effectiveness; sustainable development

Pollution indicators for use in Life Cycle Assessment: review and simplification

Thursday, 15th June - 14:00 - SD 701 - Oral Paper

Ms. Sofia Luís¹, Dr. João Joanaz de Melo²

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Life Cycle Assessment (LCA) is a well-known tool in the scientific community, useful to compare products and industrial processes. However, LCA is not commonly used in the industry, as it requires a large effort and investment. There is a large variety of Life Cycle Impact assessment (LCIA) methods, some quite complex, each with different methodologies that lead to different results and eventually different decisions. In particular, the integration of pollutants into aggregate indicators has been treated in many different ways, both due to different approaches and because the impact of certain pollutants is not yet fully understood by the scientific community (dioxins and furans are a case in point that merited particular attention). Additionally, the range of local impacts is wide and not easy to adapt to LCA (which of necessity must be standardized over multiple products and processes). The aim of this work is to provide a solid comparison of indicators of pollution to air, water and soil, provided by a variety of LCIA methods: CML2001, Eco-indicator99, EDIP2003, Impact2002+, ReCiPe, TRACI and EcoBlok. The pollutants considered are those in the Pollutant Release and Transfer Register (PRTR), established by the Kiev Protocol under the Aarhus Convention, which covers nearly all pollutants invoked by the LCIA methods and is supported by international databases. The first step was to compare the relative importance attributed by each method to the range of pollutants. The second step was to compute equivalent pollution, as defined by each method, for nine major industrial sectors (energy, metallurgy, mining, chemicals, waste treatment, wood and paper, livestock, agri-food, and others), using available information of the PRTR-Europe database. The third step was to compare results provided by the different methods and examine similarities and differences between them. Results indicate that most methods converge in impact categories such as global warming and acidification potential. The most significant differences emerge in the human health and ecotoxicity impact categories, where the same pollutant may vary in relative importance by five orders of magnitude, from one method to the other; similar differences appear when comparing economic sectors in those impact categories. Although these are preliminary findings, it can be argued that the additional work required by some complex methods does not seem to be rewarded by more robust or useful results. Simpler methods may be as meaningful, more transparent and easier to use in practice by the industry. **Keywords:** environmental indicators, life cycle assessment, pollution

ECO-PRODUCTIVITY AS AN INDICATOR FOR SUSTAINABILITY

Thursday, 15th June - 14:15 - SD 701 - Oral Abstract

***Prof. Carolina Daza-Beltrán*¹, *Prof. Martha H. Saravia-Pinilla*¹, *Dr. Gabriel García-Acosta*²**

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The work presented in this paper is part of a collaborative research project looking for the development of ergoecology as a framework for the design and improvement of innovative products and services. Defined since 1997 by García-Acosta, Saravia & Romero as a scientific and technological discipline, the *Ergoecology* –from a systemic focus– takes care of studying the human-being and its relationships with the environment –through its activities (work)– to establish, analyse, reduce, prevent, control and rectify the impacts (positives and negatives) that derive from such a relationship (García-Acosta, Saravia, Romero & Lange, 2014), creating a direct interdisciplinary connection between the area of ergonomics and the broad field of ecology. Looking forward to a dynamic equilibrium and an environmental balance, Ergoecology proposes as postulates ‘eco-efficiency’ and ‘eco-productivity’. However, the last one has not been sufficiently developed in a way to be applied. This work puts forward the concept of eco-productivity and some guidelines for its application from the Ergoecology perspective. The methodology was a systematic literature review with analytical approach using Nvivo 11. The basis for the review was the Ergoecological Fundamentals, which include: principles and postulates (eco-productivity, eco-efficiency and eco-effectiveness (García et al, 2014) as well as some notions (macroconcepts) regarding design, product development, innovation, sustainability, ecology, and ergonomics was built, in order to identify the keywords to build the search equations. After reviewing almost 850 documents from different databases we found 15 that mentioned at least two of the three postulates of ergoecology. Only five of them ~talked about eco-productivity (Barbiroli, 2006; García-Acosta, Saravia & Riba, 2012; Tatcher, García-Acosta, & Lange, 2013; Lange, Tatcher, & García-Acosta, 2014; García-Acosta, Saravia, Romero & Lange, 2014). Barbiroli proposed the need of achieve eco-effectiveness in order to increase productivity of resources. This relationship is based on restitution and regeneration of resources which could increment the availability of materials and supplies. Instead, ergoecology, defined eco-productivity as the ability of systems to transform energy, matter (resources) and information into products or services, without generating negative impacts on other systems that interact with them. In that sense, this implies in the first place, the rationalization of the impact variables to control the productive system and always tending to the operational equilibrium (García-Acosta, Saravia, Romero & Lange, 2014), and secondly the application of environmentally friendly innovative technological changes to develop environmentally acceptable products and processes. In order to achieve the eco-productivity, some guidelines for its application are proposed from Ergoecology. These guidelines includes three moments of productive processes: The use of resources (input), resource processing (processes) and products obtained and use (output); adopting the axioms of Ergoecology (energy, matter and information) as eco-productivity estimating variables. We may conclude, that the concepts of *eco-productivity* along with the *systemic eco-efficiency* can become strategic indicators to assess the interdependencies between artefact–human systems or sociotechnical systems and natural systems. The eco-productivity guidelines can contribute to decision-making in the different phases of production processes to ensure the long-term sustainability of organizations.

The Sustainability of the Millennium Development Goal to Halve Poverty

Thursday, 15th June - 14:30 - SD 701 - Oral Abstract

Prof. Yaniv Stopnitzky¹

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The United Nations Millennium Summit in 2000 resulted in a commitment by UN member states to a development agenda comprised of eight specific human development goals with accompanying sub-targets, which are to be achieved by 2015. Most prominent among these ambitious objectives has been the halving of global poverty between 1990 and 2015. This MDG represents an international commitment to reduce the incidence of people living on less than \$1 per day from approximately 3% to 15% of the developing world population. Given population growth, reaching this goal meant the abrogation of extreme poverty for an estimated one billion people. This paper makes two contributions to our understanding of the sustainability of progress toward this goal. First, it extends recent work on sustainability indicators, such as the adjusted net savings figures of the World Bank, by incorporating novel methods for human capital accounting and the country-specific computation of capital-output ratios. Second, the paper applies these new measures of genuine income and comprehensive wealth to assess countries' progress toward the MDG on poverty reduction. I use this new dataset on 126 countries from the period 1990 to 2014 to calculate annual genuine income, genuine income per capita, and genuine wealth per capita, and show that for a large subset of countries this indicators of sustainability were negative. Most importantly, I show that genuine wealth per capita was shrinking rather than growing in 58 countries over this time period. These countries may have made progress toward or achieved their Millennium Development Goal of poverty when looking at traditional income measures such as Gross Domestic Product but a more expansive view of economic activity suggests GDP per capita was boosted at the expense of the overall productive asset base on which the economy, and all human well-being, fundamentally depends. This finding raises concern about the medium to long-term sustainability of the globe's recent halving of absolute poverty.

Sustainability Indicator Approaches in River Basin Planning and Management: An Integrative Review

Thursday, 15th June - 14:45 - SD 701 - Oral Abstract

***Mr. André Batalhão*¹, *Dr. Denilson Teixeira*², *Prof. Tomás B. Ramos*³**

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Sustainability indicators are essential tools to ensure the identification of a comprehensive strategies and realistic way of assessing and improving sustainability. This tool can be used for river basin planning and management, including monitoring, assessment and reporting. Also, indicators are important assessment tools to identify social needs and contribute to public planning and management. However, the proper use of indicators in the public management is still a methodological and political challenge with rather vague guidelines in many scales. Few studies explored the different potential uses and impacts of indicators as complementary tool to decision-making in water management and planning processes. The aim of this research was to conduct an integrative review of different sustainability indicator approaches used for river basin planning and management. The literature review was mainly supported by a selection of scientific papers from Scopus. The analyzed manuscripts were dated from the year 1995 to 2016 with the following keywords: "sustainability", "river basin", and "indicators". The initial list (N = 134) consisted of academic papers based on set of keywords. Secondly we performed a screening based on all the topics of the papers, not limiting the search of the terms in titles or abstracts. We executed this task manually to ensure that the content of the papers was related to the system of indicators (final list N=130). The main findings demonstrated similar results in territorial level however we identified different models of sustainability adopted. Most of the experiences were regional territorial scope, had a systemic approach, and adopted an indicator model supported by environmental metrics. We conclude that the indicators systems reviewed are not only a set of different technical approaches and tools, but a balance of strategies, demands, actions and tacit knowledge. Keywords: sustainability indicators; river basin, management, planning

Assessing the financial sustainability of 'Alternative Food Networks' in the UK using box schemes as an example

Thursday, 15th June - 15:00 - SD 701 - Oral Abstract

Ms. Paola Guzman¹

1. Coventry University

Retailing of organic produce in Europe and North America can be divided into two types -supermarket and non-supermarket. Supermarket retailing of organic produce usually favours production in bigger farms which grow six to ten crops per year, employ low wage labour and are profitable due to the economies of scale. Non-supermarket retailing is perceived as favouring small scale production where farmers tend to grow more than 30 varieties of crops and earn higher returns due to smaller supply chains. Examples of non-supermarket retailing are farmer's markets, independent shops, food cooperatives, buying groups, online retail, community supported agriculture (CSAs) projects and box schemes. In academia, these types of enterprises have been part of the 'Alternative Food Networks' (AFN) literature. The literature proposes that AFNs are more sustainable than conventional food retail because they aim to provide food sustainably by belonging to a certain locale, being financially viable, ecologically sustainable and socially just. But the sustainability of AFNs is questionable. Literature has highlighted socio-economic problems in the implementation of AFNs such as low wages, exclusion and protectionism. Whilst the organic movement in Europe and North America has developed knowledge and complexity in organic production techniques, it lacks knowledge on how to sustainably retail organic produce. As a result, some AFNs have begun to self-regulate by what is being called 'beyond organic' certification. In the UK 'beyond organic' certifications hope to demonstrate that there are AFN retail businesses that have overcome socio-economic problems. They aim to introduce industry standards and benchmark current practices to support the growth of the sector. However, the organisers behind these initiatives have little understanding of the financial sustainability of the sector and what indicators to use in order to assess it. Furthermore, interest in understanding the sustainability, including financial, of the sector has become more important thanks to the uncertainty on food and farming policy in the UK due to Brexit. The AFN sector wants to be able to influence new policy that potentially will be beneficial for it. This research aims to assess the economic value, economic impact and scalability of AFNs using vegetable box schemes as an example. Vegetable box schemes are businesses that deliver fresh produce weekly and customers pay in advance of delivery therefore ensuring demand week by week. The research will develop indicators to assess the financial sustainability of box schemes This presentation will show a hybrid approach to assess box scheme's financial sustainability. This approach considers box scheme's commitment to locale, environment, social justice and financial viability. It will present results from a desktop research of frameworks to evaluate the financial sustainability of supply chains and food systems and a critical review of the values based supply chain framework developed in the USA. Finally, it will report on initial results of a national box scheme survey and how the hybrid approach will generate financial sustainability indicators that could be adopted by 'beyond organic' certifications.

The growing acceptance of eco labelling: An empirical analysis in Spain

Thursday, 15th June - 14:00 - SD 702 - Oral Paper

***Mrs. Vanessa Prieto-Sandoval*¹, *Prof. Marta Ormazabal*¹, *Prof. Carmen Jaca*¹, *Dr. José Alfaro*¹, *Prof. Andrés Mejía-Villa*²**

1. University of Navarra, 2. Universidad de La Sabana

An ecolabel is the visible manifestation of a voluntary eco-innovation process. In this process, consumers' environmental expectations are met; firms increase their created and captured value and enhance their sustainability, and governments and institutions foster sustainable production and consumption. The European Ecolabel, also known as EU Flower, has the mission to regulate and propose common standards in the region and it has been considered one of the ways to promote the Europe's transition to a circular economy in Europe. Even though, the European Commission communicates the evolution of EU Label in the whole region, little is known about the EU Ecolabel evolution in Spain and it is not clear what are the drivers that encourage its implementation. Thus, the aim of this study is to assess the EU Label growing acceptance in the European Union and, more specifically in Spain by product categories and by geographical regions. The analysis shows that the major part of EU Label awarded products, in Spain, belong to the following categories: do it yourself (paints and varnishes), paper products, cleaning up, and electronic equipment. Interestingly, this study also shows that there are clear indications that the regions with higher incomes and exports in the country tend to register more products with eco-labels. Moreover, the regions with higher rates of ecolabelling have implemented and promoted sustainable public procurement criteria. Finally, this study may contribute as an important guidance for policy makers and firms to trigger ecolabelling practices and the transition to a circular economy in Spain and other regions with cultural proximity, like Ibero-America. \textbf{Keywords:} Environmental certificates, EU Flower, eco-innovation, Spain, Circular Economy indicator, eco labeling.~

Exploring the relationship between green hotel attributes, guest satisfaction and loyalty

Thursday, 15th June - 14:15 - SD 702 - Oral Paper

Prof. Roberto Merli ¹, Dr. michele preziosi ¹, Dr. Alessia Acampora ¹

1. Roma Tre University

Sustainability in tourism emerged as a critical issue for a long-term strategy of industry's growth. The accommodation sector is responsible for roughly one-quarter of tourism GHG emission and, since decades, have been applying eco-friendly practices on a voluntary basis. The implementation of these practices is partly a consequence of consumers' growing awareness toward environmental sustainability. Examining the results of a survey addressed to guests of an Italian hotel awarded with Legambiente Turismo Eco-label, the paper investigates the relationship between guest perceptions of hotel green attributes, guest satisfaction and loyalty. Variance-based Structural Equation Modelling (SEM) has been employed to test hypothesis. Findings suggest that the environmental practices implemented by the hotel have positive impact on guest overall satisfaction, loyalty. Moreover, results indicate that the staying at green hotel lead guests to develop a specific loyalty toward the whole range of hotels implementing green practices.

Management Challenges of a Circular Economy

Thursday, 15th June - 14:30 - SD 702 - Oral Abstract

Prof. Rupert J. Baumgartner¹

1. University of Graz

The concept of a circular economy has received an increased interest by public, societal and corporate actors in the last years. The basic idea is that the current linear industrial system, which uses raw materials for infrastructure, products and services which are disposed after their life time, is changed to a circular system where products, materials and energies are used in cycles as long as possible. The advocates of a circular economy ascribe different benefits coming along with this change from a linear to a circular economy; especially environmental benefits like less/zero waste, increased resource efficiency and less negative impacts in ecosystems, but also societal and economic benefits. However, two research questions require still further attention. First, is circular economy contributing to the vision of sustainable development? Second, which implications for companies come along if principles of circular economy are being applied in our economic system? To answer these research questions the concept of a circular economy is analyzed from both, a management and a sustainability perspective. By doing so, it is revealed in which way and under which conditions a circular economy contributes to a sustainable development of our societies and which implications the concept of a circular economy has for the management of companies pursuing this idea of circularity (or loop-closing). This analysis follows a pragmatic approach to combine insights from management science, especially strategic management and supply chain management, with sustainability studies. Propositions are developed to explain the relationship between a circular economy and sustainable development as well as business management, these propositions are based on a comprehensive literature analysis. The results of this analysis are relevant for those interested in the links between circular economy, sustainable development and business management. The theoretical contribution is that it is clarified, when and how circular economy can contribute to sustainability and which implications circular economy has for business management. Managerial implications are that managers can identify central issues for the integration of circular economy into their organization.

Integral design of wastewater management systems: Challenges and opportunities to contribute to environmental sustainability

Thursday, 15th June - 14:00 - SD 703 - Oral Abstract

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1. Universidad Autónoma de Occidente

Wastewater has been one of the most widely researched environmental resources due to the environmental, social and economic impacts of its discharge on aquatic and terrestrial ecosystems. The development of wastewater management systems has caused, that currently a numerous of technological developments are available, ranging from transport structures for wastewater to advanced treatment systems, that allow the separation of pollutants that limit its use; However, in many cases these systems have been conceived as independent structures or components, which has limited the efficient and integral use of resources derived from wastewater management. According to van Loosdrecht et al. (2014) the future performance indicators of the urban and municipal wastewater systems should be include apart from the water quality limits, five fundamental aspects, related with the management of resources such as water, solids, air, energy and chemicals. For water, options such as reuse, aquifer recharge, potabilization and industrial or agricultural consumption are proposing. For solids are proposed the use in industry or agriculture and their adequate final disposal. For the air is proposed the control of the greenhouse gases emission. For energy is proposed to potentiate the generation and exploitation of methane and hydrogen as a result of the organic matter of the wastewater transformation, and for the chemical alternatives are proposed, the recovery of nitrogen and phosphorus of the wastewater and reduction of chemical uses, through the use and monitoring of the biological communities present in the wastewater treatment systems and for the incorporation of new environmental microbiology developments (Reardon et al., 2013; van Loosdrecht et al., 2014). From this perspective, this research analyzes the challenges and implications for an integral management of wastewater and proposes some technological schemes to promote the sustainable management of this kind of systems.

Conclusions Preliminary results have shown that the main challenges regarding the integral management of wastewater are: Ensure strategic planning of wastewater treatment systems as an integral part of the projections of municipal, departmental and national development, through the integration of life cycle analysis and resource recovery tools, into the technical regulations for drinking water and basic sanitation.

- Undertake the technological conversion to take advantage of the methane and hydrogen generated in wastewater treatment systems, and reduce the generation or emission of greenhouse gases.
- Reduce energy consumption for nutrients transformation.
- Incorporate strategies that allow community participation to guarantee the adequate flow of resources, the fulfillment of the goals of wastewater management systems and the support of investors and managers of technological development.

Keywords: Resources recovery from wastewater, nutrients recovery, integral management for wastewater.

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WOOD AS A TOOL FOR SUSTAINABLE URBAN MOBILITY

Thursday, 15th June - 14:15 - SD 703 - Oral Paper

***Dr. Andrés Valencia*¹, *Dr. Alejandro Zuleta*¹, *Mrs. Yuliana Areiza*², *Dr. Esteban Correa*³, *Mrs. Laura Marín*², *Mrs. Laura Osorno*², *Mr. William Tibavija*², *Mr. Sergio Soto*²**

1. Universidad Pontificia Bolivariana, 2. SENA CTM, 3. Universidad de Medellín

The use of bicycles for transportation activities has shown a high contribution to the environmental care in urban contexts. Between all bicycles types, folding bicycle is presented as the most effective for intermodal transport strategy since combine easily its use with the use of subways, buses and streetcars, among others. On the other hand, wooden bikes has been built since the beginning of the bicycle history, however, during the XXI century, the wood has reborn as a material full of metaphysical, mechanical and environmental properties for the building of bicycle frames. There are a lot of bicycles frames made out of wood, but there is no one commercial folding bicycle built with this material. The aim of this project was to design a frame for a folding bike using local wood available in Colombia. To do this a strategic alliance between the Design Studies Research Group GED at the Universidad Pontificia Bolivariana and Materials Group for Furniture MATERMOB at the SENA CTM arises. A methodological scheme of systematic concurrent design process was used in which science of materials, structural design, techniques of digital manufacturing and industrial design converged in a multidisciplinary design team. The requirements for the project were identified as well as the wood was selected, the geometry of the parts and the structure and the different components were defined. Finally, the folding mechanism was developed and several prototypes were built and validated in order to define the final specifications for the product. The final model was made out of teak strip board showing not only aesthetic features but also an acceptable structural behavior. It was found that teak strip board could be used for folding bikes frame if a set of variables related with an optimum combination between shape, material and structure are considered. Morphological transitions between all the parts of the frame, wood grain orientation, adhesive materials and flexural behavior were identified as the main design parameters.

Design Challenges for the implementation of Product Service Systems in Colombian Companies. Design as Co-creator of worlds Sustainable

Thursday, 15th June - 14:30 - SD 703 - Oral Paper

***Mrs. Nancy Mahecha*¹, *Dr. Alejandro Boada*², *Dr. Salomón Montejano*³**

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This research derives from the recognition of an ethical conflict for the design discipline as a result of being in the middle of two visions: The Sustainable vision and the vision of the Free Market Economy Model. This conflict has generated a deeply reflection on the practice of design, which allowed rethink its meaning as a discipline. Among the solutions generated in the extension of the scope of design, there are the Product-Service Systems (PSS) solutions. The basic idea behind the concept is that it is an innovation strategy, which shifts the business focus from the design and sales of physical products to the design and sales of a service system. The PSS solutions have been implemented mainly in European countries since the decade 2000. With the aim of transferring their benefits to the national economy and generate a contribution to overcome implementation barriers in emerging countries, this research seeks to answer the question regarding the critical factors in the implementation of PSS in the Colombian business context. The methodological approach used was qualitative, selecting the case study method (four cases) with an explanatory approach. Study cases, consisted of designing a business model under the concept of the PSS: (Sustainable Mobility, Package Assessment; Energetic Efficiency and Assessment of reels). In each case was following the Study case methodology proposed by Yin R. K (2014) with the following stages: Study Case Design, Preparing Study Case, Data Collection, Analysis and Conclusions. Proposal guiding the study cases was: There are contextual factors that inhibit or enhance the development process of business models under the concept of Product-Service System. The main results are: The theoretical analysis identified and synthesized 43 Critical Factors for the implementation of PSS. 12 factors were selected and validated in the Colombian context. Identification of new context factors: Calling Capability, shared value between organizations, Complementary Business, Multidisciplinary participation, Management commitment. Conclusions: The relationship between the success of PSS solutions development and the percentage of presence of Critical Factors acting as Potentiators was clearly established: the higher the presence of these factors, the greater the probability of success of a PSS. The absence of any Critical Factor becomes an inhibitor of PSS development. Critical implementation factors for emerging countries identified by the UNEP are confirmed: availability of knowledge, lack of tools and design methods, poor entrepreneurship skills, lack of experience in service process and a weak legal framework of support. Five Critical Factors offer a promising level of success in the development of PSS solutions: Culture of Innovation, Knowledge Level of Environmental Economics, Design Capabilities and Trust, Public Policy. Given the low level of development of these factors, they should be considered in the planning stage of a PSS. The circular economy in emerging economies it is presented as a solution to develop the Factor E-8 Management and Technology Capacities, where the knowledge of Technology of closed production cycles, it is required. In the context studied the importance and necessity if Design discipline was validated.

Eco-design methodology for new material development in favor of society, products and services.

Thursday, 15th June - 14:45 - SD 703 - Oral Abstract

Ms. María Escallón¹, Ms. Alejandra Fernández Valencia¹, Mr. Daniel Gonzalez¹

1. Pontifical Xavierian University

Facing the increasing environmental dilemma and the responsibilities as Industrial Designers concerning industrial production and waste, eco-design has become one of the most current methodologies in the conception and development of new products. The requirements for eco-design imply the achievements of strict ecologic conditions that reach complex products rigorous with the raw materials, machinery and available production processes, which may limit the range that the proposals want to attain. As professionals, we elaborated the following design methodology focused on the development of products based on the creation of new materials taking into account important principles such as: “Design Thinking”, “Cradle to Cradle”, “Inverse Engineering” and “Eco-design”. We propose a new process with different steps from those known in common design methods. The comprehension and exploration of unused raw materials is the first step to this procedure. Simultaneously, it is required to understand the usage opportunities for the raw material and explore how its properties may be applied in objects, products or services for the possible solutions of problematics and/or market needs. The axis for this methodology is the development of eco-design strategies and eco-efficiency that guarantees the desired environmental sustainability. There are diverse stages where the ideas are produced, a new material is explored, and in consequence, a new product, object or service is born accomplishing the requirements set by this methodology. The next step includes the life cycle analysis that encloses the phases of products from the collection and use of the raw material till the end of its usage life, understanding the critical points of each phase to be able to improve them decreasing the negative environmental impact. In the same way, the material is explored, defining its properties by testing it with official laboratory tests and categorizing it in different selection matrices. The opportunity, needs and problematics are then analyzed, taking into account the selected scenario and how the material may play an important part of the solution. This results in an extended compilation of information based on qualitative investigations that shows the character and understanding of the problem while proposing effective and precise solutions. Our premise understands Industrial Design as an user and environment-centered discipline where a new material is developed and it is placed at the service of nature and our community. As a result of this methodology, we developed a project starting with coffee grounds, an organic residue that is not frequently used in Bogotá, Colombia. We created a new material that favors the cultivation initiative in homes: reducing time, operations, processes and contaminating materials resulting of a chore that aims helping the environment and self-consume. CAFIVO is a cultivating system, 100% biodegradable, for homes based on agglutinated coffee grounds (BOA) by industrial designers: Escallón, Fernández and González. The material BOA and the product CAFIVO testifies the reaches of this methodology, the investigation of causes and alarming problems for the chosen raw material and the synthesis of a product design for a specific group of people with a widespread of application possibilities.

PACKAGING PRODUCTS FROM CONTEIRA LEAF: A MARKET INVASIVE PLANT!

Thursday, 15th June - 15:00 - SD 703 - Oral Abstract

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Presently, polymeric materials are used in many objects of our daily life, and their use is still growing. They play an important role in the economy, particularly in the packaging industry. However, there are two major drawbacks related to these products: 1) they are obtained from fossil fuel resources in decline; and 2) they are non-biodegradable wastes after use. During the last years there has been a renewed interest in natural materials as substitutes for a wide range of polymers motivated by potential advantages of weight saving, lower raw material price, and 'bio-recycling' or the ecological advantages of using resources which are renewable. An adequate, abundant and renewable resource is that which comes from invasive plants. In particular, conteira is a plant of the species *Hedychium gardnerianum* originally from the Himalayas that became invasive in the Azores, an archipelago of volcanic origin with fertile soils and humid forests, where it was placed as an ornamental plant. Presently this plant is seen by the people as a resource without any utility and by the scientific community as a threat to local biodiversity. Stopping the spread of an invasive plant is almost impossible and very expensive and so instead, it can be transformed into value-added products. A promising solution is using their leaf as a source of raw material to develop packaging and disposable daily objects. In this work, green leaves from conteira were used to create eco-designed packaging products in the framework of a sustainable business approach through the commercial valuation of endogenous Azorean products, under the motto "from nature to the market". However, the range of products is for now restricted to non-structural components such as daily domestic pieces (e.g. plates) that usually are made of polymers. Their use is clearly limited to situations of low impact properties. Although leafs are natural composites, they have their shortcomings, namely lower durability and lower strength, and these have to be solved in order to be competitive with polymeric materials. Recently our group has developed a leaf transformation procedure that has improved these properties considerably. Tailored sizes and shapes and relative high thickness transversal sections are possible. Therefore, our thermopressing technique enables the manufacture of products with suitable mechanical properties. To understand its behavior and how this kind of natural materials should be treated, a closer look into their structure is required. Fourier Transform Infrared (FTIR) analysis revealed that structurally, such leafs are rich in hydroxyl and phenolic groups. Moreover, the conteira leaf exhibits hydrophobic properties and a peculiar geometric fiber/matrix combination together with an inherent surface roughness that was characterized by Scanning Electron Microscopy (SEM) and Atomic Force Microscopy (AFM). The leaf's mechanical properties were derived from the force versus displacement curves obtained using the AFM probe. In addition, the related adhesion forces maps and histograms provided also valuable information about its surfaces adhesion properties. Thermal decomposition analyses of conteira leaf were investigated in terms of global mass loss by thermogravimetric analyzer (TGA) and Differential Thermal Analyzer (DTA).

