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WELLBEING AND  
EQUITY WITHIN  
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Abstracts book



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MODELS AND SCENARIOS OF THE GLOBAL FUTURE



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Session 1.1.A

Models, scenarios of the global future - global dynamics



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## 1206 Does Environmental Kuznets curve exist in the context of forest use? Implications of a global integrated ecological-economic model of forest recovery

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While understanding of deforestation drivers is becoming more and more solid, knowledge on forest transition at the global scale is remarkably underdeveloped, despite the fact that forest cover has been increasing on the 40% of the world forested areas. The existing literature focuses mostly on case studies; scholar attention seems to slowly move towards broad-scale patterns and drivers. Addressing drivers of forest recovery may also improve the overall understanding of underlying causes of global land use changes by regarding the other side of the forest cover coin. Our study focuses mostly on countries where the forest cover increased between 1990 and 2010, with the aim of analysing the possible effects of certain socio-economic processes.

We conduct our analysis in two steps. 1) First we introduce a biodiversity corrected Forest Recovery Index in order to distinguish between different forest types (primary or naturally regenerated forests or the ones that are planted by the use of native or exotic species). Empirical evidence shows that overall biodiversity is clearly affected by management type. Thus, we introduce Biodiversity Factors by modelling the potential biodiversity level of forest types by the application of the species-area relationship function well-known from the fields of island-biogeography and conservation biology. Biodiversity Factors are used to modify forest cover data. 2) The relationship of our Forest Recovery Index and several variables is analysed in the second step which employ instrumental and conditional instrumental variables regressions. Forest cover data are derived from FAO Global Forest Resources Assessment. Data on factors that may act as underlying drivers are from institutions such as The World Bank, FAO, IUCN and others. Our results present evidence to support the existence of an environmental Kuznets curve (EKC) regarding forest use. The extent of agricultural areas has positive effect on decisions about forest recovery, while corruption (besides the fact that enhances deforestation) acts against it. Several factors, which are important in deforestation (such as economic freedom, magnitude of rural population or trade) seem to have no impact from forest recovery perspective.



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## 1370 Beyond World 3: a new system dynamics model for global sustainability analysis

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In 1972 the Limits to Growth highlighted the role of human activity on the depletion of natural resources and on growth. The unsustainable population-growth path emerged from its newly developed System Dynamics (SD) World 3, whose overshoot scenarios generated a lively debate on what was erroneously conceived as "end of growth" message. Still, its alarming results were confirmed: natural resources fundamental for human life are being depleted a rate incompatible with the Planetary boundaries.

We argue that World 3 scenarios may be too optimistic because they do not include important dimensions able to reflect and shape global political instability. New societal challenges (i.e., increasing population, urbanization, change in consumption) summed up to more frequent extreme weather events caused by anthropogenic climate change resulted in more volatile commodity prices which, in turn, contributed to make the access to limited resources more unsure and unequal. These issues have strong implications on global composition of growth and investments, on political instability (e.g., the Arab spring), on inequality and on the quality of life of future generations.

Thanks to the increase in availability, quality and coverage of statistical information, and in power of computational modelling tools, we develop a new SD which includes the missing dimensions of World 3. In particular, we explore adding prices and social and governance metrics into World3, and later we will incorporate climate change and technology development cycles.

As a difference from the qualitative intuitions of World 3, our model dynamics are informed by multivariate statistics analysis on a multidimensional dataset of internationally validated, comparable and yearly updated variables collected from 1995 to 2012. Then, we regionalize the SD, grouping UN 214 countries according to their level of GDP p.c. In this way, we overcome the main drawbacks of SD, i.e., the strong assumptions of homogeneous and well-mixed agents, and the homogeneous nature of transition events which limit the SD expressive power. We cleaned World 3 creating proxies for the data sources whose quantification is not straightforward, and we run a correlation analysis on SD variables to give a quantitative validation of intensity and direction of feedback loops.

The development of this SD is part of the new methodological framework developed by the GSI's GRO Project aimed at assessing the impact of resources constraints on short term global growth creating a hybrid SD-ABM model to provide clear information to policy-makers, committing governments to introduce targeted sustainability measures.



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## 1077 The needs for food, feed and fuel: transitions and interactions on a global scale

**Nonhebel, Sanderine**

In the coming decades an increase in the need of food is expected since global population will increase to 9 billion people. Next to this all over the world consumption patterns are changing to more luxurious diets including meat. Finally several clean energy policies exist that aim at an increased use of biomass as feedstock for energy generation. This implies that the demographic transition, the nutrient transition and the energy transition are all putting a claim on globally available biomass. Different parts of the world are in different phases of these transition processes. In order to obtain insights in the order of magnitude of the upcoming global biomass demands we developed a simple model.

We distinguish between developing countries, upcoming economies and developed countries. While the first group of countries will need extra food for their growing populations, the second group will require extra animal feed, since increased average income levels lead to higher demand for animal products. Many developed countries will need additional biomass to meet their clean energy targets. Our analysis shows that the future extra needs for biomass as fuel are in the same order of magnitude as the needs for food and feed (around 1000 MT each).

In the coming decades the need for food/biomass will than double from the present 2800 MT to 5500 MT per year. When no changes in yields are expected this would imply a doubling of the land needed for biomass production. If we assume an annual increase in productivity of 2% on a global scale, we still need 50% more land. It is obvious that this is not a route to walk. Our very simple model however provides some insights in how this can be prevented. It is obvious that we cannot change the food needed, since the more people that are expected on earth need to have food. A reduction of the meat consumption, however, is an option since smaller shares of meat and other luxurious products can reduce land needed for food substantially. The third route to walk is not using biomass as clean energy source. Photovoltaic systems provide far more energy per unit area than crops/plants. Obtaining energy from solar panels will reduce the area needed for energy supply with a factor 10!



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1493 Prosperous human society within planetary boundaries:  
measuring the declining carbon intensity of life  
expectancy

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In this research paper, we present novel results that go against the common wisdom driving governance on climate change. We analyse three key interlinked factors which determine anthropogenic pressures on the earth system: international greenhouse gas (GHG) emissions, economic growth and human wellbeing. We quantify the carbon dependency of human and economic development, using complementary statistical and econometric methods to ensure the robustness of the results: panel analysis, counterfactual estimations, as well as drivers and partial derivatives. Contrary to common wisdom, we demonstrate that the huge improvement in human development of past decades is not, in fact, mainly due to the simultaneous increase in energy use and resulting carbon emissions, but instead due to exogenous processes, such as advances in public health provision. However, using the same methods, it can be seen that economic growth is much more closely associated to GHG emissions. We explore the consequences of this surprising result. Rapid, significant, and equitable carbon mitigation need not come at the expense of human prosperity, even when population growth is taken into account. Instead we faces a stark choice of priorities: long term sustainability through focus on low carbon, equitable human development, or short term, carbon-driven, inequitable economic growth, leading to medium and long term human disaster.



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## 1413 A climate change scenario that is ecologically sustainable, fair, and welfare-improving

**Lawn, Philip Andrew**

Nil

To resolve the climate change dilemma, many believe that a global emissions protocol must be negotiated with the aim of stabilising greenhouse gases at no more than 450 parts-per-million (ppm) of CO<sub>2</sub>-equivalent. But more is required than this to deal with climate change and to promote the broader goal of sustainable development. It will also be necessary to:

- 1) initially stabilise the human population at no more than 8 billion, and eventually stabilise it at something much lower;
- 2) reduce the rate of global resource use so it is again within the Earth's sustainable carrying capacity (global resource use currently exceeds biocapacity by around 40%);
- 3) improve the distribution of income and wealth between and within nations;
- 4) make the transition from a growth-based economy to a qualitatively-improving steady-state economy.

High-income countries will need to make the transition to a qualitatively-improving steady-state economy immediately, which will mean having to radically cut greenhouse gas emissions as well as reduce per capita resource consumption. Low-income countries will need a further phase of growth, albeit growth that is as green, equitable, and efficient as possible. This will mean that low-income countries will need to enjoy some increase in greenhouse gas emissions in the short-term, but will need to rapidly stabilise their population growth. Eventually low-income countries will also need to make the transition to a qualitatively-improving steady-state economy. Towards the end of the century, and barring wars and political factors, it should be possible to have everyone enjoying a per capita GDP of around \$15,000 (at 2004 prices) – an outcome that would be ecologically sustainable, fair, and welfare-improving.



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1107 The politics of macroeconomic modelling for sustainability

**Urhammer, Emil**

This article presents an attempt to develop a methodology for studying macroeconomic models for sustainability as political agents in a historical context. The methodology is a patchwork comprising elements from science and technology studies and discourse analysis. A central element of the article is that macroeconomic models are not merely political in terms of their ability to provide calculations and suggestions for policy-making but also in terms of their ability to participate in the creation of macroeconomic realities that governments try to manipulate. This ability can be seen as a form of power, and as such macroeconomic modelling for sustainability becomes a weapon in various power struggles regarding what to do about the rising socio-ecological crisis of our age.



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## 1153 Analyzing Energy Policies in a Stock-Flow Consistent Agent-Based Macroeconomic Model

**Wäckerle, Manuel**

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We present a highly stylized stock-flow consistent, demand-driven agent-based computational macroeconomic model of an artificial economy. The model includes six categories of agents with bounded rationality: central bank, government, private banks, firms, households, and energy suppliers. The latter are split in two sectors – a high emission cheaper fossil fuel sector and a low emission more expensive renewable energy sector. Households with heterogeneous skill levels interact with firms, where firms produce a homogeneous good in order to meet current demand and adjust labor input accordingly. Production requires a fixed combination of labor, capital and energy input, and firm growth is leveraged by banks via a credit market. The government collects taxes and uses it to finance public goods and to provide unemployment subsidies. Energy consumption comes both from households and firms. A transition to a lower emission energy technology is expensive and therefore needs to get financed by the government. In this paper we explore various energy policies including progressive tax regimes, environmental taxes, and subsidies. We plan to look at the overall impact of various energy policies on income inequality, wealth distribution, energy consumption, and growth. To this extent we derive a variety of differing path-dependent policy-driven scenarios for a sustainable transition in context of the European Union 2050 carbon emission targets.

Keywords: agent-based model, stock-flow consistency, macroeconomics, energy transitions, income/wealth distribution



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## 1238 Is Happy Sustainability an Existing Lifestyle

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### Is HAPPY SUSTAINABILITY AN EXISTING LIFESTYLE?

The paper discusses the potential for sustaining the achieved level of happiness at a moderate level of ecological footprint. It combines conceptual analysis with a nationwide representative survey of 1000 individuals.

The impact of income on subjective wellbeing is analysed in-depth both in psychological and economic literature. Their focus of analysis differs, though, and they came to quite different conclusions while studying the same reality. Economists tend to emphasise the significant relationship between consumption and wellbeing, while aspiration theory underlines the weakness of the association. This paper combines the two perspectives and proposes an alternative economic explanation of subjective wellbeing, rooted in the empirical analysis inspired by aspiration theory.

The research questions the monotone function between subjective wellbeing and ecological wellbeing as was proposed by mainstream economic theory or even Inglehardt's more progressive convergence theory. It argues that the association between ecological footprint and subjective wellbeing disappears beyond a certain point, thus fitting a line, even a logistic curve, beyond that point may drive to misleading findings. Instead, cluster analysis of existing lifestyle patterns is a more straightforward tool in that domain for exploring lifestyle patterns.

The empirical analysis of 1000 respondent revealed four different clusters based on the ecological footprint and subjective wellbeing. Interestingly, the happiest cluster was not the one featured by the highest ecological footprint. Consumption patterns with mid-sized footprint seem to have the highest potential to ensure a happy and satisfied life. The cluster with high ecological footprint was featured by high, but not the highest level of subjective wellbeing. The article concludes that the assumed monotone function between subjective wellbeing and ecological footprint is not supported by empirical research. The correlation holds only for the low income domain. Once getting beyond the deprivation point, the range of possible lifestyles widens. The highest potential in achieving a high level of subjective wellbeing is associated with lower-medium level ecological footprint and personal orientation towards family and intrinsic values.

The work was supported by the OTKA105228 project.



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## 1360 Planetary Boundaries, Ecological Debt, and the Efficiency Treadmill: Forty Year Trends

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Increasing ecological efficiency — or reducing the amount ecological resources required to produce a given quantum of economic output — is considered a necessary (but not sufficient) requirement for putting the global economy on

a path of biophysical sustainability. Using the 46-year global ecological footprint data (1961-2006) that keeps track of both biological capacity of the planet and the aggregate global ecological demand, we present trends in global ecological efficiency. We find that while ecological efficiency has consistently risen starting 1984, it has not kept pace with the minimum efficiency needed for the global economy to achieve biophysical sustainability.

The ecological efficiency metric introduced here also allows us to calculate the dollar value of the ecological overshoot — the ecological debt of the global economy. Between 1984 and 2006, the value of global ecological debt

increased from little under a trillion dollars to nearly thirty-five trillion dollars (measured in constant 2005 US\$). As a way of comparison, the global public debt in 2006 was around 26 trillion US\$.

We also introduce a new metric, the treadmill elasticity to keep track of the relationship between trends in global economic output and planet's regenerative capacity. The treadmill elasticity tracks the percentage change in efficiency

gap (measured as the difference between minimum required ecological efficiency for being biophysically sustainable and the actual efficiency) for every percentage increase in ecological efficiency. The treadmill elasticity has been

consistently greater than 100% in the last 40 years.

In addition to global trends, we also present trends in ecological efficiency, ecological debt, and treadmill elasticity for select countries around the world. We include a number of robustness checks on our econometric models of ecological

efficiency and treadmill elasticity.



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1926 Interpretation of Ecological Integrity in the Sense of  
Planetary Boundaries: A New Way Forward for  
Implementing Multilateral Environmental Agreements

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This paper describes the idea of an interpretation of the principle of Ecological Integrity in terms of different quantifiable planetary boundaries. Ecological Integrity is already referenced in several global and regional environmental agreements as a legally binding goal. Recently scientists have quantitatively identified planetary boundaries with regards to several environmental goods. This paper is a first attempt to combine these two to foster an improved implementation of Multilateral Environmental Agreements (MEAs). We apply an in-depth review of literature to improve the understanding of the current interpretation of "Ecological Integrity" and search for the use of Ecological Integrity in a randomly chosen sample of 116 MEAs. Furthermore we analyse the results of our sample with regard to whether and in how far the planetary boundaries identified are addressed in quantitative and qualitative ways. We argue that the existing use of Ecological Integrity in many MEAs can already be interpreted in the sense of the quantifiable planetary boundaries. We show innovative implications of this proposal for MEAs which have already binding character and we discuss the pitfalls for those agreements considered not to be binding. For both types of agreements huge challenges remain. Among those is the question of the just allocation of duties among the different MEAs to maintain the quantifiable planetary boundaries. One planetary boundary is usually addressed by more than one MEA. These MEAs can be regionally or globally concluded ones. And sometimes one MEA addresses different planetary boundaries. All these issues are discussed on the background of the principle of shared, but differentiated responsibility and solution proposals are provided.



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## 1606 Understanding disaster risk and resilience for effective climate policy: requirements and ways forward

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Extreme events are at the forefront of deliberations regarding climate change. Climate-related disasters are often considered game changers with the potential to help shift national and international policy towards action on mitigation and adaptation. Yet, "true" action has not been substantial as recently evidenced at COP19 in Warsaw. Despite its dramatic start concurrent with the massive destruction wrought by typhoon Haiyan, this convention has been considered as one of the COPs with least impact. Literally in the last minute, however, it saw the establishment of the "Warsaw international mechanism for loss and damage," which is to provide support to deal with climate-related damages. The exact form and functions are more than unclear with three years foreseen to develop this mechanism further.

In order to help take this potentially powerful mechanism forward, key questions related to attribution and compensation need clarification. We suggest enhanced understanding of risk and resilience will be essential to this debate. We provide commentary and systems-based modelling analysis conducted in disaster-and climate hotspots in Bangladesh, Nepal and Indonesia.

Attribution is linked to better understanding risk. Climate-related risks are twice caused by anthropogenic interference. As recently documented in IPCC's fifth assessment report, anthropogenic climate change, in addition to causing gradual shifts, is modifying intensity, duration and frequency of climate extremes for many hazards. A second -very different- anthropogenic contribution that renders disasters 'unnatural,' is through the interaction of socio-economic exposure and vulnerability with hazards. These two components are often mixed up, and not examined sufficiently in terms of what they mean for disaster risk and attribution of climate-related risks to anthropogenic forcing.

Compensation is linked to understanding resilience. Climate change is real and on-going, and predictable and adequate support for adaptation of those that are victims of climate change is required. Ideally, compensation should be built on the holistic notion of resilience. Resilience, which is an increasingly popular concept in the disasters, development and climate change adaptation fields, has however not been well operationalized and made conducive for action. Our perspective on resilience is based on systems thinking which considers the multi-scale and multi-variable dynamics of disaster risk and wellbeing. Among others, we work with a variant of the Sustainable Livelihoods framework, which operationalizes and embeds multiple notions of capacities and multiple scales central to a systems perspective of resilience.



Theme: 1.1 MODELS AND SCENARIOS OF THE GLOBAL FUTURE  
Session: 1.1.C Models, scenarios of the global future - Policy options  
Time: T1 Room: R1

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## 1322 Shales vs. Renewables: Using The Capital Markets to Address Climate Change

**Rogers, Deborah Lawrence**

### ABSTRACT

Shale gas and tight oil have been touted as global energy panaceas for the twenty first century. With over 65,000 unconventional wells having been drilled in the U. S. to date, a comprehensive view of well performance can now be examined. Such examination exposes a different reality than industry and government hype would suggest. Unfortunately, such hype has obscured the true performance of wells and led many to believe that shales can provide a cheap and abundant source of global energy for decades to come.

Based on analysis of production history, virtually all shale plays in the U.S. are already in decline on a per well basis with overall fields peaking about 2017, a mere four years hence. The subsequent decline to plugging and abandonment is expected by approximately 2024, meaning that the "shale revolution" was an extremely short lived phenomenon. Further, shale operators are experiencing massive asset write downs, significant deterioration in the value of deals and free cash generated from operations demonstrates a long term pattern of deterioration.

Given that hydrocarbons are finite and energy is the bedrock of the global economy, an economic transition to a cleaner and more sustainable energy paradigm must be effected with least disruption. As climate change has escalated, discussions surrounding limiting or reducing growth in GDP as the only viable alternative have abounded. Such discussion may be misguided. It would seem not a question of limiting growth as to limiting and designing the type of growth. The use of fiscal instruments such as carbon taxes or, better still, imputed "taxes" by the capital markets are warranted and highly desirable and should be promoted on a greater scale. Global financial markets are nimble and not reliant on political will. In fact, they often dictate political will. Using the capital markets could be the quickest and most elegant solution for addressing climate change by encouraging investment opportunity and innovation in research and development while still delivering economic stability and growth.



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## 1337 Maximising affluence within the planetary boundaries

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Ordinary product life cycle assessment (LCA) studies focus on measuring or minimizing environmental impact, but do not address if the product fits in a sustainable consumption pattern. This paper proposes a set-up in which the planetary boundaries define the maximum impact, and the minimum requirements for a reasonable consumption level specify a lower impact level. Thus a "safe operating space" remains.

We use an IO table for EU-27 and the consumption pattern of the Bulgarian population extrapolated to the EU-level as driving climate impact. The EU's policy targets are used as a planetary boundary for climate change.

The 2020 target is shown to be able to accommodate the Bulgarian-style consumption, with room for a much higher GDP. The 2050 target, however, is too narrow, and a slightly smaller consumption pattern and reduced GDP level is needed to reach it.

Although the approach is highly simplified and neglects many developments, the idea of using IO-tables and minimum consumption levels to backcast directions to be taken is expected to help policy makers.



Theme: 1.1 MODELS AND SCENARIOS OF THE GLOBAL FUTURE  
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## 1705 Isn't it time to put human population growth and attendant consumption back on the radar screen?

**Limburg, Karin E.**

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Global population will shortly hit 7.2 billion people. By the time ISEE 2014 takes place, roughly another 40 million people will join the tally. Ultimately, human population growth is the driver of consumption, but consumption also drives population growth. When needs cannot be met, whether for economic, political, religious, or (increasingly) environmental reasons, people move. And yet, environmental scientists, including ecological economists, have not placed this largest of environmental issues on the current radar screen, preferring instead to deal with consequences. The paradox of embracing complexity while largely ignoring human population and consumption needs to be addressed. With over 7 billion people and ecological decay how do we envision a path to a healthy human ecology at multiple scales? We propose that a new conversation be opened up to bring human population demographics back into the ecological economic equation. Attention to the whole over marginal units, ultimate versus intermediate goals, and understanding ourselves as citizens of Earth versus as consumers are dialogues worth pursuing. Hardin included attention to human population as a paramount position of ecological economics in 1990. It's time to link this to an additional paramount position that the current economic structure is unable to provide for a just and sustainable world, especially when considered with human population growth trends.



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Session 1.1.D

Models, scenarios of the global future - regional cases



Theme: 1.1 MODELS AND SCENARIOS OF THE GLOBAL FUTURE  
Session: 1.1.D Models, scenarios of the global future - regional cases  
Time: T2 Room: R1

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**1724 Assessing Impacts of A Large Engineering Project on Ecosystem Services at the Regional Level-A Case Study of the Middle Route Project of the South-North Water Transfer Project in China**

**Ding, Xiaohui**

Construction of large engineering projects, especially large-scale hydraulic projects, has the potential to meet the needs of social and economic development in developing countries. Although the economic benefit from such projects can be significant, the regions that host them are often exposed to enormous social and environmental pressures, including challenges to the integrity of the ecosystem and its potential ecosystem services.

Such challenges are apparent in the water source area of the Middle Route Project (MRP) of South-North Water Transfer Project (SNWTP), which comprises 40 counties (belong to Shaanxi province, Hubei province and Henan province respectively) with a total area of 81,000 km<sup>2</sup> in China.

Using the MRP as a case study, this article proposes a rapid assessment evaluation method for estimating ecosystem service values. This method is applied to the water source area of MRP ('the research area'). Results show that the estimated ecosystem service value of the research area decreased by 2.8%, from approximately 228 billion Yuan in 2002 to 222 billion Yuan in 2010. An 8% reduction in forest coverage (a net loss of 849,868.20 ha) is the leading reason for the fall in ecosystem service values. The areas covered by water bodies and wetlands increased by 85.71% and 53.61%, respectively, from 2002 to 2010, and their contributions to the total ecosystem service value grew to 3.5% and 8.52%, respectively, over that period. From the perspective of single ecosystem service functions, the values of soil formation and retention, biodiversity protection, gas regulation, climate regulation, raw material and recreation and culture decreased during the research period. Among these functions, soil formation and retention and biodiversity protection are closely correlated with the quantity and quality of water resources in the water source area of the MRP. Therefore, hierarchical land use control policies formulated based on the different ecosystem service values of different land cover types is urgently required for the conservation and restoration of the ecosystem. These findings indicate that local governments should advocate for a form of urban expansion that is more compact and aggregated. The industrial structure of the research area should be adjusted from more secondary industries involved to advocate the booming of tertiary industries, which are more environmentally friendly and higher value-added.



Theme: 1.1 MODELS AND SCENARIOS OF THE GLOBAL FUTURE  
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## 1655 Accounting for climate disasters: costs of extreme events in Rio de Janeiro State, Brazil

**Frickmann Young, Carlos Eduardo**

Camilla Aguiar

This work aims to evaluate the economic losses caused by extreme weather events, more precisely floods (abrupt and gradual) and landslides caused by torrential rains in Brazil. We used official data for the number of people affected, frequency and locations of these events, and then the information was crossed with average estimates of economic cost per person affected, homeless or displaced, calculated from the assessment of damages, floods and landslides in the mountainous region of Rio de Janeiro in January 2011 by the World Bank (2012). Based on these data, it was possible to estimate the damages with similar disasters occurred in the state of Rio de Janeiro, during the study period, between R \$ 48.4 and 54.5 billion, somewhere around the average value of 1.3% of the State GDP in 2010. These results indicate that the incidence of climatic disasters is increasing, due to three possible causes: (i) better data coverage; (ii) more people is living on dangerous areas; and (iii) climate change. Possibly, these three causes happen simultaneously. The paper ends with the discussion of possible future scenarios, with the worsening of climatic extreme events, and the necessary public policies to address these important issues, comparing existing efforts and the actions that are required to minimize risks.



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1766 The Ring of Fire mining development project in the Far North of Canada: Can prosperity for all be achieved and at what cost?

**Pastoret, Corinne**

NA

While economic growth in Canada has traditionally been driven by exports of natural resources extracted in remote Northern communities, mining-driven revenues have mostly been transferred to large cities in the South of Canada.

With the neoliberal turn of the 80s, multinational mining companies have taken control over the exploitation of Canadian natural resources as part of a worldwide strategy of production, division of labor and trade of natural resources, which resulted in deepening regional and international disparities. There was little chance that this global strategy would genuinely improve the well-being of local communities in terms of higher living standards, full-employment, safe levels of pollution, ecological integrity and adequate infrastructures.

The Far North of Ontario is one of the world's largest and most intact ecological systems. This paper looks at the expected impacts of the "Ring of Fire" (ROF), a new large-scale mining development project in the Far North of Ontario, which is portrayed by Canadian politicians and mining companies as the engine of economic growth and prosperity for all, for the next 30 years. It is asked if prosperity will be shared with communities in the Far North of Ontario, how and at what environmental costs?

The paper is divided into 3 main parts, as follows:

- 1) Part one provides an overview of the global and regional contexts: neoliberal turn, speculation on commodity markets, strategies of multinational mining companies, weakening of labor unions, increasing regional inequalities and recent provincial economic proposals in Ontario and Québec to intensify the exploitation of natural resources in the North and Far-North of Canada.
- 2) Part two presents the natural and socioeconomic characteristics of the Far-North of Ontario. It is a remote region, rich in natural resources and populated by scattered aboriginal communities which have not traditionally benefited from mining projects, but suffered from pollution of their environment and the disruption of their traditional way of living. Most of the communities experience poverty, indecent living conditions, low education, high unemployment and lack of road access, power and sewage systems.
- 3) Part three critically analyzes the expected benefits and the related monetary and environmental costs of the ROF project. A specific attention is given to both public policies aiming at including remote aboriginal and Northern communities into the economic development process - such as resource revenue sharing, employment and training policies- and to private negotiations of impact benefit agreements between mining companies and aboriginal communities.



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## 1521 Ecological Economic Modeling in Decision Support for Sustainability Scenarios

**Safonov,Paul**

A Decision Support Systems class in a Business School is used to test how ecological-economic modeling helps students grasp concepts of sustainability and build scenarios of the global future. Several types of macro and micro ecological-economic modeling approaches were included in such an educational experiment, and the outcomes of a number of other similar courses taught by author are discussed in a comparative analysis.



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CONSTRAINTS ON RESOURCES



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ISEE CONFERENCE ICELAND 2014

Session 1.2.A

Food, Feed and Bioenergy: Planetary boundaries related to land use and net primary production; Proposed session



Theme: 1.2 CONSTRAINTS ON RESOURCES  
Session: 1.2.A Food, Feed and Bioenergy: Planetary boundaries related to land use and net primary production; Proposed session  
Time: W1 Room: R2

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## 1161 Conflicts, trade-offs and constraints in harvesting biomass for carbon dioxide removal

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Abstract for submission to the session 'Food, Feed and Bioenergy: Planetary boundaries related to land use and net primary production' (Krausmann et al)

Previous work (1) has examined human harvest of NPP in the context of managed carbon fluxes and agricultural land-use. We used a spreadsheet model to look for possible sources of biomass for bioenergy with carbon capture and storage (BECCS) under different global scenarios of future diets and changing efficiency of agriculture. We have also used macroecological trends to take a first look at possible effects on biodiversity under the different HANPP and land-use regimes of our scenarios (2).

Here we present an updated version of the model with differentiated crop-types and more explicit representation of different livestock systems, waste-streams and land-use change. We then use the biomass flows and associated land- and waste-management strategies of our scenarios as inputs to a newly developed box-model representation of the global nitrogen cycle, examining the impacts of nitrogenous wastes and the removal of natural nitrogen sinks.

We find that if food production is given priority for use of harvested biomass, the feedstocks available for BECCS are highly constrained by the efficiency of agricultural biomass harvest; especially that of livestock production. Efficiency gains, however, often come at a cost of increasing intensity of HANPP, which has its own negative consequences on biodiversity, soil carbon and the nitrogen cycle. Interventions such as reducing food-waste losses and reducing consumption of animal products can significantly reduce constraints on available BECCS feedstocks, providing a significant carbon sink by 2050.

In all our scenarios rising food demand from a global human population growing in number and wealth serves only to tighten the environmental and resource constraints on the harvest of NPP. A multidimensional view of human biomass harvest is essential to ascertain the constraints on appropriating an increasing portion of global NPP, and the compromises (environmental, social and in resource allocation) that may be necessary.

1. Powell T W R and Lenton T M 2012 Future carbon dioxide removal via biomass energy constrained by agricultural efficiency and dietary trends *Energy Environ. Sci.* 5 8116–33

2. Powell T W R and Lenton T M 2013 Scenarios for future biodiversity loss due to multiple drivers



reveal conflict between mitigating climate change and preserving biodiversity Environ. Res. Lett. 8  
025024



Theme: 1.2 CONSTRAINTS ON RESOURCES  
Session: 1.2.A Food, Feed and Bioenergy: Planetary boundaries related to land use and net primary production; Proposed session  
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## 1484 An NPP related approach to analyse global grazing pressure

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Grasslands and livestock systems play a key role in the Earth system and are closely linked to the sustainability of food systems and food security. It is well known that a high grazing pressure is often related to overgrazing and possibly results in the loss of annual Net Primary Production (NPP) through degradation. NPP is an essentially constraining resource, hence productivity losses may influence the global food system and foregone productivity possibly limits the future ability of livestock systems for food production. In addition, areas showing high grazing pressure may be dependent on feed imports in order to cover their total feed demand. However, despite their importance, large knowledge gaps relate to grasslands and the pressure put on them through grazing. We present a spatially explicit approach to analyse grazing pressure on the global level based on the gridded livestock of the world dataset from the FAO and information on the total feed demand and the share of this covered by grazing and market feed for cattle, goats, buffaloes and. In a next step we compare the grazed biomass per grid cell to the available NPP for the year 2000. In order to account for variations in suitability of grasslands for grazing we apply suitability classes based on the assumption that in highly suitable areas up to 75% and in less suitable areas 50% of the annual NPP is harvestable. This approach highlights areas of very high grazing pressure and allows to locate areas where current grazing pressure exceeds the available NPP. Hotspots of grazing pressure can be found on all continents but are relatively large in South Asia (India, Pakistan) and Mexico. Scattered, smaller hotspots are found in parts of North America and Eurasia. Areas where grazing pressure exceeds the actual NPP are, compared to the total grassland area, relatively small. This analysis contributes to close the knowledge gap associated



with grasslands by providing a spatially explicit analysis of grazing pressure on the global level. The application of NPP as a baseline enables to highlight areas of high grazing pressure and potential dependency of biomass imports.



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1214 A NPP perspective on global cropland productivity: analyzing the trade-offs between societal gains and ecological costs of yield increases.

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Submit for session: Food, Feed and Bioenergy: Planetary boundaries related to land use and net primary production (submitted by Fridolin Krausmann)

Increasing outputs from global croplands and so avoiding further expansion into natural areas has been highlighted a key agenda for sustaining a growing and prospering population's biomass demand in the coming decades. Research has shown that regions where current crop yields are low and high potential for future yield increases exists could have the capacity to cover a substantial share of future biomass demand. However, many uncertainties remain regarding a)



the identification of areas suitable for land use intensification in terms of socio-economic or bio-geographic conditions and b) the evaluation of possible environmental externalities caused by land use intensification in these areas. Here we compare patterns of global cropland productivity against potential productivity on croplands in the year 2000 in order to distinguish regions where conversion of natural ecosystems has resulted in losses of NPP from regions where it has led to productivity gains in comparison to potential NPP. Specifically, we ask the question to which costs some world regions were able to surpass their natural productivity thresholds, while other regions remained below. We found that around 33% of global croplands surpassed natural productivity in the year 2000 and that these regions are mainly situated in temperate regions of the Northern hemisphere as well as in highly intensified dry-land areas. These lands consumed around 67% of global nitrogen fertilizers and used 72% of the global irrigation infrastructure. Furthermore our results show that while high levels of land use intensity imply a high degree of human disturbance (e.g. biodiversity losses, changing bio-geographical cycles, depletion of Carbon stocks), regions exhibiting "surplus-productivity" in the year 2000 were at the same time responsible for the lion's share of global biomass outputs in form of food, fiber and energy. We discuss our results on NPP differences between natural and current productivity in the light of trade-offs in the land system, in particular between social and ecological consequences related to land use intensity.



Theme: 1.2 CONSTRAINTS ON RESOURCES  
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**1121 Human biomass use and HANPP: A global long term analysis of biomass use and NPP related planetary boundaries**

**Krausmann, Fridolin**

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Industrialization is based on a fundamental change in the resource base of human society and the composition and amount of energy and materials used. This process has been discussed as socio-metabolic transition. In the last century, the metabolic transition entailed a multiplication of human use of natural resources and a shift from renewable biomass as the main energy carrier and material resource towards mineral and fossil materials. In spite of the relative decline of the significance of biomass in social metabolism, the overall amount of biomass harvested and used has been growing.

This paper uses a global database on the development of biomass harvest and use as food, feed, fuel and fiber during the 20th century. It explores the dynamics of biomass use in relation to population growth and economic development in six world regions. In addition to these socio-economic aspects of biomass use, the paper also investigates the impacts of human biomass use on energy flows in terrestrial ecosystems by using the concept of human appropriation of net primary production (HANPP). Our results shows that in spite of the far reaching changes in the patterns of biomass use, overall demand was tightly coupled to population growth but, unlike other resources, not to economic development. Considerable efficiency gains in the production and conversion of biomass have allowed for biomass production to keep pace with population growth and to substantially increase the amount of biomass available for human consumption while keeping growth rates of HANPP lower than those of population and GDP. However, this expansion of one planetary boundary, achieved through increased land use efficiency, came at considerable ecological costs (e.g., inputs of large amounts of fossil fuels, water and, nitrogen and phosphorus) and resulted in a shift of pressures to other components of the Earth system.



Based on the discussion of the historical development, the paper discusses changes in land use intensity/efficiency and draws conclusions on the possible role and limitations of biomass use in a transition towards a more sustainable social metabolism. It contributes critical knowledge on the connections between various planetary boundaries and their association with the limits to growth debate.



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## 1652 Institutional Compatibility Assessment for more Sustainable Agricultural Practices in Degraded Steppe Soils in Russia

**Jelinek, Ladislav**

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Agriculturally-used steppe soils possess a large capacity to act as a carbon sink after optimizing land use and soil management in a carbon friendly way. Such fertile soils can also be found in Kulunda region in south-western Siberia (Russia). Its potential began to be exploited and yet overexploited in 1950s and 60s, when the former natural steppes were transformed into arable land. Massive soil degradation began. The question is how to facilitate a land-use change towards more sustainable agricultural practices, such as no-tillage farming in that part of Russia. No-tillage farming is known to have several positive effects on steppe soils, such as increasing organic matter and reducing risk of wind and water erosion.

Supporting land-use change is partly an economic question, but to a large extent an institutional question in Russia. Institutions - property rights on land and the governance structures, such as the advisory or monitoring mechanisms, play a central role in the way how supporting policy measures could be implemented in order to become effective at the local scale. Further, the understanding of various forms to implement a policy to serve the same objective is different in the Russian context compared to a Western context.

This contribution aims at the ex-ante investigation of the institutional aspects that are crucial in facilitating agri-environmental policy implementation in the Kulunda region. We use the PICA method (Procedure for Institutional Compatibility Assessment) for the analysis. PICA has been designed as an explorative and flexible, yet formalized methodology that enables policy-makers to identify, at an early stage, potential institutional incompatibilities.

Policy-makers from the Altai regional administration, agricultural advisors, farmers and environmental non-governmental representative are involved in the assessment. Preliminary results from first field studies conducted in 2013 point to the following crucial institutional aspects i) unknown compliance costs for farmers, ii) lack of knowledge of farmers on environmental policy aspects and objectives, iii) insufficiently specified property rights on land (conflicts between formal and effective ownership rights on land), iv) discrepancy between policy objectives at the regional and national level (envisaged policy objective may be in the contradiction to the national policy), v) missing administrative capacity and compliance control mechanisms and, finally, vi) poorly specified law and dysfunctional state apparatus.

This study will supply policy-makers with the additional view on the agricultural policy formation - that is shifting the attention from the still prevailing 'technical' perception to the institutional dimension.



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Session 1.2.B1

Resource use in transition: past and future developments of  
stocks and flows; Proposed session

Theme: 1.2 CONSTRAINTS ON RESOURCES  
 Session: 1.2.B1 Resource use in transition: past and future developments of stocks and flows; Proposed session  
 Time: T1 Room: R2

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## 1400 Accounting for material flows around the world - the SERI/WU MFA database before the background of global accounting approaches

**Lutter, F. Stephan**

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The extraction of material resources such as fossil fuels, minerals or biomass (e.g. crops or forestry products) is increasing at an ever higher pace; so are the environmental impacts related to resource use, such as environmental degradation, an increase in GHG emissions and biodiversity loss. These environmental effects, but also economic consequences such as increasing raw material prices and competition for rare materials have led to an increased political focus on resource use topics on the EU and international level.

In order to evaluate current trends and development trajectories, to set targets for sustainable resource use and develop strategies to monitor progress towards them, it is essential to develop adequate indicators and robust underlying data to calculate them. On both ends, indicators and data, currently a number of efforts and initiatives are ongoing, and significant advances have been reached during the last years. On the data level, Material Flow Accounts (MFA) have been used already for many years as accounting standard for national material use (used and unused extraction), for which Eurostat and the OECD have developed guidelines to ensure comparable data entries.

Over the past 10 years the Sustainable Europe Research Institute (SERI), since recently in collaboration with the Vienna University for Economics and Business have developed the first global comprehensive database on worldwide material extraction. This database follows the international guidelines of economy-wide MFA and builds upon official data sources such as FAO, BGS, USGS, or the IEA. It covers more than 300 different types of materials, about 200 countries and the time period 1980-2010.

In this paper we discuss the current state of methodological development underlying the various material categories, including accounting techniques and estimation methods in cases where real data is not available. Furthermore, current developments especially with regard to improving accounting methodologies in areas such as the extraction of construction minerals, the uptake of grazed biomass, or the estimation of unused domestic extraction are discussed. We show different tools for illustrating and communicating the resource use topic as contained on the SERI/WU website [www.materialflows.net](http://www.materialflows.net). These consist of interactive world maps, a Gapminder tool as well as Worldmapper images which all visualize the current status and trends in resource use and thereby enhance the usefulness of the data for a broad group of users. We close with an outlook on necessary next steps in the refinement of material accounts as well as possible ways for further increasing the application of the data and indicators.



Theme: 1.2 CONSTRAINTS ON RESOURCES  
Session: 1.2.B1 Resource use in transition: past and future developments of stocks and flows; Proposed session  
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## 1786 An Indicator framework for a comprehensive evaluation of resource efficiency (DESIRE)

**Eisenmenger, Nina**

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Resource efficiency is high on the political agenda. In 2011 the EU published a flagship initiative and a roadmap towards a "resource-efficient Europe" and in 2007 the UN launched the UNEP International Resource Panel, which provides "assessment on the sustainable use of natural resources and the environmental impacts of resource use". However, the policies addressing resource efficiency are rather vague about what are the resources considered, what is resource efficiency, and what types of indicators to use. Thus, a consistent conceptual framework is needed that structures resources within the cause and effect chains such as the DPSIR framework. We will present a conceptual framework for resource efficiency which was developed in the FP7 Project "DESIRE" building on an Input-Output framework.

Resource efficiency is about using natural resources efficiently that is minimizing natural inputs and maximizing socio-economic outputs. The meaning of "resources" can be rather broad, by having all natural stocks and their potential service as a resource. The EU for example includes among resources: materials, energy, water and land, wastes and emissions, "environmental media" such as wind, solar, geothermal, and finally also biodiversity and ecosystem services. But resources cannot be "efficient" themselves. Consequently, resource efficiency is about using resources efficiently either in a technical sense (less physical input per physical output) or economic sense (more economic value generated by unit of resource), and thus in fact one should talk about "resource use efficiency".