Regulating resource recovery: issues raised by recovery of metals from steel slag

Thursday, 15th June - 14:00 - SD 704 - Oral Abstract

***Prof. Pauline Deutz*¹, *Dr. Helen Baxter*¹, *Prof. David Gibbs*¹**

1. University of Hull

Policy drives towards the circular economy raise the prospect of attempting to recover resources from hitherto neglected sources. One such source is legacy waste from industrial processes, such as steel slag.~ However, bringing substances back into economic use that have previously been disposed of raises challenges for regulation and regulatory compliance.~ ~~This study draws on a project examining both the technical and policy issues relating to the recovery of vanadium from steel slag. New markets for vanadium have opened up as the result of its suitability for use in renewable energy technologies. ~Given that virgin vanadium is not produced in Europe, implementation of recovery technologies has implications for security of supply. In this paper we focus on the response of and to regulators relating to the proposed recovery strategies.~ Alongside an extensive review of policy documents, we have carried out more than 20 semi-structured interviews with stakeholders, including industry representatives and, prominently, Environment Agency officials.~ Our attention has been focused on the UK, with some attention to the wider context.~ Findings suggest that the relationship between the regulated and regulator is an important but sensitive one, which in the UK has been put under stress as a result of austerity cuts.~ This implies that the social and economic benefits expected to come from the circular economy may not be easily accessed as a means to offset strains elsewhere in the economy. ~ Circular economy, steel slag, regulations, UK, austerity

Developing sustainable local systems through Industrial Symbiosis: the cases of Agro-Industrial and Urban contexts

Thursday, 15th June - 14:15 - SD 704 - Oral Abstract

***Prof. Roberta Salomone*¹, *Prof. Pauline Deutz*², *Prof. Andrea Raggi*³, *Prof. Giuseppe Ioppolo*¹**

1. University of Messina, 2. University of Hull, 3. University "G. d'Annunzio"

Industrial Symbiosis (IS) is an environmental business practice and one of the founding notions within the interdisciplinary field of Industrial Ecology (IE). It describes the operation of communities of firms, from various industrial sectors and of various sizes, where the by-product/waste of a company serves as a raw material for one or more organizations in the same network, obtaining both environmental and economic benefits connected to the improved efficient use of materials and energy. Since the concept of IS emerged, many forms of IS implementation have been identified in different places. Indeed, there are many different local contexts that could be associated with different forms of the IS model. Comparing these forms and their relationships with the places where they occur is challenging because a comparative analysis of IS experiences in different national contexts, involves finding concepts that identify equivalent empirical phenomena in different countries. It is therefore difficult to begin to generalise the processes by which IS has developed and the extent to which the conditions necessary for it to flourish are generalisable. Considering these complexities, in this paper, the key findings of different authors that have dealt with the classification and characterization of IS systems are put together. Leaving aside a common and specific definition of IS, as well as the influence that local circumstances may have on the form in which IS may take place (on which a significant scientific debate persists), this paper aims to identify the main general attributes that an IS network may satisfy. Then an evolutionary path toward sustainable local systems for the specific cases of agro-eco-industrial and urban context is presented, in order to verify the role played by the identified attributes. The evolutionary approach looks at how companies/organizations respond to the external economic, social, cultural and environmental changes. Three main stages of evolution are identified, based on the literature, representing progressive network of an IS network. Type I is a linear immature system which includes firms that have no connections with each other, even if they operate geographically close; type II describes a system in which the previously isolated actors start to co-operate, also including other companies and creating new shared activities; type III is a mature system with roundput material and energy flows, characterized by a high degree of diverse exchange relationship between firms, but also by links with firms external to the system boundaries. The analysis highlights that differences and specificities for each case of IS exists, but also that the evolutionary path seems to confirm the role of the identified attributes and that common situations may be identified for the development of sustainable local systems.

The multiple dimensions of urban contexts in an Industrial Ecology perspective

Thursday, 15th June - 14:30 - SD 704 - Oral Abstract

Prof. Alberto Simboli ¹, Prof. Andrea Raggi ¹, Dr. Raffaella Taddeo ¹, Prof. Roberta Salomone ²

1. University "G. d'Annunzio" of Chieti-Pescara, 2. University of Messina

Industrial ecology (IE) includes approaches and tools aimed to an efficient management of resources and a reduction of the environmental impacts associated to limited spatial contexts. They are also recognized as "place-based"(PB) and are focused both on the analysis of these contexts and on the definition of improvement actions in a perspective of sustainability. These actions, inspired by biological systems, often exploit the potential associated with the differences among the various entities that compose the system. Within IE, "life-cycle-based"(LCB) approaches have also been developed to assess the environmental, economic and social impacts of products, processes and organizations throughout the various stages of their life cycle. Recent studies on IE show a great interest in the analysis of urban contexts, considered to be very promising for the achievement of the economic, environmental and social sustainability at local level. Urban Metabolism (UM) is recognized as a PB approach focused on these contexts; however, their study in an eco-industrial perspective shows, at present, some limitations: i) urban contexts are complex systems and are constantly changing; ii) urban contexts primarily include consumption activities (and this implies a limited variety); iii) PB approaches are still lacking as regards the measurement of the effects, especially environmental, of the proposed scenarios. In addition, scholars from economic geography and urban planning, recognize the need of an expanded view of the "urban contexts", to include different forms of estates, with which the residential areas strictly interact, by means of physical, energy, services and human flows (s.c. Urban Economies or Urban Systems). In an IE perspective, expanding urban contexts (e.g. to include neighboring industrial and rural areas) allows them to be analyzed in synergy with other approaches, such as those inspired by Industrial Symbiosis/Metabolism. The broadening of the scope would also enable an easier integration with the LCB approaches in the measurement of symbiotic scenarios. This is especially true in the case of local economies that grow up showing a strong integration among the urban, industrial and rural dimensions (e.g. in the districtal models). This article, after a comparative analysis of PB approaches deemed suitable for urban contexts, offers an integrated analytical framework in which the main flows and synergies among urban, rural and industrial systems are depicted. It also shows an analysis of the critical issues (functional unit, etc.) and suggests trajectories for the development of LCB tools for the measurement of potential eco-industrial scenarios. As a result of an integrated view of these multiple dimensions, the typical urban flows (e.g. products, energy, food, water) can be identified and efficiently managed beyond their use and consumption, and improvement actions (leveraged by the greater heterogeneity and by the proximity) can be better defined, together with more effective policies for a sustainable local development.

Countryside in the city: effects of urban agriculture in the livelihoods of internally displaced peasants in Bogotá, Colombia.

Thursday, 15th June - 14:00 - SD 715 - Oral Abstract

*Mr. Juan Camilo Sandoval Vasco*¹

1. *Universidad de los Andes*

Forced internal displacement caused by Colombia's internal armed conflict constitutes one of the country's main challenges nowadays, with more than 6.6 million victims during the last four decades and nearly 225,000 new cases just in 2015 (UNHCR, 2016. p. 5). According to Refugees International (2012), the city of Bogotá holds nearly two thirds of the grand total of internally displaced people in Colombia, 65% of whom are peasants who migrated from the countryside. During the last few decades the Colombian government has incorporated several institutional tools with the purpose of assisting and repairing this vast universe of victims. In parallel, during this time period the Colombian government has designed and implemented several projects with the purpose of assisting vulnerable communities—more broadly defined, but including internally displaced people—in cities like Bogotá. Some of these programs have focused on the implementation of Urban Agriculture (UA) practices to assist these communities. This research attempted to do a multi-dimensional sustainability analysis of the effects of UA practices on the livelihoods of internally displaced peasants residing in Bogotá, by using a qualitative approach, involving semi-structured interviews, focus groups and participant observation with two communities of internally displaced peasants living in San Cristóbal (a neighborhood of Bogotá). The research concluded that UA has traditionally been considered by scholars to be a merely socio-economic dynamic, nonetheless it also has a profound symbolic impact on the lives of internally displaced people and their process of healing the wounds of armed conflict and displacement. This symbolic aspect has not been explored adequately in the literature. By understanding displacement not only as a social dynamic but as an identity in constant transition, it was possible to observe that the particular context of the internally displaced communities plays an important role in the way they identify themselves and interact with local institutions. By analyzing UA activities from a holistic sustainable development framework—thus taking into account social, economic, environmental and cultural elements—it was possible to identify the multiple benefits that UA has brought to these communities. These include access to low cost, highly nutritious, organic food, as well as the spatial relationship between peasant and land, and the way spaces of UA became safe places where internally displaced people can communicate with others they conceive as equals, allowing them to share their life stories and entering into a realm of catharsis, thus healing their pain while also being able to use their traditional knowledge and cultural backgrounds to grow crops, feel re-empowered and contribute to the notion of community inside their neighborhoods. This last point relates to the main theme of the conference as it poses a bottom-up view of local initiatives towards sustainable development while aiming to reframe UA as a plausible tool for the assistance and reparation for internally displaced people, the victims of the armed conflict in Colombia. References: Refugees International. (2012, December). IDP's report in Colombia. UNHCR. (2016). Global Report on Internal Displacement (GRID).

Ethical aspects of the Sustainable Development Goals: a reflection

Thursday, 15th June - 14:15 - SD 715 - Oral Abstract

Prof. Bert de Vries¹

1. Copernicus Institute of Sustainable Development, Utrecht University

The Sustainable Development Goals (SDGs) contain explicit and implicit ethical components, for instance in the goals to ensure universal access to health and education services, reduce inequalities and promote sustainable use of ecosystems. These ethical statements are framed within the paradigm of (late) Modernity, with its emancipatory politics and its imperatives of justice, equality and participation. They express the aspiration and necessity to reconcile desires of the individual, the core unit in Modernity, with that which is collectively desirable. The implicit assumption is that there is such a thing as a collective – and the emerging signs of global unsustainability reinforce the notion that there does and should exist such a planetary community of humans based on universal values. The reality is that only a rather small fraction of the human population lives in accordance with the premises of Modernity, although global trade flows and (social) media may give a different impression. In this presentation, I explore the history and philosophy of ethics and morality in various epochs and cultures and use the findings to present a broader palette against which the SDGs can be interpreted and implemented. It will be illustrated with examples and case-studies in scientific (Global Change) modelling and religious practices. Endeavours like this one can hopefully help to bridge the rational and universalist view of Modernism on the one and the more emotional, particularist and contingent worldviews on the other hand. This is an urgent need in a fragmented world of increasing interaction as well as inequality. It is also in line with and supportive of the deliberate attempts to decentralize the operationalization of the SDGs.

Development and Heritage: An Unfounded Paradox in Sustainability

Thursday, 15th June - 14:30 - SD 715 - Oral Abstract

Mr. Luis Franklin Combariza Luna¹, Mr. Alberto Escovar¹

1. Ministry of Culture

The term patrimony has two distinct meanings: i) Cultural: “Heritage is our legacy from the past, what we live with today, and what we pass on to future generations” (Unesco, 2017); ii) Legal-economic: “value of the assets that a person or business has, after any debts are taken away” (Cambridge dictionary, 2017). However, the two definitions can converge in their synonyms: inheritance, heritage, legacy. Heritage has been seen as an obstacle to development. However, recent discussion about the disruptions that development can have and about alternatives pose strategies that coincide with the concept of heritage: i) to place value on cultural traditions to reduce dependence on expert knowledge and a greater attention to the efforts of common people to construct more humane culturally and economically sustainable worlds; ii) to multiply production centers and agents of knowledge, making forms of knowledge that are produced by the beneficiaries of development visible, thereby helping them to become subjects and agents of development; iii) adaptations, subversions and resistance carried out locally in reaction to development interventions (Arturo Escobar, 2005). Put another way, people converting heritage into net worth for the good of humanity. The goal of this work is to show Colombian cases in which the application of heritage is scalable and viable. With minor legal adjustments, and within an ecosystem of State-academia-entrepreneurs, the model promotes the status of sustainable development practices, leading to a new way of conceiving progress. Each case consists of describing traditional practices, actors, materials, products and market conditions. This is followed by an analysis of i) legal advances fostered by Colombian ministries including Culture and Education, ii) research applied to other cases and to entrepreneurship in the University of los Andes and others. The following cases are described.

- i) **Construction practices in housing in the Pacific Region**: significant decrease of overhead costs caused by heat and humidity, ii) **materials (wood, bamboo, soil and fibers) produced sustainably in the region**;
- iii) **advances in research in the sustainable production of existing materials that can be cultivated in the region**;
- iv) **Legal Framework: Ministry of Culture, changes in the norms regarding earthquake resistant structures that include local sustainably produced materials and traditional practices and the concept of “cultural interest housing” as opposed to low-income housing or public housing.**

- Traditional midwives and the decline in infant mortality/morbidity from access barriers in the formal healthcare system** Legal Framework: Tertiary education as an alternative to reduce access barriers to the health system.
- Gastronomy and contamination: Alternatives to plastic packaging in culinary traditions: use of natural materials such as banana leaves and gourdes, wooden utensils to serve and preserve traditional foods, including tamales, sweets, wraps.** Legal Framework: health regulations imposed by Invima, the National Institute for the Regulation of Health and Safety.
- Traditionally produced wooden boats using local materials:** Legal Framework: Cost reduction in harbor fees compared to boats constructed with conventional materials.

The cases will establish different factors that make heritage preservation viable in terms of net worth in sustainable development.

A Healthy Environment: Human Health versus Environmental protection- dilemmas for policy makers

Thursday, 15th June - 14:45 - SD 715 - Oral Abstract

Prof. Shobhana Madhavan¹

1. University of Westminster, London

Principle 1 of the Rio Declaration says that human beings are at the centre for sustainable development. However this is not reflected in the policy agenda on environmental protection. Environmental problems, notably air pollution, has been at the centre of research, and policies, and much less attention has been paid to human health especially in poor countries. A dilemma for policy makers is whether poverty alleviation must come before environmental protection given the immediacy of committing resources for the production of food and provision of shelter. Perceptions of policy makers differ from people in poverty although poor people are at greater risk of damage from environmental degradation. This paper seeks to examine the issues surrounding the above dilemma and to explore methodologies and research frameworks that will help to provide the bases for policies designed to eradicate both poverty and environmental damage in developing countries.

Collective action and Development in the Colombian South Pacific

Thursday, 15th June - 15:00 - SD 715 - Oral Abstract

Dr. Armando Durán Durán¹

1. Universidad del Rosario

The main purpose of this research is to analyze and interpret contemporary processes of collective action in the Colombian South Pacific and its relationship to possible Local Alternative Approaches to Conventional Development -ELAD (for its acronym in Spanish), in the context of Black Community Process PCN (for its acronym in Spanish), particularly in the experiences of three community councils in the region. The Colombian Pacific has been understood primarily from conventional guidelines of development, i.e. as solicitation territories ready for self-sustained economic growth. Although in recent decades new development initiatives have tried to change this dominant view, the deterioration in the living conditions of the population and the deterioration of strategic natural environments of the region show the crisis of these concerning social life in the region. It is in this context that the research assumes the study of recent collective actions of the locals in order to examine whether these processes of social mobilization are shaping Local Alternative Approaches to Conventional Development - ELAD, this, in response to life conditions of the region. From the theoretical point of view the study departs from the perspective of collective action proposed by Sidney Tarrow, and the concept of Local Alternative Approaches to Conventional Development the author constructs based on the literature reviewed in the study. These two theoretical framework are used to analyze the corpus of data collected in the research process. The study is oriented from a qualitative methodology, inspired by the world of subjective meaning. The process is structured from the review of secondary sources and the organization of group talks and interviews. Perhaps one of the central findings of the inquiry is related to the fact that at present the various processes of collective action in the Colombian South Pacific lead together to a framework of meaning that exalts the sustainability of life in the region. It is circumscribed both in contexts of restriction generated by the armed conflict and in contexts of opportunity and hope to establish the evidence of development anchored to place i.e. those forged from the intercultural, plural and collective character of the region. Collective action, Development, Colombian South Pacific

IMPACTS OF THE IMPLEMENTATION OF JIRAU AND SANTO ANTÔNIO HYDROELECTRIC POWER PLANTS: IMMIGRATION MOVEMENTS IN THE MUNICIPALITY OF PORTO VELHO

Thursday, 15th June - 14:00 - SD 716 - Oral Abstract

Ms. Ana Carolina Chaves Catolico¹

1. Escola Nacional de Ciências Estatísticas

There is now a growing search for renewable energy sources and less aggressive to the environment. In Brazil, despite the fact that oil and derivatives are the main source in the national energy matrix, the production of renewable energy - mainly hydroelectric - is highlighted. In this context, the Amazon Basin region stands out due its hydroelectric potential, still little explored. In the region of the Amazon River Basin, the “Madeira River Hydroelectric Complex”, is formed by the Jirau and Santo Antônio Hydroelectric Power Plants, in the municipality of Porto Velho (Rondônia). The region, since the licensing and implementation period of the project, has been consolidated as a stage of disputes over the right and forms of use of water resources. The infrastructure and electricity generation projects in the Amazon provided periodic immigration movements, resulting in rapid annual population growth in the implementation periods of the projects. The immigrants that no return to their places of origin generates sociocultural impacts in the municipality of Porto Velho and increases the pressure on the local infrastructure~services. The installation of the enterprise established a new form of appropriation of the natural resources and of the arrangement of the territorial functions. In this way, the immigration movements are consolidated as one of the main impacts of the implementation of hydroelectric plants in the Amazon, as they aggravate a series of problems related to social and economic order. The main objective of this research was to characterize and compare the immigration movements and the immigrant profile of the municipality of Porto Velho, in the period before and after the installation of the project through descriptive analysis of the microdata of the Demographics Census 2000-2010. The proposed immigration analysis will be obtained by fixed date, that is, those individuals who reside, at the reference date of the Census, in a place different from the one registered at a previous fixed date, generally 5 years before. The results obtained allowed to characterize the immigrants by sex, state of origin, schooling and main economic activity developed, besides ratifying the Hydroelectric Complex as a new locus of attractiveness. In addition, the impacts of immigration on the provision of basic services and local infrastructure were measured through the following variables: electricity, treated water, garbage collection and sanitation. In Porto Velho it is possible to perceive the construction of a new social dynamic, established in such a way as to favor an occupation of an economicist character which, in turn, does not correspond to the existing social and economic practices. In this sense, the immigration movements of the Madeira Hydroelectric Complex should be viewed from a macro perspective, integrating the role, function and interest of all the actors involved and evidencing the need for projects that present sustainable perspectives inclusive. Keywords: renewable energy, Amazônia, migration, hidroeletric power plants\\

Wicked Problem Solvers: Public Libraries, Citizens, and Quality of Life in Bogotá, Colombia

Thursday, 15th June - 14:15 - SD 716 - Oral Abstract

***Ms. Juliana Saldarriaga*¹, *Mr. José Ignacio Caro*², *Mr. Daniel García*², *Ms. Gabriela Bruna*¹, *Mr. Otoniel Castañeda*¹, *Mrs. Lissette Muñoz*¹, *Mr. Cristiam Vargas*¹**

1. School of Architecture and Design, Universidad de los Andes, 2. BiblioRed, Secretaría de Cultura, Recreación y Deporte

Sustainable development can be best understood as a holistic approach to improving quality of life, as it takes into account environmental, economic, and social aspects, and the connections that exist between these. Quality of life is a concept that can be explained using Nussbaum's Capabilities' Approach (2011), in which *how free an individual feels to make choices* reveals more about a country's development than economic growth. Governments must therefore provide the right conditions for individuals to feel empowered and choose for themselves, thus becoming problem solvers and agents of change. In this paper we describe a joint effort between the academy and the public sector to understand how Bogotá's cultural institutions could impact quality of life. Our research team worked with the city's *public library network (BiblioRed)* in order to understand how the public library institution could prepare and empower current citizens to deal with future local and global problems (50 years from now). BiblioRed is composed of 19 libraries located in different neighborhoods. It is a great institution to work with due to its significant access to a wide array of communities and users (and potential users). Since our research team was composed of anthropologists and designers, we used literature and methods from both disciplines to define our approach. We focused on qualitative research methods such as ethnography, participant observation, interviews, focus groups, and workshops. We also implemented a design thinking methodology (Beckman & Barry, 2007) to transform unclassified and disorganized fieldwork data into a limited number of insights and (afterwards) a prototype. Finally, considering our research was *projective*, we used speculative design theory (Dunne & Raby, 2013) to conceive the local and global problems Bogotá's citizens would have to deal with 50 years from now. The first thing we concluded was Bogotá's future condition could best be understood as series of *wicked problems* (Briggs, 2007), as its urban and environmental complications 50 years from now would exhibit strong resistance to resolution and threaten quality of life. This meant BiblioRed and its libraries had to rethink themselves in order to adequately prepare current citizens for this future scenario. We suggested the city's libraries had be less like static institutions and become more like live beings in two ways: first, they should be able to reach remote places, thus being able to have a greater impact on the citizenship. Second, they should be able to obtain constant feedback from their users. This meant questioning the active-library passive user-paradigm, and suggesting a scenario in which knowledge is collectively constructed and in which nobody is just a teacher or just a student. We materialized these two aspects in our prototype: a mobile or "to-go" library that reached citizens in remote places and obtained constant feedback from them. A more direct and fair interaction with the citizenship was the best way libraries and other cultural institutions could empower individuals to become problem solvers and thus increase their quality of life. *Keywords:* quality of life, wicked problems, BiblioRed, speculative design, library as live being. ~ ~ ~

Realizing subsistence consumers' functionings by mobilizing social capital

Thursday, 15th June - 14:30 - SD 716 - Oral Abstract

***Dr. Cecilia Soler*¹, *Prof. Shainesh G*²**

1. Gothenburg university, 2. IIMB

This article focuses on consumption-induced poverty alleviation in the urban subsistence setting. The increasing urbanization of poverty (Datta, 2006;)—which results in slum growth and increasing vulnerability due to increased costs of living (Boonyabanha and Mitlin, 2012), cuts in income due to unemployment, small incomes and day-to-day survival strategies (De Soto, 2000; Rosa, 2012)—illustrates a commoditization of poverty where income and work are the most important assets (Moser, 1998; Wratten, 1995). The BOP approach to consumption in subsistence communities, which is largely managerial in perspective, is contested because of its focus on individualized poverty alleviation. Income is but one (of many) means to enhance the well-being of the poor (Ansari et al, 2012; Sen, 1985, 1999), and a capability view on poverty alleviation emphasizes the socio-material and structural features of increasing the functionings of the urban poor, i.e., the ability to realize things perceived as valuable.~ Our interest in capability building among subsistence communities has turned our attention to the bridging opportunities of social capital enhancement in subsistence communities (Ansari et al, 2012). Recent research on business initiatives as generators of bridging social capital acknowledge the social enterprise as a vehicle for capability building and inclusive growth (Azmat et al, 2015) in subsistence communities (George et al., 2012).~ The social enterprise, combining resources from business, non-profit or government organizations in novel ways with the aim to create social value (Austin et al., 2006), is particularly interesting as the link to subsistence consumers' access to resources and skills that enable their participation in the formal market. In this paper, we investigate how social enterprises enable the realization of urban subsistence consumers' functionings through bridging social capital. The aim of this paper is to describe (1) functionings in the urban subsistence setting and (2) how they can be met through social enterprise provided bridging social capital. We draw on a study of (1) the self-reported consumption needs of informal workers belonging to a subsistence urban community in a South Indian city and (2) the offerings of social enterprises in this city. We analyze the functionings of urban subsistence consumers and social enterprise social capital building through the lens of practice theory in terms of elements of material, meaning and competences (Shove and Pantzar, 2005; Shove et al, 2012). This article extends scholarly knowledge on the interplay of social capital sources for the sake of poverty alleviation in settings where poverty is, to a large extent, commoditized. The specific characteristics of urban subsistence communities, in combination with institutional voids (Mair, 2010), make discussions about formal/transaction-based systems of exchange versus informal/ reciprocity-based market systems instrumental for the contribution of social enterprise to wealth creation in these communities (London et al, 2014). We show how these different systems of exchange can be combined in social enterprise engagements. In particular, we highlight the influence of norms motivating social capital transfer on the realization of consumer-related functionings and how such norms may be an outcome of government programmers that are part of social enterprise bundles of activities.~

Facilitating spaces for co-creating microfinance models in conservation areas.

Thursday, 15th June - 14:45 - SD 716 - Oral Paper

Mr. Santiago de Francisco ¹, Mr. Miguel Navarro-Sanint ¹, Ms. Rosa Torguet ¹

1. Universidad de los Andes - Design Department

As part of the project of the conservation of dry forests, sponsored by the United Nations Development Programme (UNDP) and Fondo Patrimonio Natural we were asked to explore the microfinance practices of a local region in Colombia to define a microfinance model that would help them engage in sustainable practices. Together with seven master's degree students in Design, we traveled to Natagaima, Tolima to spend a week with the inhabitants of Yaví and Pocharco. During the exploration, we used different participatory design tools, such as social cartography and generative sessions. The design team presented three proposals. Trust and solidarity inspired the first one. The second one was a network of local producers that were able to access to information about offer and demand for their products, as well as the reputation of the buyer. The third one is a saving and investment system using animals.

The Role of the Arts and Culture in Sustainable Development: The Case of Medellin, Colombia

Friday, 16th June - 08:00 - SD 1003 - Oral Abstract

*Dr. Susan Appe*¹, *Ms. Laura Milanes-Reyes*²

1. University at Binghamton, 2. Universidad de los Andes

Sustainable development is most often recognized by its three pillars: environmental, economic, and equity (social). However, over the last several years, advocates in a global campaign have pushed for the recognition of a fourth pillar: culture. For example, in 2013, the global campaign, called “The Future We Want Includes Culture”, emerged during the post-2015 agenda debates, led by several global and regional cultural civil society organizations. By May 2014, the “Declaration on the Inclusion of Culture in the Sustainable Development Goals (SDGs)” was launched and signed by 900 organizations and more than 2,500 individuals in 120 countries. Advocates for the inclusion of culture in the SDGs proposed that a goal explicitly about culture be included and suggested the wording: “Ensure cultural sustainability for the wellbeing of all”. In the end, an explicit goal about culture was not included in the SDGs that were adopted in September 2015. However, during the post-agenda debates the global campaign did propose targets that might help to benchmark the arts and cultural sector in development. This paper considers these proposed targets and indicators through the case of Medellin, Colombia, a city that has used the arts and cultural sector within its overarching urban planning for some time. We examine archival information, such as Medellin’s development plans and evaluation reports using qualitative methods, to answer the following question: How has Medellin used arts and cultural programming and planning within its development plans? Is SDG language informing recent Medellin development plans and how? Do development plans incorporate or discuss any of the types of arts and cultural targets and indicators suggested by the “The Future We Want Includes Culture” campaign and how? Through the case of Medellin, we assess culture and its contributions to development at the municipal level. According to its advocates, culture contributes not only to the economic and productive sector but also provides a range of non-monetary benefits, such as social inclusion; thus, in many instances it promotes socially inclusive development, the central theme of the conference. The paper fits across several of the conference themes and tracks, including the 23rd ISDRS Conference’s special track of Art & Sustainability; as well as two of the tracks in the theme about Institutions and Governance Structures for Sustainable Development: Advocacy and public participation and Collaborative Governance for Sustainable Development.

A MANAGEMENT MODEL FOR THE SUSTAINABILITY OF PUBLIC THEATERS IN THE CITY OF BOGOTÁ – COLOMBIA

Friday, 16th June - 08:15 - SD 1003 - Oral Paper

***Ms. Katherine Guio*¹, *Dr. Eduardo Wills*¹, *Dr. Nathalia Franco*¹, *Mrs. Juliana Diaz*²**

1. Universidad de los Andes, 2. University Paris 1 Panthéon - Sorbonne

Bogota is a metropolitan city of more than seven million inhabitants. It has a rich tradition of arts and popular culture. Over the last few years, the institutional framework and infrastructure for cultural management has been improved substantially. Bogota is well-known for its cultural diversity and management of different public festivals, and at the same time, it is possible to find a vast variety of popular artistic expressions in the local communities. Consequently, UNESCO recognized Bogota as one of the most musically creative cities in Latin America. This paper presents a theoretical as well as a practical model for the sustainability of the artistic and cultural expressions in the city's public infrastructure (theaters), as well as the business model for fundraising and financial balance. Based on a systemic view of the arts performance, we proposed the creation of an infrastructure network for Bogota that integrates the individual theaters by organizational, financial, marketing, operational, organizational, logistical, human resources and fundraising processes for optimizing money and resources: in other words, to establish a public network of municipal theaters. All the theoretical support of this paper is based around a concept: social networks in organizations and the systemic approach where every actor of the network has its own function for sustainability. That has always been a challenge for cultural managers: the financial gain as well as the cost effective cultural programming in terms of audience preferences. This paper aims to reduce this gap between effective cultural management and financial balance. Some references used to support the present research are: Granovetter (1985), Powel, W.W., Smith-Doer (1994), Scott, J (2000), Fligstein, N (2001), Boyd, (2000), Borgatti, S.P. and Foster, P. (2003), Smith-Doer, Powell, (2005). As mentioned before, this work is based on the systemic approach to the cultural sector. We proposed five principal subsystems for its management: i) Government, ii) Planning and Intelligence, iii) Monitor and Control, iv) Coordination, v) Management of day to day responsibilities and functions. We followed a participative methodology to develop the sustainable arts and business model. In this paper we present the basis for participation of the different institutions involved, how decisions were made, and how they could be improved. The proposed Management Model seeks to enable a proactive change process, led by e The District Department of Culture and Sports (SCRD) and The Bogota Philharmonic Orchestra (OFB) to overcome the internal operational weaknesses and to create a sustainable cultural programming for the citizens. There is an uneven and differential distribution of income within Bogota's population, which requires these cultural agencies to create differentiated and specialized events for the public, guaranteeing that it is free for some. To continue Bogota's recognition as a cultural epicenter of Latin America, this process towards a new Sustainable Management Model must be propelled by these principles: i) taking advantage of cultural opportunities, ii) creating and strengthening an institutional and political coalition, iii) communicating this new vision within public institutions, iv) empowering the players, v) establishing short term results and achievements.

Affect and Perception: the role of aesthetics in sustainability ethics and education

Friday, 16th June - 08:30 - SD 1003 - Oral Abstract

Ms. Andressa Schröder¹

1. International Graduate Center for the Study of Culture (GCSC)

In recent studies about education for sustainability, there has been growing recognition of the necessity of integrating different forms of knowledge construction and assessment, as well as the necessity of searching for a more interconnected exchange of information and experiences – finding transdisciplinary ways of addressing sustainability. In this paper, I explore the theoretical implications of the role of aesthetics in discussions of sustainability ethics and the potential of arts-based approaches for sustainability research and education. For this matter, I indicate examples from the environmental arts and some aesthetic approaches that are already being explored in different educational contexts. This is done in order to expand on the much needed transdisciplinary debate within the realms of education for sustainability, as well as to investigate how aesthetic features can help us overcome common divisions in the theory-practice, academic-activist, mind-body dualisms, which tend to make meaningful actions for sustainability unfeasible. Environmental aesthetics is an all-encompassing value to environmental appreciation. Our perception of the environment is permeated by a complexity of experiences that influence how our imaginary about it is formed, as well as how we assess and share this information. Aesthetics is, therefore, a crucial step in finding ways to generate or increase sensitivity to the surrounding environment and to re-think the concept of education for sustainability. Understanding aesthetics as forms of multisensorial experiences and perceptions of the environment, allows one to explore beyond the usual association of environmental aesthetics to a contemplative appreciation of landscape. Aesthetics indicates, instead, the potential for multiple dynamics of engagement and environmental responsibility. Furthermore, the focus on the multisensorial, affective, and imaginative characteristics of aesthetic experiences indicates that not only artistic practice or appreciation encompass aesthetic features, but they are open for a wide range of social interests and activities – including environmental perception, education for sustainability, and interspecies relationships. In this sense, the contribution of environmental aesthetics for the discussions in the realm of sustainability ethics and education enables the exploration of multiple levels of the transdisciplinary approach reclaimed in such fields, integrating experiential forms of knowledge construction and an affective exchange of information and perceptions of the environment.

Unraveling the efficiency and equity effects of communication in collective compliance: The role of leaders among small-scale gold miners in Colombia

Friday, 16th June - 08:00 - SD 701 - Oral Abstract

*Mrs. Luz Angela Rodriguez*¹, *Mr. Alexander Pfaff*², *Dr. María Alejandra Vélez*¹

1. *Universidad de los Andes*, 2. *Duke University*

It has been widely demonstrated that collective action and self-governance are powerful means for communities to avoid the ‘tragedy of the commons’. The capacity of a community or a group of users to manage common-pool resources depends on their ability to craft and enforce rules to cope with the dilemmas of cooperation (Ostrom 1990). Some settings such as small-scale gold mining in alluvial deposits face some of the challenges of common-pool resources such as non-excludability but the structure of the situation do not provide the incentives to develop and sustain cooperation strategies among participants. Even though the challenges that states face in the regulation of small-scale gold mining due to the huge costs of monitoring and enforcement, states can provide incentives that promote cooperation, reducing the burden of enforcement and changing social outcomes. We designed and implemented a field experiment with 200 gold miners in Colombia’s Pacific region to explore an external intervention based on collective compliance. In our setup, the government sets the target for aggregate compliance, verifies the target and then, conditional on collective compliance, provides a reward to the group. This limits the state’s burden to verifying aggregates, leaving the community members to decide among themselves whether to reach the aggregate target. In this setting, we varied the strictness of the aggregate compliance target and, as our focus, varied communication. Communication, i.e., allowing individuals in groups to talk before decisions, is well established as improving coordination for efficiency. Yet we are interested in details of equity that we believe are much less studied for collective action. We find that collective incentives appear to be promising as a mining intervention. We also confirm that communication enhances the probability of coordination sufficient to achieve collective success and we find that communication raises equity on average. However, in contrast to (implicit) expectations, it does not always raise equity – and inequity can be stable. Concerning when communication raises versus lowers equity, here we add a considerable novel focus on the dynamics of the communications that occur when groups are trying to coordinate. Our greatest focus is “leaders” who play central roles in leading groups towards the efficient or inefficient outcomes they achieve. Those leaders at the same time are establishing how the costs of group compliance will be distributed among group members.

BEYOND THE CLASSICAL PAYMENTS FOR ECOSYSTEM SERVICES (PES): INTRODUCING VALUE CHAINS AND SUSTAINABLE MARKETS TO COMPLEMENT PES IN AGRICULTURAL LANDSCAPES

Friday, 16th June - 08:15 - SD 701 - Oral Abstract

*Dr. María Alejandra Vélez*¹, *Prof. Ximena Rueda*¹, *Prof. ANDRES GUERRERO*², *Ms. Lina Moros*¹, *Dr. Andrés Link*¹

1. *Universidad de los Andes*, 2. *School of Management at Universidad de los Andes*

In recent years, there has been a boom in environmental policies using conservation incentives, aiming to create behavioral change to provide and preserve ecosystem services of high strategic value. One of the most widely used incentives is the Payment for Environmental Services (PES). The traditional approach of this incentive is based on the idea of a payment covering the opportunity cost of the owners of the threatened forest areas. This payment comes from the beneficiaries of ecosystem services, either directly or through institutions interested in conservation. PES have demonstrated positive effects on conservation but limitations in the long term regarding its economic sustainability. Based on a pilot design of incentives for the conservation of biodiversity in the Colombian Amazon (Piedemonte region), this article presents a new approach to PES by including the establishment of value chains in agricultural landscapes that economically recognize environmental practices to complement the traditional PES. The objective of this new design is the conservation of the forest along with the transition to sustainable productive practices. This institutional design allows the articulation of producers to value chains in the long term and markets that reward their efforts in sustainability, reducing their dependence on PES in the long term. The proposed incentive system differs from traditional PES in that a central component is designed to increase the quality of the agricultural product, in this case coffee, conditioned to compliance with a minimum of forest cover. The logic behind this proposal is that agricultural productivity will reduce the pressure on the forest because the market makes the payment conditional on the maintenance or improvement of forest cover. This new incentive system generates the socio-environmental conditions for the conservation and increase of the forest cover as well as the connectivity of the forests in the benefited region. Additionally, it shows how it is possible for small farmers to obtain economic benefits derived from greater productivity and sustainability of their agricultural practices. The article discusses the challenges in the design of the incentive, including the role of differentiated opportunity costs based on productive activity but also size of the farm; the simulation of the associated costs of the program and the opportunities of designing a new system oriented to both the conservation of forests and rural development. In this case, compared to traditional PES, the importance of designing incentives that link conservation to the productive activities of the area is highlighted, facilitating the development of value chains linked to promote forest conservation, with an effect in the economic sustainability of the incentive. The improvement of the income of local communities is transformed into regional benefits for the conservation of the forest and protection of the water resource, and finally in global benefits due to the conservation of the biodiversity and carbon capture. Our article brings new light to the land-sharing versus land sparing debate, offering an alternative in which both productivity and conservation increase, if the incentives are correctly aligned. PAYMENTS FOR ECOSYSTEM SERVICES, VALUE CHAINS, FOREST~CONSERVATION, INCENTIVES

Valuing Victoria's Parks

Friday, 16th June - 08:30 - SD 701 - Oral Abstract

Dr. Zaida Contreras¹, Ms. Helen Betts O'shea², Mr. Tony Varcoe³, Prof. Rob Wallis⁴

1. Energy, Environment and Climate Change | Department of Environment, Land, Water and Planning, 2. DELWP, 3. Parks Victoria, 4. Federation University Australia

Over the past decade much work has been undertaken globally to develop consistent frameworks and methods for accounting and valuation of natural capital and ecosystem services, with an increasing number of case studies demonstrating that well managed natural assets, including parks and protected areas, can contribute significantly to economic and social health and wellbeing.~ In this paper we will outline the methods and findings of the application of a new framework for ecosystem accounting to the parks network of the State of Victoria, Australia based on the System of Environmental Economic Accounting (SEEA). To highlight the benefits that Victoria's parks provide to communities and the economy, a range of ecosystem services were assessed in their current land use (i.e. as a park), compared to an alternative land use.~ The benefits of these services were estimated both in physical quantities and monetary values where feasible. The assessment has highlighted that Victoria's parks network contributes many and large benefits to Victoria's economy, its productivity, sustainability and liveability. These contributions include to income and jobs through tourism and other industries, cleaner waterways, avoided water costs to consumers and producers, improved health benefits and avoided health costs, increased amenity, protection of coastal assets, regulation of climate, supply of pollination services for agriculture and habitats for flora and fauna to maintain genetic diversity and opportunities for research and education.~ The information gained from the project will inform environmental policies and raise awareness among community stakeholders and decision makers about the significant return on investment of management of healthy parks and protected areas, contributing to the State's economy and community wellbeing as well as benefiting biodiversity conservation.~ Improvements in the ability to quantify the benefits of nature for human wellbeing, including economic benefit, has the potential to substantially shift the current paradigm of for park and protected area management by demonstrating multiple benefits to society and reaching new audiences and cross-sector partners and advocates.

Reducing Hg pollution in small-scale mining through associative entrepreneurship: an experimental and modeling approach

Friday, 16th June - 08:45 - SD 701 - Oral Abstract

Prof. Adrian Saldarriaga Isaza¹

1. Universidad Nacional de Colombia - Sede Medellín

After signature to the Minamata Convention on Mercury in 2013, several challenges remains to deal with the transboundary pollution and reducing the harmful effects that mercury usage has on human health and ecosystems. Artisanal and small-scale gold mining (ASGM) is one of the main sources of mercury pollution worldwide, but it is also the most attractive or the unique source of livelihood several millions of people in the world. The application of conventional practices, mercury amalgamation being the most representative, makes ASGM an activity with a high negative environmental impact, primarily due to mercury pollution. These and other rudimentary techniques continue to be massively popular techniques despite the fact that cleaner technologies are available to miners. Several policy instruments have been proposed to phase out mercury in ASGM, from the traditional command and control to other approaches such as associative entrepreneurship. By associative entrepreneurship, we mean the creation of local associations between small-scale gold miners in order to acquire more environmentally-friendly technologies. This approach, associative entrepreneurship, has been proposed as a scheme that would bring cleaner technologies to miners engaged in the extraction of gold at small scale. By using the results of an economic experiment and with the construction of a behavioral simulation model, we assess the feasibility of associative entrepreneurship (collective action) in the context of the public-good dilemma that ASGM communities face. We investigate the effect of two different institutional arrangements on associative entrepreneurship: (i) exclusion, and; (ii) the interaction between internal communication and the intervention of a non-coercive authority. We show that a sustained collective action (associative entrepreneurship) is possible when miners completely understand the social dilemma they face, but that self-organization is not possible. Features such as reciprocity and temptation to free ride partially explain why self-organization fails. In such a case, external intervention has a key role in promoting programs that improve the understanding of the social dilemma faced by artisanal and small-scale gold miners. However, a monetary (des)incentive such as exclusion did not trigger associative entrepreneurship. \textbf{Key words:} small-scale gold mining; public goods; co-management; exclusion; mercury pollution.

Meta-evaluation of environmental education projects: rethinking the role and effectiveness of indicators

Friday, 16th June - 09:00 - SD 701 - Oral Paper

Dr. Claudia Pocho¹, ***Prof. Tomás B. Ramos***²

1. Universidade NOVA de Lisboa, 2. CENSE, Centre for Environmental and Sustainability Research, Universidade NOVA de Lisboa

There is a relevant amount work on the assessment of governmental environmental education projects and programs. However, these tools do not usually include evaluation of the performance instrument itself. There is a lack of research on approaches that support the evaluation of the evaluation, identifying the strengths and weaknesses of an evaluation, and drawing conclusions about its overall utility, accuracy, validity and feasibility. This main research aim is to present a meta-evaluation approach to analyze the efficiency and effectiveness of an assessment model of governmental environmental education programs. Meta-evaluation can serve a valuable function as a quality-control tool during the implementation of an assessment. A Brazilian case study in the energy sector is used to test the proposed approach and usefulness of the proposed methodology is demonstrated. The selected case to test the meta-evaluation approach is an assessment model of environmental education programs operating in oil and gas facilities. The assessment model is supported by monitoring indicators. The proposed meta-evaluation framework is based upon a participatory oriented approach and is structured through a checklist of criteria and meta-evaluation performance indicators, that analyses how appropriate the education assessment indicators are and allows an evaluation of overall assessment tool's performance. The case study data were collected through a questionnaire survey and focus groups. Stakeholders evaluated model's performance, covering several parameters: utility, accuracy, validity and feasibility. Stakeholders also conducted a detailed analysis on the relevancy and adequacy of the model indicators and assessment procedures, as well as its capacity to guide teams in the improvement of environmental educational programs and projects. The main results indicated that the analyzed assessment model was accepted by stakeholders as a relevant tool to foster improvements and innovations on education environmental projects, programs and public policies while many suggestions were given to the betterment of indicators and its descriptions. The meta-evaluation process also included governance procedures that pre-established how the collected suggestions about the analyzed assessment model could be judged and implemented. Lastly, a seminar was provided to share the meta-evaluation results to stakeholders in general, including the changes adopted in the assessment model for government environmental education programs. These results enlightened the question about the role and applicability of indicators considering the challenges of supporting government policy development and management strategies, and sustainability evaluation and reporting of strategic instruments (policies, plans and programs). meta-evaluation, environmental education project, performance assessment, indicators

The circular economy as a key component of sustainable development teaching

Friday, 16th June - 08:00 - SD 702 - Oral Abstract

Dr. Elsa Joao¹

1. University of Strathclyde

The circular economy is a systems-based concept in which production is designed to be restorative and regenerative, while waste is designed out of the system. Circular economy is thus featured as a reaction to the conventional dispensation of the linear 'make-use-dispose' economy, and as a framework for the development and management of a sustainable, 'waste-as-resource' economic system. The value of the circular economy to sustainable development is therefore paramount. However, although the circular economy is gaining interest around the world, there is still a lack of teaching in this area. Due to the value of the circular economy to sustainable development, this paper argues on the importance of circular economy teaching as part of sustainability-based degrees. The paper presents findings related to an innovative new course on the circular economy (launched at the University of Strathclyde in Scotland in January 2017 and offered across the University) which has become a compulsory element of one of the oldest sustainability MSc degrees in the UK (the MSc in Sustainability and Environmental Studies that has run since 1992). This new circular economy course will be compared to other courses currently available worldwide and their explicit links to sustainability are evaluated. A review is also included of papers on higher education for sustainable development and any links to circular economy evaluated. Results of a survey of the 50 participants on the new circular economy course at the University of Strathclyde, from 16 different programmes across the Engineering and Business Faculties, are presented. The circular economy is a key component in sustainable development, and has huge implications for research, policy and industrial practice, and therefore it is fundamental that the teaching of sustainable development includes the leading issues in circular economy.

Participation Processes for Social Learning in the Transition towards a Sustainable Circular Economy: The Case of the Resource Recovery from Waste Programme

Friday, 16th June - 08:15 - SD 702 - Oral Abstract

Dr. Anne Velenturf¹, Prof. Phil Purnell¹

1. University of Leeds

If our society continues in its current patterns of production and consumption, we will soon face a twin environmental crisis of resource scarcity and waste overload. Positioning waste and resource management in the context of ecosystem stewardship, we relate our increasing demand for resources and production of wastes to the crossing of planetary boundaries and failure to meet human rights. We argue that a transition towards a circular economy *\emph{that contributes to a resilient environment and human well-being}* is necessary.~ While the urgency of a transition towards more sustainable waste and resource management is well-recognised throughout society, progress has been limited and requires strongly increased engagement from actors throughout society. We argue that academia has a moral obligation to play a more active role in facilitating engagement.~ We will present the engagement strategy developed and applied by the Resource Recovery from Waste programme (RRfW), running from 2014 until 2018. RRfW is an environmental research partnership with more than 170 academic, governmental and industry members, developing knowledge and tools to reduce pressure on natural resources and create value from wastes. The overriding purpose of RRfW is to support a mentality change in waste and resource management, moving away from end-of-pipe approaches and one-sided thinking about wastes from an economic and/or technological perspective and, instead, towards whole-system thinking about resources throughout their life-cycles including extraction, the cascading of products, materials and components through our economy, and eventually the associated impacts of resource recovery from wastes.~ According to the principles of participation process management, the envisioned mentality change and, importantly, uptake of knowledge and tools to make tangible progress in the transition towards sustainable waste and resource management, requires high levels of engagement of key actors in a social learning process. Hence RRfW initiated a participatory approach to facilitate learning through the mutual engagement of academics and government- and industry partners. We present RRfW's approach to identifying key actors active in waste and resource management, applying social network- and stakeholder analyses, and strategies to increase participation, from informing up to consulting and co-producing our research focus, methods, results and dissemination activities. In this way we strive to create a sense of ownership in our government and industry partners; supporting the uptake of research results, a legacy of continued dissemination of RRfW outcomes after programme completion, and ultimately the much needed change in mentality regarding, and management of, wastes and resources for a sustainable future. Keywords: Waste and resource management; Planetary boundaries; Human rights; Participation processes; Social learning

Challenges of engineering education for sustainable development: the experience of Ingenieros sin Fronteras Colombia - Engineers without Borders

Friday, 16th June - 08:30 - SD 702 - Oral Abstract

Prof. Catalina Ramirez¹, Mrs. Julia Helena Díaz Ramírez¹, Mr. Andres Acero¹

1. Universidad de los Andes

Academy plays a key role as spreader and foster of sustainable development in future managers, workers, entrepreneurs, politicians and researchers. In addition, academy, but specially engineering faculties, has a role in the industrial and environmental setting, through the development of projects related with topics such as sustainable business models, natural resource management and social engagement (Espinosa & Walker, 2011), among others. These approaches to sustainable development must allow theory application and favor students' opportunities to face real environments during their training. Accordingly, this abstract presents an initiative which foster partnership for sustainable development for engineering education, Ingenieros Sin Fronteras Colombia (Engineers without Borders Colombia). This organization is the result of an alliance between Universidad de los Andes and Corporación Universitaria Minuto de Dios, whose purpose is to improve the quality of life of marginalized communities in the country through engineering projects that are sustainable, economically and culturally viable. Furthermore, this initiative aims to develop social and environmental awareness in students, teacher, researchers and industry. To achieve that purpose, this group designed an interaction model based on partnership, teaching strategies and learning communities related with sustainable development issues. This model, that is being used by Ingenieros sin Fronteras since 2009, take social approaches, such as participatory action research (Ramirez et al., 2011), to engage communities to participate actively and teaching approaches, such as active learning (Lucke, Dunn & Cristie, 2016), to unleash students' potential. Accordingly, this group promotes the development of sustainable partnership models between and from direct participation of small and big industries, students of colleges and schools, teachers and community in general. Finally, the application of this model into engineering students have several results. In terms of impact on sustainable development applications, students participate actively into the creation of green business associations, the implementation of green processes and foster water saving on rural areas, among others, meanwhile changes on learning approaches to real problems are implemented each semester. In brief, this abstract summarizes a model to integrate sustainable development teaching with engineering education through hands-on experience and the results of the implementation of this model to several contexts.

Towards 'Transgressive Learning' in Bioregional Transition Labs in Colombia

Friday, 16th June - 08:45 - SD 702 - Oral Paper

***Mr. Thomas Macintyre*¹, *Dr. Martha Cecilia Chaves Villegas*²**

1. Wageningen University, 2. MINGAS en Transición

This research project addresses the emerging calls for more radical learning-based transformations in Education for Sustainable Development (ESD). With the overall aim of confronting 'wicked' challenges of sustainability, this research has the objective of mapping, analysing and ultimately promoting the emergence of 'transgressive' learning processes (radical forms of learning-centered transformation), with the contention that these processes can contribute to sustainability transformations at the food-water-energy-climate-social justice nexus. This research makes up part of the ISSC (International Social Science Council)-funded international project 'Transgressive Learning for Social-Ecological Sustainability in Times of Change,' which involves nine countries (Ethiopia, Malawi, India, the Netherlands, Sweden, South Africa, Vietnam, Zimbabwe and Colombia). Making up the Colombian case study, the specific aim of this case study is to develop regional 'transition labs' in community-based settings in Colombia which address local nexus challenges. Building on the educational traditions of 'critical pedagogy' as a means to address deep-seated assumptions and norms contributing to 'unsustainability' and 'place-based education' so as to connect such learning to the ecological places people actually inhabit the Colombian case study works towards a 'critical pedagogy of place' (Gruenewald 2003), demonstrating that such pedagogies are emerging across diverse communities of different ethnic origin in Colombia. We argue that such practices and approaches can contribute to innovative, inclusive, and place-based models for ESD which can bridge the gap between formal and informal education/institutions. The methodology is based on participatory action research, including co-researchers from each bioregion, with the aim of generating collaborative and inclusive 'transgressive pedagogies' between students and educators, investigators and community members, by connecting people to place through collective action-based change. Methods include participatory mapping, participant observation, and semi-structured interviews. With the first stage of mapping complete, findings show the presence of learning networks anchored in communities which are challenging traditional educational models and practices. They do this by putting forward alternative pedagogies based on principles of hybrid mestizo-indigenous buen vivir (bioregion Muisca-Bakatá), art and social innovation (Bioregión Macizo Acogedor), afro and indigenous rights (bioregion Caribbean) and family agriculture and permaculture in the bioregion Quimbaya. The next stages of the research are to analyse the extent to which such learning really is 'transgressive' in nature, and importantly, how to upscale such learning to other sectors of society. This will be achieved through exploring the power of social networks/movements and intercultural workshops to collectively construct pedagogical programs based on community resources and needs. By sharing our work into 'transgressive learning,' we provide the opportunity for researchers and educational practitioners to learn from emerging theories and models of learning, as well as early experiences of the bioregional 'transition labs' which we will present.

Sustainability literacy in older age groups: on the way to sustainable development

Friday, 16th June - 09:00 - SD 702 - Oral Abstract

Mrs. Patrícia Dolores¹, Prof. Fernando Caetano², Prof. Carla Oliveira²

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The world is facing sustainability challenges for which actions and results are needed in a 10 to 15 years time frame. Sustainability Literacy or Education has a crucial role for the Sustainable Development and is a set of different forms of education aiming to create economic, social, cultural and environmental conditions for sustainable development. This study looks at Sustainability Literacy or Education for Sustainable Development as a potential tool to empower individuals and communities to make more informed decisions that are aligned with long-term sustainability goals and can produce the short-term results needed. Any Education for Sustainable Development initiative relies and can greatly benefit from a bottom-up approach in local communities. An active participation of individuals in the community initiatives generates more opportunities for formal and non-formal lifelong learning and creates relevance that is engaging for other community members. The traditional approach of investment in Sustainability Literacy focuses on youth. However, while this approach is important in the long run, it may not yield results for current sustainability challenges. Older age groups (i.e. 50 or older), usually overlooked because they are perceived as not being motivated by sustainability or as being too late in their life span to have a significant impact, may play a crucial role in promoting sustainability within communities. Our study addresses the importance of improved sustainability literacy in older age groups (i.e. 50 or older) as a driver for sustainability. Endorsing a new role for senior citizens, by leveraging their last active years for short term sustainability efforts, we also empower them with the knowledge and tools to raise the sustainability literacy in younger generations. This work is being carried out in a Lisbon suburban community of around 12000 people, half of which are over 50 years old, and analyses some reflections on the importance of sustainability literacy within this age group and its effects on other age groups. It should be stressed that this population of 50+ years of age is actively engaged with the local University of the 3rd Age (U3A), where topics are presented and discussed in the classroom, using videos to generate a guided discussion toward the construction of the concepts by the students. The results from a group attending a life science literacy class show that the students experience increased personal satisfaction and wellbeing, are motivated towards learning and knowledge sharing within families and communities, including younger generations. These students also expressed greater understanding of messages from the media, health professionals and care takers, as well as a more positive health self-assessment and a greater treatment adherence. These results, aligned with the targets for good health and well-being sustainable development goal (SDG) suggest that initiatives to increase literacy lead to immediate behavior changes and knowledge dissemination. Further studies are ongoing regarding other SDGs, such as climate action, responsible consumption and production or affordable and clean energy.