The first type of indicators proposed are resource use indicators, i.e. indicators in absolute values directly at the interface of society-nature interactions. Among those we consider material use, energy use, water use, and land use, as well as wastes and emissions. In a second step, resource use can be linked to the natural system on the one hand side resulting in indicators on the environmental impacts (both in quantitative as well as qualitative terms). A clear and structured link in particular to ecosystem services and biodiversity is proposed. On the other hand, resource use can be linked to socio-economic output and services, i.e. resulting in resource efficiency indicators. The innovation of this perspective is the consistent link of socio-economic activities with resource use and the natural system and its functioning, i.e. ecosystem services, net-primary production and biodiversity.



Theme: 1.2 CONSTRAINTS ON RESOURCES  
Session: 1.2.B1 Resource use in transition: past and future developments of stocks and flows; Proposed session  
Time: T1 Room: R2

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## 1285 Current state of and future options for the global economy's circularity

**Haas, Willi**

Markus Heinz  
Fridolin Krausmann  
Dominik Wiedenhofer

The Circular Economy is an appealing strategy for sustainable development that is promoted by industries and governments in several industrial and emerging economies such as the European Union, Japan and China. The principles of what we now discuss under the idea of a Circular Economy are not new but have a long history. Pre-industrial history and the early phases of industrialisation provide numerous examples how societies were concerned with reusing and recycling materials and turn them into valuable resources. Waste flows of pre-industrial societies were low and until industrialization entire societies were organized on the basis of largely closed loops. The process of industrialisation characterized by a shift into a fossil fuel energy regime changed societal flows fundamentally. This presentation explores the situation at the turn of the 21st century by applying a socio-metabolic approach combined with Life Cycle Analysis to assess how circular or linear global material flows are. Since inputs into the global economy are still growing and a substantial amount is used for energetic use or put on stocks only a small share of input becomes End-of-Life waste within a year (about 20%). Roughly half of this is used to substitute for the input of virgin materials. Since there are significant differences between different world regions we apply this approach to two world regions namely the eu27 as industrialised countries with a saturated material consumption and to the Rest-of-the-World. Based on this analysis we explore the potentials and limitations of recycling of different material categories for closing loops. Finally we discuss what the most effective steps towards a Circular Economy could be.



Theme: 1.2 CONSTRAINTS ON RESOURCES  
Session: 1.2.B1 Resource use in transition: past and future developments of stocks and flows; Proposed session  
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## 1785 Resource use – where are we heading for? Global resource use scenarios until 2050

**Eisenmenger, Nina**

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The explosion in global resource use around the turn of the century is the combined result of stagnation followed by de-growth in the Industrial region and immense growth of metabolic scales in all other regions (with the exception of Sub-Saharan Africa). Massive growth of resource use in the highly populated Asian region has dominated global DMC in the last decade and left the region with a metabolic rate which is similar in composition to the Industrial region's yet much lower and even slightly below world average.

Resource use is meanwhile well understood and empirical data as well as analysis of trends and pattern are rich. Recent development in the area of policy implementation increasingly claims for resource use scenarios. We developed resource use scenarios until 2050 where we assumed that other regions "catch up" to the average industrial metabolic rate. Along 6 major world regions we find that Asia would have to increase its DMC to approximately 50 Gt/a, assuming zero population growth. That is an amount of materials corresponding to 70% of all materials globally extracted in 2010. If all regions were to have an Industrial metabolic profile, global DMC would rise to just below 100 Gt and to twice its 2000 level. Even if we simply assume that the 2000-2010 development of global resource use, including the slight decrease in the industrial region, continues in the next decade ("business as usual"), we would reach a global DMC of more than 100 Gt/a by 2020. Our scenario models are based on the population growth scenarios of the UN as well as characteristic metabolic rates for 6 world regions (OECD, Asia, FSU, Middle East and North Africa, Sub-Saharan Africa, Latin America and the Caribbean). Additionally, assumptions with regard to resource efficiency were taken, as well as assumptions on the different development paths of the major four material categories.



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Session 1.2.B2

Resource use in transition: past and future developments of  
stocks and flows; Proposed session



Theme: 1.2 CONSTRAINTS ON RESOURCES  
Session: 1.2.B2 Resource use in transition: past and future developments of stocks and flows; Proposed session  
Time: T2 Room: R2

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## 1361 Efficient material management on an EcoIsland

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Infrastructure is a key mediator in the resource dependence of modern societies. As well as acting as a conduit of resources from the environment to societal use, infrastructure itself has a substantial material requirement. The transition to low-carbon infrastructure required to avert the most disastrous consequences of climate change often lacks consideration of related material demands. Many of the technologies required for low-carbon infrastructure use a group of materials that have not previously been prevalent in infrastructure and are at potential risk of supply shortfall or disruption, a problem that will be greatly exacerbated due to the large scale of infrastructure compared to that of technologies in which these materials currently find their primary use. The overlap in technology and critical material dependence between different infrastructure systems, such as energy and transport, introduces a new level of interdependency.



New analytical approaches are required that look across individual infrastructure systems for opportunities for technology and material recovery and reuse. As well as improving resilience of infrastructure networks, such a system-of-systems approach to managing material resources would foster a more connected industrial ecosystem as is needed in a circular economy.

Here we present the results of a material stocks and flows analysis of a set of transition scenarios for an EcoIsland (the Isle of Wight). The transition includes a move to low carbon transportation in the form of electric battery or hydrogen fuel cell vehicles, and the installation of renewable energy generation; both of which are dependent on a set of materials that have been identified as critical in previous studies. By using a new infrastructure-focused stocks and flows model, which includes a hierarchical description of infrastructure technology, components, and materials, we analyse the potential for primary material demand reductions and more efficient resource use through not only material recycling, but also the reuse of technology components in new infrastructure systems, for example, reusing electric vehicle batteries for grid-attached storage. We hope that the methodology we demonstrate here will stimulate a more analytical approach to critical material management that recognises the benefits of a system-of-systems view of infrastructure technologies.



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Time: T2 Room: R2

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## 1081 BOUNDARIES Metabolic transformation in the river plate basin: Modern agriculture, nutrients flows and regional boundaries

**Pengue, Walter Alberto**

The River Plate Basin is in the core of the most relevant rural transformation in Latin America and the world. Since 1996, transgenic crops (particularly soybean, corn and cotton) have been expanding in the Region and for the coming years new events will be releasing in the different ecoregions of the Basin.

In the next seven years (2013-2020), the region (particularly The Pampas, the Cerrados, the ecoregion of Chaco (drainage and humid) and the Espinal), will be facing an increasingly intense acceleration process in the transformation of their natural resources basis. More than 100.000.000 hectares are under a serious process of transformation, which will transform not only the different ecosystems instead the relevant structure for the stability of the agriculture production: the soils

Also, new technologies implemented in agriculture are being tested in their agronomical conditions but unfortunately very much lesser extent in the direct and undirected relation to their ecological impacts and their relationships with the natural resources involved, particularly the nutrients flow and their impact on agriculture stability and environmental services and processes.

Here, we analyze some of the technoecological changes that will be occurring in the River Plate (chacompampeana region) plains in the coming years, identifying and quantifying the shadow externalities that are going to be produced through the utilization of some biophysical relationships with land use and water and material flows.

In the first stage we will study the environmental conditions through statistical analysis, bibliographic and cartographic production variables, and geographical conditions, demographic, economical and ecological ecoregion in two points of time with the dual purpose of identifying the changes and compare the subregions.

We decided to follow a MFA analysis and logic, but in this case, to analysis the material flow of the basic resources of soils, particularly nutrients, in terms of incorporate this discussion, particularly with the focus on the environmental and agronomical effects of a nutrients depletion as result of the intensification process of demand of biomass materials.

Then selected a department/county in each area, resulting representative of each ecoregion, and studies will be conducted on the basis of census data and fields work, to find associations between changes in land use, natural vegetation patterns and driving forces that cause them, the types of production and the conservation status of soil and extraction of macronutrients(nitrogen, phosphorus and potassium) (nutrients depletion) and other material flows (virtual water and others) exported and between degree of urbanization and indicators of deforestation.

The current proposal is part of a project supported by the National Agency of Science of Argentina (PICT 1636-2013).



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## 1154 Global long-term dynamics of material stocks and flows in infrastructure and buildings, from 1900-2010

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Submission for the session proposal: Resource use in transition: past and future developments of stocks and flows by Dr. Nina Eisenmenger

### Abstract:

The construction of material stocks of buildings, infrastructure, machinery and durable consumer goods mobilizes large amounts of materials and energy. Additionally long service-lifetimes of these stocks induce long-term dynamics in resource use for operation and maintenance of stocks, also determining the availability of materials for reuse and recycling. Systematic knowledge about material stock dynamics is crucial for understanding long term resource use trends and for the development of strategies towards more sustainable resource use.

This paper presents estimates of global material stocks in infrastructures, buildings and durable goods from 1900 – 2010 in a breakdown by 6 world regions based on a dynamic material stocks and flows model. We apply a top-down modelling approach, tracking annual cohorts of inflows of stock-building materials throughout the time period. We utilize a global material flow database covering the time period 1850 – 2009 (Krausmann et al., 2009; Schaffartzik et al. 2013), and distinguish input flows of 10 major stock building materials: plywood, sawn wood, paper, plastics, concrete, asphalt, bricks/stones/tiles, copper, steel and aluminum. A 'stocking-rate' corrects for the fraction of stock-building material inputs which turn into outputs/waste within the same year due to production losses and consumptive uses. Two types of functions are then used to model the lifetimes of the materials in use: A uniform distribution is applied for materials with short lifetimes, while a normal distribution is applied for materials with longer lifetimes. Furthermore, all outputs/waste flows are subject to recycling, thereby turning into additional input flows of non-virgin materials. Due to the inherent uncertainty in such an exercise, we perform Monte-Carlo simulations, applying uncertainty ranges for all model parameters and the material inflow data introduced above. This allows us to a) identify further research & data requirements for improved stock estimations and b) discuss possible ranges of global material stocks in use.

In conclusion, we reflect on quantitative long term developments of material stocks in six major world regions with different socio-economic characteristics and discuss the relation of economic development and stocks. We finalize with reflections on the role of material stocks in ongoing socio-ecological transitions into the fossil-fuel based regime as well as implications for more sustainable resource use strategies in the light of the need for a new transition towards sustainability.



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Session 1.2.C

constraints on resources: policies and technologies



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## 1532 Designing Industrial Sustainability Policies in the Agent-Based Macro-Economic Framework EURACE

**Raberto, Marco**

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Evidence increasingly suggests that the industrial system is a large contributor to anthropogenic climate change, is increasingly creating resource scarcity, and is generating unmanageable waste to land-fill. To develop more sustainable industrial systems and sustainable societies, policy makers and industry need to better understand how to transform industrial behaviour leveraging on appropriate investment and implementation of technology. The phenomena to be studied originate in classical economic externalities. In recent years, a bottom-up approach to economic analysis, referred to as "agent-based modeling," has been motivated by new insights on the limitations of traditional economic approaches, as well as computational advances. The key advantage of agent based modeling in this context is to explicitly treat the incentives that face behaviorally realistic agents in empirically credible environments and its ability to take into account behavioural heterogeneity and interactions, which can lead to emergent behaviour which might be very difficult to foresee in an aggregate model.

We employ the EURACE agent based macro-economic model and simulator (Cincotti et al., 2010, Raberto et al. 2012) and enrich it to encompass industrial sustainability considerations. In particular, we endow the firms' production function with an additional raw material input (provided by the environmental agent at costs rising with the demand), and with an additional output representing the creation of waste/emissions. The fiscal policy of the government agent is also enriched to include possible fiscal incentives to the industry to support investment in eco-productivity enhancement to avoid potential future obligations to pay for mitigation/adaptation to address negative environmental impacts of industry. Preliminary computational experiments show non trivial complex behaviors, where the fiscal incentives to the sustainable transition may have different macroeconomic and environmental outcomes, depending on both the business cycles and the size of the rebound effect of the improved technology.

The contribution of this work is then to initiate a new research field into the use of an agent-based macro-economic framework for investigating industrial sustainability and to assist policy makers by providing a framework to better assess policy options for investments and incentive systems to drive sustainability.

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Theme: 1.2 CONSTRAINTS ON RESOURCES  
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## 1731 Geothermal sustainability assessment protocol

**Shortall, Ruth**

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Sustainable development calls for the use of sustainable energy systems. However, the way in which a geothermal resource is utilized will ultimately determine whether or not it is sustainable. Sustainable utilization of geothermal energy means that it is produced and used in such a way that is compatible with the well-being of future generations and the environment.

This presentation provides a review of the linkages between geothermal energy developments and sustainable development, as well as a review of available sustainability assessment frameworks. In addition, a proposed sustainability assessment protocol for geothermal power will be introduced.



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## 1405 Energy Regime Change and Institutionalism: Understanding Developments in Carbon Capture and Storage

**Toikka, Arho**

Many analyses of energy technology development disregard the importance of institutions and the interdependence of economic, technological, political and societal concerns and events. I propose a dynamic institutional systems framework to integrate the various concerns into a simultaneous analysis and demonstrate the frame with case analyses on the budding developments of Carbon Capture and Storage (CCS) technologies in Europe.

The framework integrates cognitive institutionalism, Socio-Ecological Systems (SES) and socio-technical transitions theory. Institutions are the rules of the game in a society shaping human interactions; both formal rules, such as laws and regulations, but also informal institutions through traditions, practices and beliefs. Individual but shared beliefs about energy regimes shape how the systems develop, leading to issues of technology lock-ins, incremental change, institutional inertia and path dependency.

This paper focuses on self-referentiality in the mental models of stakeholders as a factor that shapes these issues. The institutions held by the actors are seen to organize in a nested mental model: the three levels of socio-technical landscape, socio-technical regimes and the innovative niche (Geels 2002) are seen nested holons or SESs.

This paper is based on case studies in Finland. The case studies are focused along two projects: one cancelled retrofit of a coal power plant and one case of technology in development, mineral carbonation. These two projects are deeply embedded in a national and international context, and the aim of this paper is to establish how stakeholder's institutional self-referentiality affected the developments in the projects and what these project issues tell us about CCS and energy regime change in general.



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## 1758 Potential Impact of Transition to a Low-Carbon Transport System in Iceland

**Shafiei, Ehsan**

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System dynamics modelling of Iceland's energy sector (UniSyD\_IS) is founded on the UniSyD\_NZ model of New Zealand's energy economy. The model focuses on the energy supply sector with endogenous representation of road transport energy demand. Equilibrium interactions are performed across electricity, hydrogen, biofuels, and road transport sectors.

Possible transition paths towards a low-carbon road transport in Iceland are explored with implications for fuel demand, greenhouse gas (GHG) emissions and associated costs. The consumer sector of the model simulates the long-term evolution of light and heavy-duty vehicles through a vehicle choice algorithm that accounts for social influences and consumer preferences. Through different scenarios, the influence of four fundamental driving factors is examined. The factors are oil price, carbon tax, fuel supply-push and government incentives.

We find that changes in travel demand, vehicle technology and fuel type along with efficiency improvements can support feasible transition paths to achieve sufficient reduction in GHG for both 4°C (4DS) and 2°C (2DS) climate scenarios of the Nordic Energy Technology Perspectives study. Initial investment in supply infrastructure for alternative fuels will not only mitigate GHG emissions, but also provide long-term economic benefits through fuel cost saving for consumers and reduced fuel import costs for government.



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Session 1.2.D

constraints on resources: economic constraints



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Session: 1.2.D constraints on resources: economic constraints  
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## 1222 Are real estate valuers constraining sustainable land use?

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Property markets regulate the use of the environmental resource soil. The aim of this study is to contribute to a better understanding of the role of real estate valuers for sustainable land management.

Land is a limited resource providing essential ecosystem services such as food and fiber (Dominati et al. 2010, Wall & Nielsen 2012). Ownership of land is strictly regulated, and can be traded. The real estate market usually doesn't reflect externalities such as ecological effects on the sustainability of land use. However, environmental economics provides a toolbox for such analyses to adjust market prices to externalities. These tools are based on the assumption that – when neglecting externalities – pricing in the market is a result of demand's preferences and supply's costs. Yet, often market participants do not negotiate on a property's price directly but consult an intermediating professional valuer for an appraisal.

Considering ecosystem change, a more systematic valuation of land is needed. A rich body of literature provides property price prediction methods (e.g. Pagourtzi et al. 2003), explains the determinants of values, e.g. through hedonic pricing approaches (e.g. Rosen 2002), or advises how to monetize external effects (Endres 2011). However, we know little about the role of the valuer, i.e. by whom property market prices are actually often determined. Hence, this study focusses on the following questions: (1) Why are market participants paying for a valuer? (2) What are the role performed and the benefit provided by the valuer? (3) Can the surveying be altered to reflect externalities?

We paired theoretical literature with expert interviews to provide empirical evidence for the role of valuers. Reasons for buying expertise are discussed including transaction costs, reducing information incompleteness/asymmetry, trust goods or signaling. Our study adds to the understanding of the role of valuers in the real estate market, by elucidating their potential contribution to a more sustainable land-use management.

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Theme: 1.2 CONSTRAINTS ON RESOURCES  
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## 1290 Assessing the Environmental Footprint of Financial Decisions with a Shadow Impact Calculator

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Conventionally, investors have used financial information and behavioral cues in constructing a portfolio that meets their risk-reward and time horizon expectations. This process has been disconnected from the externalities associated with energy and materials mobilized to create financial value. In a world where environmental and societal pressures can lead to significant unaccounted risks, a systematic approach that places financial decisions in the context of their associated externalities is a necessity.

To address this need, we have developed the Shadow Impact Calculator (SIC) to model the energy, land, water, greenhouse gases and toxics required to deliver financial returns. SIC calculates this 'shadow footprint' on the basis of the value of any asset or portfolio. These calculations are made possible by merging company financial data with economic input-output life-cycle assessment models. The findings presented here are from SIC models developed for the United States and Canada, representing ~40% of the global market value for publicly traded equities.

We characterize the distribution of shadow footprints by economic activity and financial characteristics of the equities held. We then compare the shadow footprint of a portfolio chosen for income generation with a portfolio chosen for its growth potential. Finally, we assess the footprint of a portfolio divested from fossil fuels. We discuss these findings in the context of university endowments and their growth or income targets.



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## 1782 Private costs on water conservation: Study case at Cantareira-Mantiqueira Corridor Region

**Sarcinelli, Oscar**

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REFERS TO "POLICYMIXES" SESSION. Conservation projects require restrictions on economics land use. To increase the bargain power of the institutions that promote conservation projects in relation to landowners it is important to evaluate these private costs. Assessing the private opportunity cost is presented as the most appropriate methodology for accounting private costs of conservation interventions. These costs can be accessed by evaluating the loss of net profit expected from an investment opportunity or land use for an agricultural activity more profitable than conservation activities. The question is when an extensive conservation project involves different private opportunity costs that vary spatially and implies in defining a mix of strategies for planning low cost-effectiveness conservation interventions. The Cantareira region located on Southern Brazil holds the most important water provision system for São Paulo Metropolitan Region and its main ecosystem service threatened are water related services. In these cases conservations projects aims to enlarge forest cover in private lands that implies in agricultural areas reduction. This study aims to evaluate the private opportunity cost for an extensive forest recover program in the Cantareira-Mantiqueira Corridor Region and discuss its results focusing in three central questions: i. What is the private opportunity cost of forest restoration for the main land use activities in the Cantareira-Mantiqueira Corridor Region? ii. How the private opportunity costs varies in the region? The survey's methodology was conducted collecting data in the field from production costs and revenues for the four most important agricultural activities in the region and furthermore obtains the private opportunity costs using the net present value (NPV) analysis. We developed a sample design that considered water catchments with different landscape and socioeconomic context and composition. For the Cantareira-Mantiqueira Region pasturelands (milk and meat) and eucalyptus plantation (timber, firewood or charcoal) drives the higher proportion of agricultural based activities (38.79% and 11.47%, respectively). By using high resolution images we identified all riparian areas defined as protected areas by Brazilian Forest Code. A private opportunity cost of each agricultural activity was obtained from the calculation for a land use change between agriculture activities and native forest in these protected riparian areas. Results have showed that the private opportunity costs in the region varies from US\$ 117.07 to US\$ 449.80 ha<sup>-1</sup>.year<sup>-1</sup> which represents a range of 384.22% between the lowest and highest private opportunity cost value.



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## 993 REGIONALISATION OF RARE EARTHS ELEMENTS

**Edith, Dobre Mihaela**

The 17 mineral oxides of lanthanides and actinides, after separation technological processes, some quite complicated, are mainly used to obtain high-tech products, as well as some green technologies. After the volume of deposits, the main focus of minerals containing rare earths are found in China (Inner Mongolia province), in the U.S., Australia, India, the former USSR. Some sources estimate that 47 percent of the world's rare earths are found in China. The remaining 53 percent of rare earth deposits are found almost everywhere: in 2002, mine Mountain Pass (California, USA) closed its doors, as the strongest mine in Australia. Then, in 2012, both mines were reopened, there is me running in Central Asia and South Africa. Geological studies have identified rare earth deposits on the island of Greenland and even in Europe. The problem is that the development of an exploitation of the more times. Be 5 to 10 years to do research and gather the necessary authorizations.

Researchers working to find alternative solutions to enable companies to obtain products of the same level to advanced in this respect in the recycling of products containing rare earth for reuse. And if the price of rare metal separation increases, they will be more profitable to recycle.



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## 1593 How to integrate institutions into an Agent-Based Model? An example from the wood sector in Switzerland

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Both institutional analysis and agent-based modeling have advanced considerably during the last decade. Agent-based modeling has been proposed as a method to analyze the effects of institutions on outcomes. We analyze and discuss options of how to integrate and analyze institutions in an agent-based model of wood markets in Switzerland. Due to an increasing demand and political interest for wood as a renewable energy source and new value chains for material uses, the wood markets are subject to considerable structural changes, with new marketing organizations and contractual relations emerging. Changes in allocation create competing interests and potential conflicts. Public forestry organizations simultaneously experience reorganization through consolidation into larger units, driven by own initiatives as well as changes in public administration, especially due to financial considerations.

We show that agent-based models are already per se fully institutionalized, both at the level of agents, their interactions, and the structural conditions. Institutions are mostly implicitly included but invisible and hidden in the model structure. Only through institutional change will their effects become visible. We choose two instances of institutional and related organizational change, namely the consolidation of public forestry and the emergence of larger bundling and marketing organizations, to identify the implications for agent-based modeling. The analyses and prototype agent-based models cover the two contrasting cantons of Grisons and Aargau. The institutional analyses draw from interviews and a survey conducted with forest managers.

We find that both consolidation of forestry and marketing through bundling organizations are not only a shift that creates economies of scale, polycentric governance and changes in the number of agents, but also a change in economic decisions and functions that each agent performs. Furthermore, these institutional changes create a set of new action situations that did not exist before. One public forest corporation now has to interact with multiple public owners and communities for service delivery and wood provision, changing accountability and economic rationales. A forest manager can now also decide to outsource marketing function to a bundling organization. This creates dynamics similar to other cooperative organizations. Modeling these dynamics not only requires shifts in parameters, but fundamental changes in the underlying model structure. Agent-based models can then capture the complex interaction patterns and outcomes emerging from these changes and enable informed decisions in wood sector politics.



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## 1459 Multiple technologies in an input-output framework: the role of constrained primary resources

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Within a standard input-output (IO) model of inter-industry linkages in an economy, each industry producing a homogeneous output is represented by one (representative) technology. However, in real life multiple co-existing technologies within the same industries are often observed. Especially industries using natural resources tend to employ distinctly different technologies.

To allow for situations of 'multiple technologies' to produce a homogeneous output, Duchin and Levine (2011) [Sectors may use multiple technologies simultaneously: the rectangular choice-of-technology model with binding factor constraints, *Economic Systems Research*, 23(3), 281-302] propose a linear optimization model constrained by primary resources. In the initial situation production factors are in sufficient supply and sectors use only one technology. The additional technologies are activated as soon as a binding factor constraint is encountered by a current technology. This is a common phenomenon in many industries depending on natural resources.

In this paper we show that the Duchin-Levine model contains two different mechanisms by which multiple technologies can arise, both linked to different strands of economic theory. The different mechanisms are a consequence of the fact that factors can be used economy-wide, sector-wide or technology-specific. This means that a choice is involved with direct implications for commodity prices and scarcity rents. Users of the model need to carefully consider the implications of this choice.

If the factors in short supply are used economy-wide or sector-wide, the underlying mechanism is based on how efficient this homogeneous factor is used. It also implies that these types of factors can be interchangeably used by different technologies and that the multiple technologies are substitutes. Multiple technologies come into existence, because the resource constraint forces higher-cost technologies to push out inefficient lower-cost technologies. Scarcity rents are earned by all technologies that use the factor in short supply, relative to how intensively they use the factor.

However, if the factor in short supply is technology-specific, multiple technologies originate via the entry of new, higher-cost technologies next to the lowest-cost ones that stay active. In this sense, the technologies are complements. Consequently, a heterogeneous factor, for example one that is associated with decreasing productivity, should be modeled as a technology-specific factor. Technology specific factors, and their related production technology, can be assigned a specific factor constraint, for which the associated rents can be individually determined. Rents are only earned by the technology that uses the factor that is constrained.



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## 1612 Integrating environmental accounting and ecosystem services assessment

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Human societies and well-being are dependent on the exploitation of stocks of natural capital and flows of ecosystem services. Disregarding the biophysical support to human economy can in the long run result in non-reversible impoverishment of natural resources and severe problems of environmental degradation. Concerns about the size and impact of human economy at global scale in relation to “planetary boundaries” were discussed by Rockström et al. (2009). The interplay of environment, economy, and resources should be investigated by implementing integrated environmental assessment frameworks overcoming mono-dimensional metrics and criteria. The Millennium Ecosystem Assessment (MA, 2005) defined ecosystem services as the benefit humans obtain from ecosystems, and classified them in provisioning (e.g. food, timber, fiber), regulating (e.g. climate regulation, watershed protection), supporting (e.g. photosynthesis, soil formation), and cultural services (e.g. recreation, aesthetic experiences). Ecosystem structures and functions are self-maintaining and supported by natural renewable flows (e.g., solar radiation, wind, rain, and geothermal heat). Nevertheless, the majority of ecosystems are managed by humans to maximize the supply of specific ecosystem goods and services. Especially in the case of provisioning and cultural services, ecosystems are exploited by applying human-driven inputs (e.g., fossil fuels, chemicals, and machinery) entailing environmental costs and impacts at both local and global scale (Buonocore et al., 2014). In this paper, we explored the integration of environmental accounting and life cycle assessment in the ecosystem services framework. In addition to the theoretical discussion, we applied such an integrated assessment framework to a managed forest ecosystem to account for environmental costs, impacts, and obtained benefits in terms of ecosystem services.

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## 1082 An Input-Output/ System Dynamics Approach to Regional Ecological-Economic Modeling: An Application to the Restoration of the Seine Estuary, France

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We develop a hybrid model which couples a system dynamics (SD) with an input-output (I-O) table to capture the complex dynamics of an ecological-economic system. We apply this technique to the restoration of the Seine Estuary, France.

As various studies assert (e.g., Folke et.al., 2002), it is essential to coalesce an ecological system and an economic system into a single ecological-economic system in order to elicit effective policy implications. While various modeling techniques have been developed to investigate ecological-economic systems (e.g., Proops and Safanov, 2004), there is still much room for improvement with regard to their reflection of complexity. For example, while environmentally extended I-O models can capture a great number of components (e.g., industries and pollutants), they are not well suited for capturing the nonlinear dynamics that are typical in ecological processes and at the interface between the ecological system and the economic system. System dynamics, a computer-aided approach based on differential equations enables the capture of nonlinear dynamics.

Therefore, we propose an I-O/SD model in which the I-O part captures an economic system while the SD side captures an ecological system and the interaction between both systems. While there have been several attempts to incorporate I-O and SD (e.g., Braden, 1983), to the best of our knowledge, this is the first attempt to couple I-O with SD for studying an ecological-economic system.

We apply the modeling technique to the restoration of the Seine Estuary, France, where sole juveniles live. Despite its importance as a natural capital, these areas have been destroyed by economic activities. Our study is based on Cordier et al. (2011) with an extension to SD modeling. We model three impacts: i) the impact of various allocation rules of restoration costs on incomes of companies that are responsible for nursery destructions, ii) the subsequent impact on households incomes and their effects on the behavior of fish product consumers, and iii) the resulting impact on fish catch and the size of sole population

We show that the impacts of the restoration on Common soles and on the economy vary according to the timing and scale of restoration. The I-O/SD model also shows the impact of the cost allocation rule on the profitability of economic sectors responsible for nursery degradations (economic impact), as well as the impact on employment (social impact) and on the size of sole population (ecological impact).



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## 1283 Environmental Economic Valuation: a tool for rationalising public policy or a strategic instrument? The example of the elaboration of Programme of Measures for the Marine Strategy Framework Directive.

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Responding to increasing pressures on marine environment, the European Union adopted the Marine Strategy Framework Directive (MSFD, Directive 2008/56/EC). The aim of this new integrated policy is to enhance marine resources and ecological services protection and conservation. European marine water should reach good environmental status (GES) by 2020. The implementation of the MSFD is divided in five steps, of which the definition of Programmes of Measures (PoM). The MSFD ask the member states to "identify the measures which need to be taken in order to achieve or maintain GES" (MSFD, L 164/29, art. 13.1.). Despite a strong sustainability objective, namely the conservation of marine environment, the MSFD asks member states to "carry out impact assessments, including cost-benefit analyses, prior to the introduction of any news measure" (MSFD, L164/29, art. 13.3). Relying on cost-benefit analyses (CBA) implies that too costly measures can be dropped. In this perspective environmental goods and services are considered to be substitutable with other kind of assets. This incoherence bias put the MSFD in a weak sustainability perspective and conflicts with its conservation objective.

In France, the definition of the PoM is made via concertation arenas, bringing together various actors: administrative staff, representative of various trades (fishermen, farmers, harbours...), non-governmental organisations... The aim of those meetings is to discuss measures to be included in the PoM. The incoherence bias gives actors the opportunity to act strategically to defend their own interests. It put at stake the conservation objective of the Directive. In situ observations are needed: (i) to understand and analyse the strategic behaviours and (ii) to know if such strategies use economic information (e.g. to influence CBA), and how.

Observations have been conducted during the first phase of the concertation process in the 4 French sub marine regions (11 meetings, lasting between 3 and 6 hours each). This corpus is to be completed with semi-directive interviews with key actors, to contextualise the data collected in a wider frame. The goal is to shed light on the network of actors and institutions, coordination phenomenon or contradictions influencing the definition of PoM both during and outside concertation meetings.

This analysis should provide useful conclusions on strategic behaviours and their impacts on the implementation of environmental policies and management. If it appears that such behaviours indeed lead to lower environmental objectives, both the layout of environmental policy and the place and role of economic tools should be redesigned.



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1146 New insights on the valuation of water as a scarce resource: revisiting the impact of ordering effects on sensitivity to scope in contingent valuation

**Martin-Ortega, Julia**



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## 1061 Changing farm type as an adaptation to climate change: Can it help European farmers?

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Climate change is already having an impact on agriculture, and is expected to continue to affect agriculture in the future. Most climate studies to date have concentrated on predicting changes in yields, assuming no changes in farm type, farm inputs, or crop and livestock choice. This research measures the economic benefits that European farmers gain from climate adaptation for the first time. A micro-econometric model of farm type choice and conditional income is estimated using data on climate, soil, geography and regional socio-economic characteristics for 23452 individual specialized farms across Western Europe. Warming will result in a different European agricultural system. The results show that the farm type choices and the resulting incomes across farm types are highly sensitive to climate. As climate is forecasted to change in the future, farmers are predicted to shift towards sheep and goat farms, while cattle farmland will become less important. Dairy farming will remain important. The results are predicted to be the strongest in southern Europe and the United Kingdom. Changing farm type is an important adaptation measure and can reduce the damages from climate change up to 50%. The aggregate impacts and economic benefit of climate adaptation by 2100 vary depending on the climate model scenario. Bootstrap estimation show that the economic benefit of adaptation is low in a mild scenario (NCAR PCM) and higher in the harsh scenarios (Echo-G and Hadley CM3).



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## 1568 Potash Mining Struggles as Ecological Distribution Conflicts in the Bages Region, Spain (1926-2013)

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Since the 1920s, potash mining in the Bages region has caused significant environmental impacts, such as the salinisation of the Cardener and Llobregat rivers supplying the region of Barcelona. Until the recent implementation of reverse-osmosis technologies in water treatment stations, such salinisation configured a severe constrain to the uses of Llobregat river water and determined the historical development of the regional water supply system. Following Martínez-Alier, we attempt to characterize the struggle around potash extraction and its socio-environmental impacts as an ecological distribution conflict (Martínez-Alier, 2002; Martínez-Alier et al, 2010). In order to unearth the origins and evolution of this struggle, we explore the fertile ground between environmental history and political ecology, applying a historical approach that brings together the analysis of water, potassium and chlorine flows. Despite the relevance of potassium as an irreplaceable plant nutrient together with phosphorus and nitrogen, research about potassium world flows and potash-extraction related conflicts remains mostly unaddressed in the literature.

We use archival primary sources – including records of the water supply company, municipal and state archives – to present potash extraction in relation to the historical evolution of water salinity in Barcelona. Additionally, press sources and interviews with activists and former employees of the water company are used. We explore how discussions on groundwater quality coalesced in the late 1920s, when the growing salinity caused by potash mines affected the aquifers located in the river valley that supplied Barcelona. The episodes of fish kills and the worsening conditions of the river water raised also concerns among fishers and naturalist movements booming during the democratic period of the Second Spanish Republic (1931-1939).

While these early environmentalist concerns were silenced during the Francoist dictatorship (1939-1975), historical research proves that they didn't completely disappear. Today, they re-emerge and configure a growing socio-environmental conflict in the region. A critical historical approach to this case study shows that Martínez-Alier's definition of externalities as cost-shifting successes applies to the economic burdens caused by the environmental remediation required by potash mining. While nowadays such costs are mostly covered by public budgets, in the original projects of the 1930s private mining companies were to be hold responsible for it. Finally, we reconnect the narratives of present-day struggles to the historical concerns of the 1930s, highlighting the changes in the character of the protests, which have turned their original stress on health issues to give more attention to landscape impacts.



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## 1188 Towards a better understanding of environmental conflicts in Turkey: Statistical political ecology meets with societal metabolism

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Since 1990s, Turkey has witnessed a growing number of environmental conflicts. While the size of the economy more than doubled in the past two decades, urbanization level rose from 60 percent to 75 percent and the population increased by 32 percent—all putting immense pressure on the ecological system of Turkey. The corresponding reaction in civil society has mainly manifested itself as environmental justice movements at the local and national scales. Over the past two decades, complaints against current or potential impacts from natural resource extraction, land use change, energy production and pollution have been very common and involved local communities at grassroots levels as well as national and international civil society organisations.

This paper explores the remarkable spectrum of environmental conflicts in Turkey based on a field study undertaken as part of the EJOLT map of environmental injustices and links them to the country's societal metabolism. This is done by analysing 50 well-known cases in Turkey, as described by local activists and scholars and then contrasting them with Turkey's biophysical/socio-economic data for the period between 1960-2010. The selection of the cases is made without an aim for statistical representation but to illustrate critical issues in environmental conflicts in Turkey. While many of the reported cases focus on water conflicts (e.g. access to water, dam construction, wetlands), several are about mining activities, industrial activities and (mega) infrastructure projects and others address energy production (e.g. coal, nuclear). Despite its limitations, the compilation and analysis of these cases together with a parallel exploration of the change in material and energy flows of the country provides a basic, yet arguably very important step toward informing public debate in Turkey over the structure of growth and the distribution of risks, benefits and costs within the development and environment nexus.

The analysis reveals that while Turkey's growth is extractivist in nature, this is not export-driven, and comes along with subordination of public interests to those of national and international capital owners. The primary sources of tension here seem to be the presence of a highly modernist state ideology and an unquestioned commitment to rapid economic growth not well translated into development in the absence of a deliberative planning process and a democratic scientific culture. The challenge remains for the environmental movement in Turkey to link local movements with each other and with an overarching national and global movement capable of robust and sustained action.



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1442 A social multi-criteria evaluation approach to open-up social debate in mining conflicts. The case of Intag, Ecuador.

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Since the 2000s, Latin America (LA) is the main ore mining investment destination of the world. LA governments promote the expansion of the mining frontier as a source of income and employment contributing to advance national development and wellbeing. However, the expansion of the mining activities is fostering a growing number of conflicts where contrasting arguments regarding the (local and national) economic, environmental, social and cultural implications of developing extractive activities are deployed. However, hegemonic discourses led by LA governments and mining companies stress the contribution of extractive activities to the overall society, making invisible and/or de-legitimizing local actors, values and frames. Scholars and activists are pointing to the need to open a social debate that addresses with transparency the economic, social, environmental and cultural implications and trade-offs related to extractive activities at national and local scales. Such a process requires tools able to cope with the social and technical incommensurability embedded in socio-environmental conflicts. This paper explores the potential of Social Multi-criteria Evaluation (SMCE) approaches to structure and open-up a social debate on the multi-dimensional local implications of developing mining activities. Discussing its ability to make visible values, uncertainties and stakes that have been invisibilized by hegemonic discourses in the mining debate. We present and discuss an application conducted in a mining conflict in Intag (Ecuador).



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Session 1.3.A  
Ecosystem services and biodiversity



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## 1270 Payments for environmental services as a mechanism to promote biodiversity conservation in a Green Economy: Potentials and limitations

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The concept of a Green Economy calls for increased utilization of market-based instruments to make efficient use of natural resources. Payments for environmental services (PES) are a market-based instrument which translates externalities into incentives for the provision of ecosystem services (ES) and the protection of biodiversity. But what are the potentials and limitations of PES in a green economy, especially with respect to private sector involvement as a service buyer?

Existing PES schemes exhibit little private sector involvement. This is easily understood by recognizing the public good nature of most ES. Flows of ES can rarely be isolated and utilized by private entities alone. Demand of the private sector is therefore limited but not absent. Corporate environmental responsibility or the interest to obtain/maintain an operating license can create demand (Sell et al. 2006, 2007). And governments can foster the generation of private demand for ES through regulation, for example by increasing scarcity as was done with the implementation of carbon markets.

However, the complexity and spatial dependency of biodiversity make it difficult to standardize and trade. Bundling biodiversity to ecosystem services that can be harnessed by the private sector, i.e. standardized carbon and excludable/rival water services, therefore appears to be a less controversial approach to foster the delivery of biodiversity related services by the private sector. Private involvement can also go beyond business interests. Intrinsic household preferences may also be captured by bundling ES to a private good or by creating an ecosystem service shopping platform that helps to keep transaction costs down.

Private sector involvement requires paying particular attention to the effectiveness and transparency of PES schemes. Recent evidence shows private ES investors to more rigorously monitor the effectiveness of payments. While these criteria should also matter to the public sector, governments often pursue additional goals like catering for potential voters and balancing political interests. We identify four effectiveness-related concepts to be largely neglected in PES implementation and recommend a stronger focus on these to attract private investors into PES. Payments should be conditional on service delivery; services should be additional to what would have been delivered in the absence of payments; payments should be targeted to areas where the ratio of cost and benefits is highest; and the latter should include the consideration of benefits from spatial interdependencies.



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## 1385 Green Infrastructure as a bridging concept between biodiversity protection and the Green Economy?

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According to UNEP the Green Economy builds on improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. A specific feature, which distinguishes the Green Economy from prior economic regimes is the direct valuation of natural capital and ecosystem services in a

full cost accounting regime. At the same time, the Green Economy is conceived as a concept for sustainable growth by investing in green technologies and innovation and thus to support a 'recovery' from current economic crises by stimulating (sustainable) consumption, technological development and investment.

While the value of biodiversity for the economy and human well-being has been increasingly recognised in recent years, its role in a Green Economy still remains unclear in current research.