Education for Sustainable Development in Portuguese Universities Institutional Framework: The key actors' opinion

Friday, 16th June - 09:15 - SD 702 - Oral Abstract

Ms. Carla Farinha ¹, Prof. Ulisses Azeiteiro ², Prof. Sandra Caeiro ¹

1. Universidade Aberta, Portugal and CENSE, Centre for Environmental and Sustainability Research, New University of Lisbon,

2. Universidade de Aveiro, Portugal and CEF, Centre for Functional Ecology, University of Coimbra

Universities have played key roles in transforming societies, by educating decision-makers, leaders, entrepreneurs and academics. However, education and research on sustainability and inclusive development in universities, is still at an early stage in many institutions. Over the last decades several integrated studies were undertaken in Northern and Eastern European countries to evaluate how Education for Sustainable Development (ESD) has been applied in the institutional frameworks of Higher Education Institutions (HEI). In Portugal, the Government promoted the effective institutional autonomy of HEI and the diversity of higher education systems focusing on building human capital. Nevertheless, to date, no attempts were made to evaluate the incorporation of ESD by HEI or by the Government both in their plans, programs and in the development policies regarding, in particular, Universities engagement to embed Sustainable Development (SD) in their academic systems. This study's aim is to determine, from a key actors' perspective, how sustainability was integrated into policies and strategies of HEI, particularly in Portuguese public Universities, within the framework and goals of the United Nations Decade of Education for Sustainable Development (DESD) 2005-2014. Semi structured exploratory interviews were conducted after gathering a sample of 15 key actors of decision-making processes namely from (i) Education, Science and Higher Education Ministers, as well as the Ministry's General Secretary and the General Director of Higher Education, (ii) Chairpersons of the Portuguese University Rectors Council, representing Portuguese Universities Chancellors and, with (iii) HEI and non-governmental key persons who designed and implemented Portuguese ESD. Considering that beforehand only a relatively small number of not particularly insightful documentary resources were gathered and analyzed, these interviews goal was to obtain complementary information either from the key actors themselves or from other documentation they could have accessed. Seven interviews were analyzed to provide a better understanding of the compromises concerning ESD in Portuguese public Universities, as well as the possible forms of the DESD goal implementation and their impact in their strategies and actions. Interviews with key actors led to other hidden or not publicly accessible plans, policies and programs. Preliminary results confirmed the documentary analysis findings that there is a lack of national integrated strategies or policies. Nevertheless, not only there are some relevant international drivers as well as a few good examples at specific national Universities level that have already their own Sustainable Reports published. It is also of critical importance for the effectiveness of the process concerning Inclusive ESD the commitment to the implementation of public policy and sustainability at universities level. Subsequently, there is an urge for a change in Portuguese universities paradigm and characteristics and still several boundaries to overcome. Further investigation will be undertaken, including the analysis of plans, policies and strategies at universities level and a questionnaire survey will also be applied to the person responsible for the sustainability implementation in the HEI, to better understand how the sustainability for development in Public universities in Portugal was accomplished. Keywords: DEEDS – Decade for Education for Sustainable Development, Environment/Environmental, Sustainability/Sustainable, Inclusive Development, Universities

The Magdalena river valley as an example of pervasive degradation of natural ecosystems and biological communities.

Friday, 16th June - 08:00 - SD 703 - Oral Abstract

*Dr. Andrés Link*¹, *Dr. Ana Gabriela De Luna*²

1. *Universidad de los Andes*, 2. *Fundacion Proyecto Primates*

The Magdalena river basin in Colombia, concentrates approximately 77% of the country's population and is responsible for 80% of its economy. The basin provides most of the country's hydroelectric power and almost 70% of the nation's agricultural products are produced within this region, which comprises only one fourth of Colombia's geographic extension. None the less, natural ecosystems in the Magdalena river basin have been widely transformed and to date less than 20% of natural ecosystems exist, most of them with a high degree of fragmentation and degradation. Here, we assess the current threats, challenges and opportunities that these ecosystems face at a regional scale and evaluate the impacts of anthropogenic disturbance on keystone species, and specially on large bodied mammals. We combined an assessment of the extent of natural forests from 1990, 2000, 2005 and 2010 combined with maxent modelling (for endemic taxa) in order to estimate the rates of habitat loss and fragmentation. We compiled secondary information to address the extent of habitat degradation associated with extensive cattle ranching, large oil palm monocultures, legal and illegal mining and major infrastructure development in the basin. Finally, we used occupancy models (through camera trapping) for medium and large mammals to better understand the vulnerability of large and emblematic animals to environmental changes from current patterns of land use and management. Based on our models, The Magdalena river valley has lost over 82% of its natural habitats, and rates of degradation have increased dramatically in the last decade. Although historical processes associated with extensive cattle ranching account for the vast majority of transformed areas, in the last decade large palm oil plantations have been the major driver of the transformation of natural forests into economically productive areas. Large predators (e.g., jaguars and pumas) and large herbivores and omnivores (e.g., tapirs and white-lip peccaries) are the most sensitive species to habitat loss and degradation and had a negative relation with the extent of forest cover and proximity to human settlements and access routes (roads, rivers, amongst others). We conclude that even though the Magdalena river valley is considerably degraded, current trends of habitat transformation are still not decreasing. In fact, the agricultural, and extractive industries continue to grow and increase their area of influence in this region. The disruption of biological processes through the potential local extinction of large predators and herbivores, might also derive in unpredictable changes in the diversity and dynamics of the remaining forests in the region. In conclusion, the Magdalena river basin is facing a critical moment in which large inter-institutional efforts will need to reconcile Colombia's development plans with the conservation of natural ecosystems end in order to guarantee their integrity and the goods and services they provide.

STAKEHOLDERS 'AUSCULTATION ON THE NEEDS AND TYPOLOGIES OF AGROBIODIVERSITY DATA THROUGH THE VALUE CHAIN OF THE VINEYARD AND WINE SECTOR IN ALENTEJO, PORTUGAL

Friday, 16th June - 08:15 - SD 703 - Oral Abstract

*Prof. idalina dias sardinha*¹, *Prof. Rui Figueira*², *Prof. Vânia Proença*³, *Prof. Margarida Lima de Faria*², *Dr. Filipa Monteiro*², *Prof. Maria Romeiras*², *Prof. Cristina Branquinho*⁴, *Prof. Margarida Santos-reis*⁴

1. Universidade de Lisboa/ISEG-Lisbon School of Economics & Management/SOCIUS-CSG, Researcher Centre in Economic and Organizational Sociology, 2. Universidade de Lisboa/ Instituto Superior de Agronomia, 3. Universidade de Lisboa/ Instituto Superior Técnico, 4. Universidade de Lisboa/ Faculdade de Ciencias

Agrobiodiversity encompasses all biotic variability of genes to ecosystems that somehow derives or relates to agricultural activities. Agrobiodiversity data is needed to understand the combined ecological and societal functions of agrobiodiversity, to determine its contribution to ecosystem resources and services and its value to society in general, e.g., responding to the current pressure on sustainable agro-food sector. This work focuses on the typology and interactions of information about agrobiodiversity in the vineyard and wine sector in Alentejo, Portugal. This sector of activity has national socioeconomic significance and can benefit from environmental valorization through the agrobiodiversity. A participatory workshop was conducted to assess how the stakeholders perceive and discuss agrobiodiversity, its management, how the information interactions on biodiversity and agrobiodiversity are drawn in and by this group, and the dilemmas associated to the biodiversity data use made available in databases and other collaborative tools. First, focus groups of stakeholders belonging to three groups of activities (i.e., production chain, governance entities and R & D entities), and secondly, in the form of non-target groups of stakeholders were modeled. The workshop was highly valued by the participants and the focus groups allowed for detailed perceptions about the type, information and interactions related to agrobiodiversity. Differences and resemblances in stakeholder groups' perspectives are analyzed and discussed. Recommendations to cover stakeholder's data information needs and actions to promote synergies and foster collaboration between and within stakeholder's groups are provided. This work is part of a larger project on the use and understanding of biodiversity and agrobiodiversity online information needs, which also includes a quantitative and a training approach.~~

Assessing and valuing ecosystem services from urban greenery -a method developed based on case studies in Sweden

Friday, 16th June - 08:30 - SD 703 - Oral Abstract

Prof. Yvonne Andersson Skoeld (in Swedish it reads Sköld)¹, Dr. Jenny Klingberg², Prof. Bengt Gunnarsson³, Prof. Sofia Thorsson⁴

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Despite the knowledge that greenery provides a range of important benefits to city residents, the current fast urban exploitation and densification increases the pressure to transform urban green spaces. The concept of ecosystem services (ES) has been suggested as an important concept to highlight and evaluate the services provided by greenery in relation to this and other pressures. As a result of this, methods for assessing and valuing the ES:s have been developed. There still is, however, a need of further development of methods that also are easy to use in the planning and decision processes. In response to this we have developed an empirically founded framework for integrated assessments of ES benefits and values of urban greenery. The method is based on identification of what can be measured in the urban environment that relates to specific ecosystem services, here referred to as indicators, (e.g. leaf area index, species diversity etc.) that. It is based on the so-called cascade model. The empirical data was collected from study areas in Gothenburg, Sweden. ~The method output is a semi quantitative estimate of how an area contributes to regulating ecosystem services such as local climate regulation, air pollutant deposition, noise and storm water management, and cultural ecosystem services such as physical activities and perceived well-being. The method also includes a valuation based on ranking preferences. The method is simple to use, and based on the functional indicators that are easy to measure. The empirical data was achieved, and the method was developed, through a cooperation among a multi-disciplinary team of scientists as well as civil servants. The method is highly requested by spatial planners in cities as well as the transport sector. The aim is accordingly, that the method shall be used in the local/municipal planning processes to investigate the current situation and impacts of future planning alternative. Key Words: ecosystem service assessment, method spatial planning, urban greenery,

Understanding stakeholder-ecosystem (dis-)service associations and the need for policy intervention to avoid environmental conflicts

Friday, 16th June - 08:45 - SD 703 - Oral Abstract

Dr. Joachim H. Spangenberg¹

1. Helmholtz Centre for Environment Research UFZ

Humans attribute different Ecosystem Service Potentials (ESP) to the same ecosystem, and they value different Ecosystem Services (ESS) differently. They do both not only as individuals, but also as collectives sharing similar habits, cultures, value systems and patterns. We have analysed such patterns by (i) conducting a systematic stakeholder analysis in different countries in Europe and South East Asia, (ii) and conducting qualitative interviews with those stakeholders to identify the ESS and Ecosystem Disservices (EDS) they emphasise. The result is a matrix showing the juxtaposition of different ESS indicating synergistic, ambivalent or unclear and obviously contradictory and to a large degree mutually exclusive ESS. It can be used to illustrate that those who define the ESP of any given ecosystem, by this very act, eliminate at least some alternative ESP, which may have been preferred by different groups of agents: trade-offs in terms of loss of other ESP are inherent to any decision which ESP to realise for generating ESS. Any such choice is also a choice on the distribution of cost and benefits. Thus the power to define the ESP structurally and unavoidably includes the power to define potential beneficiaries and those discriminated against, who have to bear disadvantages at least in terms of opportunity cost (lost alternative opportunities). Even more damage can be inflicted on the same or other groups by the EDS which are almost necessarily defined by defining an ESS (e.g. river flood regulation ESS – reducing flooding EDS, but also natural fertilisation ESS; carnivores defines biocontrol ESS – herbivores defined as pest EDS). They are distributed as determined by the ESP definition (biocontrol ESP presupposes agricultural use; it makes no sense for primary forest or wilderness). Of course, such matrices – both ESS vs. ESS and ESS vs. agents – are context dependent: indigenous groups with specific cultures and religions have different ones than urban dwellers, the differences being within and even more so between such groups of agents. Nonetheless the matrices are helpful for inclusive and sustainable land management planning and ESS governance. They highlight which ESS have to be accounted for in evaluating a decision option to guaranty its suitability for sustainable development, which groups have to be addressed for inclusiveness, and which themes have to be addressed when communicating with them. This may help avoiding discrimination and extended disagreements over land use decisions which might otherwise hinder sustainable land management implementation and cause environmental conflicts. Given the powerful role of those defining the ESP, this act must be understood as not scientific but highly political and in need of a legitimised decision. Politics has to accept its responsibilities; neither science nor social interest groups can have this power in a democratic society. **Key words** Ecosystem services, disservices, power, beneficiaries, disadvantaged

Sustainability of Social Design Laboratories: Infrastructuring of publics and Micro- planning in the development Design Networks

Friday, 16th June - 08:00 - SD 704 - Oral Paper

***Prof. Carlos Delano Rodrigues*¹, *Dr. Carlo Franzato*², *Dr. Rita Almendra*³**

1. University of Lisbon, 2. Unisinos Creative Industries School, 3. CIAUD, Faculty of Architecture, University of Lisbon

This paper presents the initial results of the doctoral research in design held at the Faculty of Architecture of the University of Lisbon, which is based on the possibility of expert and non-expert designers acting jointly in co-design processes, which make the infrastructure of design networks feasible from the engagement of young residents of neighborhoods stigmatised by poverty and social vulnerability. From January 2016, participatory design dynamics are being conducted in neighborhoods located in Lisbon, Portugal; and in São Luís do Maranhão, in Northeastern Brazil. Here we present the developments of the field study conducted in the Desterro region, the historic centre of São Luis do Maranhão, Brazil, where the LABDES - Desterro Social Design Laboratory was constructed, a platform for collaborative research based on design experimentation which is intended to search for solutions to complex social problems. The question that arises in this experiment is how to continue the LABDES platform beyond its initial scope. This involves the responsibility to reflect and to define strategies to ensure that the participatory design initiatives can continue when the expert designers cease to operate in the design network, understanding how they start, operate and not least, how they leave a project. In other words, we question the sustainability of the participatory design project when the designers or design researchers no longer have the central role in these initiatives. We understand the ability to establish lasting relationships between various stakeholders to promote continuous appropriation of the problems of a particular design network as project sustainability. At first, reflections are presented from the theoretical framework of participatory design, co-design, micro-planning, infrastructuring and living labs. After this first phase, as the LABDES design network was established, which used the participatory design approach, guided by “\emph{bottom-up}” decisions and “\emph{peer-to-peer interactions}” involving designers, members of the Desterro neighbourhood community and other stakeholders. The results presented explain the difficulties for the engagement of young residents. Apathy and resentment caused by the lack of continuity of actions undertaken in the past, hidden agendas, conflicts of power, the need for leadership and the legitimacy of the established leaders, the scarcity of resources, the impact of the use of social networking tools and the influence of the power of drug trafficking are the challenges that are presented to the sustainability of the lab project. In the discussion of the issues, planning, participatory design and low complexity prototyping tools were used, Participant Observation being used for the collection of data for action in the field. We conclude the paper by discussing strategies to support designers and researchers in their practice for training, performance and sustainability of design networks.

Inclusive Sustainability in Slum Upgrading and Incremental Housing. The case of the Rocinha, in Rio de Janeiro.

Friday, 16th June - 08:15 - SD 704 - Oral Abstract

***Prof. Nuno Martins*¹, *Ms. Jacira Saavedra*²**

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Rocinha is a favela (slum) located in the south zone of Rio de Janeiro, located 15km from the city center. Its population of more than 100,000 inhabitants is distributed around a 143.72ha valley that is surrounded by the rock formations of the Tijuca Rocky Massif and Atlantic forest of the national park, and occupied by the compact construction of the favela houses. This paper addresses two different urban phenomenon's that currently take place in the Rocinha. On the one hand, that of the expansion of the houses, typically made through the construction on the rooftop (the upper slab), an operation locally known as the *construção de laje* (upper slab construction). These works are self-help processes whenever the goal is to meet families needs regarding built areas to accommodate new family members, or; constructions featuring local contractor or workers, as seen in recent times, when the construction results from the selling of the building rights relate to the rooftop, in a process of verticalization that may acquire significant and unexpected dimensions. Thus, it is common to find three, four or even five and six-storey houses, built in seemingly precarious techniques, with narrow superposed volumes defying gravity. These operations express with remarkable clarity the concept of incremental housing, not grounded in design and intellectuality, as delivered by acclaimed architects, such as Pritzker-winner Alejandro Aravena, rather in its most popular and pragmatic sense, instead. On the other hand, as a result of public resettlement operations consisting of clearing of tangled webs of narrow and dark and unhealthy alleys that cross upside down the favela, new urban spaces rises. They are often bordered by lines of remaining superposed houses punctuate by collective social houses with low density, frequently three-storey buildings. These buildings replace the row houses stuck at the alleys and provide decent and affordable houses to the removed families. As an example, we will take the Number 4 street, accessible to cars, built on the old road of the same name through a complex process of de-densification that involved demolition and removal of many houses, partially or entirely. This urban renew was carried out thanks to the resources of a federal program of urbanization of precarious settlements (favelas) conducted by the state government, but with the involvement of different local actors, including local associations and community activists. This paper analyses both phenomenon, the incremental housing and the urban renew, emphasizing the social sustainability issues underlying the private and public process. It will be looking at the role-played by the different stakeholders, from householders to local leaders, NGO and social technicians, as well as designers and local representatives, analysing their interactions. The collection of data and subsequent analysis comprises diverse methods ranging from literature review, examination of architectural and urban projects, surveys, interviews, co-mapping and inquiries to the householders. Conclusions highlight the social networks that arose and consolidate over the slum upgrading process and qualify the interactions among the members of those networks.

Microgrids as an alternative energy solution for off-grid rural areas in Colombia

Friday, 16th June - 08:30 - SD 704 - Oral Abstract

*Mrs. Laura Hinestroza-Olascuaga*¹, *Dr. Célia Maria Santos Cardoso De Jesus*¹

1. CERis, Instituto Superior Técnico (IST), University of Lisbon

Access to electricity contributes to increase productivity, enables and improves the delivery of social and business services from a wide range of village-level infrastructure such as schools, financial institutions, and farming tools [1]. Considering the Colombian case study, energy access in rural and remote areas represents one of the most challenging issues [2]. Although the country has a high average electricity coverage index (99.59% in urban areas and 84.84% in rural areas), two-thirds of the national territory correspond to non-interconnected zones (ZNI) [3]. During the last decade, the national government, through the Institute of Planning and Promotion of Energy Solutions for Non-Interconnected Zones (IPSE), has installed 16 hybrid microgrids across the country. However, they are not enough to extend the service to approximately 1565 small localities without electricity access. In addition, the Mining and Energy Planning Unit (UPME) launched a series of sustainable rural electrification plans for Colombia's departments (PERS), but only five departments have enacted PERS: Nariño, Guajira, Cundinamarca, Choco, and Tolima [4]. Although state-owned utilities have traditionally carried out electrification, limited public and donor funds have proven insufficient to meet the aggressive access goals that governments and international organisations have set [1]. Main barriers include: a lack of clear and effective public policy, high levels of risk, lack of enough subsidies, low population density or isolated areas, payment culture and low willingness to pay, low income families, and potentially low returns. Although extending the grid could be also an alternative, high costs associated with the generation, transmission and distribution of electricity in these zones, have made that provision of the electricity service is mainly performed by means of diesel generation plants. Therefore, there is the need of more investments to promote the installation of hybrid microgrids in these areas. This paper will focus on the benefits and challenges of enabling microgrids in the electricity supply system in rural areas, specifically in milk producer areas. Due to a lack of clear and effective public policy and high levels of risk and potentially low returns, microgrid electrification studies are not attractive opportunities for the private sector. Specifically, there are two primary drivers of uncertainty for investors: *fuel price* and *electricity demand volatility*. Interviews constituted the primary source of information for this research. Interviewees were selected in order to obtain comprehensive insights from the different stakeholders involved in the electricity market: generators, regulators, public agencies, retailers, consumers, and academic institutions. We analysed the qualitative data through the software NVivo. Results from this study will support the formulation of policy recommendations for energy planning in off-grid rural areas, as well as enabling the participation of private investors in microgrids projects.

Afforestation and urban crime in Bogotá

Friday, 16th June - 08:45 - SD 704 - Oral Abstract

Prof. Fernando Carriazo¹, Prof. Jorge Tovar¹

1. Universidad de Los Andes-Department of Economics

The relationship between vegetation and crime has been the subject of recent research among urban scholars. While vegetation may have positive effects on human health, it could be related to a greater propensity for certain criminal activities. Using census and georeferenced data of trees, we explored the relationship between the process of afforestation and criminality in Bogotá-Colombia. Results from econometric estimations suggest a negative and significant relationship between the afforestation activity and crime, measured as the reported number of robberies. These effects are significant both temporally and spatially. Existing literature on this topic has focused on case studies in developed countries. This study is the first effort to quantify this relationship in an emerging country. We discuss implications of our findings for city planning and public policies aimed to reduce urban crime.

STUDY OF STRATEGIES TO PROMOTE CYCLING IN FOUR LATIN AMERICAN CITIES: THE RESULTS FROM BOGOTA, ROSARIO, MEXICO CITY, AND RIO DE JANEIRO

Friday, 16th June - 09:00 - SD 704 - Oral Abstract

Dr. Daniel Paez¹, Ms. NATALY SAENZ¹, Mr. Miguel Angel Ortiz¹, Mr. Miguel Dario Hoyos¹

1. Universidad de los Andes

The Inter-American Development Bank (IDB), as part of its commitment to the development of sustainable cities in Latin America, has supported the development of a platform to promote cycling in the continent. As part of the platform's development framework, four cities (Bogotá, Mexico City, Rosario, and Rio de Janeiro) were studied and compared in terms of their abilities to promote cycling. This paper uses a comparative methodology to assess the promotion of cycling and presents the results from the four cities. The fundamental criteria on which the comparisons were based were demand, infrastructure, regulations, and promotion of cycling. On the whole, we found positive aspects in terms of the increase in both the size of the bikeway network and demand from cyclists. This was particularly the case in Bogotá, where the increase in cycling has led to the city having the most extensive bikeways in the region. In the region, multimodality bicycle programs have also become common, as have the implementation of specific informative campaigns in each city. However, the comparisons that we undertook showed the need to improve road regulations. We also found that in the four cities the advertising campaigns do not paint the cyclist as vulnerable, and they also do not portray the responsibility of drivers as something fundamental in preventing fatalities. Due to the social inequality evidenced in this study, design and develop strategies that increase the status of the bicycle as a social and gender equal transport mode is a necessary promotion in this cities. In this sense, it is worth highlighting the success of the "Sunday cycling" program, in which there is a new contact with the bicycle and create a change of vision. Lastly, this study found there to be a need to define strategies to gather suitable information that demonstrates regulatory actions as well as the promotion of management and development indicators.

B Corps in Colombia: a legitimate alternative to face the sustainable development challenges?

Friday, 16th June - 08:00 - SD 715 - Oral Abstract

Dr. Nathalia Franco¹

1. School of Management at Universidad de los Andes

B-Corps are recent organizational models that are opening a path between the traditional business and the nonprofit organizations to support the sustainable development. Since their arrival to South America, they have become an attractive alternative to address socio-environmental issues in a profitable way. To become a B-Corp, organizations need to certify that they meet rigorous standards of social and environmental performance, accountability, and transparency. This new kind of enterprises started in the US around 2006, and arrived to South America around 2012. In fact, these all came together in the tendency of for-profit organizations adopting the social purposes through CSR initiatives, and non-profits implementing business logics to develop and scale their social projects. The convergence between these two sectors (social and business) call the attention of scholars around the world, and some researchers focus on the institutional changes of such integration. Literature has studied the managerial dilemmas that these organizations face using the concept of hybrid organizations by considering legal, financial, commercial and organizational dimensions (Battilana & Lee, 2014). These dimensions determine the underlying identity of the organization understood as the underlying logic for decision-making. Identity changes and evolution affects organizations' structures, but also social cognition. Through the hybridization, social structures to assess the organizational outcomes change, and can affect the organization legitimacy. According to the institutional theory, legitimacy is a socially built construct based on stakeholders' perceptions about organizational outcomes (Suchman, 1995). Cognitive legitimacy exists when social actors believe that certain types of organizations contribute to the public good. Social and environmental value migration represents a change on the structure and framework that society has to assess organization's contribution to the public good, and implies a challenge in cognitive legitimacy management. The aim of this article is to explore how organizational identity of the B Corps evolved over time, in order to identify the main organizational mechanisms these organizations use for managing organizational identity and cognitive legitimacy. To develop the study we analyzed four B-Corps working in Colombia. Two of them, *La Tercera Mirada* and *Green Factory*, working in the service sector (consultancy); the other, *Hybrytech*, a company that offers sustainable solar energy to low income population in isolated rural areas of the country; and the last one, *Alcagüete*, a business model that seeks to offer better nutrition alternatives to green consumers and low income children. These cases showed a clear example of hybrid organizations, with both commercial and socio-environmental logics at their core business. Findings of the study highlight the role of the entrepreneur in the legitimation process, as well as the importance of the certification as B-Corp to enforce the social understanding around their business model. Likewise, the analysis of the evolution of this B-Corps, allow us to identify key stakeholders who influence in the legitimation process, as well as the main tensions that the organizations face to maintain the commitment with the social, environmental and economic value generation.

Corporate sustainability: from anthropocentric to eco-spherical vision

Friday, 16th June - 08:15 - SD 715 - Oral Paper

***Prof. Martha H. Saravia-Pinilla*¹, *Prof. Carolina Daza-Beltrán*¹, *Dr. Gabriel García-Acosta*²**

1. Pontificia Universidad Javeriana, 2. Universidad Nacional de Colombia

Due to the challenges met by companies when facing problems like population growth, climate change and lack of resources, while responding to the economic and market demands, one of the issues required in global sustainability agendas is *Corporate Sustainability*. As a framework, this document is based on a research project that carried out a systematic search of specific concepts as key words to find the existing relationships and proposals that could associate *sustainability aspects* with *human aspects*. The results of the search showed that a conceptual development has taken place from two disciplines: economy and ergonomics. From this approach we refined the search using three concepts: eco-efficiency, eco-productivity and eco-effectiveness obtaining 15 documents which were read and analysed carefully and comparatively. It was found out the three concepts used are tightly related to Corporate Sustainability development. In this context, and considering the Ergoecology approach we may say that Corporate Sustainability needs to reorient its traditionally anthropocentric and economic-based view towards a holistic, integral, and ecospheric approach. To structure this paper we introduce the model proposed by the economists Dyllick and Hockerts (2002). It is based on six criteria for the management of Corporate Sustainability and their work from the concept of Triple Bottom Line (TBL). From there, it is presented the anthropocentric vision of the ergonomists Zink, Steimle, and Fischer (2008). Based on Dyllick and Hockers proposal, these authors involve on a determinant way the Human Factors and Ergonomics approach in the development of Social Sustainability. Then, going back to the economics point of view presenting the Mauerhofer's approach (2008), which proposes "3D Sustainability" to understand the concepts of *three capitals*, in order to achieve equity and environmental sufficiency. Finally, with the literature review it was confirmed that there is a different manner to approach forward and understand Sustainability. This new manner is exposed first, in the Ergoecology proposal by G. García-Acosta et al. (1997), and then in Green Ergonomics proposed by Thatcher, (2013). The starting point comes from the systemic approach of ergonomics towards the ecology aspects to become aware of the interdependence between natural systems and human systems, seeking a dynamic balance. Parallel to the development of the research project, other perspectives are recognized from the approach of the economists who move from the classic view of the Financial Economy, through holistic proposals such as the Ecological Economy and Economic Degrowth, among others, but are not directly related to the human aspects and therefore are not included in the theoretical framework.~ Concluding, it may be said that under Sustainable Development, the eco-efficiency criterion has become the main objective of organizations, which misrepresent the notion of *economic growth* and neglect environmental and social aspects. Likewise, it is needed to develop other criteria to address issues such as *ecological equity* with a view to achieving *social sustainability*. In order to achieve this transition, *from Ergoecology approach*, routes and strategies are raised allowing to identify actions that organizations should make to achieve true *Corporate Sustainability* *with an ecospheric approach*.

Corporate Social Responsibility in Community Development: A Case of GAIL (India) Limited

Friday, 16th June - 08:30 - SD 715 - Oral Abstract

Prof. Arun Sahay¹

1. Birla Institute of Management Technology

This study attempts to gain insight into corporate social responsibility (CSR) policy and processes of GAIL (India) Limited; how CSR initiatives are planned, aligned and implemented and how these initiatives contribute to the community development and company's growth. A descriptive case study research design has been adopted for the study. The study shows how community development which earlier was a separate thrust area is now (after the enactment of CSR Act) undertaken within different thematic areas and projects providing the trend in amount spent in community development under CSR. Further, it highlights issues and challenges faced by GAIL in undertaking CSR initiatives. The limitation of the study lies in the fact that the opinion and perception of communities benefited by GAIL projects could not be captured. **{Key Words:}** Corporate Social Responsibility, Community Development, CSR Act

Private contribution on public schools and academic performance. Efficiency measures using non-parametric frontier techniques

Friday, 16th June - 08:45 - SD 715 - Oral Paper

***Prof. Alexei Arbona*¹, *Prof. Diego Prior*², *Prof. Josep Rialp*²**

1. Pontificia Universidad Javeriana, 2. Universidad Aut3noma de Barcelona

This study measures the effect of voluntary contributions from private companies on the academic quality of public schools in Colombia. The impact is measured by integrating non-parametric frontier techniques in efficiency analysis (order-m) with a meta-frontier framework, which is a contribution of this study to the empirical literature on efficiency in education. This methodology decomposes the students' total inefficiency to estimate the direction and magnitude of the Private Contribution Effect (PCE). With a sample of 101,874 students, we found a positive PCE that for certain regions reaches a maximum equivalent, on average, equal to 25% of the total effect.

Policy coherence for sustainable development in developing countries: A South African perspective

Friday, 16th June - 08:00 - SD 716 - Oral Abstract

Prof. Willem Fourie¹

1. University of Pretoria

Background In Africa, the adoption of the 2030 Agenda's Sustainable Development Goals (SDGs) followed in the wake of the Africa Union's adoption of the aspirations of Agenda 2063. Africa's broad-ranging and ambitious set of development goals was designed with a view to direct national and subregional development in Africa. However, the alignment of the SDGs and Agenda 2063's aspirations remains a challenge, which may impact on development progress in Africa. This is particularly the case when additional alignment with national development plans is factored in.

Research argument Policy coherence on subnational, national, subregional, regional and global levels is key to ensuring inclusive and sustainable development. However, policy coherence for development remains a perspective applied to the implementation of policies of providers of development assistance. In Africa, the challenges related to aligning and implementing both the SDGs and Agenda 2063's aspirations illustrates the real-life challenges related to policy coherence, and the need to expand the current perspective. This paper investigates correspondence and tensions between the SDGs, Agenda 2063's aspirations and South Africa's National Development Plan – both on theoretical and practical levels. This forms the basis for arguing that research on policy coherence for development can fruitfully be applied to the policies of developing countries.

Aim The aim of this paper is to illustrate the opportunities and challenges related to applying policy coherence for development to the policies of developing countries. The African Union's Agenda 2063 is the only regional policy instrument of its kind and provides a unique opportunity for investigating the challenges of policy coherence for sustainable development.

Theoretical framework This paper is qualitative in nature and bases its conclusions on documentary analysis, engagement with key policy-makers, enriched with personal experience. Due to the operative theoretical framework, it will not make use of empirical research. It seeks to present a conceptual argument.

Conclusions This paper highlights the complexities of policy coherence in developing contexts and suggests implementation-level solutions to challenges. It is argued that the national level remains the level of implementation, which provides national governments with the opportunity to use their own development policies as integrative instruments.

Implications for the conference theme This paper contributes specifically to the notion of 'engagement' of the conference theme. It is aimed at reflecting on the most effective engagement between multilateral policy-making platforms towards transformative policy coherence.

Keywords 2030 Agenda; Agenda 2063; policy alignment; African Union; South Africa; National Development Plan

Linkages between Capacity and Sustainability of Development Outcomes in Rural Africa: Empirical Evidence from Community-Level Capacity Assessment in Ghana and Malawi

Friday, 16th June - 08:15 - SD 716 - Oral Abstract

*Ms. Yasuko Kusakari*¹

1. The University of Tokyo

Despite Africa's potential, the large amount of funding and various development interventions over the past decades, poverty in Africa has not been abated significantly. To tackle multi-dimensional challenges, past development programs led by central governments or external organizations alone have clearly shown their limitations. Consequently, local capacity development deserves more attention than ever as a means of reducing poverty and promoting sustainable development. However, there has been no clear definition of capacity or capacity assessment framework that can be applied at the community level in the context of rural Africa. Against this backdrop, undertaking a critical assessment is indispensable to examining roles of local capacity and exploring effective and efficient approaches to capacity development to ensure sustainable development outcomes in rural Africa. This study aimed to develop a capacity assessment framework that can: 1) evaluate capacity of rural communities particularly development leaders, 2) examine linkages between local capacity and sustainable development, and 3) identify factors that contribute to levels and qualities of capacity at community level – for recommending feasible capacity development approaches for contributing to long-term sustainable development in rural Africa. For accomplishing these objectives, a series of research activities has been undertaken in six communities in the Wa West District of Ghana and six communities in the Mulanje District of Malawi. The communities were selected based on distribution of geographical and administrative areas and development project history, i.e., existence or non-existence of integrated rural development projects with capacity development components supported by external development partners. Functional capacities, which are soft skills of development leaders for facilitating community-driven development, were examined as a main pillar of this research. Key dimensions of functional capacities examined include “Mutual Accountability”, “Engagement and Participation”, and “Ownership”. The research also examined one selected area of technical capacity as well as communities' perceptions about 16 key development sectors that have been selected based on the context of rural Africa, for comparison with functional capacities. These dimensions have been examined mainly through focus group discussions (FGDs) with separate groups of men, women and development leaders, totaling 568 participants in the 12 communities. Observations and individual interviews were undertaken for crosschecking with the results obtained through FGDs. The capacity assessment revealed: i) critical linkages between functional capacities and sustainable development, ii) external support's limited contributions to functional capacities (despite positive effects on technical capacities and development outcomes to some extent), and iii) crucial roles of local ownership in sustainability of development. The research also affirmed the validity of community-level capacity assessment tools that have been developed through this research as well as potentials of these as a learning tool for facilitating changes in mindset and actions for impacting the sustainability of development outcomes. Based on the results, the research offers some concrete and practical recommendations for putting more emphasis on institutional platforms of development leaders consisting of diverse representatives, functional capacities with long-term perspectives, local ownership, and application of community-level capacity assessment, leading to inclusive sustainability for development, which is the central theme of the conference.

Assessing Agricultural Transformation Pathways in Rice Production in Nigeria

Friday, 16th June - 08:30 - SD 716 - Oral Abstract

Dr. Olawale Emmanuel Olayide¹

1. University of Ibadan

Nigeria is the highest producer of rice in West Africa, and the third largest in Africa after Egypt and Madagascar. Yet, there is still excess demand for the commodity in the country. The per capita consumption of rice has grown from 3 kg in the 1960s to an estimated 37.5 kg in 2014. Current government policies to boost local rice production through self-sufficiency in production have less focus on the impact of rice production systems on carbon footprint and climate change mitigation. The agricultural sector has been implicated as a driving force in greenhouse gas (GHG) emissions and land use effects. Direct sources of GHG from agricultural production systems are emissions from cultivated and fertilized soils which include carbon dioxide, ammonia and nitrogen oxides. Rice (*Oryza spp*) constitutes a major staple crop (and drainer of foreign exchange) in Nigeria. It also contributes to greenhouse gas emissions through its intensive and high-input production system. Proper identification of the nature and intensity of emission (and sources) could assist in appropriate greenhouse gas emission actions as well as proper estimation and reduction of carbon footprint from rice production systems. Hence, the importance of assessing the nature of deep carbonization that would be required for agricultural transformation pathways in rice production systems in Nigeria. ~ The transformation pathways methodology which seeks to analyse agricultural production systems taking into cognizance climate change and sustainability of the agricultural production systems, was adopted for the study. In this regard, a step-by-step of the analysis of back-casting involved: analysing the present economic and environmental situation of rice production in Nigeria; stating desired future scenario; undertaking feasibility assessment; prescribing a concrete course of action; and elaborating detailed pathways. The findings yielded a strategic matrix for the transformation of the rice production systems in Nigeria. The transformation pathways have indicators on productivity, biodiversity, climate change scenarios, and nutrient demand. Also, targets, roadblocks and levers for sustainable rice production were presented. These issues are with a view to mitigating greenhouse gas emissions and promoting efficient water management in the rice production system in Nigeria.

Organic innovation in African agriculture

Friday, 16th June - 08:45 - SD 716 - Oral Abstract

Prof. Raymond Auerbach¹

1. Nelson Mandela University

The green revolution was a disaster in Africa for three reasons: water was a major limiting factor, most crop research was on rice and wheat, while maize is the staple for much of Africa; the inputs recommended (hybrid seed, chemical fertiliser, pesticides and irrigation) were simply not available, or were too expensive to be justified in the context of high-risk rainfed agriculture. Two approaches have been advocated to assist with African food insecurity: one is the new green revolution, with its Millenium Villages Project (AGRA-MVP); the other is the Export Programme for Organic Products from Africa (EPOPA).~ Five years of implementation of these two approaches were compared in terms of financial and human capital invested, numbers of farm families reached and costs per farm per year.~ The investment in both money and people for the EPOPA project was a fraction of that invested in AGRA-MVP, more than twice as many farmers were reached and the cost per farm for AGRA-MVP was estimated to be US\$120 per year, while EPOPA spent \$2 per farm per year.~ AGRA deployed one doctoral-level and four masters-level scientists for each village cluster, while EPOPA had only three professional staff running the programme.~ We concluded that both approaches had merit, and that EPOPA should learn from the greater focus on infrastructure development adopted by AGRA and the grander scale of intervention, while AGRA could learn about institution building, market linkages, capacity building for farmer training and use of locally available natural resources.\\ Keywords: Organic agriculture; capacity-building; institution building; farmer market linkages.

Examining Citizen Power in Tanzania

Friday, 16th June - 09:00 - SD 716 - Oral Paper Rejected

Ms. Krystal Dixon¹

1. University of Florida

Upon independence, the government of Tanzania implemented various restrictive policies aimed at suppressing political organization among citizens. In a seemingly contradictory fashion, they also encouraged greater citizen participation at the village and local level and through service-driven organizations, recognizing the role civil society organizations play in meeting development objectives. The concept of citizen engagement and participation in governance—as being developmentally valuable—specifically when aiming to increase accountability and responsiveness from public officials and improving the delivery and quality of public services—has been widely accepted among development researchers, practitioners, and organizations internationally. Over the last two decades, the political environment in Tanzania has opened up to allow community service organizations to collaborate with government officials on policy formulation, budgeting, and planning—at the local and central level. Therefore, Tanzanian citizens are in a more advantageous position than ever before to embark on the process of political empowerment through civic engagement and political-participation. There is a need to understand what the process of citizen empowerment entails in Tanzania, and how that process is shaped by specific social, economic, and political contexts. This research argues that the prospects for increased citizen empowerment, referred to as the ‘Citizen Power’ framework, is made greater through an effective combination of three main concepts: citizen participation, social accountability practices/participatory governance, and good local governance. This research aims to identify the factors which facilitate—or inhibit—the acquisition of ‘Citizen Power’ in Tanzania. These factors are 1) Political Will, 2) Citizen Will, 3) Socio-economic and Demographic Characteristics, 4) Resources, 5) Institutional Capacity, 6) Administrative and Legal Framework, and 7) Third Party Support. The ‘Citizen Power’ framework was developed through an analysis of the theoretical literature concerning concepts of citizenship, civic engagement and participation, social accountability, participatory democracy, institutional performance, and local governance. In addition, the concepts were contextualized through an analysis of data presented by Afro Barometer in 2014/2015. Sixteen case studies were also selected after a thorough review of empirical literature and were chosen because they provide in-depth information on specific participatory projects and programs in Tanzania and the conditions that caused them to be successful or limited their success. The seven stated factors were identified through the review of the—empirical literature. The findings from the review of the empirical literature and 2014/15 data from Afro-barometer revealed that lack of citizen participation, low trust of public officials, lack of political will at various levels of governance, and lack of ‘Citizen Will’ are major constraints to the effectiveness of collaborative initiatives, and therefore citizen empowerment. The research concludes that policies and programs implemented in Tanzania should seek to address the citizen-state relationship and foster positive attitudes towards collaborative—governance. This should include the objectives of strengthening social capital, particularly trust, between CSOs and the state. Too little focus has been placed on exploring *\emph{Citizen Will}* in empirical studies, and understanding the complexities in citizens’ disinterest and their decisions to disengage, or limit their engagement in local and political matters in Tanzania.

(WHY) DOES AFRICA NEED FEMALE RESEARCHERS?

Friday, 16th June - 09:15 - SD 716 - Oral Abstract

Prof. Margareth Gfrerer¹

1. Education Strategy Center

Gender issues as widely discussed at all political levels mainly manifest female rights and claims. Male issues are rarely covered under this topic except if those refer to males' misconduct. No information could be found that gender issues refer to the value of having female researchers in 'hard core science' in order to bring to research results a female touch without losing international academic recognition and acknowledgement from their research communities. Normally, female researchers active in the gender movement focusing in their research more on gender issues than on research in science, technology engineering or mathematics (STEM). Female researchers in the STEM disciplines are very much in to the topics that they can't bring thoughts to the gender movement. However, female researchers are primarily females with the specific female attitudes of rating relationships higher than rules and norms, thinking through their views of selfishness and responsibility (Preissle, 2006). Feminist research ethics demonstrate that female researchers are biased in how researchers draft assumptions, design questions, conduct procedures and build on data to reflect to social values. No research could be found, how feminist research ethics impacts research subjects, others than in social sciences. This research aims to find out the differences between female and male researchers in their research works and to visualize how female and male specifics could be characterized through out their research. This research is a field research in form of a proposal writing workshop for researchers and graduate students in Ethiopia. In preparation of the workshop indicators for the female research approach will be elaborated in a literature review. All proposals have to address one and the same topic. The submitted proposals will be measured against the set indicators in a first step. In a second step the different sections will be scrutinized against each other and finally analysed on the overall added value. ~The findings will contribute to learn about the specifics of female and male approaches in the different sections of a research proposal. The strengths of both, female and male researchers will be captured and amalgamated in a concept to demonstrate how to build strong research teams that are able to focus on the society at large and communicate the results in the female way to citizens, who are rarely interested on research issues. ~ Overall this research envisages to find the strength of female researchers and make them more visible in sectors, which are primarily dominated by females such as agriculture, education or health. Based on these findings training programmes can be elaborated to encourage females to pursue their careers as researchers and contribute to improve especially the lives of 'voiceless' African females in the globalized world.

Toward Inclusive and Collaborative Climate Change Governance at the Municipal Level in Costa Rica

Friday, 16th June - 08:00 - SD 203 - Oral Paper

*Dr. Sergio A. Molina-Murillo*¹, *Ms. Vanessa Valerio-Hernández*², *Ms. Sonia Arguedas-Quirós*², *Ms. Alina Aguilar-Arguedas*²

1. Universidad Nacional de Costa Rica (UNA) y Universidad de Costa Rica (UCR), 2. Universidad Nacional de Costa Rica (UNA)

In 2007 Costa Rica was the first country committing to become carbon neutral. Two years later it developed its National Strategy for Climate Change and has since generated significant efforts aimed to governmental institutions and the private sector; however, advancements at the local level remain scarce, fragmented and poorly supported, particularly limited by the technical and organizational capacity that local governments have in leading mitigation and adaptation strategies within their territories. Since climate change is a multi-level, multi-sector and multi-term challenge, it asks for a different public governance style, with a higher commitment with civil society and the private sector, and with enhanced human capacities for the collective action. Supported by a research and extension project since 2011, several municipalities have been engaging in the development of collaborative and more inclusive climate change strategies within their territories in tune with local businesses, institutions, and civil society. The main purpose of this project is to support and document the process taken by our different case municipalities in developing and implementing their local strategies, and thus, supporting other local governments in developing their own. For this, the research team has been following a participatory action research approach with three local governments over several years, and during 2016 a structured survey was also conducted to the 81 municipalities of the country regarding the incorporation of the climate change topic into their municipal governance. General results are presented with an analysis of the perceptions from the nation-wide survey; then, with the help of the three cases studied, we explain the process taken in the adoption of such strategies and the challenges emerged. We found that in spite of the existing concern about the climate issue, appropriate mechanisms and information are lacking to enable its more efficient adoption in local governance. Therefore, we conclude that in order to adequately address the issue of climate change in an inclusive and sustainable manner, local governments are required to develop both internal and external capacities—beyond good administrative management—to allow a collaborative interaction with the actors involved, in order to generate and maintain their recognition, involvement, and commitment. It is evident that this project supports an alternative collaborative governance model, through the enhancement of individual and social local capacities leading to a more systemic commitment for collective climate action. This action requires transcending voluntary and isolated initiatives, leading the way to planned, and politically supported mitigation and adaptation strategies for inclusive development.

Understanding Governance of Natural Protected Areas Through Social Network Analysis in The National Natural Park Amacayacu, Amazonas Colombia

Friday, 16th June - 08:15 - SD 203 - Oral Abstract

***Mr. Orlando Vargas*¹, *Prof. Masahide Horita*¹, *Ms. María J. Novoa Alvarez*²**

1. The University of Tokyo, 2. Universidad Nacional de Colombia

Colombia has 59 National Parks that represent 11.27% of the continental land. These protected areas are managed by National Parks of Colombia (NPOC), which has the main responsibility of not only to conserve the natural resources of the protected areas, but also to protect the traditional cultures that live inside or surrounding the protected areas, as well as to contribute to their sustainable development. NPOC coordinates with other governmental institutions from local, regional, and national level that have a relation in their territories with protected areas. In this way, NPOC promotes development, and environmental conservation policies, articulated with national, regional, and municipal development plans. However, managing protected areas and its surrounding areas often generates conflicts among institutions since interests and objectives of each institution might be contradictory. The research focused on the National Natural Park Amacayacu (NNPA) located in the south Colombian amazon, between the jurisdictions of Leticia and Puerto-Nariño. This national park is interesting, since it has overlaps with four indigenous territories from different ethnicities, which have formulated or are in process to formulate their own management plans for their territories. The NNPA administration has developed a Co-Management (CM) strategy for including communities as active subjects of the conservation; strategy that recognizes indigenous traditional use and management of their territories. Different studies have analyzed this CM process using qualitative analysis, however, none of this research has used a quantitative approach that identifies the structural properties of the CM of the NNPA. This research uses a social network analysis for describing the current network governance structures of the NNPA and establishes three networks that show the sharing and collaboration processes between institutions and indigenous communities. In addition, this research uses quantitative analysis in each identified network for identifying underlying properties of the networks structures and the institutions related to it. To get the relational data necessary for the social network analysis, 27 interviews were done to institutions related to the NNPA, among which six were to indigenous communities having overlaps or surrounding the NNPA. Three networks related to knowledge, resources and cooperation were identified and analyzed, using the software Pajek. The analysis was carried out in two different levels related to CM. First, at network level to understand overall characteristics of the network, and second, at agent level to understand positions of institutions in the network. In addition, an Exponential Random Graph model was done for understanding the creation of connections among institutions and indigenous communities. The networks exposed the institutional complexity related to the CM of the NNPA. Each network revealed its own particularities and provided valuable information for identifying structural and agent characteristics. In addition, the analysis revealed that the CM of the NNPA has strengths in the actual collaboration process between indigenous communities with overlaps and the management of the NNPA. In contrast, the analysis also showed some lacks in the governance of the NNPA surrounding areas, since indigenous communities that do not have overlaps with the NNPA are not engaging with resources or knowledge about conservation.

Adopting a place-based approach: community waterway adoption as an iterative approach to the collaborative governance of inland waterways

Friday, 16th June - 08:30 - SD 203 - Oral Abstract

Dr. Alex Franklin¹

1. Coventry University

This paper examines the role of community 'adoption' initiatives as a means to stimulating and sustaining local engagement in the multi-level governance of natural resources. Guided by a critical review of the meaning of community resource adoption in both a public resource setting, and neoliberalist governing context, particular attention is given to the process of learning to govern and care for natural resources as place-specific community assets. The paper takes as its empirical focus the case of inland waterways in England and Wales. It considers how the recent launch of community adoption schemes by the managing authority (the Canal & River Trust) impacts upon and serves to shape the collaborative governance of a national public resource. This includes facilitating the practices of repeat place-based volunteering and inclusive decision-making that community adoptions seemingly have the potential to motivate. However, it also requires sensitivity towards the feelings of local ownership that such initiatives can stimulate, as well as co-ordination of the shared, and on occasion 'bounded', practices of care upon which they depend. The paper reports findings from semi-structured interviews and focus groups undertaken with relevant Trust employees and with a sample of community adoptees. The research suggests that the localized, place-based and participatory nature of waterway adoptions present both challenges and opportunities to existing forms of resource management. Conclusions are drawn on the contribution of adoption schemes to enabling a shared sense of ownership and authority to take root at a local level, but also the challenge of learning to accommodate specifically place-based forms of community interest within the collaborative governance of national environmental resources. Key words: Governance; community; water; shared practice; adoption

Transcending Hydro-Social Boundaries: The Use of System Thinking Boundary Objects Toward Improved Collaborative Governance in The La Plata River Basin

Friday, 16th June - 08:45 - SD 203 - Oral Abstract

*Mr. Jason Walters*¹, *Ms. Erin Kenzie*², *Mr. Alexander Metzger*³, *Mr. Jesse Baltutis*⁴, *Ms. Kakali Chakrabarti*⁵, *Ms. Shana Hirsch*¹, *Ms. Bethany Laursen*⁶

1. University of Idaho, 2. Portland State University, 3. University of Massachusetts Boston, 4. University of Victoria, 5. Washington State University, 6. Michigan State University

Transboundary collaborations related to international freshwater resources play an integral role in society, as they establish frameworks for shared access to our planet's most fundamental resources. Maps, diagrams, and other constructed visual elements, functioning as boundary objects, are used in transboundary collaboration documents to convey understandings and facilitate discussion across scales about challenges and opportunities from multiple perspectives. Such focal points for discussion are valuable in creating shared, socially-negotiated priorities and integrating diverse and often disparate cultural perspectives that naturally exist in transboundary water resource contexts. They can also promote alignment of mental models related to complex hydro-social cycles and encourage non-linear systems thinking in decision-making, which has been suggested as more appropriate for tackling complex wicked socio-ecological problems in a variety of fields, such as political ecology, engineering, and natural resource management. The La Plata River Basin is a unique case for multi-scale collaboration among the represented states of Argentina, Bolivia, Brazil, Paraguay, and Uruguay, as the socio-economic, political, and biophysical landscapes represent interdependencies at all levels within the over three million square kilometer area. Although early agreements related to water use and governance in the Basin began to be developed over a century ago, the 1969 La Plata Treaty ultimately created the current framework, which is unlike that of other large international transboundary river basins. Instead of a highly centralized management body that may be heavily influenced by upstream or more hegemonic states, the 1969 Treaty established mechanisms for additional bi-lateral and multi-lateral treaties at the regional level within the Basin, and included objectives now recognized in international law, such as reasonable and equitable use, environmental protection, and socio-economic development. Despite the ubiquitous presence of systems thinking boundary objects (STBOs) in transboundary water collaboration documents and their potential for improving decision-making and stakeholder inclusion in development, scientific understanding of their use in this context is limited. In order to address this gap, the specific focus of this research is to identify visual STBOs and how they are being used in transboundary river documents at multiple scales toward inclusive collaboration, conflict resolution, discussion, and understanding across disciplinary, social, cultural, and organizational boundaries within the La Plata Basin. Over 1000 documents were reviewed on the websites of the primary national, bi-national, and multi-national entities formally involved in La Plata River Basin and Sub-Basin collaborations in order to identify 100 data visuals that richly represented hydro-social cycles for further analysis. A mixed-methods approach was developed from the peer-reviewed field literature and applied to analyze the visuals based on the strength of representation of elements of systems thinking and boundary objects, as well as contextual use in the documents. Initial results indicate a range from weak to strong for both systems thinking and boundary object elements and the analyses are currently ongoing. Keywords: Water Governance, Boundary Objects, Systems Thinking, Mental Models, Collaboration

Governing through a Database

Friday, 16th June - 09:00 - SD 203 - Oral Paper Rejected

Ms. Josefin Borg¹, Dr. Henrikke Baumann¹, Dr. Cecilia Gabrielii¹, Dr. Hannes von Knorring²

1. Chalmers University of Technology, 2. University of Gothenburg

Within the Swedish shipping industry, a collaborative initiative for increased energy efficiency is being established; *Sweship Energy*. It aims to overcome an energy efficiency gap by enabling knowledge sharing between both different actors and different communities of practice. Within the initiative, different activities are being executed; including a network for energy managers, education focusing on onboard personnel, and a database project. Through a PhD project, we study the organization of the initiative, aiming for a better understanding of inter-organizational collaborations for transition towards sustainable development. In the project, we have a qualitative approach. We use empirically grounded, ethnographic methods. The data is collected through observations, interviews and documents. In this paper, we explore the database project's role within the initiative during the earliest establishment phase of the initiative. It was the first project that was initiated when the collaboration was first established. For decades, objects have been included in research aiming to explain collaborations, and have with time gained an increasingly central role in the literature. Much of recent literature apply the concept of *boundary objects*. Boundary objects could be described as objects which form boundaries between different communities of practice in shared spaces. In the literature, databases are examples of boundary objects previously studied. In *Sweship Energy's* database project, the actors involved translated the database project differently; as a project developing a database for decision support for companies, a pedagogic tool at the initiative's workshops, a tool mapping the industry's total energy saving efforts, or a tool for central support from the initiative's secretariat to its members. These translations also changed throughout the project. Despite the lack of a common understanding of what the database meant, all actors involved agreed on a database to be developed. During the database project, several challenges were experienced, and the project's outcome did not meet all expectations. Whether the database project was a failure or a success could be discussed, and depends on what definition of failures being applied. Based on a market definition, a technically functioning database was not created, even though parts of the project's outcome are still being used in other forms. From a social context, several key actors considered the project to be a failure. However, if the aim of the database project was not to create a technical object but rather to contribute to the establishment of a collaboration, then it could be argued that it might have been at least partly a success; as a project, the database project resulted in additional actors becoming involved in *Sweship Energy*.