Our paper will draw on the concept of green infrastructure, which has gained a central role in achieving the targets of the EU's Biodiversity Strategy to 2020. Green Infrastructure - a strategically planned and managed network of natural lands, working landscapes and other green spaces - is highlighted in the Strategy as a central approach to strengthening Europe's ecological coherence and connectivity while simultaneously enhancing human well-being.

In a first step, we will examine, how the concept of green infrastructure theoretically matches with some fundamental elements of the Green Economy, most importantly with enhancing green innovation and human well-being. In this context, we make use of the ecosystem services approach to link the human with the natural sphere, discussing to which extent green infrastructure can enhance the functionality of ecosystems and the delivery of their services to human beings. In a second step, we underpin our theoretical assumptions by empirical evidence from previous research. Building on results from a database of 127 European green infrastructure projects, six in-depth case studies and the outcomes of an expert workshop in 2011, a comprehensive overview of the design, implementation and cost efficiency of green infrastructure in the EU is presented. Moreover, potential barriers for the implementation of green infrastructure on European territory are briefly discussed.

From this theoretical contextualization and empirical analysis, conclusions are drawn on whether and to what extent green infrastructure can be an economically viable and sustainable tool, which addresses conservation, environmental and socio-economic objectives simultaneously and could therefore serve as a concept to protect biodiversity in a Green Economy.



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## 1570 Valuing ecosystem services – panacea or Pandora’s box for biodiversity conservation?

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Scientists increasingly talk of “ecosystem services” and “natural capital” and try to quantify their economic value, hoping that high economic value might support the conservation of biodiversity, inhibit destruction and make additional funding available.

Before discussing the value of nature, however we turn to the nature of value, based on the philosophy of values (axiology). Exploring different kinds of value concepts (from ideal via real/objective to subjective values), and by distinguishing, within the subjective concept between intrinsic, inherent and instrumental values, and (in classical terminology) use and exchange values within the instrumental category, we can identify the niche in which value can be adequately described with economic methods. Applying economic quantification methods to other kinds of value (e.g. intrinsic or inherent values) is classified as a category error.

With this classification at hand we have a fresh look at the “ecosystem-service-for-biodiversity-conservation” line of argumentation, and we find several flaws, mostly deep running category errors in either an axiological or a logical sense. From this analysis, criteria for limitations to the use of economic measurement can be derived, and an analysis of risks caused by the category errors is provided.

However, that does not rule the use of economic methods in biodiversity conservation – it just requires awareness of the basic philosophy of science conditions of doing so, and consequently doing it in the right way in the place. Economic measurement can be helpful to support biodiversity and ecosystem service conservation when focussing on real or hypothetical cost in real markets, but it turns ineffective when applied to hypothetical cost in hypothetical markets. Whenever valuation ends with a price tag on biodiversity, this is an exchange value implying substitutability, and there is a risk that this price is considered as the main decision criterion. In particular in those cases biodiversity valuation can become devastating for conservation.

Instead of cost benefit analysis (CBA), multi criteria analysis is regarded as a more appropriate decision preparation method. However, the existing hierarchically organised MCA models, not reflecting the multiplicity of stakeholders’ values, are not suitable for biodiversity valuation either (vertical MCA). The method of choice should be social or horizontal MCA, able to accommodate a diversity of values, but hardly ever identifying an “optimal solution”.



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Session 1.3.B

Climate change and ecosystem services



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## 1374 RETHINKING ECONOMIC RESILIENCE TO CLIMATE CHANGE: A PROPOSED FRAMEWORK BASED ON ECOSYSTEM SERVICES

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The concept of resilience has gained increasing interest in the economic literature. Because the hegemony of Economics in a range of decisions from territorial planning to climate adaptation, this study focused on: i) reviewing the way in which Economics is looking at the concept of resilience and ii) proposing a conceptual framework for economic resilience analysis, which relies on the concept of ecosystem services (ES). For the first objective, a search of the term economic resilience was conducted in Scopus, which returned 44 articles published between 1985 and 2013. The analysis showed that resilience was defined only in 47% of cases. Within this group, in 33% of cases resilience was defined as the capacity of bouncing back to previous production levels (resilience for what?), in response to economic shocks (resilience to what?), considering as unit of analysis a closed economic subsystem, at different spatial scales (resilience of what?). For the second objective, key elements from resilience and ES's theories were combined. As to the resilience to what question, the framework recognizes the singularity of climate change (CC) as stressor, whose impacts are far more complex than those of a single, one-time, disturbance. The ES concept can serve as an integral indicator to measure the complex impacts of different pulses and pressures derived from CC. Regarding the resilience of what question, the framework proposes to look at the socioecological system (SES), as the space where ES provision and use takes place. As to the resilience for what question, the framework proposes: i) achieving, maintaining or increasing environmental integrity, measured as the capacity of the SES to provide a sustainable flow of valued ES bundles; ii) achieving, maintaining or increasing social justice, measured as the access and fair distribution of these ES bundles across population, minimizing social trade-offs and maximizing well-being. Thus, the resilience concept involves not only the capacity to return to the state that existed before the disturbance, but also the capacity to absorb the impact and change to another more desirable state. This research contributes to the debate of different adaptation paths, considering CC as an opportunity to shift from a development model based solely on economic growth to one led by the sustainable provision and fair access to ecosystem services, thus ensuring environmental integrity and social justice.



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## 1407 Insurance value of land management scenarios under climate change: Trade-offs between ecosystem services and between stakeholder groups

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Making efficient and equitable land use decisions in the presence of climate change requires a comparative evaluation of different land use (or management) scenarios under conditions of uncertainty. This paper presents a model to compare multiple land management scenarios in terms of their economic desirability (value) for different stakeholder groups under uncertainty. Uncertainty arises from the fact that any chosen land use scenario results in a probability distribution for the quantity of a particular ecosystem service. This uncertain quantity of services translates to income variability for stakeholders.

Assuming risk-averse stakeholders, and using concepts from decision making under uncertainty according to expected utility theory, two valuation measures, insurance value and willingness to pay, are derived. The insurance value idea is adapted from Baumgaertner (2007) and measures the value of the change in risk premium that occurs between two land use scenarios. Willingness to pay, on the other hand, measures total economic value associated with moving between two risky scenarios.

An inter-disciplinary application of this approach is presented for the "Sustainable coastal land management: Trade-offs in ecosystem services (COMTESS)" project in the North Sea and Baltic Sea coastal regions of Germany. COMTESS considers four land management scenarios – multiple use, carbon sequestration, stakeholder interviews and business as usual – under several climate change scenarios. Specifically, for each land management option, two cases of sea level rise (0.25m and 0.80m) are considered with three temperature change scenarios within each. The three scenarios are temperature increases of 1.8°C, 2.8°C and 3.6°C over the next one hundred years. Data is obtained through field experiments, model simulations and stakeholder interviews from multiple study sites in the project regions, including data on socio-economic characteristics of stakeholders, hydrological variables, coastal vegetation, plant and bird diversity. Relevant ecosystem services include forage and water for livestock, water for irrigation, habitat for birds, tourism, and reduction of greenhouse gas emissions among others. The objectives, in this application, are (1) to use the information on ecosystem services distribution to estimate the insurance value and the total economic value for each of the COMTESS management scenarios; and (2) to investigate the trade-offs between the four land management scenarios and between different stakeholder groups.



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Session: 1.3.C Land use and ecosystem services  
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## 1080 Cultural Ecosystem Services as facilitator for sustainable land management in South-East Asian rice landscapes

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In SE Asia traditional extensive rice cultivation has shaped cultural landscapes and created specific biodiversity and cultural heritage. Due to globalization effects and economic aspects the intensification of rice-growing areas increases fast, as do pressures on the natural environment. But still, in SE Asia there are many areas with extensive rice production, even though in a pre-intensification phase. Impacts from that modification are not limited to environment only, the conversion of traditional cultural landscapes into large-scale production units can lead to a loss of cultural identity. By the means of qualitative data collection we analyze differences in the landscape perception and local identity, which are crucial elements of cultural ecosystem services, in both, intensive and extensive land use systems in Vietnam, Malaysia and the Philippines. What are cultural values and perceptions that support the preservation of low-input agricultural systems? This is of particular interest as the increasing use of fertilizers and pesticides in high-input systems puts human health at risk. Further, we assume that extensive agricultural systems inherit higher biodiversity due to intact environments, thus enhancing the aesthetical value of landscapes. In contrary, intensive land use system are mainly functional with low biodiversity – does this also lead to a lower local identity? Underlying assumptions is that the appreciation of a landscape with its specific characteristics and the connectedness with a region supports landscape preservation and facilitates sustainable land use management. In Ecosystem Services research the focus often lies on the evaluation of provisioning and regulating services and cultural ecosystem services are less specific to determine. However, we consider local identity as a main trigger for the conservation of landscapes and see this aspect as being currently underassessed.



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## 1149 Implementation Challenges of Conservation Tenders in Developing Countries

**Wünscher, Tobias**

Interest in payments for ecosystem services (PES) schemes has grown considerably in recent years (Pattanayak et al. 2010). A major challenge for service buyers (e.g. conservation agencies) is to estimate the true costs of service provision: service providers (e.g. land stewards) know more about the costs of generating ecosystem services than do service buyers (Ferraro 2008). This puts the service buyer in a disadvantaged bargaining position, and may trigger high provider surpluses (Wünscher et al. 2008). Procurement auctions (tenders) for conservation contracts are one way to reduce surpluses and increase cost-effectiveness (Jack et al. 2009). To this date, most available field evidence for conservation auctions comes from high-income countries although the opportunities of conservation tenders can be of particular interest in developing countries where PES schemes grow at a disproportionate rate. However, developing country characteristics (e.g. poor infrastructure and institutional capacity) may affect auction implementation and success. This contribution's objective is to identify some of these challenges and discuss ways of dealing with them. I take a very practical approach to address the issue by outlining the implementation steps of a conservation tender and by evaluating how each of the typical characteristics of a developing country can potentially affect the implementation process in its individual steps. In addition, I also discuss poverty alleviation and equity effects of conservation tenders. The results show that each of the implementation steps is potentially influenced by developing country characteristics. Influences are both positive and negative. Imperfect markets, higher subsistence levels, stronger variability in prices and yields, little availability of information on the agricultural sector, as well as risk-averse behavior among poor landholders all constitute potential chances for conservation tenders to provide increased benefits in the form of a better service to cost ratio of PES schemes. On the other hand, constraints in the availability of human resources and infrastructure can negatively affect the design of tenders and the dissemination of relevant information to potential participants. Also, highly integrated communities increase the risk of collusion especially in small scale programs. Some of these constraints can be dealt with but solutions unavoidably increase transaction costs which, in turn, may affect the scalability of conservation tenders in developing countries. While tenders are not the tool of choice for poverty alleviation as a primary goal, they do alleviate poverty under normal circumstances and can even increase the equity of PES programs.



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## 1643 Can Ecosystem Services be leveraged to link social and environmental goals in dynamic Eastern Himalayan mixed-use landscapes?

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It is a commonplace assumption among researchers that ecosystem services (ES) have positive net economic value to local communities (Dunn 2010). Yet, in many places in developing countries, including many parts of the Himalayas, the exploitation and 'co-production' (Lele et al 2013) of ES is increasingly seen as just one among a broadening portfolio of livelihood options. Employment migration to regional, national or international urbanizing centres is growing ever more common; rural employment programs like the Indian MGNREGA scheme are becoming significant in some areas; and the importance of the tourist industry is growing explosively. Meanwhile, ecosystem 'disservices' (i.e., ecosystem processes with net negative value to communities, including crop-raiding by wildlife and changing climatic norms) are exacerbating the inherent stress and uncertainty of direct reliance on ES. How are rural montane populations negotiating this changing employment landscape? How are their perceptions of the value of 'nature's services' changing? Are rural labour shortages altering the traditional role of agriculture in some communities? How might this affect the possibilities for policy-level support and incentives for ES production?

We report here on an ongoing interdisciplinary research project located in the Indian Eastern Himalaya which has the goal of developing a 'disaggregated' understanding of local drivers, pressures, impacts and responses (Daw et al 2011). The project

- 1) measures ES access, total usage and associated time budgets (fuel wood, fodder, and water) at the household level in six categories of villages in two Protected Areas of regional and global biodiversity significance;
- 2) measures ecosystem 'disservice' impacts, estimating risks and documenting current adaptive strategies (human-wildlife conflict, climate changes); and
- 3) documents changing impacts and perceptions of alternative livelihood opportunities (urban growth, tourism, MGNREGA, migration/remittances).

The longer-term goal is to characterize and model in detail a complex social-ecological system in which the social and ecological components are linked by well-understood causal chains.

The literature on climate adaptation has suffered from an overly static view of rural developing society, based perhaps on a generalized historical notion of inherently slow technological and cultural change. Our research program takes a consciously dynamic approach, presuming that the most useful and predictive future scenarios will be built on close examination of present



conditions and trends.



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## 1636 Integrating economic valuation with land use planning in Alaska's Matanuska-Susitna Basin

**Kocian, Maya**

Alaska's Matanuska-Susitna (Mat-Su) Basin covers 25,000 square miles (64,750 square kilometers) and is home to ecologically intact open space. The basin includes rich salmon and wildlife habitat as well as agricultural heritage. However, as the fastest growing region in Alaska, the Mat-Su is vulnerable to residential, commercial, and natural resource development.

To support smart development that includes natural infrastructure in its planning, Earth Economics used Geographical Information Systems data to estimate the annual value of local and regional benefits provided by the Mat-Su Basin. The basin provides natural capital goods and services including salmon, flood risk reduction and recreation. The top three ecosystems in the Mat-Su are wetlands, riparian buffers and mudflats. The study results are being used to educate landowners, businesses and policy makers on the economic benefits of investing in Mat-Su's natural capital assets. Earth Economics is now helping groups in the basin to develop independent funding mechanisms for Mat-Su's ecosystem services.

The aim of this presentation is to provide an overview of the application of ecosystem services framework in the Mat-Su. The Mat-Su Borough's boundary is nearly coincident with the basin's outline, which allows for better management and governance at the watershed scale.



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Ecosystem services, equality and human wellbeing



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## 1196 Jatropha production in Malawi and Mozambique: delineating ecosystem services and human wellbeing trade-offs

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*Jatropha curcas* is a biofuel feedstock that has been associated with a number of environmental and socioeconomic impacts in southern Africa: e.g. GHG emissions, habitat/biodiversity loss, income/employment generation, energy security, food security and social conflicts. These impacts can be positive or negative depending on a number of factors but our knowledge of the emerging trade-offs is rather incomplete for southern Africa.

The aim of this presentation is to identify the main trade-offs associated with *jatropha* production and use in southern Africa. We employ the ecosystem services approach to identify and put into perspective the impacts/trade-offs of two very different modes of *jatropha* production, i.e. a large plantation (Niqel, Mozambique) and a smallholder scheme (BERL, Malawi).

In Malawi, smallholders were given incentives by BERL (a private venture) to grow *jatropha* trees in their plots (mainly as hedges), and subsequently sell the harvested seeds to BERL. Considering that *jatropha* farming was undertaken in land already converted to agriculture, little direct and indirect land use change is expected to take place. As a result impacts on GHG emissions due to Land Use Cover Change (LUCC) effects are minimal. However, *jatropha* farming, even in hedges, was shown to cause some indirect competition between food and feedstock production, potentially resulting in income loss from other cash crops activities. Yet this income was received at a period when all other cash/food crop production was completed. This suggests that the timing of this added income might have had a net-positive impact on food security for these smallholders.

In Mozambique, Niqel (a private venture) is producing *jatropha* following a large plantation model, in a remote area dominated by woodland and subsistence agriculture. While there was an attempt to minimize food-feedstock competition, this happened to the expense of the surrounding woodland. This has significant impacts on GHG emissions (mainly through LUCC effects) and potentially biodiversity (through habitat change). Human wellbeing benefits manifested in the form of modest employment/income to plantation workers that was nevertheless highly regarded as it proved to be a stable source of income that could increase the resilience of their households to the frequent drought events. Less tangible (but more widespread) human wellbeing benefits manifested through the improvement of road infrastructure, local schools and health clinics by the company.



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## 1340 Income inequality and willingness to pay for ecosystem services

**Meya, Jasper Nikolaus**

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Income inequality and willingness to pay for ecosystem services

Stefan Baumgärtner, Moritz A. Drupp, Jasper N. Meya,

Jan M. Munz and Martin F. Quaas

Abstract

We study how the distribution of income among members of society, and income inequality in particular, affects the average willingness to pay (WTP) for public ecosystem services. Our analysis is based on the model of Ebert (2003), specified with a constant-elasticity-of-substitution utility function with a private consumption good and a pure-public-good ecosystem service, extended by the assumption of log-normally distributed income.

We show that (i) average WTP for ecosystem services increases with mean household income; (ii) average WTP for ecosystem services decreases (increases) with income inequality, if ecosystem services and manufactured goods are substitutes (complements); (iii) average WTP for ecosystem services normally changes more elastically with mean household income than with income inequality, except for extreme cases.

We quantitatively estimate and illustrate our theoretical results with empirical data concerning how WTP for (1) a cultural ecosystem service in Sweden (from Broberg 2010), (2) a provisioning ecosystem service in rural China (from Wang et al. 2011), and (3) a proxy for global ecosystem services (from the meta-study of Jacobsen and Hanley 2009) depend on their respective distributions of income. Among other results we find that, on global average, ecosystem services are systematically undervalued by up to 16 per cent, if one assumes the current grossly unequal global income distribution rather than the hypothetical case of an equal distribution.

Our results are relevant in several respects. First, when doing benefit or value transfer, one should correct WTP-estimates for differences in both mean household income and income inequality. Second, when giving policy recommendations aimed at both allocative efficiency and distributive justice, one may correct WTP-estimates for grossly unjust income inequality, and use inequality-adjusted WTP-estimates for efficiency (e.g. cost-benefit)-analysis.

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## 1717 Inequalities and ecological economics: crossing the capability approach and ecosystem services

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Several articles have been published in recent years to support or discuss the connection between the ecological economics current and the capabilities approach (Ballet et al, 2011; 2013; Dodds, 1997; Lehtonen, 2004; Polishchuk and Rauschmeyer, 2012; Rauschmeyer and Leemann, 2011; Sneddon et al, 2006, Amongst others).

One question remains open, however, concerning the integration of the issue of inequality in the ecological economics current. In this regard, the capability approach and in particular the recent proposal by Sen (2009) of a comparative justice may participate to forge a relevant way for crossing inequality/equity issues with the ecological economics current.

From this point of view, it seems that the interpretation of comparative justice from the base of ecosystem services moves forward significantly in this debate.

In the first section we discuss the notion of comparative justice and criticisms that have been made since the proposal by Sen. We argue that comparative justice has a legitimate role to play in the analysis of inequality. In the second section we return to ecosystem services, the limitations of this approach and the role it can play in a cross with the capabilities approach.

We conclude in the last section on the path that this cross opens for the current of ecological economics.

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## 1601 Connecting Ecosystem Services, Sustainable Livelihoods, and Business Development: Cluster-Based Economic Development and Ecosystem Valuation

**Nash, Julie**

For natural area conservation to be effective, tangible economic benefits must be provided for local communities. This suggests that natural area conservation programs need to integrate local economic development strategy. Despite this need, little research has connected ecosystem services valuation to business development theories. The linked ecosystem and business research that exists usually focuses on single case study approaches within limited industries.

This paper bridges this gap by connecting two micro-economic frameworks: cluster-based economic development and ecosystem service valuation. Business clusters are geographic concentrations of private enterprises and institutions interconnected within a specific field. Research has demonstrated that business clusters are critical engines in the economic structure of regional economies. Cluster-based economic development initiatives support local business cooperation to improve competitiveness when competing on national or global level. Ecosystem services valuation studies the impact of human activities on the environment by assigning an economic value to ecosystem services. By analyzing these areas together, decision makers can assess economic and environmental trade-offs associated with alternative management choices and identify built and natural capital investments to enhance natural area conservation.

To demonstrate the integration of cluster-based economic development with ecosystem service valuation, the researchers develop a spatially-explicit model. This model analyzes the ecosystem services and economic consequences of alternative business cluster development strategies. Specifically, the model is applied to trade-offs in the remote atoll of Ahe in French Polynesia. The business-cluster development scenarios include high impact tourism, low-impact eco-tourism, marine-cultured pearl farming, and marine protected areas. The model incorporates site characteristics and locations to predict economic returns for a variety for potential land and marine uses. The research demonstrates the business-cluster development routes that combine the conservation of marine biodiversity with viable economic activities for local people.

The French Polynesia case study highlights the sustainable development issues present in Small Island Developing States. Specifically, the case study highlights the potential role of marine-cultured pearls farming to combine biodiversity conservation and sustainable livelihoods. The research also provides new insights into the emerging genre of literature on hybrid livelihoods as a pathway to sustainability.



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1200 Is Brazil really doing well? Measuring GPI for the  
Brazilian Economy

**Caixeta Andrade, Daniel. Presented by Philip Lawn**



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1354 Safeguarding diverse ecosystem services from north  
Australia's tropical savannas

**Greiner, Romy**



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1614 Developers and intermediaries of payments for ecosystem services (PES) – who are crucial actors behind successful PES types in developed countries?

**Matzdorf, Bettina**

Payments for Ecosystem Services (PES) have become a major topic in the political arena as well as an important research topic in the last years. "PES" is now used as kind of umbrella for many different financial incentive approaches and different institutional settings including user-financed payment schemes as well as governmental instruments such as agri-environmental programs. The analysis of existing PES schemes have showed that governmental engagement seems to play a crucial role specifically as legal driver and actual buyer of the ecosystem services (Salzmann, 2005; Matzdorf et al., 2013). However, different authors emphasize the importance of intermediaries (e.g. Vatn, 2010), linking buyers and sellers of ecosystem services, for the development and implementation of PES. With our research we want to identify the relevant intermediary actors and we want to understand their role for successful development and implementation of PES.

To answer these questions we analyzed 20 successful PES projects in the US and Germany. In both countries property rights are quite well defined as essential basis for PES implementation. Furthermore, in both countries financial incentive instruments such as agri-environmental programs and conservation banks have been implemented for many years. Beside these similarities the different institutional frameworks and a different understanding of the state role promise interesting differences with regard to actor constellations. The identification of successful PES has been done expert based in two workshops in the US and Germany. The analysis is based on approx. 20 semi-structured expert interviews and document analysis.

Our detailed analysis of PES projects confirms the importance of intermediaries within PES. Beside these intermediaries the developers/ initiators are crucial. With their specific capacity and motivation civil society actors and social entrepreneurs are important actor types of regarding the initiation and the organization of ES transfer. In many cases the collaboration of different actors including governmental actors and social researcher seems to be important regarding the success of PES. These results are true for both case study countries. Differences regarding actor's types could be identified mainly for different PES types, such as user-financed PES or legal driven PES.



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## 1794 Mining Offsets in Madagascar: how to settle the socioeconomic and environmental compromise?

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Madagascar is very often presented under the contradiction of being one of the most biodiverse country, but also one of the poorest economies of the world. A contradiction which is also the base of the dominant discourse of the environment and development aid, based on the paradigm of the ecological modernisation (Hajer, 1996) or modernisation (Robbins, 2004). This paradigm allows to link environment and economy instead of opposing them. Contrasting with a radical ecological approach which would need deep social and institutional changes, ecological modernisation is a more nuanced political discourse which does not put into question capitalism, but integrate environmental questions like pollution into the economic market. The economic development is said to be a condition of the sustainable protection of the environment, thanks to fiscal rules and introduction of proper technologies. Conversely, taking account of the environment would benefit to economy.

The mining industry draws upon this paradigm and the contradiction of biodiversity wealth and economical poverty. For instance in Madagascar, mining are a very interesting proposal for the economic development of the country. The two biggest mining industries, Rio Tinto and Sherrit, which represents a direct forest investment of 5 billion US\$ representing 65% of 2008 PIB. It should provide 18% of tax revenues by 2010 (Pelon, 2010). Yet, it also represents an important risk regarding social and environmental issue, with potential irreversible impacts. Conforming to international rules, the two mining industries of Madagascar are developing offset programs, to compensate the negative impacts by protecting forests in another threatened place. How are biodiversity offsets schemes developed? What is the governance of these projects? What are the controversies around these projects?

Sociological methodology (interviews, analysis of literature and observation) will be used to describe those two case studies. This presentation aims at analysing the compromise realized by the mining industry of Madagascar, the actors involved in the construction of discourse, and particularly, of the scientific justification of offsets.



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## 1243 Socio-economic valuation of ecosystem services and its role in informing public and private decision making: insights from Chinese forest ecosystems.

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The economic 'invisibility' of ecosystem services has led to mismanagement of natural resources and sub-optimal social and economic decisions. While timber is the most obvious benefit provided by forests, these ecosystems also deliver many others less perceptible, but still crucial services, such as water provision and regulation, erosion control and soil fertility, carbon storage, biodiversity conservation, nutrient cycling. Forest ecosystem services and their values received considerable attention both at national and local scale in China. Several approaches have been used to estimate the economic value of Chinese forest ecosystem services. Valuation of ecosystem services had a consistent role in raising awareness and supporting decision making in China, leading the Chinese government to develop a range of regulations, policies and economic instruments for forest resources management.

Despite previous research activity, there is a gap in systematically reviewing results from the viewpoint of economic valuation in China. For example, by assessing the emerging variation of values across different types of ecosystem services and spatial scales (local, regional or national). Since the role of forest plantations is rapidly increasing, partly under the impulse of the forest sector, it is worthwhile to analyse findings concerning natural and planted forests, including marginal values. This review paper provides a synthesis of relevant case studies. Gaps in the knowledge are identified, along with future research needs.

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## 1393 Nested Institutions for the governance of ecosystem services on a finite planet

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A productive economy depends on natural resource inputs and other services that flow from specific configurations of ecosystem components. Hence biophysical and temporal constraints hinder the narrative of infinite growth as espoused by neoclassical economists. Environmental economists propagate the internalization of impacts to ecosystem services through market transactions which treat all the benefits of nature as stocks that can presumably provide services or productive activities at any given rate. These approaches fail to consider neither the nuanced economic characteristics of ecosystem components nor the geographical and temporal scales at which they are delivered. An institutional vision that prioritizes maintaining human activity within planetary boundaries is urgently needed. In this paper, we argue for a nested institutional design for natural resources which facilitates the management of ecosystem service bundles through horizontal coordination across geographical space and vertical legitimacy from higher to lower levels of governance. The inherent feature of nested institutions for natural resources distinguishing it from polycentric governance is the hierarchical linkage between resource characteristics and governance regimes with multiple decision centres. Such hierarchy is premised on the normative objective of ensuring a socially acceptable standard of well-being while maintaining a socially determined rate of natural resource degradation that keeps society from overshooting biophysical limits.

Nested institutions distinguish a global or regional state (S) which regulates structural or supporting services that derive from ecosystem funds such as the nutrient cycling benefits provided by biodiversity and devolves governance of other ecosystem services such as the regulating services of water quality maintenance to communities or local governments (C) which in turn govern ecosystem provisioning goods amongst individuals (I) while establishing norms of practice amongst individuals for trading ecosystem components that are direct inputs for productive economic activities. The specific configuration of rivalry and excludability of a particular good or service influences the institutional arrangement and consequently the regulatory style adopted for service procurement at each nested level. Accordingly, an ethical position becomes explicit that the requirements of a healthy functioning society across the globe and across generations are of higher priority than the short-term objectives of individuals. This paper offers a conceptual framework of nested institutional arrangements for the management of ecosystem goods and services of differing spatial and economic characteristics, forms of regulation that are appropriate at each level, and the means by which adaptive learning of emerging societal needs and ecosystem conditions between nested levels can be advanced.



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## 1395 Social implications of benefit-sharing arrangements in conservation policies: the case of Indonesia

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Payments for Ecosystem Services (PES), Reducing Emissions from Deforestation and Forest Degradation (REDD) and Access and Benefit-Sharing (ABS) are prominent environmental policy instruments to manage natural resource constraints within planetary boundaries. All three conservation-oriented instruments promise to combine incentives for more sustainable natural resource management practices and poverty reduction through valuation of ecosystem services and benefit sharing mechanisms. However, PES, REDD and ABS have been developed and implemented under different circumstances related to time, context and actors. So far, adequate frameworks assessing the social impacts of such benefit-sharing arrangements are lacking. In this article we develop an analytic framework to evaluate the social implications of Indonesian benefit-sharing arrangements by looking at the institutional design of the policies, their interplay and the form of benefit-sharing they imply. First, when analysing the institutional design we look at the rules, institutions and actors (see Corbera et al. 2009) that develop and implement conservation-oriented benefit-sharing arrangements, in particular through PES, REDD and ABS policies, and investigate how these have changed over time in Indonesia. We argue that the institutional design and especially the underlying property rights systems have significant influence on the social inclusiveness of benefit-sharing mechanisms in Indonesia. Here, forests are owned and governed by the state and managed by companies through a concession system whereas local communities have only limited access and rights. Second, interplay describes the interaction of PES, REDD and ABS policies and their interactions with other related programmes and policies. We assess for example whether in parallel existing PES, REDD and ABS policies account for reciprocal effects regarding design and implementation and whether there are institutional overlaps within these policies. PES, ABS and REDD policies have been proposed and developed by different institutions and actors. ABS and REDD policies are backed up by different international conventions (Convention on Biodiversity and United Nations Framework Convention on Climate Change) whereas PES policies are usually national initiatives. We argue that the interactions of the policies are rather counterproductive. Third, benefit-sharing is a further important factor that influences the social impacts of PES, REDD and ABS policies. Benefit-sharing can be understood as an "Agreement between stakeholders, such as private sector, local communities, government bodies and non-profit intermediaries concerned about the equitable distribution of benefits related to the commercialization of forests" (see FAO 2003). Based on a review of existing theoretical literature on benefit-sharing and environmental policies in Indonesia we develop a typology of conservation-oriented benefit-sharing instruments in Indonesia that can be applied to PES, REDD and ABS policies and considers the social implications of the different benefit-sharing mechanisms.



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## 1345 Contingent valuation for different scenarios of forest restoration: is the willingness to pay sensitivity to scope?

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A general concern in contingent valuation (CV) studies is the sensitivity of responses to the scope of the environmental goods or services. Unexpected (or inadequate) responses may arise due to several reasons, such as diminishing marginal utility, substitution across goods and services, inappropriate description of the scenarios, or individual attitudes toward the instrument.

We tested the sensitivity to scope of the CV method investigating how attitudes affect the willingness to pay (WTP) for two complementary scenarios of environmental preservation in Brazil: I) reforestation of all riparian zone in the Metropolitan Region of Campinas (MRC); II) reforestation of the riparian zone and reconnection of the main forestry fragments (ecological corridor). While the first scenario provides benefits that are mainly related to the regularization of the supply of water (use values), the complementary benefits of the second scenario are mainly related to non-use values of biodiversity conservation, specially the jaguar (*Puma Concolor*).

Analyses are based on 574 questionnaires applied in the MRC: 283 for scenario I and 291 for scenario II. We used the referendum format to evaluate the WTP with 5 choices of monthly contributions: R\$ 1; R\$ 3; R\$ 6; R\$ 10; and R\$ 18. Groups of attitudes toward the environment were identified using Factor and Cluster Analysis. First, respondents answered 6 questions in a 5-point Likert-type scale of agreement (from "totally agree" to "totally disagree"). Factor Analysis identified 3 latent attitudes among these observable variables that discriminated the respondents in relation to the agreement with animal rights, threats of the human action and the overpopulation. Based on these factors, Cluster Analysis identified 4 groups of respondents, interpreted as follows: 1) positive attitude and high perception of environmental damages; 2) positive attitude and low perception of environmental damages; 3) intermediate attitude and perception of environmental damages; 4) negative attitude toward animal rights.

Results of the CV analysis highlighted that the WTP for the scenario II is significantly higher than that of the scenario I just among respondents with intermediate or high perception of environmental damages (groups 1 and 3). Among those with negative attitude toward animal rights (group 4), the WTP for the non-use values of the scenario II is substantially low. As a result, there is no significant difference between the WTP for the two scenarios in the whole population. The paper finally discusses how attitudes can help explaining the adequate responsiveness to scope of CV studies.



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2034 Pluralism of objects, functions and values in the system of accounts for global entropy production (SAGE-P): Double entry (nonlinear) bookkeeping for TEEB.

**Friend, Anthony**

We shall adopt the following concept pluralism for this paper:

A philosophical position where the trumping characteristic is tolerance towards the other point of view, theories, methodologies, values and so on. That tolerance is not an act of kindness, It is motivated by skepticism and honesty, (Friend, 2013).

The inverse of pluralism is monism. (i.e., predominance of the neoclassical economics theories, methodologies, values and so on). We start with a set of objects, a set of functions and a set of corresponding values unique to the object/function of any well-defined Topological Domain Space (TDS) of entropic processes over space-time. SAGE-P represents an hierarchical-structured system of accounts of entropy production in the form  $A[B(C)]$ .: where: (C) Econosphere, (i.e., the domain of economic objects and function) is a subset of (B) Sociosphere, (i.e., the domain of social/institutional/ demographic objects and function) which is a sub-set (C) Ecosphere, (i.e., the domain of living objects and functions and habitat).

By definition the values of all objects/function belonging to C-category are conserved-in-exchange, (i.e., prices), in the B-category are conserved-in-use, (i.e., participation), and in the A-category are conserved-in-themselves, (i.e., existential). The distinction between use and exchange values is, indeed, well-explored in the classical economic literature, see Adam Smith's water/diamonds paradox. However, for our 4 purposes the distinctions are contextual to the objects/functions of the TDS. For instance education in the B-category assume rates of participation of students/teachers/administrators etc., measured as inflows (i.e., production) outflows (i.e., consumption) of the Low Entropy (educational) Fund, (LE(e)F). The measure of the (e)F is generally assumed to be the institutional capacity, but may include more abstract categories as the stock knowledge such as the level of education of the general population, libraries, media, internet etc. The measure in the the C-category assume the money valuation of the matrix database in the Bcategory. Typically this would include the monetary valuation of the inflow, (i.e., production cost to replenish the consumed LE(e)F stock, including new investment) and the outflow, (i.e., consumer expenditure on education, or the knowledge industry if more broadly defined).

It should be noted that education is a social function of the Sociosphere and it is here that the rate of entropy production is measured. Education for sale is a sub-category that belongs to the set of objects/function in the Econosphere. However, the construction of schools, libraries, universities, etc are physical objects subject to the Second Law of Thermodynamics, as is the case of book burning. We make the distinction between: (a) immaterial objects (e.g., educational attainment of a given population) and (b) material objects (e.g., infrastructure such as buildings, as well as the material consumption of the participants). The measure of entropy efficiency is obtained by a mapping of (a)  $\square$ (b).

Valuation in the A-category is difficult, complex and to a large degree inaccessible to any accounting calculus. However, it must be kept in mind that in the hierarchical value-structure posited in SAGE-P the existential value, for instance the education system in the C and B

categories is in the A-category accounts. This makes sense since existential value is rooted in, and totally dependent upon, qualitative properties of the larger-scale ecosystem. This universal perspective is embedded in Second Law of thermodynamics, where for instance value of educational system can be neither be separated from its past, (i.e., history) nor from the anticipated future evolutionary trajectory described by the emergent properties of dissipative educational systems far from equilibrium, (Prigogine, 1997).

This paper will attempt to demonstrate, inter alia, methods whereby intrinsic values, which are infinite or zero for the individual, are transformed into a collective set of existential values.<sup>5</sup> The core accounts of SAGE-P describe the inflow (i.e., production) and the outflow (i.e., consumption) from some well defined stock of the Low Entropy Fund (LEF). The existential value of objects, both material and immaterial, are calibrated to the quantities and qualities of the surplus the LEF available for human consumption. In other words, the value of the object can only be positive (and increasing) if, and only if, the rate of production, or inflow,  $\geq$  the rate of consumption, or outflow, of LEF over some well defined time period.

While it would be tempting to treat existential-value as the residual after subtracting use and exchange values, this would be wrong. In the hierarchical valuation system the exchange-value  $<$  use-value  $<$  existential-value. Another way to see this is to consider Nature's production function as the primary producer upon which the human-production function is a fully dependent variable.

At one time the economists treated natural capital as gift of Nature. Adam Smith assuming labour theory of values anticipated the notion that Nature transforms the kinetic energy drawn from the solar system into 'work' equivalent to the work of Man, to wit: In agriculture, too, Nature labours along with man; and though her labour costs no expence, its produce has its value, as well as that of the most expensive workman. (Smith, 1994: 393).

However, it was Georgescu-Roegen insight of the Entropy Law is not only basic to the understanding of the nature and limits to the material economy, but the ultimate nonmaterial objective of the human welfare function, to wit: The significant fact for the economist is that the new science of thermodynamics began as a physics of economic value and, basically, can still be regarded as such. The Entropy Law itself emerges as the most economic of all natural laws. It is in...the primary science of matter that the fundamental nonmechanistic nature of the economic process fully reveals itself (Goergescu-Roegen, 1971: 3).

The Entropy Law enables the replacement of the unsound, and impossible to measure, neoclassical accounting of sustainability, (i.e., time-discounted monetized present value of a non-declining human welfare function), with the pragmatic, readily measurable data sets described in SAGE-P as a minima function of some well-defined, socially acceptable, rate of 'entropy production.' (Mayumi, 2001, Friend and Friend, 2009 and Friend, 2012 ).

Entailed by SAGE-P are radical statistical/mathematical structures which include inter alia: (a) Bayesian prior probability distributions, (b) algorithms which encode/decode formal inference systems (i.e., models) to natural causal systems (i.e., observed data) and vice versa, (Rosen, 1991), (d) algorithms of sustainability assumed under limit functions described by maximum entropy production

per unit of consumption, (i.e., I/O measures of entropy efficiency), and (e) algorithms of ordered structures enabling systemic mining of (computerised) digital databases. available for human consumption. The accounts are constructed from algorithms of correspondence mapping: (i) objects on objects, (ii) objects on functions, (iii) functions on objects and (iv) functions on functions. The algorithms describe the entropic process in well-defined Topological Domain Spaces (TDS) of the Ecosphere, the Sociosphere and the Ecosphere. Where feasible qualitative state variables, (i.e., ordinal or positional values) are mapped on the quantitative state variables, (i.e., cardinal values). This nonlinear method of accounting enables direct (as opposed to indirect) measures of the human welfare function, the ecological footprint, the health and integrity of ecosystems as well as other qualitative measure of state, and change of state, of any well-defined



complex adaptive system.

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## 1353 Valuing unfamiliar ecosystem services with complicated methods: A learning design for Choice Experiments.

**Völker, Marc**

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Choice experiments (CE) have gained increased popularity to value environmental goods and ecosystem services. Although CE is theoretically capable to capture the importance society places on ecosystem services, the valuation task places considerable cognitive strains upon respondents. In a one-shot CE exercise respondents are unlikely to be able to form preferences for changes to biodiversity or unfamiliar ecosystem services, and the valuation process is therefore prone to ill-considered and theoretically inconsistent responses.

In order to generate reliable data for public policy advice a learning design for CE respondents was developed. We modified a deliberative valuation exercise (Market Stall) in a way that allows respondents to learn about 1) their preferences for different ecosystem services related to forest increase in Germany (value learning) and 2) the completion of a choice experiment (institutional learning). The design includes thorough information provision, time for respondent questions/clarification, discussion, and three repetitions of the choice experiment (valuation rounds).

The overall research aim is to explore how repetition, discussion and information affect respondent certainty, stability and rationality of choices. We further investigate the extent to which discussion at the Market Stall facilitates a broad consideration of aspects during the choice task. In other words, do respondents move away from self-interested and myopic choices towards considering the consequences of their choices for society and future generations? Broader considerations are assumed to lead to well-informed and rational choices.

A detailed statistical analysis comparing choice tasks before and after discussion and between the three valuation rounds will give answers to these questions.