The Impacts of Citizen's Engagement in global Governance for Sustainable Development: The Case of Low Carbon City

Friday, 16th June - 08:00 - SD 204 - Oral Abstract

*Prof. Juliana Gutierrez Rua*¹, *Prof. Alejandro Álvarez*¹

1. EAFIT

SDG, and Paris Agreement, have mark a path for next years. Governments, corporations, academia, international organizations and even cities are desperately looking for alternatives to appropriate the discourse into practices that allow to transform the era of Anthropocene.~However, beside the existent institutional framework to address sustainable development there are some questions that still remains unanswered and constitutes a challenge for the current trends of state decentralization.~How does global governance affect local behaviors and the way in which citizens mobilize towards sustainability? How to involve citizens in global governance for sustainable development?~The lack of answers from institutional side, and the traditional means of operation from NGO, or traditional activist groups, had led to an interesting phenomenon of world wide mobilizations, showing the power of citizens in five areas i)public agenda setting, ii) raising awareness, ii) changing behaviors and contributing to change, iv) connecting globally and triggering changes locally, and v) being at the center of multi-stakeholder work.~The case of Low Carbon City, LCC, is the epitome of this Phenomenon. Citizens have come together~in a platform that looks to tackle climate change by building collective solutions in cities at global level.~Since its creation in 2015,~LCC has over 80 ambassador cities, has mobilized roughly 13.000 citizens around the world, has organized more than 150 activities in its network, and has raise the voice of citizens in international venues to discuss sustainable development and climate change.~Nevertheless, its impacts have gone beyond~global participation. From~local focus, the work with academia has been outstanding in~agenda setting. I.e.~Through the partnership with EAFIT University, LCC have been able to i) promote participation of more citizens in academic conferences, ii) foster the creation of projects and creative ways to communicate the importance of low carbon and sustainable lifestyles and iii) build connections between members of EAFIT community and other national and international players.~Some examples are the discussions with decision makers, solutions and prototypes created by undergraduate students to reduce emissions, communication strategies oriented at shifting behaviours to a climate friendly life, and finally, as an example on how far this bottom up approach of governance could go, the work with children, in which they not only receive training and adopt a low carbon life, but also become in message carriers in their communities, and active in politics.~In this specific case, after participating in the program, children talked to the City Council for giving advice in the public policy, the World LCC Forum to more than 3000 participants, and they even created their own Manifesto, which is a reference for policymakers.~There are abundant examples as LCC which demonstrate that citizens are influenced by global governance and this is a process that occurs in both ways, because from the local experiences global governances is nurturing as well. what is doing LCC is a citizen-led~complementary approach on what networks like C40 or Compact of Mayors are doing at local level. ~Citizens, global governance, climate change, SDG, Cities

Expectations and experiences in building a socio map in Venezuela, from a vision of sustainability

Friday, 16th June - 08:15 - SD 204 - Oral Abstract

***Prof. FREDDY HERNANDEZ*¹, *Dr. Esmeya Díaz*², *Dr. Maria Angela Flores P*¹, *Dr. RUTH ALVAREZ*³,
*Prof. Roxy Pérez*¹**

1. Universidad de Carabobo. INFACES, 2. Universidad de Cara, 3. Universidad de Carabobo

When addressing the production of goods and services focused on sustainable development services, local management has an important role, mainly based on the vision of endogenous development, given the internal reality of each country and the trends apparent in his environment. In Venezuela, Carabobo has been regarded as a fundamental basis in the process of sustainable development; given its natural resources, geographical location, population, among other factors; It has been key to give the profile of a prosperous region with development prospects. However, figures from the National Statistics Institute (INE) shows that by 2015, the level of poverty still remains a problem situation; And, there is at least 40% of poor households in the Carabobo region; This contrasts with the reality of abundant resources, favorable geographical location and economic and social performance. Among one of the weaknesses that has this region is the lack of targeted geographical statistical information, for which the municipality Valencia Carabobo state, even though it is one of the most important cities of Venezuela has not escaped this situation. Thus generation becomes relevant local statistics, where an interactive map that draw social and productive indicators can be a powerful tool, especially for drawing realities of the lower social classes. Currently, the municipality Valencia Carabobo state - Venezuela, does not have information to infer weakness or strength in the plane of endogenous development, even if it is a priority for the effective targeting of public policies in the social and productive spheres spearhead of the socio-political framed in the Plan of Economic and Social Development of the Nation 2013 - 2019, which are required to contribute to the Millennium Development Goals of drastically reducing poverty and sustainable development. This paper aims to show preliminary results in the participatory development of a map of socio capacity in deprived communities in the municipality of Valencia Carabobo - Venezuela, framed from the sustainable approach. Methodologically it involves field research, no experimental descriptive cross-sectional; at first participatory workshops 12 (step 1) is performed and then a sampling process was applied with the participation of 420 households (step 2). As for the results, experience in communities with participatory workshops proved very valuable in terms of exchange of knowledge in order to recognize and approach to understanding the social and productive done. Furthermore, the results show that the dimensions of the socio capacity in deprived communities bordering three levels: household (individual capacities), the collective (social skills) and public (public building), these three conjugates allow optimal levels a range of opportunities for the most vulnerable for the sake of better utilization of resources for local, social and productive development sectors of the population, showing the real possibility of influencing poverty levels from a sustainable perspective in the municipality Valencia Carabobo state - Venezuela.

Sustainable Development, degrowth and the law: context, connections and challenges

Friday, 16th June - 08:30 - SD 204 - Oral Abstract

Dr. Volker Mauerhofer¹

1. University of Vienna/Meiji University

This contribution assesses in which situations the application of law is a precondition to address degrowth as one goal of a Sustainable Development (SD). It first defines law in a broad sense including binding rules based on formal (written) as well as informal (non-written) sources. In terms of sustainable development the further assessment is conceptionally based on 3-D Sustainability, a recently developed decision support method. The contribution results in the presentation of the contexts between degrowth and the different elements as well as criteria provided by that method and inherent legal principles, such as the precautionary principle. The presentation identifies sufficiency, eco-effectiveness, ecological equity and socio-effectiveness as SD-criteria (of 3D-Sustainability) most relevant to reaching the degrowth goal by means of law. It presents information focused, incentive focused and rule focused instruments as the main, but differentiated tools for multilevel governance towards degrowth within a SD and also indicates the varying availability of these instruments on different geopolitical levels. The presentation further discusses the practical implications of these relationships and gives an outlook on further innovative applications of its results as well as additional challenges for research.

Large scale cooper mining conflict discourses in Ecuador. From neo-constitutionalism to neo-extractivism

Friday, 16th June - 08:45 - SD 204 - Oral Abstract

***Dr. JORDI PRADES*¹, *Dr. AITANA DE LA VARGA*², *Mr. Francisco Delgado*³**

1. ASTERISC. Communication Research Group. UNIVERSITAT ROVIRA I VIRGILI, 2. CEDAT. Centre for Environmental Legal Studies. UNIVERSITAT ROVIRA I VIRGILI, 3. CIEES. Center for Research and Specialized Studies

Thirty years after the concept “sustainable development” was presented and twenty years after mining conflicts in Intag started, Rafael Correa, the Ecuadorian president under whose mandate was passed the Constitution of Sumak Kawsay—which recognizes nature as a subject of law— ends in 2017 its ten years in office. In last decades, environmental conflicts arisen and sharpen at local and global level. In Ecuador, the neo-extractive model faces the Political Constitution of 2008. This paper analyzes convergences and divergences between discourses around conflicts regarding large scale cooper mining in Ecuador. Discourses are compared and related to weak (extractive), strong (efficient) or super-strong (ecologist) environmental models, and to liberal, cultural and eco-socialist approaches. To carry out this study, several relevant actors from the principal sectors in dispute (the private, the public, and the social) have been interviewed; the Equatorial legal system (Constitution, legislation, doctrine and jurisprudence) has been analyzed; and a sample of corporate documentation (plans, projects, memories, reports of environmental impacts and corporate social responsibility, etc.) has been consulted. The aim of this communication is, firstly, to identify the undertaken environmental commitments from each part as a starting point, and, secondly, to compare them with the real evolution of the discourses, the legislation, the policies and the practices during this years until today. The conclusion is that although there is a common ground between the actors, the positions still remain quite a long way apart. That means that in practice the extractive model imposes itself strongly on the ecologist model and even on the efficient model. As a result, the equatorial mining policy is stepping away from the constitutional mandates that call for the sustainability and the Good Living (*\emph{buen vivir}*), *\emph{Sumak Kawsay}*. **\textbf{Keywords:}** cooper\textbf{ mining, discourses, environmental conflict, Sumak Kawsay, Intag.

FutureTalks: Community Co-Creation for Transformative Urban Sustainability

Friday, 16th June - 09:00 - SD 204 - Oral Abstract

***Dr. Tamer El-Diraby*¹, *Dr. Sara Hughes*¹, *Dr. John Robinson*¹, *Ms. Kim Slater*¹, *Mr. Stephen Williams*², *Dr. Wendy Wong*¹**

1. University of Toronto, 2. University of British Columbia

With more than half of the world's population now living in urban areas, co-creating transformative urban sustainability solutions is paramount in the 21st century. Addressing sustainability challenges related to rapid urban growth, social inequality and climate change requires an inclusive approach to sustainability, which means involving citizens, especially those who have been traditionally hard to reach, in conversations about the future. FutureTalks is a five-year research project proposed for Toronto, Canada that will consider the choices and tradeoffs that 100,000 citizens from diverse backgrounds are willing to make in envisioning the sustainable future of their city. The project brings together scholars, non-governmental organizations, and actors from the government and private sectors in a large-scale and interactive co-creation process that harnesses the collective knowledge of the community as a means of generating new understandings and solutions. The aims of the project are to better understand: (1) how a large-scale community co-creation process can be undertaken in a large city; (2) the societal impacts of different means of engagement, visioning, and mobilization around urban sustainability; and (3) how Toronto's experience can be applied in other cities. One of the theoretical frameworks guiding FutureTalks is the emerging literature on co-production and co-creation of research and action (Jasanoff, 2004; Lemos and Morehouse, 2005; Pohl, et al, 2010). Researchers work with colleagues in the private, public, and/or civil society sectors in the articulation of research questions, in the undertaking of the research itself, and interpretation and use of the results (Robinson and Tansey, 2006; Talwar et al, 2011). Another theoretical context for this project is the literature on urban sustainability and climate change governance, which highlights the growing role of cities in addressing global challenges of climate change and sustainability (Bulkeley and Betsill, 2003; Marcotullio et al., 2014; Gore and Robinson 2009). Traditional community engagement processes often exclude underrepresented and equity-seeking groups in cities (Abbott 1996; Agyeman and Evans 2003; Hughes 2013). Meaningful and sustained engagement from the public and other non-state actors can improve policy outcomes, bolster legitimacy, and empower residents (Burch, 2010; Sarzynski, 2015). An important first step for building community and collecting data began in October 2016 at the Minden Symposium, a Toronto-based gathering hosted by the University of Toronto's School of the Environment that convened researchers and community partners who revealed that meaningful and mutually beneficial cross-sector partnerships are crucially important for the success of the project, and continued engagement with attention paid to equality between academic and non-academic partners is vital to build trust. Data collection and analysis would occur through a participatory action research (PAR) approach that uses mixed methods, notably observant participation, in-depth semi-structured interviews and focus groups to produce rich detail regarding the relational and organizational aspects of co-creation processes. During my oral presentation, I will share findings from the Minden Symposium that indicate the kinds of partners and governance mechanisms needed to undertake a large-scale co-creation process like FutureTalks, the role of academia, and opportunities for maintaining a shared vision.

A Spatial Hedonic Analysis of a Large, Failing Desert Lake The Case of the Salton Sea in California

Friday, 16th June - 10:15 - SD 701 - Oral Abstract

Dr. Amrita Singh¹

1. University of Alberta

A number of hedonic studies report that proximity to a water body increases the value of residential properties, yet many lakes around the world show acute environmental stress (e.g. falling water levels, and pollution) due to water transfer agreements, persistent droughts, and polluted urban or agricultural runoff. Inland water bodies suffer especially from air pollution and falling water levels that contribute to worsening air quality due to the exposure of desiccated lake shores. To our knowledge, however, no published hedonic study has jointly analyzed the economic costs of falling water levels, deteriorating water quality, and the resulting regional air quality impacts for a large inland water body. We conduct such an analysis with an application to the Salton Sea, which is the largest lake in California. In our study we specifically use hedonic regression models to analyze the relationship between distance to the sea and local environmental conditions (e.g. water levels, water clarity, and air quality) on single family home transaction price. The Salton Sea is a saline lake located in California's Sonoran desert. In recent decades, the agricultural runoff from surrounding farms has led to severe levels of saline within this land locked sea. The nutrient loading has caused environmental hazards such as massive fish die-offs, as well as looming sulfur odors. The eutrophication process will be further exacerbated in the coming years due water transfer agreements, which will severely reduce water inflow into the sea and further increasing salinity. Additionally, as waters recede, the sea's shorelines, along with the remaining salt levels, will become a potential source of harmful fugitive dust in the form of particulate matter PM10, thus threatening the health of the local population, which primarily consist of agricultural farm workers and their families. Given the problems associated with the sea, we use a spatial hedonic regression model to see if distance to the sea, dropping water levels, deteriorating water and air quality are negatively capitalized in the surrounding real estate values. Our analyses of single family properties, from 2009-2013, within 10 miles of the sea indicate that proximity to the Sea is negatively capitalized in the surrounding real estate market. On average, a one-mile reduction in distance to the Sea is associated with a \$1,190 fall in the price of a single-family residence. In addition, a one-foot drop in the Sea's annual water level is associated with a \$8,628 price decrease, while a one mg/m³ increase in annual PM10 concentration reduces the value of the average family residence by \$1,249. Water quality is not statistically significant. These results quantify some of the economic costs associated with the severe environmental degradation of desert lakes and illustrate the connection between water quality, water levels, and air quality. Property values are an important source of revenue for any community. We show that further environmental deterioration of the Salton Sea negatively impacts property values, as well as the community's revenue.

Stakeholder-driven initiatives using sustainability indicators

Friday, 16th June - 10:30 - SD 701 - Oral Abstract

Ms. Ana Rita Domingues¹, Dr. Rodrigo Lozano², Prof. Tomás B. Ramos³

1. *CENSE, Center for Environmental and Sustainability Research, Universidade NOVA de Lisboa*, **2.** *University of Gävle*, **3.** *CENSE, Centre for Environmental and Sustainability Research, Universidade NOVA de Lisboa*

Several authors have highlighted that stakeholders' involvement increases the quality of environmental and sustainability decisions, since such information is then taken into consideration in more comprehensive ways. On numerous occasions stakeholders have been integrated into processes when decisions have already been discussed and decided. New approaches have appeared to integrate stakeholders in environmental and sustainability processes that go beyond passive roles, with many of such initiatives being related to sustainability indicators. Sustainability indicators allow informal and semi-continuous actions of sustainability data collection and evaluation, conducted by stakeholders, covering different phases of the assessment. We aim to provide a review of voluntary and collaborative stakeholder initiatives that use sustainability indicators as evaluation and communication tools. We reviewed scientific and grey literature to analyse worldwide initiatives, including technology-driven examples. These initiatives are from governmental agencies, Non-Governmental Organisations and private companies. Findings show that the integration of stakeholders as active actors enhance social ties, communication grid, the use of a common language, the vision about what was being implemented, co-responsibility of the shared resources and feedback mechanisms. Stakeholders become part of the processes because they feel their opinions are heard in processes that have impacts in their daily lives or that it is important for their community. For instance, they become part of the team that gather environmental indicators to monitor the quality of a water systems. Some examples of indicators used by stakeholders in the development, use and communication are given. Aspects related to the conflict of interests between stakeholders and the possibility of over-representativeness of some groups are also addressed. Finally, we discuss how empowering stakeholders can boost their engagement with sustainability related-aspects and help the transition to more sustainable societies. Thus, this allows integration of new perspectives from the engaged stakeholders as a complementary evaluation to sustainability assessment processes.

Keywords: Sustainability assessment; indicators; voluntary process; collaborative process; interactive participation; stakeholder empowerment

Sustainable Neighborhoods Observatory: urban sustainability indicators at the local scale

Friday, 16th June - 10:45 - SD 701 - Oral Abstract

Prof. Renato D'Alençon¹, Prof. Roberto Moris¹, Dr. Stefan Steiniger¹, Mr. David Aviles¹

1. Pontificia Universidad Católica de Chile

The quantification of sustainability is a question that has grown in importance in academic and political circles as sustainability problems gain space in public awareness. In this debate, the installation of independent or consensus representative actors, called “Observatories”, can play a relevant role for the establishment of these tools and their effective use in design, implementation and monitoring of public policies towards sustainability. Whereas in international agreements there is rather a perspective on a country-scale sustainability, private individuals are striving for a more sustainable lifestyle and even cities start to look at their sustainability, mostly from an environmental perspective. In this context, what has been rarely looked at, is sustainability at a neighborhood scale. The construction of indicators to measure urban sustainability is not appropriate today to the neighborhood scale nor to the formulation of urban sustainability policies. A multi-criteria social evaluation is necessary as a general framework for the formulation of policies and adapted to the specificities of the local context. The work of CEDEUS Sustainable Neighborhood Observatory (Observatorio de Barrios Sustentables, OBS) addresses this particular issue, that is: to explore how sustainability and its trajectory over time can be measured and evaluated at neighborhood scale in Chile, aiming at the formulation of neighborhood sustainability indicators that are compatible with the relevant international framework and at the same time relevant to the local conditions of the neighborhoods in Chile and to the formulation of policies Public policies. This paper discusses these issues and presents a pilot study that aims to establish indicators of sustainability in neighborhoods, with the intention of becoming a working tool for neighborhood residents as well as for external actors who are interested in intervening. In a first round of meetings a list of 76 sustainability indicators was established based on a literature and policy review. These indicators are covering 10 sustainability areas, such as security, jobs and income, education, access and mobility, etc. For a pilot study 13 + 3 neighborhoods (barrios) were selected based on three criteria: (i) city size (metropolis, intermediate minor, or intermediate mayor), (ii) neighborhood context (central, peri-center, periphery), and (iii) percentage of population that needs social support (qualifying according to a social characterization named “ficha de protección social”). These 13 barrios are to be found in 6 cities, including Copiapó, La Serena, Santiago, Concepción, Temuco, and Valdivia. Additionally, three reference neighborhoods with a higher income or a central location were chosen to account for the full range of indicator values. For these cases, we establish indicators of evaluation and impact of urban improvement in neighborhoods, differentiating it and relating it to other city, commune and housing scales and their surroundings, recognizing the cultural, social, socio-environmental, territorial and economic contexts of the neighborhood and local level and evaluate the information of the scale of districts according to the processes of social, economic and environmental sustainability and urban sustainability. **Keywords:** urban analysis, neighborhoods, indicators, observatory, sustainability.

Stakeholder engagement-based evaluation of social sustainability with respect to the mining sector

Friday, 16th June - 11:00 - SD 701 - Oral Paper

Dr. Evren Deniz YAYLACI¹, Prof. Sibel Kalaycioglu¹, Prof. Sebnem Duzgun¹

1. Middle East Technical University

The mining sector exploits the non-renewable natural resources and supplies them to the industry and energy sector. Hence, it has considerable share in the national and local economies of the large number of countries. Besides the economic impacts, the sector has impacts on environment, and society. Therefore, effective integration of the environmental, social and economic dimensions of sustainability into the decision-making in the mining sector promises contribution for the achievement of the sustainable consumption and production patterns. However, quantitative evaluation of the social impacts, exposed by the local communities, is not performed as effectively as the environmental, technical, managerial and economic issues. In this regard, the paper discusses if and how much the mining sector contributes to enhance the social sustainability in the mining communities in terms of social impacts of the operations based on the quantified parameters. For this purpose, a local stakeholder engagement-based methodology is proposed for quantification and integration of the social parameters into the assessment and decision-making of the mining sector planning. The methodology is applied with a case study in Afşin-Elbistan Coal Basin (AECB) in Turkey. The case study shows that quantitative integration of the social parameters is significantly important to evaluate the negative and positive impacts of the mining sector on the social sustainability at the local-level. Moreover, it is observed that participation of the local communities into the assessment process make the social sustainability concept tangible and it prevents to use de facto social sustainability criteria for different cases.~

The Sustainable Child Development Index (SCDI) - A novel way to assess national achievement towards sustainable development

Friday, 16th June - 11:15 - SD 701 - Oral Paper

Ms. Ya-Ju Chang¹, Prof. Matthias Finkbeiner¹

1. Technische Universität Berlin

Children are the key stakeholders for shouldering and shaping societies towards sustainable development. However, an index assessing children development in the context of sustainable development is missing. To address this challenge, the framework of the Sustainable Child Development Index (SCDI) considering environmental aspect was firstly proposed and the indicators were collected and screened regarding data availability. As the following study, the research target of this study is to complete the establishment of the SCDI by selecting the representative indicator set, designing the normalization and aggregation methods, and determining the SCDI scores for countries. First, the 23 representative indicators addressing the five themes health, education, safety, economic status and environmental aspect are selected based on correlation analysis and the trade-off between the number of covered countries and considered indicators. The representative indicators are normalized according to the defined reference points regarding the Sustainable Development Goals (SDGs) and then aggregated into the SCDI for the 137 countries. The SCDI scores are classified into four levels (very high, high, medium and low) to group countries' progress towards achieving sustainable child development. The results show that a great regional inequality on sustainable child development achievement exists. European countries, especially Nordic countries, express their superiority in sustainable child development. On the contrary, 95% of the assessed African countries are evaluated as countries with medium and low achievement. Additionally, some OECD countries, e.g. Australia, Italy and Turkey, are evaluated as medium sustainable child development countries due to their weak performance in the theme environmental aspect, e.g. freshwater vulnerability and renewable energy consumption. Moreover, the correlation analysis of the SCDI, Human Development Index and Child Development Index shows that the SCDI can be applied as a complementary assessment to the existing development indexes in order to provide a more comprehensive evaluation on sustainable development by regarding children perspective and addressing relevant topics of sustainable development, such as environmental aspect and safety. Accordingly, the application of SCDI can contribute to establishing more comprehensive strategies on child as well as sustainable development policies, and to inform the condition on child development to stakeholders.

Integration Model of Productive Enterprises for Innovation Adoption in Livestock Farming in Argorejo and Argosari Village, Sedayu Sub-District, Bantul District, Special Province of Yogyakarta

Friday, 16th June - 10:15 - SD 702 - Oral Paper

***Mrs. Supriadi Supriadi*¹, *Prof. Ali Agus*², *Prof. Muhadjir Muhammad Darwin*², *Prof. R Rijanta*²,
*Dr. Ambar Pertiwinigrum*³**

1. Ministry of Village, Development of Disadvantaged Areas and Transmigration, 2. Universitas Gadjah Mada, Yogyakarta, 3. Universitas Gad

Adoption of innovation is a process of mental or behavioral changes in the form of knowledge (cognitive), attitudes (affective), and skills (psychomotor) since one recognizes the innovation until one decides to adopt it after receiving it. Integrated livestock development is a model of integrated resource management by integrating livestock and crop in accordance to the areas developed by community with bio-industry and eco-friendly (zero waste) orientation. The study of “innovation adoption of integrated farming” was a case study in Argorejo and Argosari village, Sedayu sub-district, Bantul District in Yogyakarta. Its aim was to explain the process of innovation adoption of integrated farming to encourage the development of productive enterprises that led to the improvement of the local economy and the development of rural areas. Using descriptive analytical method, the data obtained through interviews and focus group discussions related to the innovation adoption of integrated farming was described to define the aspects of who, what, when, and how in group activities. The results of the study formulated the concept of innovation adoption model in integrated farming to develop the rural areas effectively and efficiently by preparing a development program. The program was based on local wisdom as a reference for the empowerment program which included technological training, institutional strengthening, and mentoring program designed to produce innovation agents to conduct the adoption. The concept arose over the adoption process carried out by members of the group to create business activities that were integrated vertically and horizontally which would in turn increased the revenues of members of the business group.

Sustainable agriculture: challenges and opportunities for the vegetable sector in northern Philippines

Friday, 16th June - 10:15 - SD 702 - Oral Abstract

*Ms. Mursha Dalay-on Gapasin*¹

1. Monash University

The rapid diffusion of modern technology has transformed farming systems around the world, triggering widespread shifts from subsistence to market-oriented production. Indeed, the application of intensive agricultural methods have resulted in higher yield and income. However, the ecological and social consequences have set off debates about the sustainability of conventional (modern) farming, prompting the rise of local and international movements for alternative agriculture. In the Philippines' vegetable sector, concerns about the impacts of current agricultural practices are emerging and driving path-breaking actions in policy, extension work and farmers deciding alternative ways to produce. The recent enactment of a national law legitimizing the advancement of organic agriculture in the country has boosted preceding efforts of various sectors. While government agencies are mandated to implement the policy, this research highlights the essential role of farmers, non-government organizations, academe and civic groups in advocating sustainable agriculture albeit the need for consolidated actions. Drawing from interviews of farmers, policy implementers and advocates in the largest vegetable producing province in northern Philippines, the study explores the challenges in the adoption and promotion of sustainable agriculture practices, particularly organic farming. Findings show that beyond the technological limitations of such methods, historically embedded factors also deter attempts to shift from conventional to sustainable production. As the presentation will illustrate, the institutionalization of a commercial vegetable industry in the locality has generated new social relations between farmers on one hand and market intermediaries and financial actors on the other. It is argued that the power asymmetry intrinsic in these arrangements serves to constrain farmers to conventional methods of production. Moreover, notions about what constitute good and successful farming differ between conventional and organic practitioners. The existence of entrenched elements, such as those found in the research setting, alludes to the significance of understanding local conditions and perspectives in policy implementation and advocacy for sustainable farming. The study also maintains that challenges notwithstanding, organic agriculture presents opportunities for the local economy and its stakeholders. Keywords: challenges, opportunities, organic agriculture, vegetable industry, Philippines

Novel technological and management options for accelerating transformational changes in rice and livestock systems

Friday, 16th June - 10:15 - SD 702 - Oral Paper

*Dr. Ngonidzashe Chirinda*¹, *Ms. Laura Arenas*¹, *Ms. Sandra Loaiza*¹, *Ms. Catalina Trujillo*¹, *Mrs. Maria Katto*¹, *Ms. Paula Chaparro*¹, *Mr. Jonathan Nunez*¹, *Dr. Arango Jacobo*¹, *Ms. Deissy (Ciat-ccafs) Martinez*¹, *Dr. Ana Maria Loboguerrero*¹, *Dr. Luis Augusto Becerra*¹, *Mr. Ivan Camilo Avila*², *Dr. Myriam Guzmán*², *Dr. Michael Peters*¹, *Dr. Jennifer Twyman*¹, *Ms. Maria Garcia*¹, *Ms. Laura Patricia Serna*¹, *Mr. Daniel (Ciat) Escobar*¹, *Dr. Diksha Arora*¹, *Dr. Jeimar Tapasco*¹, *Mrs. Lady Johanna Mazabel*¹, *Dr. Fernando Correa*¹, *Dr. Manabu Ishitani*¹, *Dr. Mayesse Aparecida Da Silva*¹, *Dr. Eduardo Jose Graterol*¹, *Mr. Santiago Jaramillo*¹, *Ms. Adriana Pinto Brun*³, *Dr. Andres Felipe Zuluaga*⁴, *Dr. Nelson Enrique Lozano*⁵, *Mr. Ryan Byrnes*⁶, *Ms. Carolina Alvarez*⁷, *Dr. Idupulapati Rao*¹, *Mr. Gabriel Lahue*⁸, *Prof. Rolando Barahona*⁹

1. International Center of Tropical Agriculture, 2. Fedearroz, 3. Ministry of environment - Colombia, 4. Fedegan, 5. Ministry of agriculture - Colombia, 6. University of UC DAVIS, 7. INTA - Argentina, 8. University of California, Davis, 9. Universidad Nacional de Colombia (UNAL), Medellín,

Agricultural producers grapple with low farm yields and declining ecosystem services within their landscapes. In several instances, agricultural production systems may be considered to be largely unsustainable, in socio-economic and ecological (resource conservation and use and impact on nature) terms. Novel technological and management options that can serve as vehicles to promote provision of multiple benefits, including improvement of smallholder livelihoods, are needed. We call for a paradigm shift to allow designing and implementing agricultural systems that are not only efficient (serving as a means to promote development based on the concept of creating more goods and services while using fewer resources and creating less waste), but can also be considered synergistic (symbiotic relationship between socio-ecological systems) by simultaneously contributing to major objectives of economic, ecological and social (equity) improvement of agro-ecosystems. These transformations require strategic approaches that are supported by participatory system-level research, experimentation and innovation. Using data from several studies conducted, we here provide evidence for technological and management options that could be optimized, promoted and adopted to enable agricultural systems to be efficient, effective and, indeed, sustainable. Specifically, we present results from a study conducted in Colombia, which demonstrated that in rice systems, improved water management practices such as Alternate Wetting and Drying (AWD) could reduce both water input and methane emissions (70%). We also show how women can play a key role in AWD adoption. For livestock systems, we present *in vitro* evidence showing that the use of alternative feed options such as cassava leaves contribute to livestock feed supplementation and cost-effective reduction of enteric methane emissions (22-55%). We argue that to design and benefit from sustainable agricultural systems, there is a need for better targeting of interventions that are co-designed, co-evaluated and co-promoted with farmers as allies of transformational change (as done in the climate-smart villages), not as recipients of external knowledge. Moreover, for inclusive sustainability that harnesses existing knowledge and influences decision-making processes across scales, there is need for constant, efficient, effective and real trans-disciplinary communication and collaboration.