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## 1388 Ecological Goods and Services from Prairie Wetlands: Valuation and Trade-offs

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The dominant objective of land management in agricultural landscapes is the production of agricultural commodities including annual crops, and intensive and extensive livestock production. However, the capacity and importance of the landscape for the provision of a range of ecosystem services (ES), ranging from food and fibre commodities to ecosystem functions, is receiving greater recognition. A significant consequence of the focus on production of agricultural commodities is the widespread modification and degradation of prairie ecosystems thereby constraining the capacity to provide a number of ES. Wetlands are often considered an impediment to agriculture commodity production and have been steadily degraded and lost due to drainage and encroachment. In the Canadian prairies wetlands represent an important contributor to a wide range of agri-ecosystem functions and their presence and health enable the provision of many ES. However, an important barrier to the development of policy measures that will conserve wetlands, and associated ES, is understanding the preferences and values that farmers and society apply to those non-market ES. Without these values policy makers can not quantify the consequence of decisions, including the environmental trade-offs, and the final outcome of the policy will be biased in favour of those uses which have commercial value. The purpose of this paper is to estimate the perceived social value of wetland ES provided within the agricultural landscape of the province of Saskatchewan, Canada. More specifically the research will help inform policy development with a focus on determining what factors may influence these perceived values and what is the acceptable level of public/private responsibility for ES provision. A choice experiment, using ecosystem components riparian zone width, wildlife populations and water quality, was completed by a sample population of Saskatchewan residents. The measurable and easily communicated ecosystem components, along with cost of wetland conservation, represented separable dimensions that describe the outcomes of alternative wetland management strategies. The results were used to not only estimate social willingness to pay for wetland conservation but also quantify the relative importance ascribed to the ecosystem components and the willingness to trade-off these wetland attributes.



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## 1397 Use of modeling approaches for ecosystem service quantification in performance-based PES

**Sattler, Claudia**

The design of environmentally effective and cost-efficient payments for ecosystem services (PES) schemes is linked to several challenges. One of these challenges is to ensure conditionality, that is, to guarantee that the ecosystem services (ES) in question actually gets delivered as intended. To address the issue of conditionality there is a trend toward so-called performance-based (or output-based) PES schemes, where payment is made condition on actual ES outputs. This concept is in contrast to so-called activity-based (or input-based) schemes where payment is granted for certain activities performed on the land that are said to produce the desired ES, but without actually verifying it. One way to verify ES delivery for performance-based PES is to do measurements in the field. In many cases though, actual measurement to verify ES delivery is not feasible, because it is way too expensive and thus impractical. For this reason, often modeling approaches are employed for ES quantification under the specific frame conditions of a certain PES to simulate ES provisioning and ensure conditionality. In this study we present several international case studies where performance-based PES making use of modeling approaches were successfully developed. Case studies were identified through literature search and web recherche. Selected cases were then analyzed with regard to the following questions: What kind of environmental problem gave rise to the PES development (e.g. concerning which ecosystem services)? What types of modeling approaches were employed to quantify and verify ES delivery (e.g. more simplistic rule of thumb type approaches vs. highly sophisticated process-based approaches)? Which actors (from science, the for-profit, not-for-profit or state sector) were involved in developing, adapting or applying the respective modeling approaches? Needed information to do the analysis was retrieved from personal interviews with PES project managers involved in the respective PES schemes as well as analysis of available project documents and literature. Results show that depending on the problem at hand, solutions are rather individual, drawing on a multitude of different approaches with actors involved from different societal sectors.



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## 1463 Can't see the wood for the trees: Renewable energy landscapes assessment beyond monetary valuations.

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This paper presents a new method of landscape evaluation to describe the utilitarian relationship that society has, and continues to build, with the natural world. Surpassing monetary valuations, the method retains measurement of the chosen indicators in units that describe the fundamental characteristics of socio-cultural, ecological and economic values. These indicators provide inputs for a model that employs fuzzy logic reasoning to give landscape/land-use evaluations. The process employed allows for comparison of aggregated values in a manner that allows for the investigation of relationships and contributions between and within indicators, and each value domain.

Taking the use of wood for fuel to translate ecological complexity into ecosystem functions, which in turn, provide the services and goods that are valued by humans, different approaches to landscape management with a wood-fuel component are evaluated and assessed. The model uses hierarchical inference and fuzzy "IF-THEN" rule bases to aggregate the basic indicators into more composite variables; socio-cultural value derived from community preference and placed-based exercises; ecological value based on relationships between landscape structure and consequent biodiversity levels; direct-use income streams that provide landowners/users with economic value.



The cases studied include various landscapes in Greece and Austria that describe traditional wood pasture, co-operative and commercial owned sustainable forestry, and Natura 2000 forest primarily managed around ideas of ecosystem goods and services. Difference is observed between and within value domains and value components. These differences reflect the tension that exists between sustainability and society's continued use of natural resource; wood pasture – high socio-ecological values, low local economic value; Natura 2000 – low socio-ecological values, intermediate economic value; forestry – high economic value, intermediate socio-ecological values; in an equal weighting scenario socio-ecological values determine landscape evaluation.

This model allows for conflict between socio-economic needs and wants and the ability for continued natural resource provision to be fully recognised in the evaluation process. Such approaches are urgently needed if we want to address the problems of sustainable natural resource use in a manner that fully considers future generations.



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## 1638 Updating Benefit-Cost Analysis for Improved Floodplain Investments

**Kocian, Maya**

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Economics is crucial to helping policy makers allocate their limited resources for the greatest benefits. All federal and state agencies, cities, counties and many private firms utilize Benefit-Cost Analysis (BCA) to make investment decisions. This covers a diverse set of investments including levee and dam construction, FEMA's hazard mitigation assistance decisions, healthcare investments, economic development projects and others. If BCA is flawed, investments will be flawed. For example, a fish processing plant counts as an asset in BCA, yet federal rules dictate that the system that actually produces the fish (the river) does not count as an asset and cannot be valued in the analysis. Levees that provide flood protection count, but wetlands, forests, lakes and rivers that provide flood protection don't count unless a special exemption is made. In summary, built capital counts, natural capital does not. This is a significant and potentially catastrophic flaw. Earth Economics is working at the state and federal level to demonstrate the importance of including the value of ecosystem services when performing BCA. This work has direct and sweeping implications for floodplain management projects across the nation.

Several case studies and successes will be presented from this work. In the US, for example, the federal rules for BCA are currently under consideration for significant changes. Proposed changes include the valuation of ecosystem services, and Earth Economics has provided input to the President's Council for Environmental Quality through its advisory council. Earth Economics is also continuing to work alongside individual agencies to update their BCA policy as a cornerstone of mitigation policy. For example, BCA is the primary factor in flood risk management investment decisions at the Army Corps of Engineers. They require that the BCA ratio be above one for a water resource project to be considered for funding, which is generally a hard and fast rule. As a result, too little investment was made in wetland protection and restoration as they were not valued. Earth Economics worked with the Army Corps and several other groups in Louisiana, resulting in the first ever exemption to this rule in levee construction in the Mississippi Delta after Hurricane Katrina. The Army Corps recognized the hurricane protection value of wetlands for the protection they provide to built assets, including levees. Further, they recognized the importance of investments in wetland restoration specifically for hurricane protection, and now have several large diversions planned.



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1779      **The Willingness to Pay for Ecosystem Services - A Discrete Choice Experiment Application to Residents in Germany**

**Hirschfeld, Jesko**

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Land management decisions have complex effects on a wide variety of ecosystem services. Although much knowledge exists on the ecological effects as well as on direct economic effects for farmers, land use changes imply other socioeconomic consequences which are mostly not explicitly taken into account by the scientific community and policy makers so far. Especially in the context of climate change mitigation and adaptation strategies, tradeoffs and synergies between carbon optimized land management and other public demands are present and need further attention. These tradeoffs are investigated in the framework of a transdisciplinary research project drawing together the knowledge of biologists, geographers, climatologists, planners, agricultural, forestry and ecological economists as well as regional stakeholders and decision makers.

In this presentation, we focus on the provisioning, regulating and cultural ecosystem services (e.g. provision of food, sequestration of carbon, preservation of biodiversity) provided by different land use scenarios and evaluate its benefits from a residents' perspective. To do so, we rely on the results of an online Discrete Choice Experiment survey, inferring preferences on land use changes from about 3000 randomly sampled German residents in Spring 2013.

In the survey, respondents were asked to choose between different land use scenarios in their immediate vicinity. These scenarios were distinguished by differing characteristics including the degree of biodiversity, the share of forest, sizes of fields and forest, rate of land consumption, share of maize fields, share of agricultural areas with high nature value, share of hedges, share of grassland and finally an associated price. For estimation we apply a latent class conditional logit model which incorporates discrete unobserved preference heterogeneity i.e. different groups of residents, which differ in their preferences for land use scenarios, are endogenously derived.

The model allows estimating individual willingness to pay values, which make tradeoffs between characteristics scalable and can be used in extended cost benefit analyses. The results reveal that preferences between individuals vary strongly, sometimes even in opposite directions. Nevertheless, we observe an overall positive willingness to pay also for non-provisioning ecosystem services like biodiversity summing up to several billion Euro per year for Germany. The results are relevant for policy makers as they reflect the preferences of citizens and can help to design adequate mechanisms to publicly finance sustainable land management strategies.



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1440 Reconciling views and values of Ecosystem Services for sustainability? – Thoughts and tools from the Belgium Ecosystem Services community.

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- Abstract intended for the special session 'Synthesizing different perspectives on the value of ecosystem services' organized by Jakub Kronenberg, Johannes

Langemeyer, Erik Nicolas Gomez Baggethun.-



This paper builds on the outputs of the book "Ecosystem Services – Global Issues, Local Practices" (Jacobs et al. 2013) with contributions from more than 80 authors from the BEES (Belgium Ecosystem Services) community of practice. In this context, we recently performed a (non-exhaustive) review of how the ecosystem service (ES) concept could be useful to Belgian and international policy actors. As the ultimate goal of ES valuation is to improve the well being of every individual now and in the future (MEA, 2005), this paper intends to elaborate on the concept of ES valuation and how it could (not?) reach the intended goal.

A clear tension appears between policy actors' desire to acquire tools for monetary valuation and the risks posed by monetary valuation (e.g. commodification of nature, neglect of other values...). On the one hand, there is the need for 'proof of concept', and the availability of economic tools and mainstream character of 'money talk' is a pragmatic choice. On the other hand, we note a strong reluctance and critical attitude towards the culture of 'math and money' at all levels: it is perceived as one of the main causes of social and ecological unsustainability. Several actors therefore urge for more collaborative approaches of ES valuation, e.g. to build trust between providers and beneficiaries, as monetary valuation alone is not relevant in their working context.

Among the suggested solutions are the development of alternative new valuation methods and practices - amongst others using social debate and including relations between humankind and nature - as well as methods to integrate different types of values (e.g. economic, heritage, and biodiversity value) in decision making. In particular, several actors point out the necessity to account for environmental thresholds and ecological values, to consider socio-ethical values, and to deal with uncertainty, ambiguity, and complexity in decisions and actions. In the first part of this paper, we expand on the main outcomes and challenges, while in the second part some tools and test cases are presented. We conclude that integrated valuation of ES could start reconciling human viewpoints on nature and pave the way forward to the intended social and ecological sustainability, but there is still a long way to go.



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
Session: 1.3.I Valuing ecosystem services III  
Time: T3 Room: R3

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## 1566 Rethinking the Costs of Inaction - The Case for An Ecosystem Service Approach

**Meyer, Ina**

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The paper is analyzing the practise and theory of calculating long term costs of inaction in integrated assessment of climate change. The costs of inaction account for future damages from unabated climate change. They are determining whether and at which scale investments in abatement strategies are supposed to be economically efficient. Discounting is the practise of attaching lower weight to future costs and benefits than to present ones according to the time preference of individuals. Differences in the discounting of future costs of inaction assumed by different modellers (e.g. Nordhaus, Stern, Tol, Weitzman) are one of the major drivers of variability in the estimates of the long term marginal damage costs of carbon dioxide emissions to society. The discount rate thus appears to be a crucial parameter with respect to policy-relevant scientific advice. In addition, the costs of ecosystem service and biodiversity loss potentially arising from climate change are supposed to have a significant impact on the overall costs of inaction, however, they are omitted in most assessments.

The paper argues, first, that ecosystem service and biodiversity loss are major cost categories to be considered in calculating the costs of inaction, and, second, that discounting these is economically and ethically not justifiable in every respect. The discussion uses as a backdrop the recognition of a new geological epoch described as the anthropocene (Steffen-Crutzen-McNeill, 2007) according to which the human species have become a dominant force in the operation of the Earth system. Decision making regarding investments in alternative allocation strategies thus changed from an "empty world" background with low levels of population, resource and energy use to a "full world", approaching thresholds of ecological viability and irreversibilities (Rockström et al., 2009). Given this, the claim of discounting goods and services disregarding their relationship to environmental scarcities is critical. Different ecosystem service categories, i.e. provisioning, regulating, habitat, cultural services (according to TEEB and MA), are analysed in terms of their costs (monetary value) and consequences if being discounted. The paper concludes with the assertion that ecosystem services with non-substitutable functions and services are not qualified for being discounted if principles of efficiency and intertemporal equity apply. The costs of inaction should therefore be discounted in a highly differentiated manner, using the concept of ecological scarcity and ecosystem service functions as criteria and envelope for economic decision making.



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Session 1.3.J  
Agriculture and ecosystem services



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
Session: 1.3.J Agriculture and ecosystem services  
Time: F3 Room: R4

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1457 Trade-offs between crop yield and other ecosystem services in agricultural systems: The case of Llanada Alavesa, Basque Country.

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Agricultural systems have an intrinsic and complex relationship with ecosystem services (ES), as they constitute a source of provisioning, regulating, and cultural services, whilst at the same time being highly dependent on them, in order to successfully function for their intended use.

The delivery of ES by agricultural ecosystems becomes increasingly important as the demand for more food brings new areas of land under agriculture and the attempts to raise crop yield intensify. Along with the growing need to ensure food security globally, there has been a significant decline in the state of ecosystems and the services they provide. In order to reduce the

negative trade-offs and identify potential synergies, it is necessary to greatly improve our understanding of the relationships between various ES.

The model we propose was developed to capture some main ES trade-offs in a generic cropland. We use the case study of the Llanada Alavesa, located in the Basque Country, in the North of Spain, where the agricultural surface is predominately composed of rainfed land for cereal cultivation (winter wheat, barley, and oat).

Our model analyses the effects of both farming practices and local environmental conditions on several ES:

1. Crop production (winter wheat yield);
2. Water quality (nitrate leaching, phosphorus losses);
3. Climate regulation (soil carbon storage and denitrification);
4. Air quality (ammonia pollution).

Farming practices encompass irrigation, tillage, and the application of both organic and chemical fertilizer. Environmental conditions include soil characteristics, precipitation and above ground temperature.

We used a novel semantically-based simulation platform that is able to integrate different kinds of modeling paradigms in a spatially explicit fashion. In this implementation each ES is represented as one stand-alone module of the main model, however all the modules share one or more of the input variables between them. Further the effect that certain ES have on other ES is reflected through output interaction.

Some of the modules are developed deterministically through equations and look up tables derived from the literature (e.g. the ammonia module). Other modules are developed probabilistically through Bayesian networks calibrated on empirical data. All the modules interact at the pixel level. Results are produced both as raster layers and as aggregated key indicators.

This model shows that by adopting a complexity-aware perspective on agricultural systems it is possible to shed some light on the relationships between ES and to quantify the respective changes induced by natural and human factors.



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Session: 1.3.J Agriculture and ecosystem services  
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## 1708 Agricultural policy and landscapes for biodiversity: Policy targets and instruments for biodiversity in open lowlands in the context of the Nature Index for Norway

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Agricultural landscapes provide multiple services to society. Although the traditionally most biodiverse areas are crowded out by agriculture based on synthetic fertilizer and pesticides, there is a potential for giving priority to land use which might serve the biodiversity far better than the intensive single crop production which has invaded the lowlands.

In Norway, food production has been given a high priority in agricultural policy, as in most rich countries. To support the food production, which is basically less productive in Norway than in many other countries, the agriculture has been heavily subsidised. However, in line with the WTO Green Box framework the subsidies have to some extent been shifted from production to land use in order to improve economic efficiency and to take environmental issues into account. Within this context there is an opportunity to direct subsidies to specific land use practices, which conserves and even might contribute to improve biodiversity. Conserving biodiversity, for example by granting economic support to grazing in semi-natural pastures, are compatible with the WTO framework.

Biodiversity is highly sensitive to agricultural activities, largely determined by economic incentives. Use of pesticides and fertilizer has considerable negative impact on biodiversity. Economic incentives associated with animal husbandry and food crop production influence land use practices that condition the development of ecosystems. We raise the question: How will a redirection of subsidies contribute to introduce practices that contribute to a higher biodiversity?

The purpose of this paper is to study how government transfers in combination with regulations can succeed in achieving specific targets for biodiversity in open lowland expressed in the context of the Nature Index. The study will be based upon an extensive economic model of Norwegian agriculture (JORDMOD). The model describes farmers' responses to prices, taxes and subsidies and can therefore be used to assess how different policy instruments affect agricultural activity and biodiversity.

There are particularly two kinds of land use that enhance biodiversity and are relevant for subsidies. One is sheep husbandry on coastal heathland, the other is summer farming of mountain grassland with cattle and sheep. These activities will be included in the JORDMOD model within the set of options available for farmers. The potential for low intensity farming in these categories will be assessed, and the level of subsidies necessary to reach a certain target of biodiversity linked to the Nature Index will be calculated.



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
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## 1775 A framework for assessing the economic value of soil ecosystem services

**Jónsson, Jón Örvar G.**

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The National Resources Council in 2001 (NRC, 2001) emphasized the importance of better understanding of the Critical Zone to assess the impact of human activities on the Earth and to adapt to their consequences. Soil and its ecosystem services are an important component of the Critical Zone. The soil ecosystem services reside mainly within the Pedosphere, which is the thin semi-permeable membrane at the Earth's surface that serves as an interface between the solid and fluid envelopes, atmosphere, hydrosphere, biosphere, and lithosphere. At this interface, soils form. Humans depend on soils for many essential goods and services, and civilizations have risen and fallen with the status of their soil, which is a testament to the importance of properly accounting for soils in decision-making. Among soil's many services are: sheltering of plants; absorption of precipitation and mediation of the flow of water; water filtration; break-down and recycling of dead plant and animal material into usable form; and regulation of greenhouse gases fluxes (Daily et al., 1997). Despite of their importance soil functions and services are taken for granted and perceived to be in abundance (European Commission, 2012). According to European Commission communication "Towards Thematic Strategy for Soil Protection", soil is subject to a series of degradation processes or threats. These include erosion, decline in organic matter, local and diffuse contamination, sealing, compaction, decline in biodiversity, salinization, floods and landslides (European Commission, 2006). Soil degradation is driven or exacerbated by human activities such as inadequate agricultural and forestry practices, industrial activities, tourism, urban and industrial sprawl, road building, soil sealing and construction work (European Commission, 2006). One culprit for the degradation pressures is the near exclusion of the importance and value of ecosystems and resources such as soils in economic decision-making. This presentation will introduce some preliminary results from a pilot study in Koiliaris watershed in Crete where a framework for classifying and valuing soil ecosystem services was implemented. The aim of the research is to enable more thorough evaluation of the economic consequences of different land use management decisions in different agricultural systems. This work is part of the EU FP7 funded project SoilTrEC.



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Synthesizing different perspectives on the value of ecosystem services; Proposed session



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
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Proposed session  
Time: W2 Room: R3

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1106 Towards an integrative framework for the valuation of ecosystems services in monetary and non-monetary terms

**Gómez-Baggethun, Erik**

Despite growing formal recognition of the need to acknowledge different value perspectives in ecosystem service assessments, integrated valuations remain largely elusive in practice due to the absence of frameworks capable to capture the multiple and often incommensurable values of ecosystem services. Departing from the author's input to the report *The Economics of Ecosystems and Biodiversity (TEEB-D0)*, we outline a framework for the classification of categories, methods, metrics and indicators for the integrated valuation of ecosystem services in monetary and non-monetary terms. First, we classify and characterize the range of values required to capture the broader importance of ecosystem services, including economic, social, ecological and symbolic values. Second, we define metrics, indicators, and proxies required to capture this range values in quantitative or qualitative terms. Finally, we classify methods, tools and approaches for an integrative valuation of ecosystem services, including: i) traditional monetary valuation methods (e.g. market valuation, revealed preferences, and stated preferences), sociocultural valuation methods (e.g. preference assessment, time use methods, group deliberation), iii) biophysical valuation methods (e.g. embodied energy analysis, exergy analysis, emergy analysis, material flow analysis, ecological footprint), and recent methodological attempts to value ecosystems under dynamic and complex systems conditions (e.g. resilience valuation). Based on our results we discuss the potential and limits of integrated valuation approaches and identify key challenges for the research agenda in ecosystem services valuation.



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
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**1166 Integrating monetary and non-monetary valuation using deliberative, psychometric and narrative based methods: case studies at multiple scales**

**Kenter, Jasper O.**

There are increasing concerns that monetary valuation of ecosystem services using survey-based methods does not fully capture the value that people attach to the natural environment. For example, people have values in relation to nature that are not instrumental, but relate to rights, duties and virtues, which are difficult to translate into preferences and willingness-to-pay. Also, the notions of 'services' and 'benefits' do not fully reflect the intricate relation between people and nature. This relationship, established through practices and experiences, can be characterised on the basis of narratives (O'Neill, 2008). Moreover, these meanings and values are not necessarily individualistic and given, but are often implicit, shared and shaped through social processes of information sharing and moralisation (Kenter et al, in press). To assess value holistically thus necessitates a mixed method approach, but so far almost no studies have brought together monetary valuation with non-monetary, interpretive approaches in a deliberative format. This paper introduces two local and one national scale case study from the UK National Ecosystem Assessment where deliberative monetary valuation and multi-criteria analysis were combined with storytelling, conceptual systems modelling, participatory mapping and psychometric instruments. It evaluates how different methods bring out different types of individual and shared values, and critically compares and contrasts the pros and cons of different approaches.

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Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
Session: 1.3.K1 Synthesizing different perspectives on the value of ecosystem services;  
Proposed session  
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## 1722 Integrating multiple ecosystem service values by social multi-criteria evaluation - an application to inform urban policy making

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Because people allocate different meanings to nature, accounting for a pluralism of values is increasingly acknowledged as the necessary evaluative space for ecosystem service assessments. With mounting pressure on green spaces in urban areas, urban planning needs to balance multiple and often conflicting human needs and wants over land use. Multi-criteria evaluation can be used to support decisions on urban green infrastructure based on the values ecosystem services provide. The goal of our study is to use social multi-criteria evaluation to support urban green space planning based on ecosystem service values. To this end, we develop four green space planning scenarios for the city-region\* of Barcelona, Spain. First, we conduct a workshop with local policy-makers and practitioners to elicit values of ecosystem services through a stated preference approach. Second, we apply these values as weights in the evaluation of the planning scenarios using a spatial multi-criteria decision-making framework. Finally, we repeat the stated preference approach to re-value the applied set of ecosystem service. Our results are expected to demonstrate trade-offs and synergies between ecosystem service under different planning scenarios in regard to the importance stated by local policy-makers and practitioners. Our results are further expected to foster learning processes among local policy-makers and practitioners, which are manifested in changing preferences for ecosystem services before and after the multi-criteria evaluation. We conclude by providing a synthesis of the lessons learned about the operationalisation of multiple ecosystem service values to inform green space planning in cities.

Remark: This Paper is supposed to be presented within the session "Synthesizing different perspectives on the value of ecosystem services", hosted by Jakub Kronenberg, Johannes Langemeyer and Erik Gómez-Baggethun.



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Synthesizing different perspectives on the value of ecosystem services; Proposed session



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
Session: 1.3.K2 Synthesizing different perspectives on the value of ecosystem services;  
Proposed session  
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1054 Counterpoints to the Neoclassical Economics Valuation of Nature – Examples of Biophysical and Cultural Valuation Methodologies

**Patterson, Murray Graham**

Please note this Abstract has already been submitted as part of Session Proposal by Jakob Kronenburg.

Neoclassical Economics methods of valuation of ecosystem services and natural capital have dominated academic discussion, and furthermore have been the most commonly used methods of valuation. These methods are useful for elucidating the value of the environment, insofar as: (1) they measure 'willingness-to-pay' and the marginal utility of the value of 'nature', (2) they can readily be incorporated into the partial and general equilibrium frameworks of mainstream (neoclassical) economics. These methods are however just one valuation 'lens' that can be used, and furthermore it should not be assumed that such valuation methods can be universally applied to all practical policy decision-making contexts. This paper critically analyses the range of valuation methods that can be used, including but not limited to, neoclassical valuation methods. Particular emphasis is placed on biophysical valuation methods and cultural valuation methods that have been utilised in two ecosystem services valuation projects funded by the New Zealand Government. In this regard this paper first of all examines the 'ecological pricing' method (which is closely related to the EMERGY method) of biophysical valuation. This method measures value in terms of the 'contributory value' criteria, where different species in an ecosystem 'contribute' value to other species. This method is particularly important in highlighting ecological processes and/species that may be 'undervalued' or even ignored in neoclassical valuations. Then secondly, cultural (Maori) centred methods of valuation are advocated and applications demonstrated, closely linked to a discussion of the limitations from a cultural perspective of using neoclassical valuation methods. The paper concludes by advocating for a more pluralistic approach to valuation, whereby a number of different valuation methods can be used in conjunction with each other, even though they may result in incongruent value perspectives and policy decisions. It is also concluded from examining these two vignettes (biophysical and cultural valuation) that any 'grand synthesis' of valuation methods is both unlikely and not necessarily desirable.



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
Session: 1.3.K2 Synthesizing different perspectives on the value of ecosystem services;  
Proposed session  
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## 986 Insurance value of urban ecosystems in the face of disturbance, climate change and management error

**Jakub, Kronenberg**

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Note: this paper intended as part of session, "Synthesizing different perspectives on the value of ecosystem services "

Urbanization projected to occur until 2050 combined with climate change create new challenges, not least in terms of reducing urban vulnerability to projected higher frequencies of heat waves and peaks in precipitation. Interest in investments in green infrastructure (as an interconnected system of e.g. parks, urban woodlands, wetlands, green roofs) as well as in restoration of urban ecosystems as part of such adaptation strategies are growing worldwide. A considerable literature exists on the insurance value of ecosystems in securing ecosystem service supply in the face of disturbance and change, yet this literature has largely neglected urban contexts. We revisit the insurance value literature, to examine the applicability of the concept in urban contexts while parsing it from several perspectives, including its use as: i) a metaphor to foster understanding of the value dimensions of resilience, ii) an analytical concept intended to ensure the visibility of the contributions of ecosystems to human wellbeing, and iii) a category to stimulate investments in green infrastructure to reduce vulnerability and to achieve mitigation and adaptation goals. To further evaluate the applicability of insurance value of ecosystems in urban settings, we analyze several instances of investments in green infrastructure with regards to the potential for such investments to influence vulnerability and the costs of adaptation in the face of climate change and other disturbances. We conclude by identifying actions and management strategies needed to maintain or enhance the insurance value of urban ecosystems over longer time periods. Our synthesis aims to retain the insights offered by a social-ecological systems perspective of cities,



while laying the foundation for decision-making guidance regarding investments in the insurance capacity of urban ecosystems.

(This paper is intended as a contribution to: Synthesizing different perspectives on the value of ecosystem services. Organized by

Jakub Kronenberg, Johannes Langemeyer, Erik Nicolas Gomez Baggethun).



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
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991 Non-utilitarian values will be eroded: conservation practitioner perspectives on the potential of integrating plural values in a decision-context

**Fisher, Janet A.**

Application to Session: Synthesizing different perspectives on the value of ecosystem services.  
Organised by: Jakub Kronenberg, Johannes Langemeyer, Erik

Nicolas Gomez Baggethun

There is currently much policy and academic interest in ecosystem services, concepts which are grounded in anthropocentric and utilitarian values for nature. This is spurring new work examining how environmental values are debated in society and accounted for in policy- and decision-making. A central question in this new strand of research relates to how different articulations of value can be integrated in policy-making contexts, and whether they might contribute in a commensurate and constructive manner to effective environmental decision-making. This paper draws on empirical research with respondents from international conservation organisations to problematise the idea that non-utilitarian and utilitarian articulations of values for nature can be commensurable and constructive in a decision context. Conservation actors have tended historically to espouse ecocentric and intrinsic values for nature through the arguments they make for conservation. This makes it interesting to consider how they adopt and use more utilitarian arguments associated with ecosystem services. High levels of expectation exist amongst conservation actors that their instrumental adoption of ecosystem services will enable them to broaden constituencies and extend their funding sources. However, conservation agents tended to consider that this adoption carried significant risks to their future articulation of non-utilitarian values for nature. They commonly considered that their articulation of non-utilitarian values would be eroded in a process in which utilitarian and, particularly, monetary values for nature were also articulated; indeed, some cited such examples. The paper considers the implications of this practitioner perception of a hierarchy of values in decision contexts, and proposes an empirical research agenda to investigate the precise manner in which decisions are taken in processes that ostensibly consider plural values including monetary values.



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Session 1.3.L1

Impact assessment of conditional payments for environmental services; Proposed session



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
Session: 1.3.L1 Impact assessment of conditional payments for environmental services;  
Proposed session  
Time: F1 Room: R3

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## 1422 A scale of greys: global patterns of PES implementation.

**Ezzine-de-Blas, Driss**

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Conditional cash and in-kind payments have been argued as offering an alternative and efficient conservation strategy to classical command and control and development and conservation programs.

Scientists have not yet agreed on the long term trade-offs of short-term benefits versus perverse long term consequences of implementing such schemes, while there is still conclusive evidence on their efficiency and additionality advantages with respect to other policy instruments. In the present work, we aim at providing brand new evidence of the in-between levels that define the variety of PES

schemes in the field and their implications regarding their directness and additionality. We perform a quantitative statistical meta-analysis on 55 PES schemes selected from best available literature sources. Our results allow to better disentangle the heterogeneity of implemented PES and its 2

implications regarding the service targeted, the level of payments and surface of the scheme and their degree of directness and additionality.



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
Session: 1.3.L1 Impact assessment of conditional payments for environmental services;  
Proposed session  
Time: F1 Room: R3

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## 1692 Change in farmers' land use patterns and expectations through conditional payments in a watershed in Indonesia

**Lapeyre, Pirard, Leimona, Renaud, Romain, Beria**

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Article proposed within the SPECIAL SESSION (Session 2): «Impact assessment of conditional payments for environmental services: theoretical insights & empirical evidence from a multi-country international research project », organized by Esteve Corbera (ICTA-UAB, Spain), Driss Ezzine de Blas (CIRAD, France) and Renaud Lapeyre (IDDRI, France)

TITLE: Change in farmers' land use patterns and expectations through conditional payments in a watershed in Indonesia.

SUMMARY: Analysing on-going conditional payments for watershed services (PES) in Indonesia through a structured household survey (270 interviews) we assessed changes in land-use patterns by participating farmers. In particular, we looked at (a) changes in tree species before, during and hypothetically after the PES scheme (through a ranking exercise), and b) farmers' plans with respect to forest conservation on their lands once (if) the PES scheme is terminated. We divided the sample into 3 groups: farmers who currently operate under their first PES contract (participation length < 5 years); farmers who currently operate under their second, renewed contract (participation length > 5 years); and finally farmers which already have ceased the contract for some reasons. Contributing to the emerging literature (Hayes, 2012; Rico García-Amado et al., 2013), this article discusses results that inform at least three questions: a) whether or not PES participants change their land-use patterns (tree species planted) in response to payments, with a comparison between enrolled and not-enrolled lands; b) whether or not farmers modify their environmental perceptions as a result of the length of their participation to the PES; and c) whether or not farmers change their decisions about longer-term land uses as a result of the length of their participation to the PES. Results will ultimately inform us about the potential sustainability of such conditional payments for environmental services.

Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
 Session: 1.3.L1 Impact assessment of conditional payments for environmental services;  
 Proposed session  
 Time: F1 Room: R3

## 1706 The result-based agri-environment scheme in Baden-Württemberg: a PES in the agricultural sector

**Esteve, Corbera**

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Session "Impact assessment of conditional payments for environmental services: theoretical insights &

empirical evidence from a multi-country international research project"

The introduction of result-based agri-environment schemes is increasingly seen as an interesting way to improve the conditionality and efficiency of this CAP measure. They differ from classical action-based agri-environment schemes in that the latter remunerate farmers for complying with a set of established rules, for example limiting the use of fertilisers or keeping stocking rates low on grassland, while result-based measures link the farmers' remuneration to the achievement of a desired environmental outcome, thereby ensuring higher conditionality than action-based measures. Because of their higher conditionality, result-based agri-environment schemes can be considered Payment for Ecosystem Services. We have analysed MEKA B4, the oldest result-based agri-environment scheme, which was introduced in 2000 in the German region of Baden Württemberg to preserve species-rich grassland. In order to explore the point of view of the stakeholders involved, we carried out 14 semi-structured face-to-face interviews with key institutional actors and 24 face-to-face interviews with participating and non-participating farmers. We have found that the motivations of the farmers are both intrinsic and extrinsic, and are influenced by the farmers' typologies (e.g. intrinsic motivations are more important for secondary occupation farmers). The payment per hectare offered by the scheme seems to cover the opportunity costs of some categories of farmers (e.g. secondary occupation farmers, less productive fields, hay producers, farmers with few animals), but not those of cattle raisers and biogas producers. Increasing the payment would encourage more farmers to enrol, but cost-efficiency would be lower, as some farmers would be overcompensated. Differentiated payments are an option, but they would imply higher transaction costs. We have also found that neither the farmers nor the responsible authorities see the current transaction costs and risks as too high. The farmers' views differ as regards the additionality of the scheme, but the authorities and experts think that the scheme plays an important role in avoiding abandonment or intensification of species-rich grasslands. Finally, result-based schemes can play an important role as tools for environmental education.



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
Session: 1.3.L1 Impact assessment of conditional payments for environmental services;  
Proposed session  
Time: F1 Room: R3

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1709 A review of payments for ecosystem services in tropical and sub-tropical countries: a closer look at effectiveness and equity

**Calvet-Mir, Laura**

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Special session: Impact assessment of conditional payments for environmental services: theoretical insights & empirical evidence from a multi-country international research project

We undertake a non-exhaustive review of the academic literature that analyses PES initiatives targeting directly or indirectly biodiversity conservation in tropical and sub-tropical regions. We contribute to the need for rigorous review of conservation interventions, which for PES should concern both the examination of discrete programs and projects and the development of systematic reviews of the published literature. We investigate the key features of such analyses in regards to their analytical and methods, we identify emerging lessons from PES practice, and elucidate potential research gaps. In doing so, we provide insights on projects' performance on environmental and socio-economic aspects as well as highlight existing contradictions between the actual implementation of PES and their underlying logic. Our qualitative and statistical results indicate that analyses of PES effectiveness have to date focused on either ecosystem service provision or habitat proxy changes, with only half of them making explicit assessment of additionality and most conveying that payments have resulted in positive environmental impacts. Studies evaluating PES impact on livelihoods suggest

more negative outcomes, with an uneven treatment of the procedural and distributive considerations of scheme design and payment distribution, and a large divergence on the rigorousness of evaluative frameworks.



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
Session: 1.3.L1 Impact assessment of conditional payments for environmental services;  
Proposed session  
Time: F1 Room: R3

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## 1737 How effective are biodiversity conservation payments in Mexico?

### **Costedoat, Sébastien**

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Payment for Ecosystem Services (PES) programs are innovative conservation programs widely adopted by governments in developing countries during the last decade. During the last decade, Mexico has implemented two national programs, which are among the world largest. However, there are few empirical evidences of the impact of these programs in terms of forest conservation. In this article, we assess the effectiveness of Payment for Biodiversity Conservation programs on avoided deforestation using quasi-experimental methods.

Participants are rural communities and individual landowners receiving a five-year payment in exchange of guaranteeing better forest management practices and avoiding land-use change. The area of study is composed of a regional cluster of approximately 250000 hectares chosen according to statistical characteristics such as number of PES contracts, accessibility, level of social development, and initial forest cover. The cluster includes a cohort of 13 participant and 17



non-participant communities from the State of Chiapas. We develop land use maps from SPOT 5 satellite images at three points in time in order to measure losses of forest at community and parcel levels, before and during the implementation of PES contracts. The analysis is based on a counterfactual analysis that compare PES participants to a control group chosen among the non-participants. The control group is defined using a covariate matching estimator that includes physical land tenure and other socio-economic information.

We found that deforestation is occurring within PES polygons but that on average the program is effective in terms of avoided deforestation. We measure a heterogeneous impact on treated units according to communities' characteristics, in particular differences in land tenure, distance to protected areas and characteristics of technical assistance providers.

Our results highlight the extent to which payments are effectively conducive to avoided deforestation despite poor compliance of participant communities. The role of contextual factors and policy mixes in influencing such effectiveness is describe. We discuss some recommendations addressed to scientific community and policy makers about the importance of performing impact evaluation and how to include it into public policy cycle.



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
Session: 1.3.L1 Impact assessment of conditional payments for environmental services;  
Proposed session  
Time: F1 Room: R3

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2030 The efficiency of the Walloon agri-environmental scheme (AES): Who are the farmers making an environmental effort to participate in?

**Polard, Audrey**

The agri-environmental scheme (AES) has been established for twenty years in Wallonia. Today, more than half of the Walloon farmers participate in this environmental program. Unfortunately, several farmers subscribe to the AES and get paid without substantial changes in their farming practices. It decreases the general environmental efficiency of the scheme. Thereby, the paper focused on farmers who make an environmental effort to participate in the Walloon AES. More particularly, the motivations of this category of farmers to subscribe to the scheme but also their social network were analyzed. Several papers studied the social network in agriculture but did not give a special attention to the contacts of farmers with environmentally aware people. This work was conducted through semi-structured interviews in Wallonia. Following the principle of two-speed agriculture implemented by the CAP, two categories of farmers - eco-friendly and intensive - were interviewed. The survey revealed that subsidies are necessary to have farmer's participation in the scheme but do not sufficient to involve a farming practices modification. Contacts with environmental aware people seem to be another important point to really change farming practices.



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Session 1.3.L2

Impact assessment of conditional payments for environmental services; Proposed session



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
Session: 1.3.L2 Impact assessment of conditional payments for environmental services;  
Proposed session  
Time: F2 Room: R3

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## 1748 A critical analysis of methodologies evaluating biodiversity value in offset banking

**Froger, Géraldine**

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This paper is submitted in special session "Impact assessments of conditional PES : theoretical insights and empirical evidence from a multi-country research project" (organizers : Esteve Corbera, Driss Ezzine de Blas, Renaud Lapeyre). It could also be presented in session 1.3

The quality of environmental assessment represents a key element of biodiversity offsetting success. After briefly introducing the main controversies arising on biodiversity monetization, we focus our discussion on evaluation methods mobilized in the context of biodiversity offset. Although there is currently no fixed framework assessing environment due resolutely to the specific nature of biodiversity, we analyze evaluation methods through a review of the academic and empirical literature. This allows us to select few methods, justifying these choices, and to present their strengths and weaknesses by keeping the aim to contribute to the debates. Thus, we distinguish ecological assessments (service-to-service) from economic' ones (value-to-value and value-to-cost) carried out in the infrastructure implementation's framework. On the one hand we emphasize the inherent differences between the two evaluation methods mentioned above and the specific sub-categories used; on the other we highlight the strengths and weaknesses of each applied methodology. Finally, we discuss the future potentials and risks of approaches used in the development of a biodiversity market.



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
Session: 1.3.L2 Impact assessment of conditional payments for environmental services;  
Proposed session  
Time: F2 Room: R3

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1733 The Social (Carbon) Network: coordination, conventions theory and carbon offset credits

**Hendrickson, Cary Yungmee. Presented by Estelle Corbera.**

Carbon offset production networks are layered with a complexity of values and motivations different actors use to justify their exchange decisions. Conventions apply values and discursively construct the social meaning and value of a carbon commodity. Carbon markets and carbon offsets for climate change mitigation are supported by commercial and industrial conventions of price and efficiency, but other conventions persist and clash in coordinating the carbon commodity production network. This paper takes a commodity network approach, using conventions theory, to analyze the values which are mobilized in the production of voluntary forest carbon offsets. Specifically, I identify conventions which shape the production of carbon offsets in linking the value-added processes from carbon offset producers to consumers. I examine how conventions are mobilized and circulated among actors at multiple scales, and I discuss how this complicates the coordination of the network. Different conventions are mobilized in each stage of value-added production: their relevance and mobilization depends on the actor's social, cultural and economic context. Consumers express civic concerns, environmental values and/or social values in buying carbon offset credits. In turn, the certification of environmental and social characteristics of carbon offset projects mobilizes industrial conventions, such as formal standards, which influence the design and process of producing the carbon commodity, and give trust and a sense of reliability to the commodity being exchanged. Farmers and communities in developing countries receive payments for activities that offset forest-carbon and produce the carbon commodity, but they are motivated to participate because of civic, environmental or domestic conventions as well. The outcomes of voluntary carbon offset projects link to the different imaginaries built around carbon as a commodity, and their shortcomings can be understood as a failure to coordinate the conventions mobilized in justifying their production.



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
Session: 1.3.L2 Impact assessment of conditional payments for environmental services;  
Proposed session  
Time: F2 Room: R3

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1752 Adoption of environmental friendly practices in agriculture: impact of environmental benefit incentive program in Costa Rica

**Le Coq, Jean-Francois**

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abstract submitted for the special session entitled "Impact assessment of conditional payments for environmental services: theoretical insights & empirical evidence from a multi-country international research project " organized by Esteve Corbera (ICTA-UAB, Spain) [esteve.corbera@uab.cat](mailto:esteve.corbera@uab.cat); Driss Ezzine de Blas (CIRAD, France) [ezzine@cirad.fr](mailto:ezzine@cirad.fr); Renaud Lapeyre (IDDRI, France) [renaud.lapeyre@sciencespo.fr](mailto:renaud.lapeyre@sciencespo.fr)

Aside from well-known payment for environmental services program (PSE) for forest conservation, Costa Rica engaged since 2007 in conditional rewards program (RBA for its acronym in spanish) to incentive adoption of agriculture practices that provide environmental externalities (RBA) Based on direct interviews to farmers and cooperatives, we assess 1) the factors that contribute to adoption of technology at cooperative or individual levels, 2) the complementarity between RBA and other

incentives such as PES and eco-label. We finally discuss the effect of this conditional payment program regarding the generation of externalities, point out some design failure that explains limits of the results, and finally propose some options according to the different purpose of the program.



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
Session: 1.3.L2 Impact assessment of conditional payments for environmental services;  
Proposed session  
Time: F2 Room: R3

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## 1753 Exploring the diversity of motivations to join Payment for Environmental Services (PES): case of Costa Rica PES

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abstract submitted for the special session entitled "Impact assessment of conditional payments for environmental services: theoretical insights & empirical evidence from a multi-country international research project " organized by Esteve Corbera (ICTA-UAB, Spain) [esteve.corbera@uab.cat](mailto:esteve.corbera@uab.cat); Driss Ezzine de Blas (CIRAD, France) [ezzine@cirad.fr](mailto:ezzine@cirad.fr); Renaud Lapeyre (IDDRI, France) [renaud.lapeyre@sciencespo.fr](mailto:renaud.lapeyre@sciencespo.fr)

As a pioneer case of Payment for environmental services (PES), the PES program of Costa Rica has been largely analysed regarding efficiency and equity. However, distinctions between regions and types of land users have not been thoroughly analysed. Based on the results of a survey of 190 beneficiaries of PES program in two regions of the countries (respectively the Huertar norte region in the North and the Osa peninsula in the South), we capture the motivations of land users to join the PES

program. Quantitative and qualitative analysis reveal that beyond the limits due to constraint of legal access to PES programs, the motivation to join PES differs according to characteristics, strategy and perceptions of land users. We draw a typology of PES beneficiaries that differs regarding their

motivations and use of PES. We shows motivations and use of PES also differ according to regional factors (historical and cultural factors as well as development options) and to types of PES (conservation, reforestation, agro-forestry system). We finally argue that current conclusions regarding efficiency of Costa Rican PES Program should be considered according to regions, and genuine multiobjectives of the PES program.



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
Session: 1.3.L2 Impact assessment of conditional payments for environmental services;  
Proposed session  
Time: F2 Room: R3

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## 1295 The Role of Local Level Institutions for Forest Management in Mexico's National Payments for Ecosystem Services Program

**Shapiro-Garza, Elizabeth**

Environmental issues have reached a critical stage, as evidenced by recent works from the Intergovernmental Panel on Climate and the International Union for the Conservation of Nature (IPCC, 2013 ; IUCN, 2013). In the meantime, in the aftermath of the end of the Bretton Woods system, finance has grown tremendously. It has become one of the major drivers of the advanced economies through a process known as financialization, leading to the shift from the fordist regime of accumulation to the financial capitalism regime of accumulation (Boyer, 2013). Building on the existing literature (Crotty, 2003 ; Epstein, 2005 ; Krippner, 2005 ; Lazonick, 2009 ; Orhangazi, 2008 ; Stockhammer, 2004), we define financialization as the process of growing macroeconomic importance of the financial sector alongside its growing political power and the orientation of non financial corporations management towards exclusive financial objectives.

As far as we know, environmental and financial dynamics are barely considered jointly in the literature. The deepening of environmental issues in parallel of the rise of financialization calls for a study of their potential interactions. In this paper, we link financialization with the Environmental Kuznets Curve (EKC) hypothesis. Evidences supporting the EKC are subject to controversy and no such global trajectories have been observed in countries whose level of income fits this hypothesis. Only few cases of environmental input and pollutant seem to follow an EKC path (Czech, 2008 ; Choumert et al. 2013 ; Dinda, 2004 ; Stern, 2004 ; Victor, 2010).

The assumption of this paper is that financialization has concrete ecological impacts and can affect the environmental trajectories of countries. Our research question is therefore the following: How does financialization affect the EKC hypothesis ? We investigate this question for the United-States, France, Germany, United Kingdom and Japan, over a period of 30 years from the 1980s until today. We identify and estimate four potential transmission channels of ecological impacts from financialization to the environment. They are assumed either positive, ambiguous or negative, respectively: (1) The impact of financialization on growth and its feedback effect on environment ; (2) The financialization of the environment and commodities ; (3) The impact of the financialization of firms management on their ability to implement more sustainable technologies and production processes ; (4) The impact of financialization on inequalities and its feedback effect on the environment.

Since it is a work in progress, we haven't reached any conclusion yet.



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Session 1.3.M

Economic valuation of marine and coastal ecosystem goods  
and services; Proposed session



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
Session: 1.3.M Economic valuation of marine and coastal ecosystem goods and services;  
Proposed session  
Time: F3 Room: R3

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1820 Ecological-economics valuation and spatial mapping of regulation services in marine systems: results from a study on carbon sequestration in the Mediterranean Sea

**Ghermandi, Andrea**

co-authors: Donata Canu, Cosimo Solidoro, Paolo Lazzari and Paulo A.L.D. Nunes

From a welfare perspective, the regulating service of carbon sequestration by marine and coastal systems generates positive welfare impacts that are felt globally in the form of nature-based mitigation of climate change. Because of its public good nature, however, the current markets and respective price signals fail to capture these benefits to society. In other words, the current market prices, in their wide range of market goods and services, fail to embed the contribution that marine and coastal system have in terms of carbon sequestration. The absence of information in the existing market prices with respect to the benefits generated by these systems may be incorrectly interpreted as indicating that the value of this ecosystem service is zero. Since many decisions, in both the private and public sectors, are based on market information, this information failure may fuel inefficient decision-making with respect to the management of marine and coastal ecosystems. In this context, the present paper provides an attempt to estimate empirically the benefits of marine systems in terms of carbon sequestration services. We embrace an integrated, ecological-economics, spatially explicit approach with an application to the Mediterranean Sea. The paper also explores applying this integrated, spatially explicit approach in the context of climate change.



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
Session: 1.3.M Economic valuation of marine and coastal ecosystem goods and services;  
Proposed session  
Time: F3 Room: R3

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**1821 Jellyfish Outbreak Impacts on Recreation in the Mediterranean Sea: welfare estimates from a socio-economic pilot survey in Israel**

**Gowdy, John**

co-authors: Bella Galil and Paulo A.L.D. Nunes

Jellyfish outbreaks in the Mediterranean Sea are part of an anthropogenic alteration of the marine ecosystem. The recurrent massive swarms have been amply documented as health hazards and threats to tourism. A socio-economic survey, carried out in July 2012, captured the welfare impacts of an invasive alien jellyfish outbreak (*Rhopilema nomadica*) among coastal recreationists in Israel. Results indicate that, on average, the welfare gains for the individual beach visitor over the summer season are estimated in 148 ILS (29.6 EUR). The Israel Nature and Parks Authority estimates in 55 million the yearly number of visits to the Mediterranean coast, which translates into estimated annual benefits of seaside visits of 296.5 million ILS, corresponding to 59.3 million EUR. The monetary value of the impact of jellyfish outbreaks on coastal recreation is estimated on the basis of the value per trip and the expected reduction in recreation trips as observed in our survey. In our survey we estimated that a jellyfish bloom would reduce the number of beach trips between 3% and 10.5%, which on an aggregate annual basis correspond to a monetary loss in the range between 8.9 million ILS (1.8 million EUR) and 31.1 million ILS (6.2 million EUR). Furthermore, a quarter of the respondents stated they will resume seaside visits once the swarm disappears. This, in turn, signals the opportunity to invest on public information systems that focus on reducing these welfare impacts. In this context, respondents are finally asked to state their WTP to support a national public information system, including daily/real time report on the beach conditions with respect to the present of jellyfish outbreaks. We find a substantial interest in participating in such an initiative, with 56% of the respondents stating that they would be willing to contribute the proposed amount of 60 ILS (12 EUR), which is translated into an estimated annual benefit of 13.4 million EUR. These figures reiterate the significant a large socio-economic value in providing public information. According to the scientific community this may be the most effective policy instrument to adapt to jellyfish outbreaks. In this context, we present a worldwide première implementation of such an instrument using social network platforms. This was applied in 2012 in the Barcelona.



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ISEE CONFERENCE ICELAND 2014

Session 1.3.N1

Institutions and policies for ecosystem services in Europe;  
Proposed session



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
Session: 1.3.N1 Institutions and policies for ecosystem services in Europe; Proposed session  
Time: W1 Room: R4

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## 1895 Institutions and policies for ecosystem services in Europe (introduction)

**Kluvankova-Oravska, Tatiana**

Actual approaches to conservation of natural resources targeting at habitat and species protection overlook ecosystem functioning and resilience of complex biophysical systems. Major gaps exist in addressing the importance of ecosystem services and their effects on well-being in related policies. The quality of these services results – among other things - from individuals' decisions and how they as well as from how decisions are regulated by norms and formal governance schemes, legislations, policies and various forms of economic incentives operating at and across the scale. Objective of the paper is to introduce key issues in ecosystem service governance further expanded in discussion session in particular (i) reasoning for shift from sectoral to ecosystem service governance, (ii) institutions for ecosystem service governance under the asymmetric and imperfect information and (iii) appropriate policy innovations to foster behavioral change. The main focus will be put on institutional innovations and decision-making approaches of the ecosystem services and navigation of behavioral change of ecosystems ? users and managers towards sustainability under the conditions of multilevel governance and increasing pressure of global market.



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
Session: 1.3.N1 Institutions and policies for ecosystem services in Europe; Proposed session  
Time: W1 Room: R4

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## 1896 Modes of ecosystem service governance conditioning the operational applicability of research

**Primmer, Eeva**

The concept of ecosystem services represents a science-driven approach that has gained political momentum. With a concept that is science driven, there is a risk of over-supply of knowledge from researchers to confused potential users. Ecosystem service research tends to draw on large datasets, aim at spatially explicit analyses and eventually seek to integrate models of multiple ecosystem functions with knowledge about human behavior. Even though the approach is superficial as regards human behavior, there is interest in the drivers of ecosystem change and the gains and losses humans might experience with this change. The analyses promise an improved understanding of tradeoffs. Much of the ecosystem service research ambition lies with very large scale assessments and targets a global, a European or a national decision-making community. But for these decision-makers, ecosystem services and trade-offs are rather abstractions. The more local level analyses reflect better the real decision-making situations and address problems that are relevant for the decision-makers in the area.

To make an operational difference, also large scale ecosystem knowledge should be channeled to the practice and institutions governing ecosystem services in a meaningful fashion. Who governs ecosystems, how are they governed and how can governance be influenced? Who makes decisions, what drives and conditions the decisions and how are decisions iterated? The different governance modes of 1) hierarchical top-down implementation, 2) scientific-technical decision-making, 3) adaptive collaborative governance and 4) managing interest driven strategic behavior have been theorized and tested in natural resource management and nature conservation. The understanding of these modes should be extended across ecosystems and ecosystem services and tested also at high governance levels. This paper analyses the applicability of these governance modes to large scale ecosystem service research and assessments.



Theme: 1.3 BIODIVERSITY AND ECOSYSTEM SERVICES  
Session: 1.3.N1 Institutions and policies for ecosystem services in Europe; Proposed session  
Time: W1 Room: R4

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## 1897 Fiscal innovations for ecosystem governance in Europe

**Ring, Irene**

Good ecosystem governance includes the sustained provision of ecosystem services and the conservation and sustainable use of biodiversity. Looking at conservation and land-use policies through a governance lens reveals new perspectives for economic analysis in the field of public finance. Firstly, the analysis of governance structures focuses on the division of responsibilities between governmental levels. The assignment of public functions to the appropriate levels of government is a familiar topic in public finances, and fiscal instruments such as intergovernmental fiscal transfers are specifically designed to address mismatches between functions and financial resources available to fulfill these functions. The perspective missing in this respect is a more systematic treatment of ecological public functions and their integration into intergovernmental fiscal transfers. Secondly, governance structures are analysed with respect to responsibilities divided between public institutions, civil society and the private sector. Thus, ecosystem governance assumes a more comprehensive perspective and includes the interplay between the public and private sector, and between different actors.

Good ecosystem governance in Europe is closely linked to sustainable land use which in turn requires a variety of conservation efforts and ecosystem services to be sustained, not least at local and regional levels. Despite this, there are few incentives for local actors to engage in environmental and conservation activities when costs are borne predominantly at the local level, whereas ecological benefits cross local boundaries. In contrast to the vast literature available on compensation payments and PES for private land users, comparatively few publications exist with regard to local public actors. However, it is just as important to consider local governments, because they hold decision-making, financing and implementing competencies for a number of land use-related issues. Although these competencies differ from country to country in Europe, land-use planning competencies in particular along with the implementation of various land-related measures are often decentralised and entail considerable consequences for conservation outcomes and the sustained provision of ecosystem services.

In this context, the paper will explore the fiscal innovations required for good ecosystem governance in Europe. This involves a multi-level analysis starting from EU-level decision-making relevant to biodiversity and ecosystem governance over national to regional fiscal transfer systems addressing decentralized public actors. This also involves a multi-actor perspective, highlighting local public actors regarding their motivations and incentives for sustainable land-use practices, and the interplay between the public and the private sector for good ecosystem governance in Europe.



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## 1898 Scope and limits of market-based instruments in ecosystem services governance.

**Gomez-Baggethun, Erik**

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The growing tendency to frame environmental problems as a failure to price non-market ecosystem services has coincided with the revival of monetary valuation and "market-based instruments" (MBIs) in the environmental science and policy agendas. Proponents of market-based instruments claim that, in comparison to traditional state-driven regulation, this new generation of policy instruments is more cost-effective, more capable to collect resources from the private sector, and more likely to create win-win solutions in pursuing goals of environmental conservation and poverty alleviation. Critical theorists, on the other hand, claim that MBIs can erode intrinsic motivations for conservation, contribute to the commodification of nature, and promote unequal access to land and resources. We draw on empirical case studies and institutional economic theory to examine the scope and limits of MBIs in ecosystem services governance. From our analysis we show that while the use of MBIs is likely to increase in the coming years, their scope of application to effectively address problems on the ground will be ultimately compromised by three major types of limitations: i) the non-fungible character of most ecosystem services complicates the definition of discrete tradable units, ii) the public good nature of most ecosystem services can involve high transaction costs for developing environmental markets, and iii) commodification of nature encounters wide societal contestation. We also note that responses to environmental problems that are traditionally framed in technical ways (e.g. need to correct the economic compass through monetary valuation and economic incentives) are in reality social dilemmas about the governance of the commons with fundamental political implications (e.g. where should the limits in the commodification of nature be set). We propose that, with rapid expansion in the implementation of MBIs there is a pressing need to deliberate on which ecosystem services fulfill the biophysical, institutional and ethical conditions to be governed by market instruments in an effective and legitimate way and which should be primarily governed by non-market institutions under logics of public policy and community-based regulation. We conclude by providing tentative criteria to define the scope and limits of markets in ecosystem services governance, including feasibility of technical substitutability and equivalence, transaction costs, basic needs, incommensurability, and environmental justice.



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## 1899 Ecological fiscal transfers in Portugal: Status quo and perspectives

**Ring, Irene**

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Intergovernmental fiscal transfers redistribute public revenues from national and regional governments to local governments usually based on socioeconomic indicators such as population. Recently, ecological or conservation-based indicators have been introduced in intergovernmental fiscal transfers, under the designation of Ecological Fiscal Transfers (EFTs), to acknowledge the role of local public authorities in nature conservation. These schemes usually apply a quantitative criterion, such as surface of protected areas, as a proxy of the importance of the ecological functions provided by a given territory.

With the 2007 amendment of the Portuguese Local Financing Law (LFL – Law 2/2007), Portugal became the first EU Member State to implement EFTs integrated in the annual transfers from the national to the local level (municipalities). The ecological criteria in play in this law are the total area under protection and the percentage of municipal land occupied by protected areas.

An analysis of the ecological signal introduced in the Portuguese LFL shows that ecological transfers are very significant both in terms of total municipal fiscal transfers and ecological fiscal transfers received per hectare of Classified Areas (Santos et al, 2012). It discriminates positively municipalities with a high share of classified areas but the incentive still does not seem to compensate for the opportunity costs in some municipalities.

Like other EFT schemes, the Portuguese law does not take into account the quality/ level of protection of different categories of protected areas, or the ecological goods and services provided by areas outside nature conservation networks. This is acceptable in a first stage of implementation, in order to avoid complexity and allow a progressive change in the mindset of decision-makers. However, this scheme can be improved to increase its effectiveness and performance regarding other relevant policy criteria (e.g. efficiency, equity).

In this paper, we evaluate how relevant have these EFT been (could be) to change local public actors behaviour and compensate for opportunity costs, based on interviews to local public actors in municipalities in the southeast of Portugal. Alternative scenarios are tested to analyze the impact of introducing new ecological criteria for fund allocation, namely applying different indicators (such as provision of ecosystem services) or assigning different weights to the ecological component. Regardless the option used, it is critical that the selected indicator(s) are aligned with the conservation policy objectives and goals of the instrument, whether they are to compensate for opportunity/management costs or to acknowledge spillover benefits.



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## 1900 Ecosystem Services in Urban Public Spaces as Commons. Challenges for Behavioral Change?

**Finka, Maros**

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Concentration of economic activities and increase of urban population has rapidly influenced demand for urban ecosystem services. Urban systems represent complex, socio-biophysical systems interacting far away behind their administrative borders. Functional interactions and global partnerships are effecting their performance, in the same time strong interdependences of urban systems on local resources remains. This leads to the growing vulnerability of urban systems to external shocks, such as climate change effects, often appearing locally but affecting the whole system. While most of economic activities are individual and private, urban resources remains common pool resources, characterised by costly exclusion of beneficiaries through physical and institutional means and high subtractability of resource units available to others. Thus individuals jointly using (CPR) are assumed to face potential social dilemmas in which individual short-term interests are in conflict with long-term society interest.

Urban commons are facing the problems of social dilemma typical to physical commons, where institutional maturity and behaviour of users significantly affect quality of public spaces, although absence of proper practice does not automatically imply into the resource depletion but rather deterioration of functions of urban public space. Vulnerability of ecosystem services in urban public spaces rapidly increased due to multilevel factor, in particular while ecosystem services are local, distant users operates across governance scale and with diverse interpersonal and social interest often ignoring sustainability and carrying capacity of local ecosystems. Furthermore, traditional governance modes based on territorial belonging challenges legitimacy of representative democracy resulting from the growing scale individualism of human existential space and overlapping action spaces of particular activities.

In our paper we determine possible institutional novelties to address issue of the efficient management of ecosystem services in urban public spaces as common pool resources. In particular polycentric governance and spatial-structural polycentricism is considered to have high potential to address challenges of public open spaces sustainability and develop adaptive strategies to manage urban commons under the complexity. We will (i) identify key factors of urban ecosystem services vulnerability, (ii) potential of common pool resource regime and polycentric governance to innovate traditional spatial resource management, (iii) demonstrate it on success and failure examples from cross border and transnational cases.



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## 1902 Behavioural change to sustainability of soil ecosystem services in Europe: Methods and analyses,

**Kluvankova-Oravska, Tatiana**

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The key challenge of soil protection is to identify the most appropriate land management strategy in the face of agriculture driven land-use change. Traditionally soil socio-ecological systems (SES) such as pastures, forest land, conventional but also alternative crop systems represents local systems that have persisted for a long time adapting their rules in use to natural and social disturbances as well as to the broader economic, political and social systems in which they were embedded. Globalisation however introduces a dimension of scale which affects the vulnerability of traditional SES systems to external disturbances. In particular traditional (long lasting) institutions are challenged by global market actors and global policies, and their institutions that are not embedded in local institutional arenas. The market increases the vulnerability of SES as it demands the intense exploration of soil biodiversity ecosystem services. Within the EU 7 FMP Ecofinders we applied innovative methodological approaches (i) institutional analyses (SES framework and Multicriteria mapping) and (ii) behavioural experiments to address long term sustainability of soil ecosystem services in Europe in particularly when dealing with large scale governance systems and their interconnections within nested multilevel governance structures.

At first SES framework was implemented as cross country comparison as well as numerous soil SES to identify alternative land use practices as key variables for soil ecosystem services preservation under the market pressure and multiple scale. Implementation of Soil directive across EU has been identified as key decision to incorporate sustainable soil use in Euro integrative policy and to address effectiveness of ecosystem services protection. Together 45 conventional and alternative farmers from 5 EU regions completed in depth- interviews that complemented data from Eurostat and analyses of EU soil policies.

Multicriteria mapping, undertaken with 25 stakeholders has provided qualitative assessment of soil biodiversity indicators beyond cost-effectiveness. Each indicator was checked against a list of criteria to assess the indicators sustainability to represent the quality of soil biodiversity. The results were compared with the assessment undertaken by soil biodiversity experts and researchers.

Effect of monetary incentives on behavior of users of ecosystem services has been tested by application of behavioral experiments . Key issue is financial incentive for sustainable use of soil ecosystem services as common pool resources under the asymmetric and imperfect information. Experiments conducted in lab (controlled conditions) determined other regarding preferences for sustainable behavior, the effect of communication on collective action and cooperation for the management of commons as well as 'crowding out' positive behavior if monetary incentive for sustainable behavior is terminated. Experiments were conducted using google drive platform with undergraduate students from universities in Slovakia and will be applied in field with farmers.



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## 1903 Ecosystem services and climate change adaptation: Participatory scenario and modelling in diverse European landscapes

**Vackar, David**

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Social-ecological systems are facing an increasing burden of climate change impacts. The future state of ecosystem services is a complex outcome of current decisions and actions within the human society. The state of ecosystems is undoubtedly influenced by the economic return from the landscape. Investments into adaptation measures as a response to recent climate change have both ecological and economic implications. The predicted impacts of climate change are driving ecosystem use trade-offs and decisions on the sustainable management of ecosystems. Several European policies have been designed to stem the loss of vital ecosystem services and biodiversity or mitigate the impacts of climate change (EU Biodiversity Strategy, EU Strategy on Adaptation to Climate Change).

Ecosystem-based adaptation (EBA) has been proposed as a "natural" solution to adaptation to climate change. EBA is supposed to enhance the adaptation capacity of human society through the sustainable management and restoration of ecosystem services and provides multiple benefits to human society. However, the conversion and degradation of ecosystems have resulted in substantial decrease in the provision of ecosystem services worldwide and the importance of ecosystem service research for environmental decision-making has been widely recognised. However, application of policies for integrated governance of ecosystems still lags behind the EU-wide developments. Analysing the trade-offs among various ecosystem services helps to understand the full impact of landscape management, which is particularly important in valuable and vulnerable areas.

In our contribution, we present impacts of adaptation measures on ecosystem services and their perception by different stakeholder groups in selected case studies across the Czech Republic. The analysis is based on different scenarios of climate change and ecosystem services utilization in different landscapes (social-ecological systems): a city urban system, rural agricultural landscape, wetland biosphere reserve and a forested national park. We demonstrate different approaches to the analysis of social-ecological systems, including for example biophysical and economic modelling of ecosystem services using an InVEST modelling tool and participatory approaches to scenario development and cost-benefit analysis. We analyse future trade-offs in ecosystem services demand and the adaptation pathways which could lead to a sustainable use of ecosystems and integration of biodiversity and climate adaptation policies.



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## 1642 Ecosystem Service Valuation for Local and Regional Decision Makers

**Winslow, Maggie**

Ecosystem services, such as pollination, water purification, and flood control, are increasingly recognized as valuable to human well-being. The destruction and degradation of these services can lead to high replacement costs. This often puts local and regional planners and administrators in a difficult position as they try to make decisions related to the preservation of natural resources along with the ecosystem services these resources provide. Increasingly, case studies and research on ecosystem services indicate that the conservation or restoration of the natural resources already present in communities can actually provide benefits and cost savings above and beyond the costs/benefits of development projects designed to offer similar services. For the past two decades, a variety of private, governmental, and non-governmental organizations have developed tools and collected data that allow for better assessments of the values associated with these services. With the increased availability of these tools and the data related to the value of ecosystem services, public administrators and planners can now better estimate replacement and other costs associated with natural resources in their regions allowing for more-informed decisions about the costs and benefits associated with preserving or not preserving these resources. This presentation considers the state of the art of ecosystem service valuation (ESV), provides case studies of how this information is used by local and regional governments for decision making, and provides recommendations on how managers and administrators can best use available information and tools to estimate values associated with their own local and regional ecosystem services.



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## 1712 The potential and pitfalls of multi-criteria evaluation methods in valuing ecosystem services

**Saarikoski, Heli Virpi**

The import of ecosystem services for human well-being is widely recognized (MA 2005) but mechanisms and approaches for integrating them into policy making and management practices are still lacking. According to the influential TEEB project, the best way to mainstream the ecosystem service approach is to make the previously invisible changes in nature's flows into the economy visible through economic valuation. Yet economic valuation of the environment is also criticized, mainly by ecological and institutional economists, who argue that economic valuation can actually undermine environmental protection and pave way to commodification of nature. According to the critics, economic valuation fails to capture the less tangible social and ethical concerns such as cultural and moral values that are not amenable to tradeoffs and monetary transactions. The critics also warn that monetary valuation can reduce citizen preferences into consumer preferences and ignore distributional impacts, which are key considerations in ecosystem service valuation.

Given the limitations of monetary valuation, there is a growing interest in non-monetary valuation methods such as multi-criteria analysis (MCA), which can be seen as an alternative or complementary approach to economic valuation. Most ecosystem services have the characteristics of common goods and therefore several scholars have recommends the use of deliberative value articulating institutions such as MCA when valuing most ecosystem services (e.g. Vatn 2009, Spangenberg and Settle 2010, Chan et al. 2012).

The aim of this paper is to discuss the potential and limitations of MCA methods in ecosystem service valuation context, as opposed to economic valuation in CBA framework. In order to ground the discussion in a concrete case, we have drawn a case study of an old-growth forest conflict in Finnish Upper Lapland, and illustrated the ways in which a participatory MCA process and traditional CBA would approach the problem and present value information.

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## 1220 Ecosystem Services in German Infrastructure Legislation

**Droste, Nils**

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Integrating ecosystem services (ES) into political decision making has recently been put forward by both a number of scientific studies (MEA 2005, TEEB 2012) and supranational institutions such as the EU. In this study we analyse how far the ES concept has been incorporated in the German public decision making process on public infrastructure projects. We illustrate the relevance of ES in a case study of a projected deepening of the Weser river channel in North-West-Germany and show that ES are hardly included in German public infrastructure decision making.

According to the Federal Transport Infrastructure Plan projects require a certain cost-benefit ratio to be implemented. Although losses in environmental quality have to be assessed and compensated, the associated costs are not included in the cost-benefit analysis (CBA). Furthermore, there are systematic overestimations of the cost-benefit ratio, particularly by classifying maintenance cost as negative benefits. For our case study, we recalculate the CBA by integrating the monetary value of changes in different ES: Firstly, we estimate the value of change in fresh water supply for agricultural production with the replacement costs of a planned man-made alternative. Secondly, we approximate the costs of change in habitat and species conservation by transferring the willingness-to-pay from a contingent valuation study in the same region (Meyerhoff 2002) to the area affected by the Weser deepening as assessed in the environmental impact assessment.

We thus show that by integrating these costs the cost-benefit ratio already drops from 1:26.2 to 1:5.8. Correcting for the systematic bias further reduces the cost-benefit ratio to 1:3.6. It can be hypothesized that including further ES in the CBA would lead to a cost-benefit ratio below the legal threshold for implementation. We conclude that integrating ES in the political decision making in Germany would substantially alter the realisation of public (waterway) infrastructure projects.

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## 1778 Urban Sprawling and Ecosystem Services: A Half Century Perspective in the Montreal Area

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Urban sprawling has become central to the issues of sustainable urban development. This process generally leads to multiple impacts on land use change, including loss of sensitive natural areas, farmland and fragmentation of ecosystems, which negatively impact the production of a wide range of ecosystem services. In this study, we used direct market prices, avoided costs and benefit transfer methods to evaluate the value of ecosystem services (ES) provided by forests, croplands, grasslands and wetlands. We then applied it to a series of four spatial analyzes of the Metropolitan Region of Montreal (Quebec, Canada) using an interval of 15 years (1966, 1981, 1994 and 2010). We demonstrated that even if different strategies were implemented to manage urban sprawling in the last 45 years, its negative impact on ES economic value is observed throughout time. The important losses of total ES value are explained by land use conversion as well as by socio-economic drivers, such as the number and size of farms, GDP per capita, total population and the density in urban population. The projections of future scenarios based on the status quo show a possible threshold in ecosystem services provisioning in the Montreal Metropolitan area by 2023. In the context of important land use demands and trade-offs, planners should consider different ways to maximise the provisioning of ES. Conservation of pristine ecosystems and key natural areas is certainly the core of biodiversity preservation, but strategic planning calls for a connection between natural areas in order to maximise ES and a densification of built-up areas in order to reduce land use demand.



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## 954 Sustaining Rural Livelihoods to Sustain the Commons in the Republic of Georgia

**Kemkes, Robin J.**

This study measures the impacts of state-imposed commercial development and forest policy on rural communities in the district of Upper Svaneti in the Greater Caucasus of the Republic of Georgia. Analyzing these effects is particularly salient as the state attempts to attract foreign investment with the option to liquidate natural capital and the wealth and power divide between urban and rural regions is widening. The forests, household livelihoods, cultural heritage and traditional property regimes of Upper Svaneti are now under threat by land acquisitions for the construction of a ski tourism zone and by revisions to the Forest Code that will allow 49-year concessions to forests and their underground resources. I use original survey data collected from 250 households in nine villages across the district to measure livelihood dependence on environmental income. I then assess how the revocation of traditional property rights and the introduction of wage employment might sever the connection between households and their environment and, in turn, affect longstanding social structures. In particular, I examine how these changes will affect collective action for community forest management. I estimate an OLS regression model with village fixed effects of household characteristics on dependence on environmental income. I find that low-income households are especially dependent, ranging up to 60 percent of total income, as are households in villages at a greater distance from market centers. Losing access to natural capital will have the greatest impact on poor households with few alternatives. I also estimate a linear probability model of household characteristics on support for community management of forests. I find a negative relationship between participation in wage employment and support, but a positive relationship between dependence on environmental income and support. It follows that the current development trajectory can be expected to erode collective action for managing natural capital. I conclude that new wage employment in the tourism and timber industries is not a sufficient substitute for losses in environmental income, due to the importance of diversified livelihood strategies for managing risk, the value of maintaining traditional governance structures and ecosystem functions, the limited substitutability of environmental goods, and the diminished purchasing power of wage income. An alternative development approach, such as ecotourism based on establishing a protected area, that retains traditional subsistence practices, supports community management of forests, and provides equal opportunity for households across the district, would be more desirable than the development trajectory that is currently planned.



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## 976 Commoning and Common Information Systems for Social Equity and Ecological Sustainability

**Vitari, Claudio**

Ecological sustainability and social equity are among the United Nations' Millennium Development Goals - but, unfortunately, as the years pass, they are still far from being reached. But concern about these issues has made its way to industry and the IS community. Information System (IS) people have also become more concerned: some have responded to the issue of ecological sustainability via 'Green IT' initiatives - although we argue that the contribution IS makes to ecological sustainability could go much further than Green IT - while others have responded to the social equity issue via 'Free Software', although other IS initiatives exist in this area too.

IS play central roles in companies, as they are cross-functional and have very high strategic value in contemporary human society - which has been called the "information society" - and so are in a favourable position to help transform both business and society at large to make them more compatible with the aims of ecological sustainability and of social equity.

This article proposes Commoning and Common Information Systems as a possible tentative to facilitate the inclusion of both ecological sustainability and social equity concerns within the IS discipline. We advance this new concept of Common Information Systems, which are IS where (1) the surrounding society is considered a human community, (2) the material and energy input into the IS are seen as common goods, and the material and energy leaving the IS are viewed as common bads, (3) commoning (i.e. sharing) information output is preferred.

As far as Information Systems are everywhere, we estimate that Commoning and Common Information Systems can infect the other business and society domains. People in contact with Common Information Systems could wonder about the applicability of the commoning to other issues, as we observed from software to hardware contagion. This contaminating effect could be levered to transform both business and society at large to make them more compatible with the aims of ecological sustainability and of social equity.

Our article first describes this novel conceptual framework which could facilitate the reflection and action needed for ecological sustainability and social equity. Second, we give several examples of contagion. Finally, we propose some research questions that need to be addressed.

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## 1379 Urban Governance. Sustainable Management of Semi-Public Spaces as Commons

**Maco, Michal**

Traditional research on commons is dealing with natural resources, but new fields of commons research are emerging constantly and commons in the urban environment are one of them. Semi-public urban spaces as human-constructed commons, shared by communities, are subtractable and their qualities are confronted by excluding users from access to them. Struggling to cope with management challenges of these shared urban spaces, lessons from commons governance can thus be seen as a promising concept. Based on the existing case studies and own empirical research (CEE countries) we are illustrating possibilities for application of commons solutions in the context of shared urban spaces and even wider context of spatial planning. In contrast to natural commons, absence of proper institutionalized or non-institutionalized governance rules does not immediately lead to the loss of the resource, a certain decrease of quality is still apparent. This indicates that urban spaces need inovative approaches to collective management. In this paper, we are bridging the disciplines of spatial planning and institutional economics, by trying to address the benefits of Ostrom's design principles to the management of semi-public urban spaces. Clarification of terms and a critical assessment of the validity of these solutions can lead towards a verification of new approaches on urban governance. Well-being and equity within the shared urban space are regarded as key qualities for its users, and it is a matter of research and discussions, if these new approaches are able to accomplish them.



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## 1128 Co-management regimes for governance of protected areas: Lessons learned from Vatnajökull National Park, Iceland.

**Pétursson, Jón Geir**

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Co-management is a widely promoted concept to govern natural resources, challenging the more traditional top-down, centralized approaches. It entails more socially inclusive approach, promoted to enhance governance outcomes, as to advance issues such as local community rights, equity and legitimacy. The general notion of this paradigm is some type of a power-sharing arrangement between the central state and a community of resource users and/or local government. This has become an influential approach's in protected area (PA) governance that has been instituted in various forms in many countries.

Iceland has gradually expanded its PA estate to approximately 20% of its terrestrial area. Vatnajökull National Park (VJNP), encompassing around 15.000 km<sup>2</sup> is the largest PA and the second largest national park in Europe. The park was established by a specific legislation in 2007 that manifests a co-management governance approach, then an innovative conservation policy intervention in Iceland.

The study has the objective to examine the governance lessons learned from VJNP after five years in operation. The research questions are:

- a) to analyse the co-management governance structure of the VJNP
- b) to examine the experience and outcomes of the parks performance
- c) to conclude on the lessons learned five years after the parks establishment

The theoretical background for the study is the important scholarship on institutions and management of common environmental resources. This provides a range of analytical tools for the examination and understanding of governance challenges and outcomes. The study elaborates a theoretical framework for its analysis, based on primary data collected in 2013 from stakeholder meetings, semi-structured interviews and questionnaires.

VJNP has a legal status as a governmental authority, while its co-management system is a innovative decentralized model, handing real executive power and decision making to local governments and civil society. The institutional attributes of the co-management system are thoroughly compared and contrasted to the more traditional centralized PA governance, revealing its strengths and weaknesses. The co-management regime is found generally effective and is perceived legitimate by most stakeholders, especially at the local level. There is a strong notion of local ownership that has added greatly to solving conflicts on sustainable use and access. The institutional properties of the local-central power sharing agreements need however some revisions, especially on the role and powers of respective actors. The study concludes and



provides general policy recommendations that are conducive to co-management models to govern PA 's, based on the lessons learned from VJNP.



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1487 Social Preferences under Different Environmental Policy Instruments: A Field Experiment with Fishing Communities based on a Common-Pool Resource Game

**Ertor-Akyazi, Pinar**

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This study investigates whether environmental policies involving economic incentives such as monetary fines or market mechanisms might create unintended consequences by crowding-out or crowding-in social preferences of the common-pool resource users. In line with existing studies on the intersection of commons and social preferences, the study employs a field experiment (e.g. Cardenas et al., 2000; Cardenas and Ostrom, 2004; Narloch et al., 2012), since this makes it possible to focus on real-life environmental issues, real actors involved in the problem, and the real good in question.

A common-pool resource game based on prisoner's dilemma is extended to include altruism as a way to capture the social preferences of the subjects, if there are any. The experiment uses policy interventions (each of which provides a different frame) to test whether social preferences are affected when the environmental problem is addressed by a fine for over-extraction, or by a market-like purchase of rights to extract, or as a deliberation process. Subjects are drawn randomly from a population of small-scale fishermen in Turkey's Marmara Region who face an overfishing problem. The subjects are given a payoff table generated using the above mentioned game's structure and parameters. There are five treatments (with eight individuals in each treatment) for four fishing communities in the Marmara Region so that the total number of participants is 160.

The calculation of the average level of altruism for each treatment allows us to test, for instance, whether the subjects in the market treatment are, on average, less altruistic than those in the fine treatment. It is expected that a fine accompanied by the announcement of the social optimum may crowd-in the social preferences of fishermen since the fine may be signaling that it is morally wrong to overfish. Moreover, a deliberation process prior to the decision about the extraction may raise the average altruism level of the subjects. Similar hypotheses are tested comparing the average level of altruism of the fishermen across different policy interventions. It is hoped that the study will have implications for environmental policies that emphasize the potential success of economic incentive approaches to commons management.



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## 1418 Angles to justice in the fishery - Notions of justice held by users of the ecosystem service fish in Newfoundland, Canada

**Kahmann, Birte**

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Since notions of justice usually differ between people, the concept of justice is contested. It is an important and often discussed issue in the context of resource use and ecosystem service management. One example is the management of fish stocks and other marine ecosystem goods and services, which are threatened by overexploitation all over the world (Coward et al. 2000, Gray 2005). This study aims to identify the notions of justice held by users of the ecosystem service fish in Newfoundland, Canada. Using qualitative face-to-face interviews, 20 different stakeholders active in the fishery were asked a questionnaire based on a 'conceptual structure of justice' (Stumpf forthcoming, Baumgärtner et al. 2012). This structure helps to specify several elements necessary to fully describe a specific conception of justice: the community of justice including the claim holders and the claim addressees, the claims of the claim holders, the *judicandum* (that which is to be judged as just as unjust), the metric for the judgement (informational base and principles), and the instruments of justice. The interviews showed that most respondents find that participation of all relevant stakeholders in the decision-making process is necessary if decisions are to be just. Furthermore, the outcome should particularly enable the inshore fish harvesters to make a good living from the fishery. However, the perceptions of the level of participation and whether stakeholder involvement should be based on the principle of equality, or should be proportional to need or desert, differed between the interview partners. Institutions (especially regulations of the fishery) played a role in the answers of the interview partners as *judicanda*, instruments, instrumental claims and informational base. Although not aiming to derive detailed implications for the fisheries management, the study nevertheless gives some insights into the difficulties of developing a management system which aims to be more just to everyone.