Participatory innovation tools in food sovereignty

Friday, 16th June - 10:15 - SD 702 - Oral Paper

***Mr. Miguel Navarro-Sanint*¹, *Ms. Azalya Latorre*²**

1. Universidad de los Andes - Design Department, 2. Universidad de los Andes

In this paper we present the use of participatory innovation tools in a food sovereignty project. We introduce participatory innovation as a feasible method for engaging a community of farmers in an innovation process regarding food production; and we do not intend to show it as the only way to innovate with farmers. We expose how a participatory innovation approach can be used to transform, through tools that invite to a groupal reflection, the production practices of a farming community. Our approach was a path that established that the transformation of daily practices and the introduction of new technologies is feasible when it involves the active participation of community members. We describe all the stages of a case study with a community of organic farmers in Chocontá, Cundinamarca (Colombia). As a result of the innovation process, the community recognized together their resources and limitations, and discovered ways of transforming their organization in order to achieve better production practices and transform their commercial practices.

Creating edible cities: Urban Agriculture as livelihood strategy and knowledge hub for agroecological cultivation

Friday, 16th June - 10:15 - SD 702 - Oral Abstract

***Ms. Nicole Paganini*¹, *Ms. Anja Schelchen*²**

1. HU, 2. Humboldt Universität zu Berlin

Sub-Saharan Africa is the most rapidly urbanized region in the world. Especially in the urban informal areas, Food Security and Food Sovereignty is one of the main challenges for policy makers, city planners, urban farmers and of course - the population itself. Urban Agriculture can contribute to Food Security and could be a solution for improving food and nutritional security as well as safe and healthy food production, especially in disadvantaged urban communities. The international research project, UFiSAMo^{1} investigates possible means through which to increase the availability, consumption, and environmental perception of diverse, safe and nutritious foods through improved production (and marketing) of crops in Maputo and Cape Town. ~ The research contributing to this paper is focused on Food Security and Food Sovereignty for vulnerable population in Cape Town and Maputo, but raises also the question on safe and healthy food production in urban space according agroecological production principles to create edible urban landscape. How healthy is the so-called organic food already produced in Cape Town's backyards and smallscale fields, compared to the food produced in Maputo's small scale farms with mostly high chemical input? ~ Comparative observation of production methods as well as laboratory analysis show differences in food quality and show up the potentials for knowledge transfer through PGS certification on the example of Western Cape PGS movement in South Africa. The grass root movement allows producers to work on their own quality assurance standard, considering agroecological principles, and building up their production on trust, participation, and sovereignty from global and national food markets. The implementation of PGS in Western Cape region is observed, accompanied, analysed and in a next step with participatory action research methods transferred to urban space requirements – so called urbanGAP- as one main outcome of our research. ~ Results from the present research will show the understanding and practice of GAP in both cities – defining urbanGAP as collection of different, to urban circumstances adapted, agroecological production principles to cultivate in an organic and healthy way with the aim to support Food Security and Food Sovereignty to the producers. It is assumed, that GAPs in Cape Town is far beyond of Maputo. However, two cities – two realities. Good practices outlined in Cape Towns backyards and Maputos “organic machambas”, verified with Participatory Guarantee Systems, could be the theoretical base for more Food Sovereignty in both cities. The implementation of urbanGAP as innovation is crucial to enhance the access of the urban disadvantaged to safe food and to enhance food and nutrition security. On this basis, the possibility to enhance agroecological cultivation methods in urban area will be shown. Due to an additional analysis on local knowledge exchange and local capacity development systems, an adapted transfer model will be developed to contribute to the adoption of innovations on organic cultivation in the city. ^{1} UFiSAMo: Research project on Urban Agriculture for Food Security and income generation in Southern Africa and Mozambique. Founded by German Federal Office for Food and Nutrition.~

The Practice of Evidence Based Policy Making in Education and Training System of Ethiopia. Tesfamariam Shimekit, Education Strategy Center, Addis Ababa, Ethiopia E-mail: tesfakit@gmail.com. Mob.No:+251912887336

Friday, 16th June - 10:15 - SD 702 - Poster Abstract

Mr. Akalnew Tesfamariam¹

1. Ed

Education is vital for the development of a nation and policy development in education affects all economic, political and social issues of the country. Besides, in this globalized era the education policy development in one country reciprocally influenced by the global contexts. Ethiopia's education system is composed of three sub-sectors, General Education (GE), Technical and Vocational Education and Training (TVET) and Higher Education (HE). The Ministry of Education (MOE) is the government organization which governs the education and training in the country. In addition, MOE designs policies, strategies, programs, guidelines, and plans for the whole education system and monitor and evaluate the implementations of these policies. This paper argues that the education policy development must be evidence based to improve the role of education in sustainable development. The purpose of this survey was to assess the status and identify factors of evidence based policy making and implementation process in the education and training system of Ethiopia. A descriptive survey method was employed and data were collected by using a questionnaire. Out of 180 experts at MoE which were involved in policy making and implementation, 61 were selected by using stratified and simple random sampling techniques. In addition, five policy documents were analyzed to examine the type of evidences used in formulation and implementation of these policies. The data showed that unsystematic evaluation and monitoring results and data collected by less incapacitated education management information system were most often used as evidence in policy making and implementation than empirical research. In addition, evidence based policy making and implementation process is more affected by national factors than personal (policy makers) and global factors. In conclusion, the practice of evidence based policy making and implementation is low in the country's education and training system. The study implies that policies, which are not evidence based, have little capacity in solving public problem and contribute to national and international development. As a result, the culture of using strong empirical research in policy making and implementation should be encouraged to develop or modify policies that ultimately enhance the contribution of education for national, regional and international development. **Key words:** Evidence based, Policy making, policy implementation

Primary and preprimary Teacher Training in Ethiopia: Analysis of Practice Vis-à-vis SDG\#4 of 2030

Friday, 16th June - 10:15 - SD 702 - Poster Paper Rejected

Mr. Animaw Tadesse¹

1. Education Strategy Center

Ethiopia, one of the sub-Saharan countries with a population of 95 million, is striving to achieve its goal of becoming low middle income country by 2025. To this end, the country has registered significant achievement in access and equity; primary school net enrollment reached 80% and preprimary enrollment to 49% where the gender parity index is getting closer to one (MOE, 2015). Nevertheless, the quality of education is a critical problem to which the country is struggling. The quality of the teachers is one of the factors that affect the quality of education in the country. This is because an education system is only as good as its teachers (UNESCO, 2014:3). The quality of the teachers largely depends on the way they are trained (Workneh & Tasew, 2013). Hence, the purpose of this research is to assess the practice of primary and preprimary teacher training in the country vis-à-vis SDG\#4 of 2030. Specifically, it tried to assess the extent to which the input, process, context and the output were quality enough. To attain this objective, a mixed method research design was employed. Accordingly, data was collected using multi-method data collection instruments from trainees, trainers, AC members of CTEs, education experts and leaders working at the woreda, zonal and regional level. Besides, field observation and different educational documents were used as data sources of the study. The participants were selected using multi-stage sampling technique through which regions, zones, woredas, CTEs, and human and non human participants were selected following sequential and interrelated sampling techniques. Data from sample units have been collected using interview, FGD and questionnaire. Field observation and document analysis were also used to triangulate the data from other instruments; in sum, the data were obtained from a total of 2638 participants. Data collected through the multi-method instruments were analyzed through quantitative and qualitative methods. The result of the study revealed, though teacher supply is increasing as a result of expansion of CTEs per region, graduate teachers lacked the subject matter and pedagogical competence and have low interest to the profession due to inappropriate recruitment policy, in proper training, mismatched curriculum and lack of shared leadership. The results inform, so as to improve the quality of primary and preprimary education in line with SDG\#4 of 2030, the country need to revisit the recruitment policy, curriculum, leadership, pedagogical competence and motivation of teacher educators and teacher accountability policy. Otherwise, its goal of becoming low middle income country may be delayed.} \textbf{\emph{Key terms}}\emph{: ~primary program, preprimary program, teacher education, teacher training, teacher education colleges (CTEs)} \emph{}

Powering agriculture: actions, actors and renewable energies technologies in region of Los Lagos and Los Rios southern Chile

Friday, 16th June - 10:15 - SD 703 - Oral Abstract

***Ms. Maria Fernanda Romero**¹, **Ms. Jilles Van Gastel**¹, **Mr. Gustavo Blanco**¹*

1. Universidad Austral de Chile

Powering agriculture becomes strategic in a country which has privileged an export-oriented model aimed to be on the top 10 of food producers in the world, according to government expectations. Indeed, the concern arise due to energy costs and market~demands~regarding low carbon footprint, as well as agriculture emissions and waste management.~ In respond, the government has promoted non-conventional renewable energies (NCRE){1}, to provide solutions for energy production and the emission reduction in agriculture sector. Moreover, farming applications for reducing energy cost and usage of clean energy have been target for irrigation, drying, heating/cooling or waste management. This has been done in a row of several programs and projects to introduce renewable energies~technologies. These actions have induced~changes in the role of the sector~for the country energy transition process.~ However, an actor oriented approach of how people who design, plan and implement the interventions in the agriculture sector give meaning to this energy issue in the sector, is needed to understand the setup landscape for fostering this shift in the sector. At the same time, together with the actor's perspectives the variety of institutional arrangements have engendered different pathways in the energy transition to renewable energy in the agriculture sector according to the spatial embeddedness of the technical solution promoted. Finding that the most important hock for farmers engagement have been energy cost alleviation, also an alternative for coping with water and waste~resource management within the agriculture prodcution. The overall environmental goals are set in the policy/program level while at implementation project is transformed in manageable units for the farmers. Initially, the programs where in the agriculture agenda, afterwards the agenda is set up by the energy sector. Today, the energy is understood as a new sector for economic development and energy deployment should be in line with local development in which the projects take place. Therefore, today agriculture sector play a key role for energy development projects due to its transversely in the management of natural resources and its centrality in local and regional development. {1} “Non-Conventional Renewable Energy”is used to exclude major hydroelectric projects in the category; “Renewable Energies” include large hydroelectric plants (>20 MW of install capacity). Law 20.698/2013 Chilean Government.

Reliability mechanism : 2015-2016 El Niño crisis and future integration of renewable generation technologies

Friday, 16th June - 10:30 - SD 703 - Oral Abstract

Mr. Javier José González Ruiz¹, Dr. Ángela Inés Cadena Monroy¹

1. Universidad de los Andes

During 2015 and 2016, Colombia suffered one of the strongest El Niño phenomenon recorded to date. Precipitations stayed in historical lows for a long period of time, leading an electrical system depended in hydro sources in to a financial and physical crisis. To avoid this kind of situations, in 1996 and later modified in 2006, an expansion mechanism was proposed to provide firm energy to the system. The generators were paid constantly to make this energy available throughout scarcity events, and then sell it a price that reflected the cost of the most inefficient plant of the system in 2006. Thermal generators, those using liquid fossil fuels, denied the services during the El Niño crisis arguing that the mentioned scarcity price did not reflect their variable costs. The situation was finally solved with government intervention, an emergency demand respond program and a lot of carbon emissions due to the hydro power that was replaced for conventional generation for more than six months. The modifications to the capacity mechanism presented in this article, designed with the main objective of avoiding similar crisis in the future, change the auction in which the energy firm requirements are assigned. With the idea that it remains technology neutral, an agent offers in the new auction two values that more accurately represent the project; a premium for its firm energy and a scarcity price. This information is later analyzed in an independent and technical organism where each agent is evaluated with the ideas of James B. Bushnell and Shmuel S. Oren shown in the paper Bidder Cost revelation in Electric Power Auctions. This performance function rewards plants with low scarcity price because their energy is available a greater percentage of the time, having a constant effect on the spot price of the system. Additionally, a pollution term is added to include the carbon costs of the firm energy produce in a plant. The results is a mechanism that would help renewable generation, as is expected that their participation in the auction comes along with a high prime, due to their also great installation costs, a low scarcity price and minimum emissions costs. Using LCOE methodology, and available data for the Colombian Market, a different range of technologies are evaluated with the auction function. Renewable plants in general but especially the ones with a high capacity factor, like geothermal, are benefit in the methodology. This change in the capacity mechanism would help to incentivize these sources that currently have no participation in the Colombian system.~ Key words: Capacity mechanism, Energy auction, El Niño phenomenon, Renewable energy sources, Colombia.~

SUSTAINABILITY PERFORMANCE FOR BRAZILIAN ELECTRICITY POWER INDUSTRY: AN ASSESSMENT INTEGRATING SOCIAL, ECONOMIC AND ENVIRONMENTAL ISSUES

Friday, 16th June - 10:45 - SD 703 - Oral Abstract

***Dr. Simone Sattori*¹, *Prof. Lucila De Souza Campos*¹, *Dr. Sjors Witjes*²**

1. Universidade Federal de Santa Catarina (UFSC) - Brazil, 2. Copernicus Institute of Sustainable Development, Utrecht University

The increased pressure on companies to address sustainability issues has resulted in the development of several voluntary corporate sustainability integration approaches. The array of existing approaches is large and overwhelming, resulting in companies not understanding what corporate sustainability really means for their businesses. Considering environmental, economic and social issues, this paper aims at assessing the performance of the Brazilian electricity power industry in terms of its sustainability performance. An analysis of Global Reporting Initiative (GRI) indicators for the energy sector lead to an assessment of its sustainability performance by applying Data Envelopment Analysis (DEA) specified with a directional distance function (DDF). Five scenarios were created: (i) Flexible weights; (ii) Triple bottom line; (iii) Social issues; (iv) Economic issues; and (v) Environmental issues. With considering (i) flexibility weights, almost all companies are efficient. We also found a significant difference when we compared (i) with the other four scenarios (ii, iii, iv and v). Taking into account the triple bottom line scenario (ii), the results indicate that companies were less efficient when compared with the flexible weights scenario (i). Taking into account the last three scenarios (iii, iv and v), only four companies were considered as providing top benchmarks in sustainability performance.

A scientifically-driven approach for the sustainable development of Arctic coastal zone

Friday, 16th June - 11:00 - SD 703 - Oral Paper

Prof. Wojciech Sulisz¹, Dr. Lechoslaw Suszka¹, Dr. Maciej Paprota¹, Mr. Duje Veic¹, Mr. Dawid Majewski¹, Prof. Marek Szmytkiewicz¹

1. Polish Academy of Sciences

The Arctic coast has been strongly influenced by the effects of climate changes. Accelerating global warming and impact of storms imply a rapid permafrost degradation and drastic shoreline retreat in an Arctic coastal zone. In many regions shoreline retreat exceeds 30 meters per year. Impact of storms on permafrost coast causes much faster processes than it has been expected. These processes impose large impacts on social and economic conditions in the region including quality of life, housing, infrastructure and developments. The observed processes significantly affect activities in the Arctic area and have also drastic effects on the degradation of glaciers by accelerating breaking and melting processes and, in consequence, accelerate climate changes. More effort is necessary to reduce negative impacts of climate changes on polar areas. These require a new approach to predict and control changes in the Arctic coastal environment. More effort is required to develop knowledge on increased coastal erosions through better recognition and understanding of physical processes as well as reliable modeling of permafrost thaw and shoreline shift. A novel approach to this problem has been proposed and its program is currently under implementation. The approach is based on original experimental investigations on wave-induced erosion of permafrost, a series of field measurement campaigns, and numerical modeling of erosion processes in Arctic conditions. Extensive experimental studies have been conducted to identify physical processes responsible for increased sediment transport rates of the frozen sandy bottom. Experimental data and theoretical analysis indicate that the new approach provide novel results of significant importance for understanding of erosion processes in polar areas.

Acknowledgements The research leading to these results has received funding from the Polish-Norwegian Research Programme operated by the National Centre for Research and Development under the Norwegian Financial Mechanism 2009-2014 in the frame of Project Contract No. POL-NOR/200336/95/2014

Keywords: Climate changes, Permafrost erosion, Sediment transport, Arctic coasts

The construction of an enabling platform for sustainability at a house hold level. PRIMA cookstove's participatory design process case.

Friday, 16th June - 11:15 - SD 703 - Oral Paper

Ms. Lina López¹, Ms. Klaudia Cardenas Botero²

1. Fondo Patrimonio Natural, 2. Alexander Von Humboldt Institute

Colombia's conservation Fund 'Patrimonio Natural' through USAID funding carried out the Conservation Landscapes Program (CLP) in an effort to interconnect remaining tropical dry forest patches in the Colombian Caribbean region where campesinos and indigenous communities have long suffered from displacement and only until recently, were able to return to their territories. This landscape approach takes into account adaptive management, including traditional or local knowledge and practice recovery as well as the participation of local people and institutions. As part of this program an efficient wood stove model called PRIMA was developed with the active participation of 6 local communities. A social innovation approach and a participatory design methodology led to the generation of a small social business and furthermore, to the creation of an enabling platform to develop activities at a household level that contribute to the generation and sustainable management of tropical dry forest corridors. This paper explores the broader dimensions of clean cookstoves beyond traditional deployment strategies shown in other conservation programs in Colombia through the PRIMA clean cook stove's development process. The discussion focuses in the potential the participatory stove design has and its use as an enabling platform in conservation programs working with communities to introduce or/and reinforce sustainable practices at a household level. As a result, this approach enabled the design of an appropriate clean cookstove and related services that promote sustainable wood consumption in the region. It also made possible the strengthening of a group of women entrepreneurs and the constitution of a social business that is currently selling clean cook stoves and solar micro-grids in the Montes de María region. The traditional energy grid was expanded and campesinos in 10 different "veredas" are now using alternative energy for their daily activities. New knowledge about the use of biomass for cooking has been transferred to more than 800 people after the implementation phase ended. Finally, the use of stove during the implementation phase generated an enabling platform to strengthened the local cultural identity and increase the different actions of conservation and decision making at a household level to reach more sustainable livelihoods.~

Integration of Big Data Analytics and Social Research for monitoring of rainforest threats in the post-conflict settings of Colombia and Peru: supporting a more sustainable development agenda

Friday, 16th June - 10:15 - SD 704 - Oral Abstract

Mr. Alejandro Coca-Castro¹, **Prof. Andres Perez-Uribe**², **Dr. Augusto Castro-Nunez**³, **Dr. Hector Fabio Satizabal-Mejia**², **Dr. Louis Reymondin**³, **Prof. Mark Mulligan**¹, **Dr. Glenn Hyman**³, **Mr. Julien Rebetez**²

1. King's College London, 2. School of Business and Engineering Vaud (HEIG-VD) University of Applied Sciences, 3. International Center of Tropical Agriculture

Post-conflict phases can lead to growing environmental threats but also to open up greater conservation opportunities. Peace generally can enable forest exploitation since national reconstruction and development demand increasing amounts of natural resources (i.e timber exploitation). Additionally, the need to incentive foreign investment often reduces the political will to protect forests. Therefore, good governance in the forest sector should be established before opening it to post-conflict exploitation. Both Colombia and Peru represent countries (and case studies proposed by this research) where armed conflict has had played a remarkable role in land-use and migration dynamics within forested areas. Armed conflict in both countries has generated large flows of migration either from the countryside to urban centers, or to unexploited frontier lands. Additional to the threats to human rights, for the environmental conservation side, there is documented evidence of both “gunpoint conservation” and “gunpoint fragmentation” in these countries’ forests. In one hand, the presence of illegal armed groups actively hinder large-scale exploitation to protect the environment. On the other hand, due to violent conflict can disrupt local economies, it also encourages, specially in these two countries, the cultivation of illegal crops and the exploitation of natural resources. With the advance of peace and the rehabilitation of infrastructure, the Colombian and Peruvian forest, in particular their most pristine forested areas in the Amazon, will be under mounting pressure by vested interests and market forces. Additionally, beside the expansion of commercial crop plantations and others human land-use types, planned or unplanned (spontaneous) migration will potentially exacerbate existing land-titling tensions and thus trigger new conflicts. The main goal of this research is to inform peace building and forest conservation policies using Colombia and Peru as case studies. Specifically, we are interested in understand the links between migration and forest conservation in post-conflict settings. These two countries were selected as case in point because they face similar issues regarding migration, sustainable development in fragile ecosystems as the Amazon biome, and post-conflict recovery. We propose to combine the application of field based research with knowledge from Big earth-observation data analytics to maximize transdisciplinary analyses which support policy development and facilitate the intervention and vigilance of most of stakeholders (national and international) involved in the post-conflict agendas of target countries. We expect that the research moves towards to a land-cover change monitoring tool dedicated for informing decision makers on the rates, locations and characterisation of proximate drivers of deforestation events in the post-conflict regions of study. Such a tool coupled with the field work will allow to determine the current state of the rainforest in the regions of study and might serve as a reference level for preparing payment schemes for forest conservation such as REDD+. These results might be exploited by other teams in a wide range of studies. Last but not least, this research will support the achievement of the sustainable development goals in Colombia and Peru and will reinforce the international development collaboration.

State and spatial production in a transition to post-conflict extractive economies: The case of Quibdó, Colombia

Friday, 16th June - 10:30 - SD 704 - Oral Abstract

Dr. Edwar Calderon¹

1. University of Edinburgh

This paper examines the spatial production of injustice in Quibdó – the main commercial centre of El Chocó, Colombia, and the principal fluvial port of the Atrato River. The paper seeks to understand the processes shaping the contemporary development and rapid transformation of land use in Quibdó, and how these processes deepen and extend inequality and injustice in the city. Quibdó is something of a frontier town – the capital of Colombia’s ‘Wild West’ it lies in one of the regions worst affected by the Colombia civil war and is in the heart of Colombia’s extractive industries – both legal and illegal. The paper is organized around 3 stories. The first is a story of a disappearing building that highlights how attempts of democratic, equitable and participatory planning in Quibdó become distorted by national government neoliberal economic policies, weak state actors, poor governance, corruption and disrespect for the rule of law. The second story serves to highlight the significance of foreign capital from extractive industries is driving uneven urban development. Focusing on the expansion of the city’s airport and the airport service centre, the paper shows how spectacular investments at the periphery of the city are displacing already marginal populations. The third story focuses how theories of accumulation through dispossession can help explain the contours of injustice in Quibdó. It focuses on the displacement and dispossession produced by forced migration from rural areas due to armed conflict and the legacies of the civil war, as well as the displacement produced by gentrification in the city center as capital from illegal extractive industries is laundered through an inflated property market.

Sustainable land management decisions among smallholder coffee growers: A dynamic optimization approach

Friday, 16th June - 10:45 - SD 704 - Oral Abstract

Mr. J. Nicolas Hernandez-Aguilera¹, Dr. Jon Conrad¹, Dr. Miguel Gomez¹

1. Cornell University

About 40% of all livable land area globally is allocated to agriculture. Consequently, sustainable strategies for land use require the identification of feasible agro-ecological practices. Shade-grown coffee is a sustainable product which has been associated to the provision of various ecosystem services. The conservation of forest canopy, combined with growing coffee, provides overwinter habitat for coffee berry borer predator songbirds, reduces agrochemical dependency, improves soil health, and serves as an adaptation strategy to climate change. In addition, shade-grown coffee enhances product quality, representing a quality-price premium alternative for smallholders in developing countries who provide 80% of worldwide coffee production and are frequently exposed to price volatility and coffee diseases. Despite the advantages of shade-grown coffee, many growers have shifted to sun-grown coffee in response to coffee-leaf rust crisis. This shift involves the utilization of disease-resistant high-yielding varieties, which often exhibit lower product quality. In particular, from 1990s to 2010, most Latin American countries decreased the percentage of coffee production area dedicated to traditional diversified shade coffee production, and sun-grown coffee dominated many new coffee-growing regions like Vietnam, Thailand and Indonesia. Previous studies document several broad trends that influence coffee management decisions between shade-grown and sun-grown coffee including: yield-focused government incentives and policies, subsidized agrochemicals, farm size, certifications and economic incentives linked to innovative value chain models. However, there are limited economic models shedding light on the optimal choice between shade-grown and full sun-grown coffee systems. We use a formal stochastic dynamic profit maximization model to understand the management decisions of a representative smallholder grower and the effects of quality and eco-friendly price premiums on these decisions. Our model chooses the optimal land allocation of sun- vs. shade-grown coffee that maximizes expected net present value subject to land endowments and available technology observed among smallholder growers and accounts for the ecosystems services provided by coffee borer predator birds and tree canopy. In addition, we identify optimal conditions to switch from sun- to shade-grown systems, considering uncertainty coming from disease and price volatility. We collected detailed farm level data on production costs for 265 smallholder growers' farms in Colombia, Honduras, Mexico and Peru. In addition, we empirically measured smallholders' discount rates using controlled inter-temporal decision games. Furthermore, we estimated consumers' willingness to pay for product quality and "bird friendly" coffees in a survey that included 1095 US potential coffee consumers and bird's conservationists. We employ these results to calibrate the optimization model. Results from this study shed light on cost effective strategies to mitigate and compensate risks associated with shade management. Moreover, our model can identify conditions under which smallholders can increase profits and promote biodiversity conservation simultaneously. Preliminary results suggest that shade-grown coffee could be a profitable alternative if growers were able to receive the premiums that consumers are willing to pay. These results are useful to other crops such as cacao, in which tropical region countries could benefit from having a comparative advantage based on product quality and biodiversity conservation.

Keywords: Sustainable agriculture, land use, rural development.

A SPATIAL METHODOLOGY FOR TRANSPORT IMPEDANCE WEIGHTINGS IN CELLULAR AUTOMATA LAND-USE COVER CHANGE MODELS

Friday, 16th June - 11:00 - SD 704 - Oral Abstract

***Dr. Daniel Paez**¹, **Dr. Francisco Escobar**²*

1. Universidad de los Andes, 2. Universidad de Alcalá

Land Use Cover Change (LUCC) models are increasingly being used to support long term urban and regional planning. These models forecast future land coverage based on land-use interactions, policy restrictions, environmental conditions and accessibility. Until now, limited research has been conducted to scientifically determine the impedance or influence of transport infrastructure on each land-use type in an LUCC model. An example could be how attractive a new metro is compared to a highway for new residential developments, which is not always well known by LUCC models. This paper presents customized geospatial analyses to calculate accessibility distance decay factors (ADDF) using a time series geospatial approach called overtime-spatial decay determination (OSDD). The ADDF factors were developed and tested as part of the practical implementation of a LUCC in Bogota – Colombia. The model, called the Bogota Land Development model or BoLD, was built using commercial cellular automata software. In BoLD, two transport infrastructure scenarios were modeled and compared for the west of the city: a highway-based transport network and a suburban rail system. The results from the scenarios are presented in a graphical representation called mobility circles, which are also a key contribution of this research. The validation of the results obtained suggests that the OSDD contributes to better technical backing to LUCC models, particularly when evaluating urban scenarios in which transport projects are the focus. Additionally, the use of geospatial tools for transport impedance weightings appears to facilitate the general understanding of LUCC modeling with cellular automata. ~ \emph{Keywords}: \emph{land-use coverage change model, Transport-land-use interaction, Scenario planning, Indicators, LUCC.}

The application of earth observation information to help manage land use change in Brazil: An analysis of user needs

Friday, 16th June - 11:15 - SD 704 - Oral Paper

***Mr. Mercio Cerbaro*¹, *Prof. Stephen Morse*¹, *Prof. Jim Lynch*¹, *Dr. Geoffrey Griffiths*², *Prof. Gilberto Camara*³**

1. University of Surrey, 2. University of Reading, 3. National Institute for Space Research (INPE)

Brazil is a country with some of the most important forest ecosystems and natural resources in the world. The expansion of agriculture, livestock, demand for food production, extractive industries, illegal logging, land conflicts, hydropower projects, deforestation and fire are some of the main pressures associated with land use and land use change in different regions of Brazil. Despite the attempts of different institutions aiming to promote the use of earth observation to support land use management and conservation projects in Brazil, established institutions at the national and state level are encountering several problems to implement environmental policies and to improve the quality of services provided for the Brazilian society. The specific agenda and lack of communication between institutions, finance, bureaucracy, legal frameworks, politics, finance and the user knowledge to access and apply all the geospatial technologies and remote sensing data available are some of the issues across a wide range of public and private organizations. Expanding on recent debates in environmental governance and political issues associated with deforestation levels, we show the challenges to promote the use of earth observation and how institutions are dealing with political and economic instabilities to apply environmental policies. The conflict of interests, historic political agendas, pressure groups within national and state governments and the lack of coordination and the conflict of national policies on specific agendas to promote the expansion of agribusiness and environmental policies at the same time. The use of earth observation and advanced technologies is very important to assist policy-making, but is just one essential factor to help governments to promote sustainable development and to reduce the complexity of institutions arrangements and particular agendas in different sectors.