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Theme: 1.4 STEWARDSHIP OF THE COMMONS  
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## 1253 Biophysical Constraints, Growth, and Equity: Evidence from India, 1988-2012

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A fundamental conundrum facing nations of the world as they confront problems at the intersection of biophysical sustainability and inequality is to redirect economic growth to make it more equitable. Large parts of the developing world need to grow even while the rich industrialised nations debate de-growth. In recent years “inclusive growth” has been presented as a panacea to the problem of equitable growth on a biophysically constrained planet. However, we currently do not have a robust metric to measure inclusiveness of economic growth.

We construct a simple metric to track the distribution of economic product in the growing Indian economy, and ascertain inclusivity of the economic growth. Given a society’s inequality aversion, inclusive economic growth ideally should result in equal distribution of the product of economic growth among all individuals in the economy. Following Atkinson (1970), we define Equally Distributed Equivalent Consumption (EDEC) as consumption that, under conditions of perfect equality of consumption, results in the same welfare as actual observed unequal consumption bundles. Simply put, we ask the following normative question: What ought to be households’ consumption pattern if the product of economic growth was equally distributed in India’s growing economy? We use systematic nationally representative data on consumption expenditure from 1988 to 2012 by National Sample Survey, India. We estimate EDEC for different levels of inequality aversion for different geographical aggregations and social groups. The growth rate in EDEC over these 25 years is interpreted as the inclusive growth rate corresponding to each inequality aversion. We juxtapose these growth rates on the actual growth rate of consumption expenditure. Such a counterfactual consumption paths aid in assessment of how ‘inclusive’ has the growth been over the last three decades, given a normative notion of desirable social outcome. We also estimate society’s inequality aversion if the actual distribution of economic product (as measured by consumption expenditure) is, in fact, considered inclusive.

Following Ashenfelter (2010), we use the price faced by an individual for a basket of cereals as the numeraire (instead of standard deflators to index consumption) to compare consumption expenditures across time. This allows us to tide over significant problems with GDP deflators used to compare consumption bundles across a long period of time.

Finally, we make normative observations about the place of inclusive growth on a planet with finite biophysical constraints, and propose a framework to integrate our inclusive growth metric in established ecological-macroeconomics models.



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## 1529 Land-based Certification for Financing Stewardship of Biodiversity in Developing Countries

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Land-based Certification for Financing Stewardship of Biodiversity in Developing Countries

The paper presents reflections and first experiences concerning chances and challenges associated with developing a land-based certification system aimed at paying stewards in developing countries for biodiversity conservation. Our case study region is Namibia's Caprivi region, the center of the Kavango Zambezi Transfrontier Conservation Area (KAZA TFCA).

For reasons of environmental justice and also explained by the expected efficiency of market-based instruments, the Convention on Biological Diversity (CBD) seeks to significantly involve the private business in conservation financing. Compensation of companies' environmental footprints is one of the arguments in favor of market-based conservation schemes. The establishment of an international standard and certification system could arrange for land management that is compliant with CBD objectives and at the same time could meet the monitoring and verification requirements of private investors. However, the parallel success of development and conservation within the same area is not an easy task and involves innovative institutions and governance structures, which can secure sustainable use of natural resources as well as the maintainable finance of the system.

The Millennium Ecosystem Assessment (MEA) established a proved framework for communicating the key role of ecosystem services for human-well-being to decision makers and to the private business, and the concept of Payments for ecosystem Services gained recognition as a market-based instrument for conservation and rural development. However, the integration into an operating international market system such as the carbon emission trading is still missing.

The framework of our empirical analysis was threefold; first we analyzed the socio-economic situation of potential stewards living in conservancy areas who often do not even know how valuable their environment is, and how the damage of ecosystems would negatively impact on their long-term livelihoods. Second, we assessed long-distant tourists' willingness to pay (WTP) for ecosystem certificates, and companies' willingness to invest (WTI) in land-based certification schemes; third we investigated appropriate market institutions to match potential stewards and investors. The study basically employed behavioral economics, choice experiments, and regional CGE modeling.

Using experimental economics, mechanisms for environmental protection like transferable quotas, inverse auctions, and protected fishing zones were introduced and discussed with local stakeholders. The group was asked to develop community-based management plans for their ecosystem. Based on existing programs such as the LifeWeb and as result of our empirical findings, we designed a governance structure for an international land-based certification scheme.



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## 1925 Conservation and change: a global conceptual framework for property rights and compensation

**Mauerhofer, Volker**

The paper describes a new conceptual framework based on property rights and financial compensation in different nature conservation situations in order to provide a globally applicable system for the assessment of changes within those situations. These situations of change represent a modification from conservation toward non-conservation and vice versa. The framework distinguishes further between governance systems based on command and control as well as on negotiation. Within these main change situations and governance types, the framework allows the distribution of change situations into 8 main sections. These main sections are further separated into 32 sub-sections by means of different property right and compensations situations. The theoretical utility of this new framework is then demonstrated by testing it by means of a random sample of 68 papers (25%) out of representative 275 papers from the academic literature dealing with property rights. These 68 papers provided practical examples for situations of change in conservation as evidence for most of the 32 sub-section. Several papers provide examples for more than one sub-section. The allocation of papers to these different subsections is described and discussed in detail. This widely possible allocation proves in general the global applicability and usefulness of the new framework. The framework also proved to be appropriate for formally (rule of law based) and informally (customary law based) institutionalized situations. Furthermore, the results allow simple assumptions on the regularity of occurrence of situations representing the 32 sub-sections. The discussion deals with the scope as well as the limits of the new framework. It also explores the frameworks' potential future extensions such as regarding relative predictions on the length of negotiation procedures and on the amount of the compensations.



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Session 1.4.D

Ecological and social impacts of a changing Arctic; Proposed session



Theme: 1.4 STEWARDSHIP OF THE COMMONS  
Session: 1.4.D Ecological and social impacts of a changing Arctic; Proposed session  
Time: T2 Room: R5

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## 1114 Sustainable development in the Arctic: exploring approaches to policy-relevant indicators in the ECONOR project

**Aslaksen, Iulie. Presented by Per Arild Garnåsjordet**

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Special session: Ecological and social impacts of a changing Arctic: exploring the capacity for wellbeing and equity within planetary boundaries. Abstract: Climate change and global economic development have large impacts on Arctic environment and nature-based livelihood, as well as on conditions for socio-economic sustainability. Studies of Arctic sustainability bring out core issues relevant for ecological economics. The complexity of the socio-ecological systems of the Arctic challenges the science community and policy makers to take into account interactions between economic development, ecological systems, and social conditions. Strong uncertainties regarding the extent of climate change impacts and their irreversible consequences amplify the need to consider Arctic economic development from precautionary perspectives. Interdisciplinary approaches are needed to take into account diverse economic, ecological, social, cultural and ethical values when assessing climate change impacts and proposals for climate change adaptation. The knowledge base for policies for Arctic sustainability need to be strengthened, taking into account institutional conditions of Arctic economies and societies and the importance of capacity building with regard to knowledge, education and politics. In the circumpolar ECONOR project we describe and explore conditions for sustainable development in the Arctic, in terms of economic and social indicators and studies of impacts on Arctic ecological conditions. The purpose of this paper is to outline conceptual approaches to studies of sustainability relevant for Arctic sustainability, in terms of natural resource management, income distribution, the role of the subsistence economy, and impacts on biodiversity. While employment and revenues from petroleum and mineral extraction are expected to be the pillar of the economy of many Arctic regions, renewable natural resources still contribute in important ways to the Arctic economies and culture. Fishing, hunting and reindeer herding for own consumption and community sharing is still a major source of subsistence livelihood for many indigenous and other local people. The economic development, with increased global demand for natural resources, has large consequences for environment, income distribution, and the potential for traditional living in increasingly market-based economies. We emphasize the need for an integrated approach to studies of Arctic sustainability and policy-relevant sustainability indicators. In the companion papers of this proposed special session, analysis of petroleum, minerals, fisheries and forest management illustrates impacts of the natural resource boom on Arctic sustainability. Together the papers present preliminary results from the ECONOR project and place a circumpolar research project on Arctic sustainability in the context of ecological economics.



Theme: 1.4 STEWARDSHP OF THE COMMONS  
Session: 1.4.D Ecological and social impacts of a changing Arctic; Proposed session  
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## 1118 Arctic petroleum extraction under climate policies

**Lindholt, Lars**

Abstract for the session: Ecological and social impacts of a changing Arctic: exploring the capacity for wellbeing and equity within planetary boundaries

Arctic petroleum extraction under climate policies:

The Arctic contains vast resources of oil and gas. Will the Arctic actually lose on an international climate agreement through a fall in petroleum revenues? In this study we present simulations with the model FRISBEE that suggest that this is not necessarily true.

The FRISBEE-model describes future supply and demand of oil, gas and coal through elaborate modelling of investments and production. The model covers six arctic regions; Alaska, Arctic Canada, Arctic Norway, Greenland, East Arctic Russia and West Arctic Russia. Lindholt and Glomsrød (2013) depict future arctic production of petroleum without climate policies to 2050. We find that although a major part of the undiscovered arctic petroleum resources is natural gas, the relative importance of the Arctic as a world gas supplier will decline, while its importance as a global oil producer may be maintained.

A global price on CO<sub>2</sub> will lead to reduced demand for fossil fuels. This might affect the price of the Arctic's most important export products, oil and gas. In the FRISBEE model, coal and gas markets modelled as competitive markets, while OPEC is a dominant player in the oil market.

The main result of the calculations is that the Arctic may not lose petroleum revenues from a global climate agreement. The reason is firstly that a CO<sub>2</sub> price may increase the demand for gas. This can lead to increased gas prices for the arctic producers. At the same time we find that oil prices do not fall as much as one could expect. The reason is that OPEC may find it profitable to reduce its production to ensure roughly the same price of oil one would have without a climate treaty. The CO<sub>2</sub>-price has far stronger effect on coal prices than oil prices, both because coal has higher carbon content than oil, but also because oil basically represents significantly more expensive energy than coal. Thus, a tax in proportion to the CO<sub>2</sub> content has less effect on the consumer price of oil than of coal, in relative terms.

Lindholt, L. (SSB) and S. Glomsrød (SSB, Cicero): "The Arctic: No big bonanza for the global petroleum industry", *Energy Economics* 34, 2012.



Theme: 1.4 STEWARDSHIP OF THE COMMONS  
Session: 1.4.D Ecological and social impacts of a changing Arctic; Proposed session  
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## 1120 The Resource Rent of Norwegian Fisheries

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Special session: Ecological and social impacts of a changing Arctic: exploring the capacity for wellbeing and equity within planetary boundaries. Abstract: The value of natural resources to an economy is typically calculated based on the System of National Accounts (SNA) numbers. The resource rent (RR) of traditional resource extracting sectors is either low or negative when calculated using SNA numbers (SNA-RR). A negative RR indicates that the natural resource sector is a net cost to the economy. In 2007-2009, the Norwegian agriculture and fisheries sectors had negative RR, while the RR for fisheries was positive in 2010-12. Norwegian fisheries are considered an important industry for the country and have contributed significantly to economic growth. It is therefore of interest to find the reasons, and there may be several, for the changes in fisheries RR. A low RR may result from inefficient management. Another significant reason may be large governmental subsidies, although this is not the case for fisheries in Norway where taxes and subsidies have been cancelling out. Finally, the RR values reported depends how the SNA numbers are updated each year.

This paper performs an in-depth investigation of RR from Norwegian fisheries to find to how RR might change with efficient management and how the reported RR depends on SNA calculation practices. The difference in RR under efficient and current management may indicate the social value of the current fishery structure.

We calculate the RR using two methods and compare with the RR reported in SNA. Method 1 uses the numbers from the 2011 Profitability survey of the Norwegian fishing fleet. Method 2 seeks to estimate the RR in an efficiently managed fishery. To that end we use a non-linear programming model and the same data as for Method 1 optimizing over the number of vessels and the catch. Finally, we use these results to calculate the optimized RR. We compare the optimized RR with the RR in Icelandic fisheries, which are managed using individually tradable quotas (ITQ). Preliminary results show that the RR calculated using Method 1 is only half of the SNA-RR, while the RR calculated using Method 2 is somewhat larger than the SNA-RR, although not as large as the RR in Icelandic fisheries. We further seek to find the causes of the divergence the estimates for RR as it is important to have accurate estimates of RR for policy and management of Norwegian fisheries.



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## 1117 Carbon storage in boreal forests – economic and environmental policy approaches

**Holtmark, Bjart**

In the research community and among policy makers it has traditionally been common to assume that wood from boreal forests is a carbon neutral energy source because the regrowth of a felled tree will capture the same amount of carbon that was released through combustion of the harvested biomass. Consequently, wood fuels have been considered an attractive alternative to fossil fuels from a climate perspective and policies have been implemented to increase the use of wood as an energy source. Moreover, the carbon neutrality assumption leads to the conclusion that there is a conflict between a forest management policy that is in the favour of the environment and a forest policy that emphasize the recreational and biodiversity values of a forest.

However, a number of recent contributions show that the carbon neutrality assumption is misleading, not least when dealing with wood from boreal forests. When wood in a slow-growing boreal forest is harvested and combusted, it may take almost a century before the released amount of carbon again is stored in the forest. As the analysis of this paper illustrates, taking the capacity of the forest as carbon storage into consideration might support the conclusion that forest conservation is socially optimal. Hence, instead of conflicting interests, there might be a synergy between concern for biodiversity and climate in increased forest conservation. Using different prices on the ecosystem service of carbon storage, referring to different scenarios for the development of prices on carbon quotas, we analyze to what extent and under which assumptions forest conservation becomes socially optimal.

The purpose of this paper is to analyze the societal trade-off between forestry and forest conservation in the Artic region, taking into account the benefits from carbon sequestration, as compared with the cost of forest conservation. The benefit of forest conservation will be enhanced by the additional benefit of biodiversity protection. Given different carbon price scenarios, it will be discussed to what extent additional forest conservation will be socially optimal.



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Session 1.4.E

Ecological and social impacts of a changing Arctic; Proposed session



Theme: 1.4 STEWARDSHP OF THE COMMONS  
Session: 1.4.E Ecological and social impacts of a changing Arctic; Proposed session  
Time: F1 Room: R5

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## 1725 Using cost-benefit analysis as a tool for illustrating natural resource conflicts in the Arctic

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We illustrate natural resource conflicts in the Arctic by applying the cost benefit analysis (CBA) methodology. CBA is one suitable method for bringing light on natural resource conflicts as costs for policy measures can be compared to costs and benefits for different stakeholders of implementing the measures. Lofoten is an area in the southern parts of Barents Sea and it is an ongoing debate regarding whether there should be oil drilling in the area or not. Independently of if the sea bottoms in this area will be exploited or not, there will be an increase in the amount of transports in the area. This is due to an expected increase of activities in other parts of the Arctic region. The increase in transport will cause an increased threat on ecosystem services since more transport will generate a higher probability of an oil spill accident. Using CBA, a case study on oil spills in Lofoten is presented as a good example on how trade-offs between increased transports and protection of ecosystem services can be analyzed. The conflict in itself is common for the Arctic region, also, the conflict involves ecosystem services common for region. Nevertheless, the conflict is between many different stakeholders, which is often the case in this region, including locals, the state, and the tourism and fishing industries. The case study is based on a valuation study in Lofoten which investigates people's preferences for ecosystem services at risk from oil spills. Risk of an oil spill accident is composed of two parts; the probability of a potential oil spill accident, and the impacts from an oil spill accident on ecosystem services. Our findings in the valuation study imply that respondents are more concerned about preventing the occurrence of oil spill accidents (which respondents mistakenly consider to be more frequent than they actually are) compared to preventing the negative impacts of a spill on ecosystem services. One policy



implication is that democratic-based governance should, given that the benefits of the measures are larger than the costs, focus more on policies that decrease the probability of spills than on policies that decrease the subsequent ecological impact. Hence, in our CBA study we compare the costs of implementing measures to reduce the probability of an oil spill versus the value losses of ecosystem services. The results will be used for making policy implications.



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1738 The Arctic Species Trend Index: using vertebrate population trends to monitor the health of a rapidly changing ecosystem

**McRae, Louise**

Special session title: Ecological and social impacts of a changing Arctic: exploring the capacity for wellbeing and equity within planetary boundaries.

Abstract

The task of measuring changes in Arctic biodiversity is a difficult undertaking given both the rate at which environmental changes are occurring and the demands associated with monitoring species in remote and challenging habitats. One approach to tracking how biodiversity is responding to these changes is to collate available data from existing Arctic monitoring schemes and use this to identify trends across the Arctic and for regional, ecological and taxonomic subsets. Working with the Conservation of Arctic Flora and Fauna and the Circumpolar Biodiversity Monitoring Programme, the Zoological Society of London has developed the Arctic Species Trend Index (ASTI) to apply this approach. As our proxy measure of biodiversity, we aggregated population trends for vertebrate species. We compiled over 900 time series datasets tracking trends in Arctic vertebrate populations over the past four decades representing 38% of all known Arctic vertebrate species. Our results show strengths in the breadth of populations and species monitored and the disaggregation of the data to uncover regional trends. Limitations of the data set are still apparent, due to the lack of any stratified monitoring scheme. Specifically, there are more bird species data and we identify gaps in species population coverage. In order to measure the impacts of a changing Arctic, indicators like the one we have developed must be strengthened and adapted. Primarily, the coverage of the underlying data set must be improved and secondly, new techniques to interpret the impacts of different threats need to be developed. The latter task is underway with a study on how and where Arctic migratory bird populations are being affected by environmental change. Never has it been more important to understand how the Arctic's ecosystems and the living resources they support are responding to environmental change; tracking how they respond to growing and cumulative pressures will enable pre-emptive action to safeguard their future.



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Session: 1.4.E Ecological and social impacts of a changing Arctic; Proposed session  
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## 1140 Ecological impacts in Arctic regions – a pilot study of biodiversity assessments with the GLOBIO model

**Van Rooij, Wilbert**

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Special session title: Ecological and social impacts of a changing Arctic: exploring the capacity for wellbeing and equity within planetary boundaries. Abstract: In the context of the circumpolar ECONOR project, this paper will present results from a pilot study, exploring the possibility of assessing impacts on biodiversity in Arctic regions within the framework of the GLOBIO model, developed by PBL Netherlands Environmental Assessment Agency. This analysis will contribute to assess impacts on Arctic nature and environment in a context of sustainable development. With regard to the Arctic, the GLOBIO model can model the following terrestrial biomes: ice (on land), tundra, wooded tundra, and boreal conifer forest. The GLOBIO model can assess current state and projected changes in the following indicators: loss of natural area (extent of biomes), change in mean species abundance (not species specific, but pressure based), wilderness (natural areas with high environmental quality, i.e. hardly affected by human impact), by climate change, nitrogen deposition, infrastructural development and impact of urban and agricultural frontiers (incl. impacts from disturbance and hunting), fragmentation and land use change caused by agricultural development, forestry, mining, urbanization, and other socio-economic development. This assessment of impacts on biodiversity will be down-scaled to the Arctic regions of the ECONOR framework. The paper will present trends of impacts on biodiversity and explore the possibility to down-scale scenarios for human impacts on Arctic biodiversity related to data on economic activity and land-use change in Arctic regions. The GLOBIO assessments will be compared with the approach of the Nature Index developed in Norway. To explore the feasibility of further assessing impacts on Arctic biodiversity, downscaled to different Arctic regions, the pilot study will focus on the importance of assessing the anthropogenic impact factors on Arctic biodiversity, e.g. increased demand from the global economy for Arctic natural resources, and the importance of changes in Arctic biodiversity for the livelihood, living conditions, and well-being of the communities and the people living in the Arctic. The key motivation for this study, in the context of the ECONOR project, is to relate environmental change and ecological impacts more directly to human activities, in order to strengthen the integrated knowledge basis for policy for sustainable development.



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ISEE CONFERENCE ICELAND 2014

Session 1.4.F

Policymixes to Conserve Biodiversity in Productive Landscapes  
in Brazil's Atlantic and Amazon Forests; Proposed session

Theme: 1.4 STEWARDSHP OF THE COMMONS  
Session: 1.4.F Policymixes to Conserve Biodiversity in Productive Landscapes in Brazil's Atlantic and Amazon Forests; Proposed session  
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## 1079 The potential of Tradable Development Rights (TDR) to improve effectiveness and reduce the costs of biodiversity conservation: study case in Sao Paulo, Brazil

**Bernasconi, Paula**

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Until today, direct regulation has been the most important type of policy for biodiversity conservation in Brazil. This has resulted in conflicts with rural sector about compliance costs and has led to limited effect on nature conservation. The main command-and-control (C&C) instrument for forest conservation is the Forest Code, which was newly amended in 2012. It requires that all private properties set aside parts of their properties for conservation, called Forest Reserve. This law has passed through many alterations and has been poorly enforced, resulting in a current very low compliance.

However, the recent change in the law has made it less strict, and a higher level of enforcement and compliance is expected. In order to reduce the economic impact of the Forest Reserve on landowners some flexible mechanisms are being discussed and proposed. One of them is the compensation of Forest Reserve requirements in another farm, as a form of tradable development rights (TDR). The landowners who have deforested more than allowed by law can compensate their deficit in another farm which has more natural vegetation than required.

The aim of implementing TDRs is to reduce the opportunity costs of conservation but it also opens to the possibility of improving gains in conservation if the instrument targets priority areas for conservation. In this paper we evaluated the possible effects of the TDR on the conservation outcomes considering both the opportunity costs and ecological effectiveness and compared this to a pure command-and-control (C&C) approach, i.e. compliance to the Forest Code on own property.

Using the conservation planning software Marxan with Zones we conducted an ex-ante policy evaluation by simulating different scenarios that combine policies and market constraints for the forest reserve market, and evaluating their cost-effectiveness. We focused our study in the state of Sao Paulo, the most industrialized and most populated in Brazil, which faces many ecological challenges.

Our results showed a clear potential of the TDR to both reduce compliance costs and improve ecological effectiveness depending on different market restrictions on allocation of forest reserves.



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1676 The effect of forest proximity on pasture pests in Northwest Mato Grosso, Brazil: a cost-benefit analysis for land use policy

**Del Arco Zuñiga, Pablo**

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In the present context of weakening environmental regulation in Brazil, due to revisions to weaken the national Forest Code, this research aims to provide information to landowners and policymakers to better value the standing forest. Since farmers are not interested in conserving forest if it means loss of productive area, if it can be shown they can gain from forest proximity to pasture, they may buy-in to a solution of global and local benefit.

Our study evaluates local economic benefits provided by the forest derived from pest control in pastures. In Northwest Mato Grosso, cattle ranching is a key economic activity, and pests represent a serious threat to profitability.

Spittlebugs (Homoptera, Cercopidae) are the primary pest affecting grasses in Tropical America. Their damage results in a dramatic decline in stocking support capacity of pastures; yet, local farmers do not clearly perceive the multiple benefits provided by forests, and tend to cutting down them to increase their pasture areas. The failure of conventional pest control methods – pesticides and burning pastures – has generated local demand for alternative control methods.

The value of biological control is assessed by the level of spittlebug infestation achieved and estimated damage caused annually, and the relationship of forest proximity to these variables. For this, we measured that level on a set of five sample plots of one hectare, with a web of 25 sample points each plot, in cattle ranching properties with different arrangements of forest and *Brachiaria brizantha* pastures.

The value of this ES is estimated by relating the pasture infestation level data recorded in each plot – three with forest, and two controls – to average economic losses caused by spittlebugs in the municipality – estimated through surveys–, and then obtaining their associated economic losses. The association between environmental variables, and pest infestation level was assessed to determine criteria for maximizing biological pest control.

In conclusion, we discuss how mosaic effects on infestation reduction could be multiplied to motivate broader land use management strategies. More integrated, efficient and ecologically balanced landscape planning involves training technicians and policymakers, and promoting alterations in owner's incentives to deforest. An appropriate policymix would include strengthened extension and agro-environmental measures in combination with the Forest Code. The final result would seek greater compatibility of ranching with biodiversity conservation within the productive landscape in one of the most threatened regions of the Amazon basin.



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**1373**      **The effectiveness and fairness of the “Ecological ICMS” as a fiscal transfer for biodiversity conservation. A tale of two municipalities in Mato Grosso, Brazil**

**Lima, Guiltherme**

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Guilherme Lima - Federal University of Rio de Janeiro  
Caroline Jordão - Instituto Centro de Vida  
Pedro Nogueira - Federal Rural University of Rio de Janeiro  
Maryanne Grieg-Gran - International Institute for Environment and Development

The main purpose of this research is to appraise the role of the Ecological ICMS (ICMS-E), an economic instrument for biodiversity conservation in Mato Grosso, Brazil. Our principal hypothesis is that ICMS-E resources can generate different conservation outcomes, depending on how they are distributed within municipalities. The case study focused on Northwest Mato Grosso (NW MT), a region of Amazonia which is under great deforestation pressure. We selected two municipalities – Jui?na and Cotriguaçu? – to evaluate the potential role of this instrument in inhibiting further biodiversity loss at the forest frontier. A prior secondary data analysis showed a restricted role for ICMS-E in promoting protected area creation in the Amazon region of Mato Grosso. We now seek to investigate the reasons for this, the potential institutional innovations to improve the instrument and to understand the role of ICMS-E in Mato Grosso in the existing policymix with respect to its effectiveness and fairness. Our research questions include: (a) How fair is the intra-municipal allocation of ICMS-E revenues according to standards of procedural and distributive justice? (b) How fair is the intra- municipal allocation of ICMS-E revenues according to standards of procedural and distributive justice? (c) What legal and institutional arrangements including flexibility in intra-municipal benefits distribution could allow an improvement in the effectiveness and equity effects of ICMS-E implementation? In summary, our research suggests that innovative revenue sharing instruments such as ICMS-E can have positive results for conservation effectiveness, but their improvement for these purposes requires local commitment to environmental governance and procedures to ensure equitable distribution of the rewards.



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## 1757 Pilot projects and agro-environmental measures in northwest Mato Grosso, Brazil: impacts and lessons for forest frontier "policyscapes"

**Davenport, Rob**

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This abstract is being submitted as part of the special session "POLICYMIXES" TO CONSERVE BIODIVERSITY IN PRODUCTIVE LANDSCAPES IN BRAZIL'S ATLANTIC AND AMAZON FORESTS.

This case study, located within the Brazilian Amazon "Arc of Deforestation" examines the effectiveness of Integrated Development and Conservation projects (ICDPs) and respective Agro-Environmental Measures (AEMs) promoted for deforestation mitigation, in Northwest Mato Grosso (NW MT). The region is a forest frontier comparable in size to Panama, and exhibits the highest deforestation rates in the Amazon, despite having experienced a broad range of initiatives aimed at halting deforestation and biodiversity loss over the past 15 years. The study evaluates ecological, economic and institutional variables on family farms of between 50-100 hectares in agrarian reform settlements, based in three municipalities (Juína, Juruena, Cotriguaçu) with varying exposure to ICDPs between 1995 and 2010.

We performed an ex post analysis of ICDP impacts by assessing: (a) biophysical indicators of land use, carbon stocks, and tree biodiversity in forest and agroforestry plots; (b) the distribution and magnitude of economic gains leading to permanence of the ecological impacts; and (c) the institutional design and social-political context behind the cases, assessed through farmer interviews considering perceptions on institutions and governance.

We identify opportunities for introducing sustainable land use practices and the need for a more systemic approach to project evaluation arising from ICDP experience. Comparison of forest cover dynamics over a 15-year period indicated that more forest area was conserved in settlements with sustained ICDP interventions. The Vale do Amanhecer settlement in the municipality of Juruena retained 57% of forest cover in 2011, in comparison to 35% in the Nova Cotriguaçu settlement in the municipality of Cotriguaçu, and 18% in the Iracema settlement in Juína. Agroforestry farm rents were considerably enhanced in comparison to a smallholder farmer baseline of mixed beef and dairy. Environmental licensing and sustainable forest product marketing outcomes supportive of local livelihoods were achieved by integrating social organization with material and institutional infrastructure. The particular combination and sequence of ICDP interventions produced synergies between cooperative social organization, alternative market chains and state-administered policy instruments.

In conclusion, even in a landscape subject to adverse political economic conditions, support for an integrated set of instruments over longer temporal scales and at finer spatial scales may be effective routes for forest and biodiversity conservation as well as economic and institutional improvements. On this forest frontier, 'policyscape' viability may be a function of the management of institutional and market synergies, which involve interfaces between formal and



informal institutions and the socio-ecological evolution of 'rules in use.'



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## 1743 "Reviewing and suggesting PES in Brazilian Waters (Amazon and Atlantic forest coast)

**Begossi, Alpina**

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SESSION: SESSION:POLICYMIXES" TO CONSERVE BIODIVERSITY IN PRODUCTIVE LANDSCAPES IN BRAZIL'S ATLANTIC AND AMAZON FORESTS

Livelihoods in Brazil are very dependent on aquatic resources, especially in rural areas, such as in the riverine environments of the Amazon and in the coastal sites of the Atlantic forest, including its mangroves, estuaries, and reefs. Much of the marine fishing activity occurs in the continental shelf up to 12 km, from which much of the fish taken is consumed inside the country. Moreover, more than a half of the national fish production comes from small-scale fisheries (artisanal fisheries) from both freshwater and marine fisheries, which are, thus, of great importance in Brazil. Riverine Amazonian fishermen, locally named 'Caboclos' and coastal fishers from the Atlantic Forest, locally names ' Caiçaras' fish mostly using paddled or motorized canoes, or small boats, using a variety of nets and hook and lines. The label of "co-management" is not currently sufficient to serve as an incentive to fishermen, since legitimacy and participation in the management processes have shown to be unclear for them, as top-down approaches have still been the 'business as usual'. It is important to get fishermen engaged into management, since often public environmental policies and fishers' objectives and interests are conflictive. In this study, we review suggestions for the management of marine small-scale fisheries of Brazil, such as the 'Defeso'. The Defeso is a temporal suspension of the fishing activities in a period in which some species area reproducing, and it has been settled for some species in some areas of both riverine and marine environments. In the Amazon, it is settled when the 'piracema', the fish migration up to the rivers to reproduce, occurs. Currently, the 'Bolsa Verde' has also been applied for poor fishers and livelihoods that live in protected areas and are below the poverty level. We will approach here many strategies of environmental public policies such as the 'Defeso', MPAs, Fishing Agreements, Quotas, and the Bolsa Verde. We will suggest management and associated incentives, using a 'policimix' strategy, through instruments such as payments for environmental services (PES).



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Theme 2.1  
DEGROWTH



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Session 2.1.A

Degrowth: Assessing the discourse



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## 1164 Assessing the degrowth discourse - from theory to policy

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Additional research on how policies should be developed and progressively implemented to address the concerns pointed out by the degrowth literature is essential to foster the adoption of this perspective on a wider scale. In this paper, we develop a framework to support a systematic analysis of the policy concerns and proposals described in the degrowth literature, and use this framework to categorise the actions, measures, policies and policy instruments that have been suggested by degrowth authors. This categorisation is done for the type of approach of the policy instrument or measure (top-down versus bottom-up approaches) and it also refers to their geographical scales (whether they have a local/regional, national or international focus). In doing so, we present a review of the evolution of the degrowth concept, identifying degrowth-related concerns/proposals and classifying them into groups of policy goals and associated potential actions/instruments. With this analysis, we find that the most emphasised aspects in the degrowth literature are related to social investment and the reduction of environmental impacts in the industrialized countries, whereas the "greyest" areas are related to the development of poorer countries in an ecologically responsible way. We also find that although the degrowth movement advocates that the ideal is a bottom-up approach, with the change coming from the society, the majority of policy goals that appear in the degrowth literature are top-down approaches, putting the emphasis on the government as the major player in the change. Moreover, we discuss that most of the measures are meaningful at a national or at a local level and what are the implications for that. We have also identified future research topics, since the policy issues that we analyse show the areas that are more and less explored in the degrowth literature, what opens gaps for what can be interesting to be addressed by future works on this topic.



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## 1168 Moral and Material Foundations of Social Metabolism: Implications for Degrowth

**Malghan, Deepak**

The celebrated Marxian concept of 'metabolic rift' partly originated in Marx's attempt to explain how the loss

of soil fertility was a direct result of an 'antagonistic separation of town and country' [1]. Metabolic rift has found

its expression in the degrowth literature primarily through works of scholars investigating the social metabolism of

industrial societies. Metabolic rift, however, is currently marginal to the central arguments advanced by the degrowth

literature. We propose that the relative neglect of the metabolic rift framework within the degrowth literature is driven

by two related factors. First, in its current stage of evolution, the degrowth discourse is primarily a call for action

rooted in moral and ethical arguments. The discourse has focused its energies on normative aspects of degrowth with

the prevailing material and sociological conditions serving as accounting appendages. Second, the Marxist tradition

itself has not vigorously debated the ontological foundations of metabolic rift. Thus the normatively-focused degrowth

literature does not have a readily available theoretical framework to engage with the deep material and sociological insights contained in the metabolic rift formulation.

We propose a dialectical framework that allows us to combine material, sociological, and moral aspects of

metabolic rift. We show how such a framework seamlessly connects social metabolism and degrowth at a more

fundamental theoretical level and facilitates a move beyond simple metaphorical and accounting intersections that

dominate the extant degrowth literature. Our dialectical framework is derived by correcting the neglect of Marx as a

moral philosopher, and Gandhi as a political economist.

[1] J.B. Foster, Marx's Ecology: Materialism and Nature, New York: Monthly Review Press, 2000,



p.141



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## 1178 Post growth society: Research questions for Ecological Economics

**Seidl, Irmi**

Since the 1950s, the OECD-countries have achieved substantial growth rates, however economic growth is no longer proving to be a solution to major societal and economic issues. The OECD has attested that GDP fails as a measure for wellbeing and there is evidence that growth impacts negatively on wellbeing in rich countries. Furthermore, in most OECD member states income differences have increased in the last 20 years, and in all these states the unemployment rates have risen steadily since the 1970s. Finally, in many countries public debt has rocketed, and most environmental problems are getting worse. There is evidence that all these issues are aggravated by economic growth and economic growth policies.

However, politicians, economists, and business representatives continue to aspire to economic growth, and this is echoed by the media. In particular in the present crisis, growth is considered the major goal. The trend of decreasing growth rates since the 1950s appears to be denied.

Why is the fixation on economic growth so strong, why are we hooked on it? Because our social security systems, the enterprises, the banking and finance sector, the stock markets, the consumer industry, and public finances are attuned to constant growth. And a wide range of policies areas including the tax system are aimed at triggering economic growth.

Yet, sectors and policies only change, if there are both public awareness and solutions to a problem. As long as neither politicians nor society know how to restructure our economies and social systems to become growth independent, we should not expect a shift from the growth paradigm. Hence, the challenge ahead will be to develop concepts for the transition of these systems and to gather experience with their application. The paper will present research questions and that Ecological Economics should tackle to contribute to this task.



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## 1500 Perspectives on measuring degrowth transitions: a north-south approach

**Meira, Teresa**

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The downsizing of the economy suggested by sustainable degrowth proposals raises questions about social and ecological justice in southern countries. The level of development achieved by the industrialized North, through unequal trade with the South, has created an ecological debt. The results of global resource extraction in recent years have shown that it is time for the southern part of the world to set future trends in terms of sustainability. This dichotomy makes the prospects for sustainable degrowth in developed northern countries, different from those of Southern nations. Aiming to measure these differences, we created a system of indicators of sustainable degrowth applicable to countries at different stages of development. The system of indicators is composed of 17 indicators spread across 4 dimensions: economic, social, environmental and subjective well-being. We then applied the indicator system to Portugal and Brazil, for a period of 7 years (2003-2009), performing a two-step analysis. The first step is based on the best data currently available for each dimension. From the rate of change of each indicator it is possible to assess how close each of these two countries is from what may be considered degrowth pathways. In the following step, we discuss the relationship between key indicators and progress towards relative or absolute decoupling goals. Following the discussion of results, a roadmap is suggested with the purpose of outlining different sustainability avenues for north and southern countries. In order to achieve a degrowth society, we take into account that some aspects must be balanced, such as priorities in terms of social needs, ecosystems health, economic well-being and happiness. We conclude that the proposed approach supports a structured discussion on the challenge of expanding choices to those who are still deprived from basic needs without necessarily following traditional western consumption patterns.



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Session 2.1.B  
Degrowth: strategies



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## 1181 "Efficiency" in Swedish pig production from a degrowth perspective

**Ohlund, Erika**

This article applies the three key R:s of Latouche's degrowth utopia: Re-evaluate, Relocalize, and Reduce, on Swedish pig production. More specifically, it analyses the role of pig production in today's agriculture, and examines its potential role in a degrowth utopia.

Notions of efficiency in five systems analyses of pork production were evaluated, and related to interviews with Swedish pig farmers. The systems analyses represented a narrow notion of efficiency: convert feed to as much meat as possible with as low emissions and land use as possible. The organic farmers considered their pigs to fill a niche in their farm systems, and to help spreading manure and prepare the soil by foraging. Furthermore, since the demand for organic ham is higher than the supply, this is often how customers find the farms.

Common for the surveyed studies is that organic pig production has lower emissions than conventional per hectare, but higher emissions when calculating per kilo. If it is considered that there are specific un-negotiable limits of certain emissions (such as N and CO<sub>2</sub>) in an area, a solution to stay within those limits would be to keep fewer animals in that area. Should the animals be raised with conventional or organic methods? If fewer but conventional pigs were kept, the emissions would be lower than for fewer and organic pigs, according to the conclusions of the surveyed studies. However, if Re-evaluated, as pointed out in one of the surveyed studies, land use in organic pig production is qualitatively better since it implies cyclical flows of nutrients, higher biodiversity because of crop rotation, etc. Furthermore, a small conventional farm would still have higher animal density, given that the farmer follows the regulations and builds stables that are no larger than required. Animal density is in itself a problem and need to be Reduced.

Among the organic farmers, pork is Re-evaluated from being produced in large industrial farms to being a niche product and one of many types of animals with different functions in the farm system. Furthermore, the organic pork is encouraging customers to Relocalize food consumption from supermarkets to the farms. Resource use is Reduced in these systems: the pressure on ecosystems around the farms decreases due to less emissions, and the effects on distant ecosystems is Reduced since the organic farms to a high extend are self sufficient of feed.



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## 1602 From 'growth for employment' to 'sustainable work'

**Stagl, Sigrid**

Ecological economists have long argued that economic growth (a) is a means not an end, (b) cannot be continued without causing serious biophysical harm; and (c) is probably not necessary for sustainable economies. Shifting the focus from economic growth to wellbeing, justice and environmental integrity does require however changes in key social institutions, such as labour markets and work culture. The paper addresses these issues in two ways: (1) developing a better understanding of the relationship between economic growth and employment; and (2) analyzing key labour market institutions and possible alternatives to their current form.

The paper presents the findings from a critical review of the empirical literature and own econometric estimates examining the employment effects of economic growth. In particular, we analyse the relationship between economic growth and the change in employment (influenced by labour supply, labour productivity, demand for types of products, working time etc.); the relationship between the change in employment and unemployment rates (hidden domestic labour reserves, additional foreign workers, demographic factors, participation rates, labour market institutions, labour market history, norms, reaction to employment opportunities etc.); and account for impacts on income distribution (influenced by financialisation, globalisation, labour market institutions, technology). Initial findings indicate that the evidence of the growth – employment relationship is mixed, which offers some room for maneuver for policy makers.

The second part of the paper focuses on a reframing of the question what role employment issues play for the transformation to sustainability. In a broader socio-economic and feminist perspective employment depends on care and nature. Hence we need to account for care work, subsistence work, civic engagement etc. There are strong parallels between unpaid care work (mostly of women) and unpaid ecosystem services. The Network Vorsorgendes Wirtschaften highlights care, cooperation, orientation on what's necessary for the Good Life.

In light of the econometric findings and socio-economic reframing, the paper ends with initial suggestions for a redesign of labour market institutions, which go much further than reducing work time.



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## 977 Can virtual currencies drive sustainable de-growth?

**Vitari, Claudio**

Both production and consumption are influenced by the nature of money. For instance, how money is allocated determines, at least partly, how society spends it; this, in turn, influences the price structure and the behavior of economic actors and entities. Peculiarly, these effects are under-researched in mainstream economics and sustainability research.

Today, the banking sector creates nearly 95% of money ex nihilo as interest-bearing debt to itself. Controlling how money enters circulation, it sets the course for the economy. Interest being the *raison d'être* of bank money, it inevitably thrusts for growth all around, and prefers lending for short-term profit than for creating long-term value for society. The interconnected goals of ecological sustainability and social justice necessitate fundamental changes to the orthodox thinking on money.

The proposed article will explore virtual currencies as an instrument and indication of the changes needed. Virtual currencies are alternatives or complements to legal tender circulating in electronic or digital forms. Typically, these currencies are created by civil society but occasionally public authorities issue them too. Dozens, like Linden dollars, Warcraft's gold, Riot Points, and Bitcoins, have emerged in the last decade. can these currencies help societies attain purposive socially equitable and ecologically sustainable degrowth?

The proposed article will attempt to answer this question by drawing on multidisciplinary academic research.

The literature review shows that virtual currencies are shaping our society but not really for purposive degrowth. Nevertheless, several virtual currencies have some characteristics compatible with purposive degrowth. For example M-Pesa and Mipys have an actual negative interest rate, restraining from currency accumulation and facilitating exchanges. On the other side, a common inherent drawback concerns the required Information Technology Infrastructure, charged with a very polluting life cycle.

This research is supported by the French region Rhône Alpes (<http://www.rhonealpes.fr/>)



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## 1090 To grow or not to growth – towards an economics of zero growth

**Rosenbaum, Eckehard**

Many ecologists and ecological economists notably Daly have since long advocated a steady-state economy with no or at most very low growth as the only means to ensure long-term ecological sustainability. Concomitantly, some authors, following the work of Georgescu-Roegen, emphasise the need to downsize economic activity through an extended process of degrowth, i.e. through shrinking GDP. In the end, both groups therefore advocate nothing less than a complete reversal of the received economic policy agenda and, at the end of the day, an economic system that differs fundamentally from what we have been accustomed to over several decades.

However, periods of low growth, not to speak of full-blown recessions, often had disastrous repercussions for society in terms of poverty and social hardship which would be a steep price for ecological sustainability and which may render any low-growth agenda politically unfeasible if left unaddressed. Thus understanding what makes economies grow, what happens economically if growth slows down permanently and, above all, what can be done to address the unwanted side-effects of low growth is of paramount importance in the context of a steady state economy.

The paper sets off by looking at the underlying assumptions of green growth and reflects on whether and to what extent they are warranted. As this will also have some implications for the question of whether van den Bergh's agrowth notion is tenable, the issue is being discussed at some length concluding that since many environmental problems are invariably linked to the scale of economic activity, physical degrowth is in fact a meaningful concept which cannot be replaced by the notion of agrowth.

The bulk of the paper then looks at the economics of low growth and develops some tentative hypotheses concerning its implications based on a bird's eye view of both orthodox and heterodox growth theory. More specifically, the paper undertakes a comparative analysis of neoclassical and post-Keynesian growth-theory and identifies the conditions under which the standard models of each theoretical approach will deliver zero growth. It shows that neoclassical growth theory accommodates the notion of zero growth quite easily, while post-Keynesian growth theory cannot do so. At the same time, the greater inherent realism of post-Keynesian growth theory places the latter approach in a more favourable position when it comes to understanding the implications of low or zero growth.



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## 1494 Analysis and measure of biophysical foundations of degrowth

**Ferrari, Sylvie**

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In the light of today's debates on the role of energy and natural resources in the sustainability of economic growth, the question of efficiency arises as a rough one and somewhat as a prerequisite for an ecological transition. Many studies put forward the eco-efficiency of the economic processes as a major condition for switching into the sustainability paradigm (Victor, 2008). It seems however that the so called decoupling between the economic growth and the environmental pressures need to be reconsidered through a better understanding of what the economic process does. While the decrease in energy intensity can be positively valued in a sustainability perspective, such an evolution does not give any information about the acknowledgement of some biophysical limits. One explanation lies in the fact that environmental impacts are depending both on intensity and (time) scale. As far as the latter dimension is concerned, one has to consider the laws of thermodynamics and in particular the physical limits to the productivities of the natural resources as they imply severe limitations to economic growth (cf. Georgescu-Roegen (1971)).

The aim of the paper is to analyze the conditions for the emergence of a degrowth path associated with a slowing down economic system when the biophysical constraints and thus the role of time as a scale limiting factor for the economic process are taken into account (entropy law consequences). In that respect, we propose a model based on the search for the minimization of a power indicator able to catch both the speed of production at a global level (the rate of transformation of the input flows) and the capacity of the system to control it (a kind of struggle for sustainability). Such an indicator of power is coming from thermodynamics (Van den Heuvel, 1988). In this particular line of concern, the declining of the power would reflect a slowing down economy, i.e. slowing the rate of transformation of the input flows while the related dissipation of energy and matter could be reduced by the control of the production speed.

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Session 2.1.D  
Degrowth and environmental justice



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1318 "We do not live on agriculture" – socio-ecological struggles and environmental justice at the soybean frontier of globalisation. The case of the Chaco Occidental, Northwest Argentina.

**Hafner, Robert**

The cultivation, commodification and distribution of soya have, particularly in Latin America, undergone enormous growth and internationalisation processes. Driven by its high lucrativeness new territories for GM soybean monocultures are explored. Here, the example of the Chaco Occidental, a traditionally peripheral region with high deficits in terms of locally based economy and infrastructure is presented. Due to globalisation processes and favoured by climate change, significant structure and power shifts are observed at the new frontier of globalisation, leading to socio-ecological frictions among old and new regional actors as well as varying interests groups.

The main aim of this presentation lies on the visualisation of change and impact of supposedly high-profit crop growing on local municipalities. The question of resulting fair and just distribution of environmental goods and bads, recognition and participation of locals should be put into a new perspective, allowing for better understanding of (extra-)local thought styles in the context of global influence on particular localities.

Thus, this presentation – while applying an environmental justice framework and going beyond activist research – takes the socio-ecological frictions as a starting and anchor point for the exploration of actors (actively and passively) involved. A method mix is applied: (1) Quantitative data (i.e. GIS analyses of land use and demographic change) has particular relevance to obtain a generalised view of the region researched and to identify areas of interest for a then (2) qualitative in-depth analysis of particular phenomena. Besides expert and focused interviews, participant observation and mapping, participatory methods in the form of workshops with young locals on pressing socio-ecological problems (including the application of elements of NetMap and Jane's Walks) and pathways towards their solution.

Results of this study show that – due to predominant absence of activist groups working against soybean cultivation – pronounced environmental justice claims or demands towards large-scale agribusinesses operating in the field are hardly presented. Lack of information (sometimes even lack of basic communication infrastructure, such as telephone lines) and opportunity for participation, combined with the underlying dogma of progress stimulated "from outside" paint the picture of low conflict potential. However, in combination with other conflict arenas (particularly on questions of indigenous' rights), environmental justice is applied as an additional argument (and thus strategy) for supporting locals' core social struggles for a more just living.



Theme: 2.1 DEGROWTH  
Session: 2.1.D Degrowth and environmental justice  
Time: T1 Room: R6

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1269 Expansion of commodity frontiers and dimensions of justice: accumulation by dispossession and assimilation grievances and the expansion of the palm oil frontier in Colombia.

**Marin-Burgos, Victoria**

The current mode of the world economic development rests to a great extent on the global expansion of commodity frontiers (Moore,2000). This expansion entails different practices of resource control that take the form of accumulation by dispossession (Harvey,2003), and assimilation, i.e. forms of local people's incorporation into modern processes of development denying or erasing difference in worldviews (Escobar,2006). Both types of practices affect local people's livelihoods. Therefore, expansion of commodity frontiers often result in social mobilisation and resistance in defence of livelihoods. Livelihoods are multidimensional. They are not only a way of making a living, but also sources of meaning and capabilities (Bebbington,2004). Accumulation by dispossession affects livelihoods in their multiple dimensions. Assimilation breaks the complex articulation between such dimensions by denying and erasing difference expressed in cultural practices of resource use and human-nature interactions.

Research on socio-environmental conflicts and environmental justice movements connected with expansion of commodity frontiers focuses mostly on social mobilization against forms of accumulation by dispossession. Less attention has been paid to resistance within process of assimilation to protect the varied and interrelated dimensions of livelihoods. Moreover, much of the research analyses local people's grievances from the point of view of redistributive justice. However, the multidimensional nature of livelihoods calls for an analysis that accounts for the different dimensions of environmental justice: distribution, recognition, capabilities and participation (Schlosberg,2007). Only few recent studies have taken this approach.

By looking at the different livelihood dimensions threatened by both accumulation by dispossession and assimilation, this paper aims to empirically identify how the expansion of commodity frontiers compromises the realisation of different dimensions of justice. The paper draws on two cases of resistance against accumulation by dispossession, and one case of resistance against assimilation connected with the recent expansion of the palm oil frontier in Colombia.

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Theme: 2.1 DEGROWTH  
Session: 2.1.D Degrowth and environmental justice  
Time: T1 Room: R6

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1579 Environmental Justice Conflicts and the Ecosystem Service Cascade: further developing the metaphor to accommodate real world challenges

**Spangenberg, Joachim H.**

Environmental justice conflicts arise whenever different stakeholder groups have different preferences regarding which use to make of ecosystem functions identified as potentially useful to human purposes. Depending on the institutional setting, such conflicts of interest will either lead to compromise (which is more often the case in democratic systems), or the suppression of other users' demands, even if based on traditional or legal ownership rights (dispossession, expropriation).

The 'cascade model' of ecosystem service (ESS) generation and valuation highlights the links between physical aspects/biodiversity and human well-being, in particular for the case of marginal changes. However, societal decision making processes do not play a role in it – ecosystem services are perceived as “nature’s free gifts to humankind”.

This paper intends to strengthen the model's applicability by highlighting the processes of value attribution by diverse stakeholders and value mobilisation which occur between the recognition of an existing ecosystem function and the provision of a service. Furthermore, after ecosystem service provision, the subsequent steps are value appropriation and – in some cases commercialisation. Ignoring such societal processes when analysing ecosystem service provision runs the risk of overlooking deep social conflicts, and legitimising whatever outcome they may have as a “gift of nature”. Ever since the age of social Darwinism the risk of such biologisms in social science should be well known, and they should be carefully avoided.

We suggest an extension of the ecosystem service cascade model allowing to integrate such processes, and thus escape the risk of introducing biologisms into socio-economic assessments of ecosystem services. The core modification introduced is adding the ecosystem service potential in between functions and services, and a focus on the processes generating potentials and services. Use value attribution turns biophysical ecosystem functions into ecosystem service potentials, a potentially controversial societal process. The potential is mobilised to provide the service, and subsequently benefits accrue to agents after appropriation and commercialisation of the ESS mobilised.

The relevance of use value attribution is illustrated by discussing different ESP attributed to the same ESF, biomass provision, and the resulting different ESS from earlier case studies. The examples demonstrate the importance of the use value attribution step for the final (e)valuation of policies, plans and their expected outcome.



Theme: 2.1 DEGROWTH  
Session: 2.1.D Degrowth and environmental justice  
Time: T1 Room: R6

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## 1264 Deconstructing the Cornish rural idyll through an environmental justice lens

**Szaboova, Lucy**

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Cornwall is well known for its abundant nature and picturesque coastline, yet it is the only English county in receipt of social and economic development-related financial assistance from the European Union. Around 10% of areas in Cornwall are among the 20% most deprived in England. Meanwhile, the county features in second place on the Happiness Index within England (ONS, 2012). Therefore, is Cornwall poor, but happy?

We explore the scope of ecosystem services for mitigating the effects of economic deprivation. Drawing on Sen's capability approach (Sen, 1985) and insights from the literatures on access theory, human well-being, ecosystem services and environmental justice, we investigate how aspects of the political-economic and socio-cultural environment interact and influence people's constructs of well-being, as well as mediate – through mechanisms of access – their ability to benefit from ecosystem services.

While traditionally the environmental justice movement linked poor people to degraded or polluted environments (Agyeman, 2004), we posit that poor people living in desired environments can, too, experience environmental injustices. We question the plausibility of a simple linear relationship between the aggregate availability of ecosystem services and well-being. By this we recognize that inequality of access may be present in different groups of people within idylled rural contexts.

We use a context-specific disaggregated analysis (Daw et al., 2011) to empirically explore the well-being paradox at multiple case study sites across Cornwall. Through focus group discussions and semi-structured interviews we develop a bottom-up definition of well-being. We employ participatory photography to elicit the role of ecosystem services in well-being experiences within communities. Participatory mapping workshops and interviewing then explore the existing mechanisms of access which mediate people's ability to benefit from ecosystem services. We provide a platform for participants to take an active role in the research process, to reflect upon existing well-being outcomes and the processes which underpin them, thus encouraging catalysts for change.

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Session 2.1.E

Radical alternatives to current neoliberal approaches in development: regional approaches, global movements and conceptual frameworks



Theme: 2.1 DEGROWTH  
Session: 2.1.E Radical alternatives to current neoliberal approaches in development:  
regional approaches, global movements and conceptual frameworks  
Time: T2 Room: R6

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## 973 Radical Ecological Democracy: A framework for a sustainable and equitable future

**Kothari, Ashish**

Radical Ecological Democracy: Towards a Sustainable and Equitable Future

Ashish Kothari

Growing evidence of the ecological unsustainability and iniquitous nature of the current economic development model is prompting a search for alternatives. While various approaches to 'green' the economy are being suggested, these are often managerial or technofix-dependent, without fundamentally challenging the political, economic, and social structures that have created the problem in the first place, and without providing an alternative to 'growth' as the dominant economic ideology of today.

Are there alternative frameworks that can point the way to a truly sustainable and equitable future? Do elements of such frameworks already exist in concept and in practice, and if so, what principles can be derived from them? What needs to be done to make the transition towards such a future?

The presentation will attempt to answer these questions, focusing on one such alternative framework, Radical Ecological Democracy. This framework arises from the myriad grassroots initiatives at meeting basic needs, and achieving alternative modes of governance, production, distribution, and consumption, that have sprung up in many parts of the world; a key focus will be on India which the author is most familiar with. This framework focuses on meeting human needs and aspirations of well-being through direct or radical democracy, localized economies embedded in ecological and cultural landscapes and free of centralized monetary monopolies, notions of human well-being that relate to actual needs of people and to qualitative values like satisfaction and social security, democratic knowledge and technology generation, and sustaining cultural diversity and exchange. It proposes a mix of localization and globalisation, the former providing communities essential control over means of production and consumption, the latter affording possibilities of intercultural exchange and mutual learning.

While proposing such a framework, the presentation will also raise some key questions for further exploration, including the role of the state and private corporations, the relationship between the individual and the collective, and the political agency for achieving the transition.



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Session 2.1.F

Alternative Conceptions of the Economy II



Theme: 2.1 DEGROWTH  
Session: 2.1.F Alternative Conceptions of the Economy II  
Time: F1 Room: R6

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1237 Of Boundaries and Well-Being: Bringing philosophical and psychological perspectives on human nature to bear on the green economy discourse

**Movik, Synne**

There is widespread concern about global environmental change – climate change, forest degradation, biodiversity loss and freshwater scarcities – and mounting efforts to address these issues in a variety of ways. As if worrying about the environment is not enough, we are still in the throes of the financial crisis that began in 2008, the biggest recession since the Great Depression of 1929, swept over the US, Europe and the rest of the world. Add to this rather grim picture the trends of rising inequalities and trenchant poverty, and it seems that radical measures need to be put in place to effect necessary changes in the way we live on this planet. The discourse on the Green Economy purports to address these issues in a way that will create a more sustainable economy in place of the ‘brown’ economy which is powering our societies at present. While there is a lot of debate regarding the various approaches that can be argued to be part of a broad green economy thinking, less attention has been paid to the links between the ideas embedded in the green economy and studies on what drives human wellbeing. Drawing on recent research as well as a large literature ranging from philosophy and psychology to behavioural economics, the paper makes the point that there is a disconnect between the positions taken in the green economy literature and emerging findings within the fields that study human wellbeing. For instance, the prevailing sense in many affluent societies seems to be that , conspicuous consumption (Veblen 2009) is the most prevalent prophylactic used to fend off ennui and boredom, a characteristic of the satiated, coming from the avoidance of confronting a profound sense of lack of purpose. There is a need to engage more deeply with the psychological roots of consumption, with behavioural economics, and with philosophy in order to understand human behaviour. Humans are not the rational preference-maximisers on which economic theory builds, but are subject to irrational impulses and shaped in subtle and not-so-subtle ways by the situations in which they find themselves. The paper argues that there is a need to link these often disparate fields much more closely in order to generate insights into the mechanisms that are at work relating to our societies, economies and our nature.



Theme: 2.1 DEGROWTH  
Session: 2.1.F Alternative Conceptions of the Economy II  
Time: F1 Room: R6

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## 1426 Context-dependent substitutability : impacts on environmental preferences and discounting

**Dupoux, Marion**

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Are consumption of man-made goods and environmental quality complements or substitutes? This is a key question for environmental economists. Empirical literature on environmental and time preferences points out that willingness-to-pay (WTP) for improving environmental quality and the discount rate vary with income. Mostly, as incomes rise, WTP increases and the discount rate decreases but some empirical results, even if underrepresented, also record the opposite. We first put forward that the concepts of WTP and discounting are closely linked to substitutability between goods. Then we suggest a wider definition for wealth – namely ‘economic-ecological wealth’ – by not only considering people’s consumption levels but a combination of their consumption level and environmental quality. To better interpret empirical evidence, we propose a theoretical framework in which all individuals’ preferences are represented by the same utility function but result in different behaviors according to the context (by context, we mean economic-ecological wealth vs. economic-ecological poverty). This framework allows us to show that substitutability is context-dependent: in a context of economic-ecological wealth, people consider the two goods as complements in their well-being, whereas in a context of economic-ecological poverty, people substitute consumption and environmental quality. We use the definition of substitutability in the Edgeworth-Pareto sense and measure it through the cross elasticities of marginal utility, which allows to disentangle the effects of (i) consumption on pleasure derived from environmental quality and of (ii) environmental quality on consumption satisfaction. Then, we analyze the impacts of a context-dependent substitutability on WTP and economic and environmental discounting. Our main result towards environmental preferences is that in the domain of economic-ecological poverty, as incomes rise, people’s WTP diminishes. Our interpretation is that as poor people get closer to the frontier between economic-ecological wealth and economic-ecological poverty, they save money to a maximum (minimum WTP) in order to reach the world of economic-ecological wealth (their opportunity cost to preserve the environment is high). Our main result towards discounting is that the substitution effect has opposite impacts on the discount rates whether people are rich or poor in a broad sense, which leads to different conclusions about the values of the discount rates. We conclude that there is no unique initial discount rate but one for each context and that making an assumption about the kind of relationship between goods (substitutability or complementarity), as usually done in the literature on discounting for example, compels the discount rates to certain values.



Theme: 2.1 DEGROWTH  
Session: 2.1.F Alternative Conceptions of the Economy II  
Time: F1 Room: R6

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1462 About the foundations of ecological economics: A  
pragmatist revisit of Spash's new foundations

**Hiedanpää, Juha. Presented by Katharine Farrell**

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Clive Spash has opened an important discussion on new foundations of ecological economics. He states: "Ecological economics has been repeatedly described as transdisciplinary and open to including everything from positivism to relativism. I argue for a revision and rejection of this position in favour of realism and reasoned critique." We agree with Spash, in principle, but are not convinced that methodological pluralism and transdisciplinarity are incompatible with reasoned realism. In this paper, we draw on positions developed within the American Pragmatism discourse, to provide concrete methodological recommendations, regarding how these diverse perspectives and orientations can be employed and applied in a methodologically pluralist, empirically robust and policy relevant ecological economics. We do this by combining John Dewey's vision of prioritizing transactive deliberative democracy over utility- and expert-driven advice based systems and the Peircean vision of life – including economies and ecosystems – as a semiotic process the purpose of which is to break, maintain and establish habits in the face of perpetual disturbances. Our argument is that ecological economics would be selling itself short if it were to give up on its commitment to methodological pluralism and that what is needed, in order to ensure robustness and relevance, are transactive methodologies, which make it possible to be to feed in concrete reasonable advice to different phases of political discourses and policy making cycles related to ecological economic matters of concern.



Theme: 2.1 DEGROWTH  
Session: 2.1.F Alternative Conceptions of the Economy II  
Time: F1 Room: R6

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**1522** In search of a new paradigm of ecological economics as the contemporary economic heterodoxy and the perspectives and methodological pitfalls of redefining its research agenda in the context of the new

**Dokurno, Zbigniew**

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More than twenty years presence of ecological economics confirms both the heuristic fertility and matter importance of its research. Can be take a chance the hypothesis that ecological economics will continue to be an important element of economics as a whole. The mainstream however is characterized by a particular set of philosophical and methodological ideas that growing out of the tradition of Cartesian-Bacon carry with them fairly significant limitations.

This raises the issue of whether ecological economics research program will be included in the mainstream reflection and will be subject to the same restrictions or perhaps in the present state ecological economics can identify potential which would allow overcoming these limitations.

The paper both attempt to reconstruct the constitutive assumptions of orthodoxy as well as the identification of opportunities for change inherent in the concepts in the area of ecological economics. There were shown from a methodological perspective the characteristics of the current state of research within ecological economics divided into three main streams: a new environmental economics, a new environmental pragmatism and the socio-ecological economics.

Conducted research aimed to critique the cognitive realism based on the correspondence model of truth. In its place was proposed a coherent model of truth based on pragmatism implying a more legally valid research program.

As a result if ecological economics has maintain its heuristic potential should first and foremost enhance those of its elements that are associated with the perception of knowledge in terms of pluralistic. For if we believe that the principle task of science is to solve problems posed by the man so we must also seek to displace restrictive notion that in scientific knowledge eventually we are going to a static state in which our knowledge is fully compatible with Being. Until theories we consider to be adequate and effective solutions to problems that have been raised as long they are valid even if these solutions will involve sophisticated and formal models which also creates the premise for the development of scientific discourse within new environmental economics whatever its orthodox restrictions. The warning should always be finding the conclusions that arise from our ecological economics theory are not the solution any significant practical problem at the time.

The paper is the result of the research devoted to the analysis of the paradigms contemporary macroeconomics from the perspective of sustainable development realized in the grant from National Science Centre in Poland.



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Session 2.1.G

Alternative Conceptions of the Economy I



Theme: 2.1 DEGROWTH  
Session: 2.1.G Alternative Conceptions of the Economy I  
Time: W3 Room: R6

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## 1524 Does Haim Gvirtzman's "Israeli perspective" hold water?

**Alcott, Blake**

Environmental justice between Jewish and non-Jewish inhabitants of historical Palestine with regard to fresh water resources has been part of the conflict between Zionism and the indigenous population since the declaration of the Israeli state in 1948. This paper addresses the three major pertinent issues of (1) per capita water consumption of residents of Israel compared with that of residents of the West Bank; (2) rights to water judged on ethical, historical and international-law criteria; and (3) the hydropolitical discourse of Israel, the hegemon, in addressing or failing to address issues of equitable allocation and rights, including the right to participate in allocation decisions.

Gvirtzman (2012) defended the status quo from "an Israeli perspective", claiming both that differences in per capita consumption are negligible and that water allocation is currently consistent with various rights criteria. While analysing factual and rights aspects of water allocation, this paper simultaneously deconstructs the discourse of Gvirtzman and other Israeli authors, suggesting that the terms of the debate must be redrawn if greater equity and dignity are to be achieved.

Figures on per capita consumption are contested because figures on both population and fresh water quantities in various geographical areas are contested. Israeli sources estimate the ratio of Israeli to West Bank-Palestinian per capita consumption to be well under 2:1 while Palestinian and World Bank sources place it closer to 4:1. Our close analysis of the data suggests instead a ratio of 2.3:1 or 3:1.

We suggest that Palestinian rights, after 20 years of neglect, should be explicitly defined, in contrast to the Israeli perspective that the Oslo Accords have rendered historical and ethical arguments superfluous. We attest the use of a double standard in Gvirtzman's deeming rights as such to be relevant to Israeli, but not Palestinian, demands, the more so as his scope excludes water of the Jordan River basin.

Finally, we suggest that the issues can be more fruitfully addressed if we re-cast them as intra-national rather than transboundary conflicts. The framework of a single state in historic Palestine, rather than two 'states', enables analytical clarity because both water resources and populations are inextricably mixed. It simplifies historical analysis because the changes in 1967 and 1993 can be ignored. It increases the chance of allocation equity because it simplifies the justice issue by rendering it in terms of human, rather than group, or national, rights.

Theme: 2.1 DEGROWTH  
Session: 2.1.G Alternative Conceptions of the Economy I  
Time: W3 Room: R6

## 994 Between Scylla and Charybdis - On the place of economic methods and concepts within ecological economics

**Strunz, Sebastian**

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Ecological economics (EE) faces a challenge akin to sailing between Scylla and Charybdis – in Greek mythology, these are two sea monsters located at opposing sides of a narrow strait, and falling victim to one of them is all but unavoidable. In the process of refining its conceptual foundations, EE risks of being damaged in either of two opposing ways. On the one hand, in trying to be radically different from economics, EE risks to lose important insights and useful concepts and methods. On the other hand, by routinely applying established economic concepts and methods, EE risks to become a redundant appendix to mainstream environmental economics.

The paper first analyzes the two lines of arguments currently debating the applicability of economic concepts and methods in EE. First, some authors suggest that EE should completely reject economic methods, which are claimed to rely on flawed ontological presuppositions. However, basing the methodological foundation of EE on narrow ontological grounds is questionable because ontological consensus is (i) unlikely and (ii) neither necessary nor sufficient to decide methodological questions. Second, many economists contend that economic methodology has overcome neoclassical shortcomings. Hence, there would be no more need for EE to eschew economic methods. However, standard economic methods still concentrate on efficiency issues while EE is concerned about sustainability, raising questions about justice, time and nature – issues where mainstream economics still lacks convincing concepts.

Against this background, we exemplarily investigate context-based environmental evaluation as an alternative to both total rejection and unquestioned appraisal of economic methodology. A literature review reveals a range of studies analyzing the specific contexts in which economic concepts are (not) appropriate. Thus, context-based and criteria-guided evaluation is an adequate way to address methodological questions. The paper demonstrates that power of judgment, i.e., the capacity to apply general concepts to specific situations, is a crucial step in applied research. When related to practical decision-making, scientific models and concepts turn into heuristics. The



question, which heuristic is most suitable for a specific problem, is then not a matter of ontology, but a pragmatic question of usefulness.

While we acknowledge the strategic aim to demarcate EE from mainstream environmental economics, we argue that this strategic issue needs to be separated from methodological questions. Promoting the ideological core beliefs of EE as opposed to allegedly neutral economics might constitute one way of further shaping EE. Specific methodological decisions, however, should rely on the researcher's judgment.



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**Theme 2.2**

**EQUITY, ENVIRONMENT AND ECONOMIC  
DEVELOPMENT**



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ISEE CONFERENCE ICELAND 2014

Session 2.2.A

Population size and equity; Proposed session



Theme: 2.2 EQUITY, ENVIRONMENT AND ECONOMIC DEVELOPMENT

Session: 2.2.A Population size and equity; Proposed session

Time: W1 Room: R8

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## 1256 Amartya Sen and the Reproductive Rights Model

**Dillard, Carter**

Consistent with the conference themes of equity, economic development, degrowth, and innovative models that will allow transition to a sustainable order, this study examines and redesigns Amartya Sen's famous economic development model by critiquing his under-theorized international reproductive rights submodel, and replacing it with a new, fully-theorized, five-part submodel that takes into account modern regulatory theory and behavioral economics, including the efficacy of legal expressivism and "nudges."

### Background and objectives

Amartya Sen made clear in his 1994 essay *Fertility and Coercion* that he was using a specific submodel of international reproductive rights, the "choice model," in developing his groundbreaking work on economic development. The United Nations Development Program has since adopted Sen's human development paradigm in its developmental efforts. But was Sen correct in using this particular submodel, and how would his broader model for economic development changed had he used an alternative, and more fully-theorized model? How should his model be altered by the many developments in regulatory theory and behavioral economics over the past twenty years?

### Methods

This study will examine contemporary sources of international reproductive rights law (treaties, conventions, custom, etc.), using a variety of accepted interpretive methods, for support for Sen's "choice model," and alternatively, for support for an alternative and more intricate five-part submodel.

### Expected findings

We expect the study to show that there is no support for Sen's "choice model" in the sources of international reproductive rights law. The sources of international reproductive rights instead support an intricate five-part model, which: 1) unbundles the right to have children from the right not to have children, 2) derives the former right from the specific value of the continuity of one's own life, 3) that is contingent on the first-born child being born at or above a minimum threshold level of health and well-being, 4) with the threshold being defined by a broader societal interests in future citizens that are capable of maintaining functional democratic systems that further the international human rights regime, and 5) with the unbundled right to have children balanced against a conflicting human right to a particular ecological environment.

### Conclusion

Sen's work on economic development has been hugely influential, but has carried with it a significant flaw in its use of an unsupported, under-theorized and detrimental reproductive rights submodel. This study will identify and correct that flaw, and thereby improve Sen's broader economic development model.



Theme: 2.2 EQUITY, ENVIRONMENT AND ECONOMIC DEVELOPMENT

Session: 2.2.A Population size and equity; Proposed session

Time: W1

Room: R8

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## 1930 The Diseconomies of Population Growth in Developed Countries and the Depopulation Dividend

**Martin, Roger**

The Global Footprint Network estimate that all but 9 OECD countries are already in ecological overshoot – their footprints exceed their biocapacity. Footprint being the product of consumption per person x number of people, these countries must reduce their population or their consumption (or a combination) to attain ecological sustainability.

The UK population, currently 63 million, is projected to increase by 2050 by 4-23 million. To persuade politicians and the public of the need for stabilization, Population Matters (PM) have concentrated on the economic and carbon costs (O'Sullivan 2013) finding that the cumulative infrastructure cost of UK population growth to 2050 adds up to: Low population growth £1.1 trillion; High £4.2 trillion; simply to maintain, not improve, current standards. Several other costs are not quantified.

This paper will summarise the findings of several research projects by LSE Masters students, commissioned and supervised by PM, which attempt to quantify the economic and carbon costs of projected UK population increase. These include:

\*The medium ONS (Office of National Statistics) projection of 10 million more people in UK by 2033 would add: 1 billion extra tonnes of CO<sub>2</sub>; or renewables equivalent to 27,000 more wind turbines; and £1 trillion extra expenditure on public infrastructure, just to maintain standards

\* To maintain water supplies, the higher 2050 population would require 1.5 - 4.9 million more tonnes per day than the lower; the additional reservoirs would cost £5.9 - £22.6 billion.

\*The high population projection requires an annual job creation rate of 0.60%, the low projection 0.25%.

\*86m people and the Government 80% emissions reduction target would need renewable power generation costing £380 - £1.02 trillion, equivalent to 260,000 more wind turbines (20 per day), plus massive investment in (still infant) storage technology.

\*At the lower end of the projected EU 2050 population range, each citizen's carbon 'allowance' would be 2.5 tonnes pa; at the top end, 2.0 tpa – significant at such low tonnages. (Current tpa 9.4 tonnes).

A few overshoot countries now have reducing populations; but respond with alarm and pro-natalist policies. They ignore the 'depopulation dividend,' comprising the inverse of the costs above, and: full employment; more habitat; greater food, water, energy security; less debt; affordable homes; real inheritance; and the opportunity to transition to a sustainable steady-state economy.

November 2013



Theme: 2.2 EQUITY, ENVIRONMENT AND ECONOMIC DEVELOPMENT

Session: 2.2.A Population size and equity; Proposed session

Time: W1 Room: R8

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## 1755 Resource wars and insecurity: the plague of unsustainable population growth

**O'Brien, Luke Joseph**

This paper argues that lower population sizes would mean less scarcity of water, food and land and therefore a reduction in associated insecurity and associated violent conflict. These causes of conflict have been continuously debated within the study of International Relations since its conception (Waltz, 1959, 1988). Homer-Dixon (1991) incorporates population, economic activity per capita and environmental effects into the normative discourse of nation-state behaviour. Populations are economically active and there are subsequent environmental effects that generate social effects, such as conflict under conditions of scarcity. Three forms of conflict are identified through empirical analysis of societies. (i) Simple-scarcity conflicts, where resources diminish and disputes emerge over remaining stock. (ii) Group-identity conflicts, where a divided society has a perception of unjust resource distribution. (iii) Relative-deprivation conflicts, when there is a frustration due to what has been economically achieved, and what that society expects or feels it deserves.

Abiotic and biotic natural resources are depleting and their future is uncertain. Daly and Farley (2011) indicate the fragility of water, food and land resources for current and future populations. The increased per capita demand for water coupled with a weakening supply signals the need for more cooperation in areas sharing land and ground water resources (Swain, 2001). Saswati et al (2011) indicated a vicious cycle of food insecurity and conflict, where population growth induces unsustainable land and water use for the cultivation of food in regions prone to severe climate change. Land scarcity has been a catalyst of conflict for centuries, with modern examples including population pressure in India (Urdal, 2008) and Rwanda (Verpoorten, 2012).

Deriving two fundamentals: population growth is expected to increase and known natural resources are expected to decrease, this paper asks, "Is war a possible outcome for a future, larger, population contending with the issue of resource insecurity?". This paper critically analyses the prospect of a future planet drawing on existing social and environmental theory, with reference to empirical evidence. A major policy question is whether addressing scarcity-inducing population growth is more humane now, or in the future.

This Paper is intended for the session on Population, organised by Blake Alcott and Roger Martin. Thank you.



Theme: 2.2 EQUITY, ENVIRONMENT AND ECONOMIC DEVELOPMENT

Session: 2.2.A Population size and equity; Proposed session

Time: W1

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## 1435 Population as an Essential Variable to Equity in Sustainable Systems

**Engelman, Robert**

To link environmental and social sustainability, we need to consider population. When we consider what levels of human activity are environmentally sustainable and then, for the sake of equity, calculate an equal allocation of such activity for all, we are forced to ask how many people are in the system.

Suppose for example, we conclude that 4.9 billion tons of carbon dioxide (CO<sub>2</sub>) per year

and its global-warming equivalent in other greenhouse gases—one tenth of the 49 billion tons emitted in 2010—would be the most that humanity could emit annually to avoid further increases in the atmospheric concentrations of these gases. We then need to divide this number by the 7.1 billion human beings currently alive to derive an “atmosphere-sustainable” per capita emission level. No one responsible for emissions greater than the resulting 690 kilograms annually could claim that his or her lifestyle is atmosphere-sustainable. To do so would be to claim a greater right than others to use the atmosphere as a dump.

One 1998 study used then-current population and emission levels and a somewhat different calculation of global emissions level that would lead to safe atmospheric stability. The conclusion: Botswana’s 1995 per capita emission of 1.54 tons of CO<sub>2</sub> (based in this case on commercial energy and cement consumption only) was mathematically climate-sustainable at that time. Although population-based calculations are not always so informative with every resource or system (sustaining biodiversity, for example), similar calculations could work to propose sustainable per capita consumption of water, wood products, fish, and potentially even food.

Once we master such calculations, we begin to understand their implications: As population rises, so does the bar of per capita sustainable behavior. That is, the more of us there are, the less of a share of any fixed resource, such as the atmosphere, is available for each of us to sustainably and equitably transform or consume in a closed system. All else being equal, the smaller the population in any such system, the more likely sustainability can be achieved and the more generous the sustainable consumption level can be for each person. With a large enough population there is no guarantee that even very low levels of equitable per capita greenhouse emissions or resource consumption are environmentally sustainable. If Ecological Footprint calculations are even roughly accurate, humanity is currently consuming the ecologi-

cal capacity of 1.5 Earths. That suggests that no more than 4.7 billion people could live within the planet’s ecological boundaries without substantially reducing average individual consumption.

Absent catastrophe, sustainable population anything like this size will take many decades to reach through declines in human fertility that reflect parents’ intentions. There is good reason to believe, however, that a population peak below 9 billion might occur before mid-century if societies succeed in offering near-universal access to family planning services for all who want them along with near-universal secondary education for everyone. Also helpful would be greatly increased autonomy for women and girls and the elimination of fertility-boosting programs such as birth dividends and per child tax credits.

In the meantime, while population remains in the range of 7 billion, individual levels of



greenhouse gas emissions and natural resource consumption will have to come way, way down to even begin to approach environmental sustainability. Consumption levels that would bring those of us in high-consuming countries into a sustainable relation with the planet and an equitable relation with all who live on it would undoubtedly be small fractions of what we take for granted today.



WELLBEING AND  
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ISEE CONFERENCE ICELAND 2014

Session 2.2.B

Welfare, Wealth and Work for Europe (FP7: WWWforEU);  
Proposed session



Theme: 2.2 EQUITY, ENVIRONMENT AND ECONOMIC DEVELOPMENT  
Session: 2.2.B Welfare, Wealth and Work for Europe (FP7: WWWforEU); Proposed session  
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## 1723 Developing Resource use Scenarios for Europe

**Fischer-Kowalski, Marina**

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Towards an ecological macroeconomics - Welfare, Wealth and Work for Europe

Developing Resource use Scenarios for Europe

Marina Fischer-Kowalski, Dominik Wiedenhofer, Willi Haas

The paper reviews a number of approaches to conceptualize and operationalize biophysical constraints for economic performance. We develop the following scenarios for European resource use until 2050: A "trend scenario" describes an average per-capita resource use similar to the 2000s. A "best practice scenario" generalizes the past success of some European countries in downsizing their resource use to all European countries up to 2050. The third scenario, the "radical transformation scenario" assumes halving per capita annual resource use in Europe, leading to what is commonly called "absolute decoupling". These scenarios relate to the global scenarios developed by the International Resource Panel of UNEP (2011; [www.unep.org](http://www.unep.org)) and focus on the specific constraints and opportunities of the EU27 countries within a global context.

Our point of departure is a descriptive analysis of the changes in global and European resource use in the past century and the non-linearities that can be observed in the course of the past decades with reference to resource use and resource prices. For Europe we find a relative stagnation of energy and materials use since the early 1970s, while economic growth continues. We term this phenomenon the "1970s syndrome" and explore some of the reasons for this happening, such as efficiency increases, outsourcing of industrial production to developing countries and saturation of material consumption. For a number of developing countries we find an opposite trend, particularly since the turn of the century: their energy and materials use is virtually exploding. This in effect also leads to a strong rise in global resource use, straining the global resource base: for both abiotic resources and biotic resources we find, in energy and material terms, declining returns on investment and in many cases stagnating output.

Under these conditions, and under the assumption that developing countries will increasingly turn from using resources for producing commodities for trading with Europe and other high income countries to satisfying demand within their own populations, we arrive at the conclusion that European economic and material growth will be very moderate indeed and a strategy towards the third scenario of halving resource use through improving resource productivity and lowering demand would be very wise, indeed. The macroeconomic implications of such a strategy will be explored in the next phase of the project WWW.