Innovative management of urban renovation processes and its contribution to the sustainable development of cities. The case of Progresa Fenicia

Friday, 16th June - 10:15 - SD 203 - Oral Abstract

*Dr. Nathalia Franco*¹, *Mr. Juan Felipe Pinilla*²

1. Universidad de los Andes, 2. JFP&Asociados- Derecho Urbano

Cities have taken a leading role in debates about sustainable development. Their expansion~turn them into key scenarios for the analysis of global challenges. As for the Colombian case, the country experienced an accelerated process of urbanization during the 60's, which meant a significant increase in the population density in different cities of the country (PNUD 2011). This showed the need of making a new legal framework capable of regulating efficiently the new social demands in terms of housing and a better planning of Colombian urban centers. In the middle of the challenges already mentioned appears the concept of Urban Renewal: a "deliberate effort of changing the urban environment through the planned and large-scaled adjustment of the existing urban areas, taking into account the present and future requirements of the city's housing and labor" (Grebler, 1963; 13). During the last three decades a series of laws and regulations have been established in order provide local authorities with more tools of intervention in the market of urban land. This way, the need of understanding urban development as a process where costs and benefits are distributed equally and democratically among stakeholders, has emerged as a fundamental principle. These laws brought with them several land management tools that became key components for the implementation of urban development in Colombian cities. Tools such as Land Readjustment, Urban Actions Units, Partial Plans and others included in the Master Plans (POT) will be explained throughout this article and have become pillars of the country's planning structure. It is in this context that the *\emph{Plan Parcial}\emph{Triángulo}\emph{de}\emph{Fenicia}* emerges: a project of private initiative that promotes urban renovation in the surroundings of Los Andes University, in Bogota's downtown. The way the formulation process has been carried out as well as the characteristics and basic goals of the project have turn it into a role model in the city. Fenicia presents three atypical characteristics: first, their promoter is neither the state nor private investors or landowners but Los Andes, a high education institution. Second, an explicit effort has been made during the formulation process in order to avoid many of the social and environmental problems identified in similar projects. This was done through inclusive, participatory and deliberative dynamics between the promoter, local authorities and landowners of the area. Third, an innovative strategy like land readjustment~is applied in order to avoid gentrification phenomenon. This strategy offered alternatives to the settlers to participate as partners and main actors in the decision-making processes of the project. The paper describes the *\emph{Plan Parcial de}\emph{Fenicia}*, highlighting its stages of negotiation and agreement among the stakeholders, its governance structure, and the managerial model in order to stand out the contributions of sustainable development in the city of Bogota. We explain how this proposal went from a model of classic urban renewal~to an urban revitalization proposal. Additionally, we explore the role of the stakeholders involved, highlighting aspects such as participatory decision-making processes and social inclusion (both, topics included in the SDGs).

Synergistic policies and measures are key to advancing sustainable forest management and forest-based development

Friday, 16th June - 10:30 - SD 203 - Oral Abstract

Dr. GLENN GALLOWAY¹, Dr. Pia Katila², Dr. Wil De Jong³, Dr. Pablo Pacheco⁴

1. University of Florida, 2. Natural Resources Institute (Luke), 3. Center for Integrated Area Studies, Kyoto University, 4. CIFOR - Center for International Forestry Research

The International Union of Forest Research Organizations' Special Project "World Forests, Society and Environment"(IUFRO WFSE) carried out 27 case studies worldwide with the participation of 144 scientists and experts. Using a common analytical framework, the case studies analyzed initiatives seeking to further sustainable forest management (SFM) in which considerable effort and resources have been expended over a protracted period of time. The analytical framework included a number of "prerequisite conditions (PC)" for progress towards SFM, based on prior IUFRO WFSE publications and current scholarship on the topic. The PCs were grouped in the following four realms: 1) Policies, institutions and governance; 2) Livelihoods, capacities, cultural and socioeconomic aspects; 3) Natural resource base and 4) Research and monitoring. The presentation will discuss the degree to which progress has been made in fostering the PCs that positively influence SFM. Attention will also be focused on the PCs that have been difficult to address across the case studies and that often undermine progress towards SFM. The importance of interactions among the PCs within specific cases will be emphasized, noting that efforts to attain SFM involve complex systems characterized by non-linear interactions among the conditions leading to observed outcomes, specifically in relation to contributions to local livelihoods and forest condition. Alignment among the PCs was determined to be key to creating synergies that favor progress towards SFM. The presentation will conclude illustrating how this analysis of SFM provides important lessons for the Agenda for Sustainable Development 2030 that seeks to attain the Sustainable Development Goals (SDGs).
Key words: Sustainable forest management; case studies; SDGs

Sustainability as social choice. The public policy of territorial ordering in Colombia

Friday, 16th June - 10:45 - SD 203 - Oral Abstract

Prof. Fabio Arias¹

1. Universidad del Valle

In this paper it is argued that sustainability is a matter of collective choice. There is no definitive definition of what it means and standard procedure to achieve it. Sustainability is always ambiguous, and may be redefined in each context where it is applied. This feature of the sustainability becomes a matter of collective choice, where the results depend on the ability of society to solve common issues. To corroborate this argument is presented the experience of some Colombian municipalities in their territorial ordering. The public policy of territorial ordering in Colombia, for its multidimensional and long-term planning, is an ideal space to investigate the practice of sustainable development. The law 388 of 1997 requires municipalities to develop a land use plan, considering social, economic and environmental aspects. This research deals with land use experience of a sample of cities in Valle del Cauca, Colombia: Cali, Yumbo, Buga, Cartago and Versalles. The paper starts from an exploratory question: how and to what extent has the territorial ordering policy, Act 388 of 1997, induced sustainability actions in the cities of Valle del Cauca, between 1997 and 2010? To answer this question we use an inductive and exploratory methodological approach. This approach demanded qualitative information, interviews and documentary analysis to reconstruct the interaction of actors in the process of collective choice. The ability of municipalities to deal with that was related to the characteristics of the relationships of those involved. In Yumbo the territorial plan was favored by sustainability synergies between the local bureaucracy, the local government and the regional environmental authority. In Buga, one of the strategies of the plan was defending a sustainable rural sector. This initiative had a strong social base, but was weakened by the Colombian armed conflict. In Cartago, the plan was the focus of discussions about growth strategies of the city on the one hand and environmental controls of this expansion, on the other part of the environmental control comes from social sectors that oppose a the power of drug trafficking and corruption present in the municipality. In Versalles, the territorial ordering and sustainability results depend on a local leader and community participation. In Cali, the relationship between territorial ordering and sustainability was weak in its first application, currently such a relationship is inevitable and depends on the formation of the local bureaucracy, local academics and social movements.

Urban Cycling Platoons Syncing Traffic Infrastructure

Friday, 16th June - 11:00 - SD 203 - Oral Abstract

Dr. Juan Salamanca¹, **Dr. Sandra Cespedes**², **Dr. Leonardo Rivera**³, **Mr. Francisco Camacho**¹

1. Universidad Icesi, 2. Universidad de Chile, 3. Universidad del Valle

Although benefits of cycling in traffic congestion and pollution are concrete, in several cities such as Copenhagen and Amsterdam the adoption of bicycles as means of commuting has overflowed the dedicated infrastructure, deriving in safety risks and gridlocks due to the lack of explicit coordination among cyclists themselves and with city transit coordination infrastructure. In this paper we present how coordinated platoons of cyclist in urban settings can be extremely useful to maximize the positive impact of synchronized sequence of traffic lights, so called “green waves”, that allow cyclists to flow without having to stop at intersections. Our project addresses the coordination of collective behavior of platoons of cyclists that could pervade dedicated express roads such as the London’s 18 mile East- West Cycle Superhighway, as well as bike paths threaded with urban car roads. Aiming to provide safer and comfortable environments that facilitate cyclist circulation in urban settings, technological solutions that integrate vehicle-to-vehicle (V2V) communication, vehicle-to-infrastructure (V2I), and human-to-machine interfaces can be developed. Our case presents a system that explores the use of control mechanisms for providing coordinated driving to a group of bicycles enabled by ad-hoc communications and embedded computing. This allows for the consolidation of unplanned “schools” of cyclists that can be detected by traffic control infrastructure as composited units, prioritizing their flow over motorized vehicles. Our empirical method integrates cycling and a well established platooning algorithm developed for car or truck convoys. In the proposed system, cyclists respond to a Cooperative Adaptive Cruise Control delivered through specific human-machine interfaces designed to elicit positive or negative acceleration from individual cyclists. As a result a school-like behavior emerges from cyclists. The benefit for cyclists riding together with others is to maintain a critical mass large enough to deserve prioritized use of urban roads that otherwise they wouldn’t get by their own. The benefit for car drivers is to stop less frequently at intersections with bike paths. The contribution of the technology reported herein to green waves is twofold: it constantly informs when cyclists are subscribed to a green wave, and triggers the green waves on collective demand. These findings and technologies could be applied in the coordination of a group of two-wheeled vehicle including moped and self-balanced electric vehicles. This work has been partially funded by Project FONDECYT Iniciación 11140045\

Improving access and inclusiveness of low-income communities to healthcare services in Brazil: the role of non-for-profit and commercial organizations

Friday, 16th June - 10:15 - SD 715 - Oral Abstract

*Ms. constance dumalane*¹, *Prof. Kavita Hamza*², *Prof. Marielle Payaud*¹

1. University of Lyon, 2. University of São Paulo;

This research highlights the processes which are implemented by non-profit organizations (NPO) and for-profit organizations to improve the access of healthcare services to low-income communities of developing countries while enhancing their inclusiveness. The NPO CIES and the company Dr.Consulta in Brazil were analyzed. These initiatives aim to improve access to healthcare services to low-income populations while overcoming the long waiting issue of the Brazilian public healthcare system. Implemented strategies were compared to scrutinize the way they adapt themselves to the social context; while improving the service accessibility and their inclusiveness. The research question is: *{How profit and non-profit organizations shape their business model to improve the access and the inclusiveness of healthcare services to low-income communities in Brazil?}* The *{Bottom of the Pyramid}* population represents people living with less than $\$9$ a day and restricted access to infrastructures and essential products and services (Pralhad & Hart, 2002). Companies can contribute to improve their living conditions by giving them access to essential products and services. Doing so requires the creation of new business models and strategies which match the BoP populations' needs, expectations, and living conditions. Tailored strategies must be acceptable, affordable, accessible to BoP populations while raising their awareness (London & Hart, 2004; Anderson & Billou, 2007). It is also necessary to build an ecosystem which integrates local communities in the organizations' global value chain (Pralhad, 2004; Karnani, 2007; Casadesus-Masanell & Ricart, 2010) and implies the creation of inclusive business model. Consideration toward inclusiveness is growing up but few used in the BoP literature (Kolk, Rivera-Santos, & Rufin, 2014), especially for healthcare services which are weak in most developing countries (Esposito, Kapoor, & Goyal, 2012). In Brazil, most NPO adopt a hybrid model, which is considered more flexible to create commercial and social value (Battilana & Dorado, 2010; Tate & Bals, 2016) while combining practices from different types of organization (Doherty, Haugh, & Lyon, 2014; Zahra, Gedajlovic, Neubaum, & Shulman, 2009).~ This is why the business models of NPO CIES and the company Dr.Consulta, which both offer healthcare services, were compared. A qualitative approach based on a comparative case study has been used. In 2016, 21 semi-structured interviews were conducted in three neighborhoods in São Paulo, Brazil, with administrative employees, medical staff and patients of each organization. Results indicate that both kind of organizations have succeed to reach their goal of improving the access and reducing the time-frame of healthcare services to low-income population of Brazil. Nevertheless, their ways of operating and their business models are different. CIES is sustainably offering~free services due to its partnerships with the government and its hybrid business model; whereas Dr.Consulta has tailored its business model to meet low-income populations' needs and reach a social goal. These differences seem to affect their way of communicating, their organizational culture, the patients' expectations and their inclusiveness. The profit company struggles to be inclusive while the NPO needs to use business and management techniques from the commercial sector, which can explain the adoption of a hybrid model.

Don't Throw It All Away: Innovative Recycling Solutions to Waste Management in Tourism Communities

Friday, 16th June - 10:30 - SD 715 - Oral Paper

Prof. Mary Little¹

1. School for Field Studies, Center for Sustainable Development

Costa Rica's tropical beaches and seaside towns attract millions of tourists annually, yet increased waste generated by growing tourism threatens to degrade the environments tourists seek. The problem is compounded by local municipalities' inability to manage increased waste and often increased vacation consumption habits. Recycling offers a means of removing large quantities of reusable materials from the waste stream and reducing disposal directly into the environment. While Costa Rican law requires all municipalities to provide trash and recycling collection, remote tourism areas often lack municipal recycling programs. This research looks specifically at the social-environmental interface in relation to waste management solutions in the context of tourism communities on Costa Rica's Nicoya Peninsula. This study argues that social impact assessments can play a key role in evaluating regional development strategies and fostering effective community response. Examination of residents' role in developing waste management solutions indicates that a recycling program will likely mitigate social and environmental risk but use of local skills and knowledge are still largely undefined. A partnership with a socially conscious garment manufacturer to collect and use recovered plastic in apparel may provide a socially agreeable solution in the face of government inaction. However, low levels of bonding among diverse residents and low participation in civil organizations indicates that further investment in social capital formation is necessary to produce positive outcomes.

The climatic disruption

Friday, 16th June - 10:45 - SD 715 - Oral Abstract

Ms. Laura Florez-Urazan¹, Mr. Gustavo Nicolas Paez¹

1. University of Cambridge

The effect of water scarcity and climate events on socio-political stability can be analysed as a triggering element of conflict and displacement, and will become increasingly critical as climate change makes disruptive events more frequent, their consequences more severe, and their extent larger. For this reason, the effectiveness of policy and crisis management in the coming years will depend heavily on how decision-makers understand communities, their environment, and their socio-economic conditions, as a system that reacts in specific ways to climate change disturbances like desertification or rising sea levels. With this aim, this paper analyses the system dynamic behind the case of Syria to understand 1) the differential effect that climate variability has on communities depending on their location, their economic activities, and their socio-economic conditions, 2) what are the dynamics and conditions that determine migration patterns in the affected population, and 3) how social and political tensions can be aggravated by environmental shocks turning into large scale refugee crises. This analysis provides a tool for decision-makers to understand the crucial elements that influence this phenomenon, and the effective leverage points that can be addressed to alleviate the pressure on the system and provide support to countries that are likely to have environmental stresses, such as the approximately 700 million people that may be displaced because of water scarcity by 2030, according to the UN. The case of Syria is compared with the famine in Bangalore in 1943 to show how policy can aggravate an environmental constraint, and with the inefficient crisis management that lead to the agrarian strike in Colombia in 2013, and uses tools for the analysis of system dynamics to reveal elements that are consistently present as common drivers and leverage points. By studying the repeated elements in these case studies, it is possible to understand the role that governmental actions, such as sensible agriculture policies, adaptation plans, or early responses to civil movements, can be decisive in how the social fabric interacts with its ecological and political environment, and how vulnerable it is to the effects of climate change. Therefore, by extracting the structural dynamics that are consistently present in different contexts, and how environmental impacts can potentially catalyse certain socio-political structures into crises, it is possible to develop a model that offers decision-makers a practical tool to face the social challenges of climate-induced disruptions. Keywords: climate change, refugees, conflict, migration, system dynamic

Waste not, want not: social innovation in the food sector

Friday, 16th June - 11:00 - SD 715 - Oral Paper

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The wasteful management of food resources is an important phenomenon characteristic to both developing and developed countries. According to the FAO, about one third of the food produced in the world for human consumption is lost or wasted – approximately 1.3 billion tons, which amounts to roughly USD680 billion in industrialized countries and USD310 billion in developing countries (FAO, 2011). Food wasted in Latin America alone could feed 300 million people. At the same time almost 1 billion people stay undernourished and another 1 billion suffer from hunger [1]. The issue of food waste has relevance from several different perspectives including food security, environmental governance, resource efficiency, hazards to health and equity between different social groups (FUSIONS, 2016). As a result, programs aiming at the reduction of the amount of food waste take many different forms and the Sustainable Development Goals (SDGs) of the United Nations addresses the issue under at least three different domains: poverty, hunger and sustainable consumption and production. While policymaking has been active around the world in raising awareness and promoting best practices, its success to date has been limited. Meanwhile, the fast development of the information and communication sector has led to the emergence of a number of new, innovative business models, which have the potential to handle social and environmental issues, such as the problem of food waste. Our research aims at identifying and analyzing innovative economic and social practices in the food sector. An inventory of different approaches to the utilization of food waste will be introduced, as well as the results of an analysis of these initiatives from both a sustainability and business model perspective. We evaluate private, voluntary and combinatory initiatives based on the experiences of existing recent examples using mainstream management theories (such as the resource based view of the firm and transaction cost theory) to draw conclusions regarding their long term viability. Initiatives such as the Leftover Swap [2] (a smartphone app to help barter or give away food leftovers), Foodsharing.de (established in 2012 in Germany and run with the participation of individuals, supermarkets, restaurants, bakeries, and food stalls, to be closed by Berlin authorities in 2016 [3]), the solidarity fridges [4] in Galdakao, and various global food bank initiatives [5] including one by ABACO (La Asociación de Bancos de Alimentos de Colombia) [6]’ will be examined regarding their environmental and social impacts. Our research includes both European and Latin American examples and differences and similarities will be pointed out. Conclusions resulting from the research will cover suggestions for policymakers regarding the promotion of social innovation in the field as well as advice to practitioners based on failure and success stories.

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The impact of the Jirau and Santo Antônio hydroelectric plants on agriculture in the municipality of Porto Velho (RO)

Friday, 16th June - 11:15 - SD 715 - Oral Abstract

Mrs. Amanda Praia¹

1. Universidade de São Paulo

The installation of hydropower has been increasing in the Amazon region of Brazil, similarly have been observed the growth of agricultural occupation in Amazonian soils. The suppression of lands and the alteration of the flow of water from the installation of hydroelectric projects have altered the dynamics of the territories due to diverse aspects such as resettlement, migration, real estate speculation etc. The focus of this study was to analyze, in a specific way, possible relationships between the extent of floods suffered by hydroelectric power plants and the agricultural production of affected municipalities. For this purpose it was chosen for a case study of the municipality of Porto Velho where the hydropower plants of Jirau and Santo Antônio were installed. The municipality of Porto Velho is in the state of Rondônia that is part of the Amazonian territory in Brazil. The site was chosen because both hydroelectric plants have already started operation and the subsidies and incentives provided by the hydroelectric projects are already in the finalization phase. Thus, the semi-structured interviews method was used to understand if the hydroelectric plants had a significant effect on agriculture and whether this effect was positive or negative on the sector. To study the phenomenon were interviewed: the relocated families, representatives of the municipal and state agriculture department, representatives of outsourced companies that worked for the hydroelectric plants and representatives of EMATER (State Technical Assistance and Rural Extension State of Rondônia). From the interviews it was proposed a tabulation of the results that sought to understand if there was any impact on six sessions of the agricultural sector: rural credit supply / access, property register, quantity produced, diversity of products produced, technology and inputs employed and quality of ground. For each group of interviewees there was a script of interviews that contemplated these sessions, and from them was analyzed whether or not there was some change in this context in the municipality of Rondônia. Preliminary analyzes indicate that there is an improvement in the supply of technology and inputs, with the installation of hydroelectric plants, many properties are registered and consequently there is an increase in the supply of rural credit, there is not a significant effect on the diversity of products, but, there is an apparent increase in the amount of production, especially cassava, most of the soils are arable in the municipality, however the soils of families living on the edge of the Madeira River are naturally more fertile. Therefore, it was concluded that the hydroelectric plant brought benefits by investing in technology, inputs and property records, but mobilized people adapted to the production of subsistence for paid agricultural activity, consequently generating a conflict, since the local culture is not yet fully adapted to manage everything the enterprise has provided. Because of this conflict of interest, it can be inferred that the impact of the hydroelectric plant on agriculture in the region may not have been as significant as it could be.

Key words: amazon, hydropower, agriculture

Local democracy initiatives in Sweden: Inclusive or exclusive participatory democracy?

Friday, 16th June - 10:15 - SD 716 - Oral Paper

Dr. Bozena Guziana¹

1. Mälardalen University

Abstract Participatory democracy emphasizes the importance of the public political participation. Citizen engagement is crucial for advancing sustainable development at local level. Citizen participation initiatives at local level in Sweden include among others civic dialogues in the planning, e-petitions and citizen proposals (CP). While participatory democrats recognize the need for representative democracy they also see the possibility and benefits of more political involvement by the public than is currently practiced. The arguments in favour of enhancing citizen participation focus on its different benefits. In this paper the design and practice of citizen involvement through CP in Sweden is studied. The aspects for analysis are chosen considering the Michels & De Graaf (2010) framework (inclusion, civic skills, limited deliberation), as well as the high administrative burden of handling CP and the high level of proposals considering issues already in progress (effectiveness). The paper is based on a study of municipal webpages and a case study of CPs in the municipality of Eskilstuna. The amount submitted CP is growing. Still, this initiative for increased public participation in form of CP both in most municipalities having this instrument as well as in Eskilstuna have some shortcomings regarding inclusiveness, development civic skills, limited deliberation and effectiveness. The intentions with the instrument to involve citizens, children, youths and non-electors with foreign background have merely influenced spreading of this measure among Swedish municipalities. Furthermore, the citizen based terminology in local democracy initiatives is by nature excluding and should be changed to resident based terminology. **Keywords:** Citizen proposal, Participatory democracy, Inclusion, Civic skills and virtues, Deliberation

“Learning it the Hard Way”: Social Safeguard Norms in Chinese-Led Dam Projects in Myanmar, Laos and Cambodia

Friday, 16th June - 10:30 - SD 716 - Oral Abstract

Dr. Julian Kirchherr¹

1. Utre

Chinese dam developers claim to construct at least every second dam worldwide. However, scholarly literature comprehensively investigating the social safeguard norms in these projects is rare. This paper analyses social safeguard norms in Chinese-led dam projects in Myanmar, Laos and Cambodia, hotspots of Chinese-led dam construction. Safeguard norms are defined as shared ideas, expectations and beliefs about what constitutes procedural and distributive social justice in a large dam project with regard to project-affected people. To analyse these norms, 47 semi-structured interviews have been carried out (with access to interviewees mostly gained via snowball sampling) which were triangulated with scholarly writings on the topic as well as news articles and reports. It is found that social safeguard norms adopted have significantly changed in the past 15 years. While Chinese dam developers claimed to adopt standards of the host countries upon the launch of China's Going Out Policy in 2001, with occasional adoption of more demanding Chinese standards, they did not adopt international norms. In recent years, however, they increasingly take into account international norms. It is argued that the root cause for this change is social mobilization, with the suspension of the Myitsone Dam in 2011 as a particular game changer. Enhanced social safeguard legislation in host countries and China, stricter rules of Chinese funders and cooperation of Chinese dam developers with international players have also facilitated this change. The findings suggest that activists can thus be central contributors to inclusive sustainability for development.~

A global overview on public participation rights in environmental matters

Friday, 16th June - 10:45 - SD 716 - Oral Abstract

Dr. Volker Mauerhofer¹

1. University of Vienna/Meiji University

This presentation aims to provide a global and comparative overview of procedural rights of Public Participation in Environmental Matters in the sense of the Aarhus convention. The contribution is based on a very recent and current publication titled “Mauerhofer V., 2016. Public Participation in Environmental Matters: Compendium, Challenges and Chances globally, Land Use Policy (Elsevier) 52, 481-491” and in particular presents the results therein related to these procedural rights. The method applied was an in-depth literature review in particular of research papers, legal documents, policy papers, which was implemented by means of electronic databases (Web of Science, Scopus) as well as by internet research using terms such as public participation, access to information, participation in decision-making and access to justice in combination with continent names. The results were then analysed according to the five continents Europe, Africa, America, Asia as well as Oceania, and distinguished as well as discussed regarding general aspects, access to information, access to decision-making and access to justice. The results for the five continents show that there exist regionally and nationally large differences within the three pillars access to information, participation in decision-making and access to justice. That access to information is widely legally established within all regions on all continents, and that access to justice is the one sector of the three mentioned in Principle X of the Rio Declaration which has obtained the least reflection in legislation and implementation so far. This innovative study provides as far as visible the first time such a transcontinental and comprehensive overview on procedural rights related to Public Participation in Environmental Matters and indicates several further challenges for researchers and politicians.

Environmental justice in nuclear power plants and radioactive waste management: Two study cases on public information and participation at Spanish courts

Friday, 16th June - 11:00 - SD 716 - Oral Abstract

***Dr. JORDI PRADES*¹, *Dr. AITANA DE LA VARGA*²**

1. ASTERISC Communication Research Group. UNIVERSITAT ROVIRA I VIRGILI (URV), 2. CEDAT CENTRE FOR ENVIRONMENTAL LAW. UNIVERSITAT ROVIRA I VIRGILI (URV)

Information, public participation and access to justice are key to ensure an effective environmental protection. Through these three pillars of the Aarhus Convention the public should have access to plans, programs and projects that affect the environment. Public information on these policies is necessary to participate in the development of plans, programs and projects and, if necessary, to have access to courts. Ultimately, all the three pillars must serve to demand effective environmental justice. We describe how have been tried in court the disputes that have taken place in relation to nuclear energy and radioactive waste management in Spain, emphasizing the issues raised on access to information and public participation processes. We analyze legal proceedings about conflicts between nuclear companies, the Spanish State and NGOs and social movements regarding (A) public information and (B) public participation and access to environmental justice. A) In relation to public information, differences between actors in conflict —nuclear companies and the Spanish Nuclear Safety Council (CSN)— arise because of the publication on the Internet of information about inspections carried out in the power plants by the CSN (JUR/2008/173166). B) The building project of the temporary storage of high level radioactive waste (ATC) makes evident the differences between the participatory process promoted by the Spanish Government against the effective public participation mechanisms and practices demanded by social movements and by Greenpeace (ROJ: SAN 431/2012 and ROJ: STS 5149/2013). We observe how different actors in conflict assessed information and public participation linked to nuclear facilities and concerns, and the different interpretations of what transparency and environmental justice mean. We also found that the Spanish nuclear legislation is archaic and scattered, which complicates the comprehension of the issue by the general public. We conclude that law and courts are prime actors in the construction of meanings about the environmental conflict. \textbf{Keywords} Environmental justice, public information, public participation, access to justice, nuclear power