Theme: 2.2 EQUITY, ENVIRONMENT AND ECONOMIC DEVELOPMENT  
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## 1411 Towards an operational measurement of socio-ecological performance

**Köppl, Angela**

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Special Session: Towards an ecological macroeconomics - Welfare, Wealth and Work for Europe

Session chair: Angela Köppl

Towards an operational measurement of socio-ecological performance

Questioning GDP as dominant indicator for economic performance has become commonplace. For economists economic policy always aims for a broader array of goals (like income, employment, price stability, trade balance) alongside income, with income being the priority objective. The Stiglitz-Sen-Fitoussi Commission argued for extending and adapting key variables of macroeconomic analysis. International organisations such as the EC, OECD, Eurostat and UN have proposed extended arrays of macroeconomic indicators (see "Compendium of well-being indicators", "GDP and Beyond", "Green Economy", "Green Growth", "measuring progress of societies"). Despite high profile efforts of extending the measurement of economic performance, few well-being and ecological variables are in use in macroeconomic models. The reasons for the low uptake of an augmented range of socio-ecological indicators in macroeconomic models include path dependencies in modeling, technical limitations, indicator lists being long and unworkable, the choice of indicators appearing ad hoc and secondary data missing. In our view, the literature on socio-ecological indicators lacks theoretical underpinnings. This is why we start by reviewing four approaches from sustainability science and ecological economics, notably happiness economics, the capabilities approach, eco-system services and energy services. These approaches have a promising conceptual base and have been used for empirical analyses. While drawing on a range of widely used approaches helps us to address socio-ecological transitions in a more systematic way, we wish to emphasize that they rest on strong normative foundations, as does neoclassical economics. In a second step we identify in this paper specific indicators that account for key aspects to foster socio-ecological transitions. We focus on four areas of provision, notably housing, food, mobility and social inclusion. While other domains could be added, these cover the majority of energy and resource use. The paper ends with a short list of candidate variables that we suggest for inclusion in ecological macroeconomic models and – as much as possible – offers data sources. We conclude that it is necessary to:

- widen the lens in macroeconomic modelling
- develop a better conceptual base
- account for stocks and flows and provide suitable indicators to measure them.



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## 1715 Socio-economic impacts of a GHG roadmap scenario

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The objective of this paper is to evaluate a GHG roadmap scenario for a European economy, applying a DYNK (Dynamic New Keynesian) model. The model integrates dynamic modeling of private consumption by income groups and modeling of factor demand for all industries. In contrast to static CGE models the DYNK model describes institutional features of the economy that may lead to short-run deviations from equilibrium (liquidity constraints, imperfect competition and union wage bargaining). The model is closed by a certain target of fiscal policy for the path of the public deficit to GDP ratio. All functions in the model are based on econometric estimation.

Special emphasis is given to energy demand in consumption and production, which is modeled via price, income (production) levels as well as technology. The model also contains a consistent link of energy/emissions to firms' and households' economic activity. The household sector comprises 5 income groups, and consumption demand is split up into the nests of durables, energy and non-energy consumption. Energy demand of households is to an important extent influenced by the level and the characteristics (energy efficiency) of households' durable stocks. In production two different types of technological change are considered: TFP growth and factor bias. Both are modeled via a deterministic trend.

We develop a scenario of radical GHG emission reduction for Spain comprising policies for energy efficiency improvement and decarbonization. The scenario is explicitly defined by policy measures including carbon pricing, as well as other specific measures for increasing energy efficiency and decarbonization. All these policy instruments also have economic effects and therefore feedback effects on energy and emissions, which have to be considered in order to achieve a radical GHG emission reduction path.



WELLBEING AND  
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ISEE CONFERENCE ICELAND 2014

Session 2.2.C1

equity and economic development: assessing the discourse



Theme: 2.2 EQUITY, ENVIRONMENT AND ECONOMIC DEVELOPMENT  
Session: 2.2.C1 equity and economic development: assessing the discourse  
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## 1163 The growth paradigm at the root of global ecological distribution conflicts

**Busck, Ole**

The growth paradigm at the root of global ecological distribution conflicts

Based on a literature review this study attempts to uncover the nature of the material and financial flows of resources between the global South and the global North with the aim to shed a critical light on mainstream recommendations of economic growth as a means to reduce poverty.

In the media and among politicians increasing attention is being paid to the seemingly rapid changes and improvements in the economic growth rates of developing countries, not least in former 'hopeless' Africa. More than anything else, private sector involvement in poor countries' economies is being proclaimed as the lever of this development. However, a closer look reveals that economic progress most often is linked to the extraction of one or more mineral or biological resources, which adds to the distorted and unequal relationship between poor and rich countries and deepens problems of equity and ecological sustainability. Neoliberal policies accommodating the growth-based need for resources and markets of companies in industrialized countries still dominate global trade and investments and in addition to the negative environmental and social effects of their involvement, beneficial economic effects in general are hard to discern. Investments in raw material and energy extraction have long been known to give little return to the host countries and often create major imbalances in their economic and social systems ('Dutch disease', 'resource curse'). However, investments in agriculture (monocultures, cash-crops) and forestry (timber, pulp), in addition to their malign ecological effects, increasingly seem to distort the social fabric of rural communities in developing countries. Land grab in poor countries by companies and governments to satisfy domestic needs of bioenergy, food or feed is the latest phenomenon. It is concluded that more attention to and research by the academic community into such negative global effects of the growth paradigm and alternative paths of development is needed to raise public awareness.



Theme: 2.2 EQUITY, ENVIRONMENT AND ECONOMIC DEVELOPMENT  
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## 1510 Beyond physical and financial capital: economics for a transforming world

**Keating, Adriana**

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Beyond physical and financial capital: economics for a transforming world

The application of cost benefit analyses (CBA) to fields outside its original scope needs careful examination. A prime example of this is the field of disasters, which is gaining increasing global attention. Disasters are the forefront of transitions in human systems as they relate to rapid urbanization and development, increased interconnectedness and inequality. Coupled with this is increased frequency and severity of extreme weather events due to climate change. This presentation will critique the theory and practice of CBA in relation to disasters, where results to date have been mixed and largely characterized by a neglect of environmental impacts and social equity. It is particularly inadequate under the rapid change and uncertainty seen in transitional periods. Economic thinking beyond the current focus on CBA has much to offer disasters and wider discussions about values under transition. To this end we propose a more holistic, systems based approach and accompanying economic methodologies. Ongoing results from three case studies in the developing world are discussed.

The root cause of the inadequacy of CBA is a narrow and static scope that does not account for the interconnection between ecological health and human wellbeing. Using examples from flooding, this presentation will demonstrate how the application of CBA has contributed to environmental destruction and increased inequality. For example, via the omission of the dynamic impacts of inequality on the environment when marginalized people are forced onto marginal lands with high risk. Current theoretical and practical issues are identified, along with how they may play out in periods of transition. This serves as a strong caution for the unquestioned proliferation of CBA in the field of disasters and beyond.

The presentation sets out a systems perspective of resilience in linked human-environmental systems which demonstrates how economic thinking can go beyond the standard static focus on physical and financial capital. It is iterative and dynamic, and establishes the centrality of ecological, human and social assets, and their accompanying thresholds for system wellbeing. We propose economic methodologies beyond CBA and their appropriate application, to redirect investment from its current trajectory. We present the ongoing application in three case studies in the developing world. Through these case studies we provide real examples of how economics can address the long-term determinants of wellbeing, especially ecological sustainability and equality.



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## 958 The fair distribution of critical resources: reducing environmental poverty and economic tools

**Kestemont, Bruno**

The fair distribution of critical resources: reducing environmental poverty and economic tools

Critical resources are limited, indispensable and not substitutable by other resources. Resource poverty (environmental poverty) is the number of people not having access to the vital minimum of critical flows which are the production of critical capitals.

We'll analyze the theoretical possibilities to reduce environmental or resource poverty. The best way to diminish poverty of an infinite (non-critical) resource is growth, on the cost of rising disparity. We'll show theoretically that in the case of a renewable critical resource, the only way to reduce poverty is a fair redistribution to the poor (giving them at least the vital minimum).

We'll show theoretically that "Economic tools" (taxes, emissions trading) appear neutral regarding global critical flows: at global level, they have no effect on the consumption of critical resources (It's not the case for non-critical resources, where economic tools can enforce a shift to substitutes). But their effect is to change distribution. We'll show that economic tools redistribute critical resources from the poor to the rich. They are unfair in this specific case. Only absolute subsidies (distribution of access power from the rich to the poor) can have the reverse effect.

This demonstrated, remains the question: do critical resources exist? We'll try to answer with literature.



WELLBEING AND  
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ISEE CONFERENCE ICELAND 2014

Session 2.2.C2

equity and economic development: assessing the discourse



Theme: 2.2 EQUITY, ENVIRONMENT AND ECONOMIC DEVELOPMENT  
Session: 2.2.C2 equity and economic development: assessing the discourse  
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1543 The economics of a world with decreasing access to minerals, metals, energy, prerequisites for food and people

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Several studies have shown that the world is quickly going towards a world of limits (Meadows et al. 1972, 1992, 2004, Heinberg 2001, 2005, 2011, Greer 2003, Ragnarsdottir et al. 2011, 2012, Sverdrup and Ragnarsdottir 2011, Sverdrup et al. 2013, 2014a,b) at the present time, following a predictable trajectory. Our global system dynamics model (WORLD) was used to assess the interaction of natural resource use, energy production, industrial production, food supply, global pollution, population and the economics of a world with declining resource availability. The present world is currently in a massive overshoot with respect to debt, population, resource use and pollution emission according to the studies mentioned above. All these issues are demanding immediate concerted and swift actions across global society to avoid unpleasant system discontinuities and agonizing troubles. We show that resource scarcity may not only lead to "peak resources", but also to "peak consumption, peak wealth, peak welfare, peak technology, peak social trust and peak civilization" unless new and innovative strategies are developed, and real actions are implemented in the near future. A process referred to as contraction will take place on a global scale, and we demonstrate how the initial stages of this process have already started in some regions of the world. We show how decreasing amounts of key resources will be available in the future, and at steadily rising prices, apparent freedoms that are taken for granted today will be eliminated and forcing a changed behaviour for both the public and governments. This renders the present growth-based, neoliberal economic paradigm obsolete and even dangerous. The development of a convergent new economic and social paradigm is urgent, where everything is reassessed. The large-scale aspects of globalization, big government, big organizations and big corporations that are fossil energy and materials-driven will in the future become a major unsustainable problem. We show that a sustainable world must be based in sustainable social structures, behaviours and principles. This involves a down-scaling or simplification of the global world, including business, government and society towards local sustainability, that has diversity, small scale autonomous units and resilience.



Theme: 2.2 EQUITY, ENVIRONMENT AND ECONOMIC DEVELOPMENT  
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## 1083 USING SOCIAL PRICES FOR SOCIAL EQUITY AND WELLBEING

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If a community is to secure social equity and wellbeing, the traditional way of evaluating private sector projects should be discarded. Financial analysis such as cash flow analysis is part of the traditional economic paradigm that contributed to economic crises. In the recent global financial crisis, we witnessed how private sector decisions can have devastating effects on the rest of the economy. If private sector decisions impact the whole society, then perhaps Social cost benefit analysis (SCBA) should be used to evaluate the feasibility of these projects. Financial analysis identifies the profits that accrue to the project-operating entity only while SCBA measures the effect of a project on the fundamental objectives of the whole economy and on every individual in a society. The art of SCBA is to assign social prices to goods and services which do reflect their actual costs to society (when used as inputs) and their real benefits when produced. The difference between the real costs and benefits is social profits (also known as net economic benefits); a true measure of society's gains. The objective of this paper is to determine whether funds are allocated to firms that yield maximum economic benefits to Malaysia after financial liberalization had occurred. A sample of private sector firms that have taken large loans from the banking sector is evaluated using Little & Mirrlees SCBA methodology. Social prices used here incorporate both the country's growth and distributional objectives. SCBA is conducted on an ex-post basis and for two time periods; pre and post liberalization periods, to compare the social profits derived. Overall, results showed that pre liberalization cases gave rise to greater positive social profits compared to post liberalization cases. This indicates that liberalization of the Malaysian banking sector did not bring about maximum economic benefits to the country. Results also showed that some sub-sectors of the economy are more efficient than others in resource utilization.

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Theme: 2.2 EQUITY, ENVIRONMENT AND ECONOMIC DEVELOPMENT  
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## 1644 Labor Productivity, Unemployment, and Energy Use

**Winslow, Maggie**

Increasing labor productivity is generally hailed as a positive outcome of technological innovation. The production of more goods and services with fewer hours worked allows for higher standards of living and for decreased inflationary pressure since wage increases can result from increased productivity and are not translated into higher costs for goods and services. However, in a world of limited natural resources, and high unemployment, perhaps increased labor productivity is too much of a good thing. This paper will examine the increase in labor productivity in the United States from the 1960s to the present, along with the increased use of natural resources, particularly energy, and then consider under what conditions increased labor productivity could be unequivocally beneficial and in what circumstances and industries the value of continued productivity gains should be further examined in light of impacts on employment and resource depletion.



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ISEE CONFERENCE ICELAND 2014

Session 2.2.E

equity and economic development: aquatic systems 1



Theme: 2.2 EQUITY, ENVIRONMENT AND ECONOMIC DEVELOPMENT

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Time: T1 Room: R7

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## 975 Decision support for integrated river water quality management

**Logar, Ivana**

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Over the next decades, environmental and societal changes are expected to affect many drivers of river water quality like water abstraction, water infrastructure and land use. To deal with these changes, a comprehensive decision support framework is needed that enables managing river water quality in a consistent and comprehensive way. The goal of this research was to develop a prototype of such a framework, to test it in selected case studies, and to assess how water quality may be influenced by future climate and societal changes. We developed a consistent chain of models that link downscaled climate change predictions with hydrology, water quality and finally the ecological status of streams. We designed the models in such a way that the predictions yield the attributes relevant for decision support in a Multi-Criteria Decision Analysis framework. Four socio-economic scenarios and eight management alternatives have been designed and analyzed for two catchments in Switzerland (Gürbe and Mönchaltorfer Aa). The socio-economic scenarios include Status quo, Doom, Boom, and Qualitative Growth scenarios, which were defined for 2050 horizon together with the relevant stakeholder. They vary based on the assumptions made about potential future demographic, land use, infrastructural and economic development. The management alternatives comprise banning of biocides in facades, increasing permeable surfaces in urban areas, rainwater retention, extensions of tanks for combined sewer overflows, upgrading of wastewater treatment plants, switching to organic farming, replacing intensive agriculture by a nature park and extending buffer strips. We studied the current situation based on existing monitoring data complemented by a specific field-study. The results demonstrate that predictive uncertainties are large even for today's condition. Despite this, the results clearly suggest that future water quality is predominantly determined by human activities in each catchment as reflected in the socio-economic scenarios and the management alternatives. Climate change has generally a much weaker influence. For management, the results imply that tackling today's problems will also alleviate most of the foreseen problems in the future. Input of chemicals into streams can be managed by mitigation measures in urban areas and agriculture, whereby agricultural measures (like switching to organic farming or proclaiming the catchment area a natural park) would be considerably more expensive to implement under different socio-economic scenarios.



Theme: 2.2 EQUITY, ENVIRONMENT AND ECONOMIC DEVELOPMENT

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## 1084 How to Make Environmental Targets Affordable in Estuarine Waters: Extending the Polluter Pays Principle?

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In European environmental water legislation, costs are deemed disproportionate when the total cost of a supplementary environmental measure appreciably exceeds the total benefit generated by the measure (cost-benefit concept). Moreover when costs are lower than benefits, they are deemed disproportionate if polluters cannot afford them (affordability concept). The implication of both disproportionality concepts for ecosystem protection is important given that they condition the possibility for environmental targets to be postponed or made less stringent. But what if this twofold concept of disproportionate cost were replaced by the affordability concept alone? A first argument supporting our suggestion is that cost-benefit analysis encounters difficulties in taking into account the important ecological functions provided by biological structures and processes from which ecosystem services stem. A second argument is that there is no reason for not implementing an environmental legislation democratically decided by representatives if polluters can bear the costs. The problem is that the affordability concept strongly depends on the range of the "Polluter Pays Principle" considered. In order to improve environmental equity and reduce the number of cases where environmental targets are postponed or made less stringent, we develop two extensions of the "Polluter Pays Principle". The extension method is based on an ecological-economic input-output model and tested on the case of natural marine habitat destroyed by harbour extension in the Seine estuary. The results suggest that disproportionate costs can be transformed into affordable ones when the "Polluter Pays Principle" is extended to economic sectors with indirect responsibilities of second order ("User Pays Principle") and third order ("User of User Pays Principle"). To ensure that such extension is fair to the ecosystem and to economic sectors, equity issues are considered inside a system that we named the Three Laws of Equity. Our results suggest that if the method developed in this paper were applied, economic feasibility would no longer be an argument to impede the implementation of policies with ambitious environmental targets offering significant improvements to ecosystem quality.



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## 1330 NIMBY or Policy: Lessons from socioecological conflicts related to marine finfish aquaculture in Europe

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The increasing gap between fish products consumption and the stagnated global capture fisheries has promoted the growth of aquaculture at a global scale (FAO, 2012). Compared to the significant growth of global sector in the last decades, the aquaculture in Europe rather experienced stagnation. In order to reverse this trend, several European authorities including European Parliament and European Commission currently encourage the growth of the sector in Member States, and marine finfish aquaculture has a decisive role in the future of the European sector. However, there are some concerns of various actors about existing and possible social and ecological impacts of marine aquaculture activities. These effects already gave rise to significant conflicts throughout the world such as in Canada, Asia and Chile (Noakes et al., 2003; Adduci, 2009; Barton and Floysand, 2010). To have a better understanding of socioecological conflicts related to marine finfish aquaculture in Europe, in this paper, we identified their localities and studied their characteristics, their link with environmental justice theory, and their significance considering policy implications. We used three main sources of information: (i) academic articles based on a keyword search from SCOPUS database, (ii) grey literature, and (iii) in-depth interviews conducted with different actors. In this way, we explored what kind of resistances to marine finfish aquaculture exists in Europe focusing on the relevant actors such as fishermen, environmental NGOs, tourism sector representatives, local communities, and their arguments. Using an environmental justice framework, we analyzed the demands of actors in relation to four dimensions of environmental justice (proposed by Schlosberg, 2007), i.e. distributive justice, recognition, participative justice and capabilities. The results showed that resistances to marine aquaculture in Europe do not have a purely conservationist motivation, but they include claims linked to environmental justice concerns. They include demands for an even distribution of costs and benefits resulting from marine finfish aquaculture, actors' recognition as relevant stakeholders, participation to decision-making processes, and enhancing their capabilities to be able to gain access to information and to the means to influence decision-making. The future development of European policies should take these factors into consideration if a greater social support to the sector's development wants to be achieved.

Acknowledgements: Research for this paper benefited from EC funding under the Marie Curie Actions - Initial Training Networks - FP7 - PEOPLE - 2011; contract N° 289374 - "ENTITLE".



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## 1607 FISHERIES INSTITUTIONS: ENVIRONMENTAL EQUITY/JUSTICE, CLIMATE- AND SOCIAL ADAPTIVE CAPACITIES OF MARINE CONSERVATION

**Bukowski, Meike**

It is well known that climate change and biodiversity losses are closely connected. However is it also well known that these are closely connected with social equity and justice? Climate change is emerging as one of the greatest threats to biodiversity, increasing pressures on resources and the continued provision of ecosystem services. Addressing these challenges will require more than pragmatic conservation action informed by site-specific understanding of adaptation capacities to climate change. It will also require an understanding of the institutional and social capacity to cope with and adapt to change.

Coral reefs and mangrove forests as fish assemblages are one of the most species dense communities on earth, they contribute to critical ecosystem functions and provide essential ecosystem services to poor human societies in tropical and sub-tropical countries.

The establishments of Marine Protected Areas have therefore become an important part of society's approach to conserving these habitats. Managing protected areas must therefore attempt to take into account climate change as well as other threats to its biodiversity, and also to include the needs of the local communities in the conservation action.

Using the cases of the Conservation Area "Menai Bay" in Zanzibar, Tanzania, and the Conservation Area Cagarras Islands Archipelago in Rio de Janeiro, Brazil, this PhD thesis paper discusses the Environmental Justice- and climate adaptation integration of MPA's managing institutions and users (local communities and artisanal fisheries) as well as their social acceptance that enables a "fair perceived" (Perceptual Justice) adaptive ecosystem-based governance process.

Both cases fall under a UNESCO World heritage site; both are supported by different institutions in different ways. In this regard it is of interest in which regard a country in transition like Brazil, that is by now the 6th largest economy in the world, and one of the least developed countries like Tanzania, use different approaches and/but engender similar or different push and pull factors. The two protected cases are part of compensation measures for destructive industries (e.g. Petrobras) and industrial fisheries (setting up exclusive economic zones) to protect the marine ecosystems.

For this, the paper uses a new approach as it combines the theoretical findings of several scholars on climate change capacity, governing the commons and "fair" governance, and has developed an own conceptual framework to identify problems and key factors (push- pull) in this regard. It focuses on the 6 dimensions of climate adaptive capacity identified by Gupta et al. to investigate the institution's climate adaptive capacities. To identify a "fair" adaptive ecosystem-based governance process this paper distinguishes between distributive and procedural "fairness" (Adger 2006) and further analyses of institutional social capacity with a selection of Ostrom's Principles of successful governance of the commons. Information for the study has been collected through documentary surveys and interviews with the Marine Parks and Reserves Authorities and local management offices of these areas.



Note of thanks/acknowledgement: My special thanks to my academic supervisor Prof. Siebenhüner for his support on all levels, I also want to thank Prof. May and Dr. Jiddawi for helping me to get access to the abovementioned research areas.



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1764      **The Ring of Fire mining development project in the Far North of Canada: Can prosperity for all be achieved and at what cost?**

**Pastoret, Corinne**

NA

While economic growth in Canada has traditionally been driven by exports of natural resources extracted in remote Northern communities, mining-driven revenues have mostly been transferred to large cities in the South of Canada.

With the neoliberal turn of the 80s, multinational mining companies have taken control over the exploitation of Canadian natural resources as part of a worldwide strategy of production, division of labor and trade of natural resources, which resulted in deepening regional and international disparities. There was little chance that this global strategy would genuinely improve the well-being of local communities in terms of higher living standards, full-employment, safe levels of pollution, ecological integrity and adequate infrastructures.

The Far North of Ontario is one of the world's largest and most intact ecological systems. This paper looks at the expected impacts of the "Ring of Fire" (ROF), a new large-scale mining development project in the Far North of Ontario, which is portrayed by Canadian politicians and mining companies as the engine of economic growth and prosperity for all, for the next 30 years. It is asked if prosperity will be shared with communities in the Far North of Ontario, how and at what environmental costs?

The paper is divided into 3 main parts, as follows:

- 1) Part one provides an overview of the global and regional contexts: neoliberal turn, speculation on commodity markets, strategies of multinational mining companies, weakening of labor unions, increasing regional inequalities and recent provincial economic proposals in Ontario and Québec to intensify the exploitation of natural resources in the North and Far-North of Canada.
- 2) Part two presents the natural and socioeconomic characteristics of the Far-North of Ontario. It is a remote region, rich in natural resources and populated by scattered aboriginal communities which have not traditionally benefited from mining projects, but suffered from pollution of their environment and the disruption of their traditional way of living. Most of the communities experience poverty, indecent living conditions, low education, high unemployment and lack of road access, power and sewage systems.
- 3) Part three critically analyzes the expected benefits and the related monetary and environmental costs of the ROF project. A specific attention is given to both public policies aiming at including remote aboriginal and Northern communities into the economic development process - such as resource revenue sharing, employment and training policies- and to private negotiations of impact benefit agreements between mining companies and aboriginal communities.



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## 1092 Brazil's pre-salt oil layer: cursing the blessing or blessing the curse?

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Since the announcement, in 2007, of the pre-salt oil layer by the Brazilian Oil Company (Petrobras), there has been a lot of optimism about Brazil's future economic development. Even before any extraction has been started off, pre-salt revenues have already been legally addressed to fund country-wide educational and health systems. Nevertheless, on one hand, the country formally subscribes to international negotiations on climate change to curb fossil fuel emissions; on the other hand, even though claiming to bear a clean energy matrix, it falls back on its newest oil reserves to support its future economic development. Nowadays, though, many leading economic countries have heavily invested in renewable rather than in fossil fuel energy sources. Moreover, alternative fossil options, such as shale gas, have become economically and technologically feasible. So, in this international context, is the ownership of a large oil reserve a blessing or a curse? The answer is given by a non-renewable resource multi-period model (Hotelling model). By drawing an optimal depletion price path along which extraction revenues would not dramatically rise or fall in response to a non-optimal programme, its objective is to prevent the "Dutch disease" and distortions in the oil volume to be eventually shared between the pre-salt reserve owner (government) and its exploiting companies. If market prices are higher than the optimal ones, the primary commodity is likely to be over-depleted and largely exported, thereby causing the exchange rate to over-appreciate and the demand for foreign, instead of



domestic, goods to increase. Nonetheless, results show that optimal prices, quantities and economic lifetime of the resource critically rely on current estimates for the existing stock, oil prices and interest rates.

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964      **The great Indian conservation debate: Contextualizing inequalities and poverty**

**Thapliyal, Sneha**

Protected Areas (PAs) have proliferated in recent decades, especially in developing countries (WDPA, 2011). However, there is often substantial overlap between biodiversity hotspots and incidence of poverty (Sachs, 2009). Furthermore, rural communities in developing countries, often extensively dependent on forests for sustainable livelihoods, bear the cost of global preservation of natural resources. For instance, over 70% of population in India lives in rural areas with some form of direct dependence of households on forest-based natural resources varying between 40-80% in villages. Thus, it is imminent to ask if PAs exacerbate or alleviate poverty. Focussing on IUCN type I and II PAs in India, the objective of this paper is two-fold: (a) to determine if forests are being converted to PAs in regions with greater poverty, and (b) to examine how regions with PAs have performed on inequality and poverty indices over the last three decades as opposed to their counterparts i.e. similar regions but without PAs. Controlling for non-random nature of site selection of PAs, we generate counterfactual districts within states using propensity scores matching method. We estimate Atkinson, Gini and Theil indices using nationally representative systematic consumption data collected by National Sample Survey Organization from 1980 to 2010. Following Nielsen et. al. (2012), we also combine consumption and asset data to determine chronically poor, transient rich and transient poor households. Results of the fixed effects model suggest that districts with PAs have had better economic outcomes than the counterfactual districts. While PAs restrict opportunities for land-use, they generate new incomes by tourism and allied infrastructure development and increasing flows on economically significant environmental services. We posit that our counter-intuitive results are largely driven by tourism-related revenue. Inference of this causality has significant bearings on conservation policies, especially for the developing nations rich in biodiversity but poor in public welfare outcomes.

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1675 Exploring the food security discourse in Russia

**Griewald, Yuliana**



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## 1212 Eastern Europe and the Great Economic Transformation: Treadmill of Production, labour market and the Environment.

**Filcak, Richard**

Some twenty years after the political changes we find better air quality in Central and Eastern Europe, but in the same time more unemployment, economic inequalities and social tensions. Environmental sustainability, once presented as the corner stone of the new emerging civil society is surviving at the edge of interest. Based on the statistical data and surveys outcomes we explore how the economic transformation affected quality of the environment and resources consumption vis-a-vis labour market.

The 1990s were in the region the years of rapid development of the new environmental policy and institutional framework, mostly propelled by the European Union accession process. In the same time, it was the phase of rapid economic transformation, opening to the global market and privatization. Outcome is deindustrialization of whole regions, and collapse in many branches of the economy. The second phase of the transformation is characteristic by gradual re-industrialisation caused by orientation of the industry on semi-products for the European market and by shift of production from Western Europe to the Eastern countries. This re-industrialisation stage we analyse using conceptual framework of the Treadmill Theory suggested by Alan Schnaiberg. Keeping the production costs low, while increasing amount of outputs leads to the most challenging and problematic discrepancy we find between the environmental impact and employment. It is automatisisation accompanied by gradual decrease of workforce and parallel increase in energy and material consumption. Introduction of machinery and information technologies, and the cost of the machines and IT itself is cost-effective only if there is a substantial increase in production and/or decrease of the operating costs (i.e., employment).

Based on the data about the manufacturing sector we analyse the first and the second phase. While deindustrialisation was accompanied by sharp decline in employment on the background of improving majority of the environmental indicators, the second phase of re-industrialisation is more complicated and is characteristic by increasing economic output on the account of increasing energy/material consumption and decreasing amount of jobs in the economy.

In conclusion we discuss several macro-level policy option how to revert adverse economic and social trends. Here we focus on merging the environmental and social agenda. In the second flow of argument we discuss concept of re-localization, or approaches of how to return green economic activities back to the people in marginalised regions.



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## 1218 Spatial Polarization of the Ecological Footprint Distribution

**Teixidó-Figueras, Jordi**

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This paper consists in a distributional analysis of natural resource consumption as measured by Ecological Footprint (EF) indicator. So far, distributional analyses on natural resource consumption have been focused on the inequality dimension (White, 2007; Steinberger et al., 2010; Duro and Teixidó-Figueras, 2013) rather than polarization. However, conflict, such as the one emerging from a core-periphery relationship among countries, is better captured by the measure to which there is a clustering on the distribution (polarization) rather than the extent to which a distribution is more spread (inequality). Such latent conflict in the distribution might be a by-product of the Ecological Unequal Exchange theories where, from a world-system analysis perspective (Wallerstein, 1974-1989), global distribution of environmental deterioration is somehow structurally determined whereby the resource flows are driven from the peripheral countries towards core countries. In this paper, we intend to evaluate, for the first time as far as we know, the degree of international polarization of EF, and so the distributional inherent conflict, by the use of methodology widely accepted in the literature of distributional analyses: the polarization cardinal approach mainly developed by Esteban and Ray (1994), Zhang and Kanbur (2001), Duclos et al. (2004). Results obtained (for a sample of 119 countries from 1961 to 2007 that amounts 90% of World Population) provide empirical evidence of a two groups' polarization from 1961 to 2000, conspicuously driven by exogenous income groupings, and three groups polarization from 2000-2007. Decompositions of Polarization performed inform of further insights of the EF distribution and contribute from a quantitative perspective to core-periphery debates.

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## 1599 Farming societies of the Okavango basin in transition – 3 case studies of farming societies

**Kowalski, Benjamin**

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The Okavango River Basin (ORB) is a sparsely populated nearly pristine water-based environment shared by three countries of southern Africa: Angola, Namibia and Botswana. Recent population growth and a general desire for economic development lead to changes in resource use and rural livelihoods, as farming is the main livelihood source and land use form in the ORB. An empirical analysis of current farming systems and socio-ecological societies was conducted in three place-based case studies – one in each country. We aim to understand from a transition perspective what characterizes the current systems, which environmental and societal critical factors may shape their transition pathways, and towards which state they may develop under the current conditions. Results are interpreted in relation to the current political aims of the riparian countries in order to assess opportunities and challenges with regard to sustainability and equity.

Data was collected from 2011 to 2013 at the household level using household surveys and explorative farmer interviews and at the basin scale via stakeholder interviews following a stakeholder analysis. Methods of analysis comprise livelihood analysis, farming system analysis and in the case of Botswana a Material-&Energy-Flow-Accounting.

Results show that stratification among rural households of the ORB increases with population density and cash availability. Furthermore, relative household wealth is a decisive determinant of farming strategies and, under conditions of advanced soil degradation, for reaching food self-sufficiency. Poorer households are strongly dependent upon agricultural production and they have to invest their scarce resources primarily into farming. For them, increasing crop failures resulting from soil degradation lead to an increasing danger of falling into a poverty trap.

In addition, the societies in all case studies are at a point of transition. In the next decades and resulting from population growth, increasing environmental degradation and growing cash market integration, both the Angolan and Namibian case studies may turn to more intensive forms of agriculture. At the same time, competition for land will increase due to government-funded commercial agricultural projects. In the Botswana research area, the advent of a tarred road may spur an economic diversification and the abandonment of arable agriculture by many households. Thus, our results suggest that without policy intervention, societies within the ORB may continue on a pathway of gradual resource degradation and growing inequity.



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## 1410 Endogenous population change and economic growth under increasing water scarcity

**Pande, Saket**

Many ancient civilizations such as the Indus Valley civilization dispersed under extreme dry conditions. Even contemporary societies, such as the one in Murrumbidgee river basin in Australia, have started to witness a decline in overall population under increasing water scarcity. Hydroclimatic change may not be the sole predictor of the fate of contemporary societies in water scarce regions and many critics of such (perceived) hydroclimatic determinism have suggested that technological change may ameliorate the effects of increasing water scarcity and as such counter the effects of hydroclimatic changes. To study the role of technological change on the dynamics of coupled human-water systems, we develop a simple overlapping-generations model of endogenous technological and demographic change. We model technological change as a process that depends on factors such as the investments that are made in a society, the diversification of a society into skilled and unskilled workers, a society's patience in terms of its present consumption versus future consumption, production technology and the interaction of all of these factors. In the model the population growth rate is programmed to decline once consumption per capita crosses a 'survival' threshold.

The model demonstrates that technological change may indeed ameliorate the effects of increasing water scarcity but typically it does so only to a certain extent. We find that endogenous technology change only helps to delay the peak of population size before it inevitably starts to decline. While the model is a rather simple model of societal development, it replicates the patterns of technological and population changes and economic growth in Murrumbidgee basin. It replicates the pattern of declining consumption per capita in presence of growth in aggregate production and the exponential population rise, even under increasing water scarcity. The results of the model suggest that societies that declined or are declining in the face of extreme water scarcity may have done so due to slower rate of success of investment in technological advancement. The model suggests that the population decline occurs after a prolonged decline in consumption per capita, which in turn is due to the joint effect of initially increasing population and increasing water scarcity; despite technological advancement and increase in aggregate production. We suggest that declining consumption per capita despite technological advancement and increase in aggregate production may serve as a useful predictor of upcoming decline in contemporary societies in water scarce basins.



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## 1547 Global peak production of natural resources will lead to peak wealth

**Ragnarsdottir, Kristin Vala**

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In the Limits to Growth report Meadows et al. (1972) used dynamic system analysis models to show the consequences of the interaction between population and limited natural resources. The purpose was not to predict the future, but to examine the interaction between exponential growth of population and resource extraction. Now, 40 years after the report came out, we see that measured trends have followed their "standard run." The problems humanity faces are as predicted: overpopulation, destruction of ecosystems, pollution and dwindling natural resources. We evaluated the quantity of over forty resources that currently underpin global infrastructures and technologies (Fe, Al, Ni, Cu, Zn, Mn, I, Li, REE, Y, Zr, Sn, Co, Mo, W, Ta, Nb, He, Cr, Ga, Ge, Ti, Te, Sb, Se, Au, Ag, Pt, Rh), agricultural and energy production (P, U and fossil fuels (coal, oil, gas)). Using several evaluation methodologies of how long the resources may last we find that these metals and materials will run into scarcity within the next decades under the present paradigm of usage. Our evaluation methods include burnoff rates (business as usual), observations of peak discovery versus peak production (generally 40 years), Hubberts peak production curves, and system dynamics modelling. Our global system dynamics model (WORLD) was used to assess the interaction of natural resource use, population and pricing. As the material volumes that can be supplied from fossil reserves are reduced with respect to today resources will go up in price. The creation of wealth from conversion of resources with work and energy, as well as the current extensive futures trading, demonstrates that peaking energy and materials production will lead to "peak wealth" and the end of the golden age we live in. We show that scarcity may not only lead to "peak wealth", but also "peak population", "peak waste" and "peak civilization", unless urgent counter-measures are systematically undertaken. They need to include comprehensive recycling, thereby closing material cycles, optimizing energy use, minimizing irreversible material losses, and counteracting exponential population rise. International and national research efforts need to be transdisciplinary and based on systems thinking and concerted efforts are needed so that future generations will have both a liveable planet and some of the comforts that we enjoy today. Failing these policy actions the materials that underpin modern society may become unavailable for global mass production of goods as we approach the middle of the 21st century.



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**1506**      **Equity considerations when getting closer to thresholds:  
a comparative analysis of the socio-ecological dynamics  
in three watershed territories of South America**

**Le Coq, Jean-François**

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In the three Forest Models territories Jujuy (BMJ, Argentina), Chiquitano (BMCh, Bolivia) and Araucarias de Alto Malleco (BMAAM, Chile), water security problems are subject to exacerbation by climate change. Issues pertaining to water quality, availability or both, need to be tackled collectively by the actors of a same watershed, given their interdependencies when managing natural resources. In this context, where the EcoAdapt research-action project is operating, our objective is to promote a common understanding of the issues at stake on water security and the corresponding socio-ecological dynamics that might either worsen the current situation or lead to solutions. To this end, we proceed in two steps, co-building successively in each of the three watershed sites two main products : a conceptual model that provides a synthetic representation of how the socio-ecosystem functions around the water security problem; and a historical profile of the last five decades that characterizes successive development phases marked by various occurrences or disturbances (new policy measures, cooperation interventions, market fluctuations, climatic event...). Based on the Resilience approach and nurtured by a learning-by-sharing process amongst the actors of each territory, this analytical method produces threshold cascades allowing the participants to visualize the possible impacts of new climate event o policy reform. In the three territories, equity issues emerge, confronting: upstream versus downstream actors in Argentina when reacting to water scarcity risk and trying to secure access to water for irrigation; communal smallholders versus private largeholders in Bolivia when adjusting their cattle raising practices and pasture expansion to new policy measures; water rights owners versus water users in Chile when the legal conditions enhance speculative water management. Addressing these equity issues in water management decision-making appears a necessary way to prevent conflicts and non-cooperative responses to climate change threats.



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ISEE CONFERENCE ICELAND 2014

Session 2.2.I

equity and economic development: CO2 and climate impacts



Theme: 2.2 EQUITY, ENVIRONMENT AND ECONOMIC DEVELOPMENT  
Session: 2.2.I equity and economic development: CO2 and climate impacts  
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1262 The Causal Components of International CO2 emissions Inequality: a Regression Based Decomposition analysis.

**Teixidó-Figueras, Jordi**

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The international inequality in CO2 Emissions per capita is one of the main barriers that international environmental agreements must face. Consequently, knowing the underlying blocks of such international inequality may be critical. So far, the analysis of the factors contributing to international emissions inequality has been tackled through the analysis of factors that satisfy identity automatic relationships with CO2 emissions (Duro and Padilla (2006)). However, this paper takes advantage of the methodological advantages of the Regression Based Inequality Decomposition (Fields (2003)) to explore the contribution of different explanatory factors without any prior restriction imposed on their relationship. In particular, we assess the relative contribution of factors such as affluence, sectoral composition, demographical variables, technology and climate. The results for selected years of the 1993–2007 period reveal, for instance, the crucial (but decreasing) importance of demographic factors, and the importance of the affluence, sectoral composition and technology factors. These results have some interesting policy implications.



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## 1537 Reassessing the Energy- and CO2- EKC curve

**Luzzati, Tommaso**

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Building on a previous piece of research (Luzzati, Orsini 2009), this paper re-examines the environmental Kuznets' curve hypothesis (EKC) both for CO2 emissions and total primary energy supply for the period 1971-2011 and for 142 countries (IEA CO2 highlights database).

The following are the two distinctive traits of our approach

1) Robustness check

- a) we use both parametric and non-parametric estimation methods,
- b) we validate cross-country findings by looking at other levels of analysis (i.e. different subsample to assess the role of potential outliers, the world as a single country and individual countries). This should mitigate the risk of statistical artefacts arising when pooling heterogeneous country patterns.

2) Use of CO2 and Energy in absolute terms.

We show that both for theoretical and econometrical reasons, pressures cannot be taken in per capita term, as it is customary in the literature. Actually, sustainability is about absolute rather than per capita emissions. Moreover, this is consistent with the standard EKC narrative and theoretical papers.

Our analysis reached two main findings

- 1) it confirms the importance of robustness exercises,
- 2) it brings new and robust evidence that estimates revealing the existence of an Energy- and CO2- EKC are mere statistical artefacts.



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## 1573 The determinants of individual carbon offsetting: An international micro-econometric analysis

**Ziegler, Andreas**

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The voluntary provision of public goods has received increasing attention in the literature. Without being forced by regulations, people, for example, donate money to climate protection projects or behave in environmentally beneficial ways. Instead of directly reducing carbon emissions, an increasingly popular approach is targeted at voluntary engagements in carbon markets, i.e. voluntary carbon offsetting. This offsetting mechanism refers mainly to the financial compensation of carbon emissions from everyday activities such as driving, flying, or heating buildings. Carbon offsets are generated in connection with specific projects such as investments in renewable energies, energy efficiency, or reforestation. In general, the global market for voluntary carbon offsets is open to individuals, organisations, and corporations.

However, the existing academic literature on carbon offsetting is still scarce. Only very few theoretical (e.g. Kotchen, 2009) and empirical studies (e.g. Brouwer et al., 2008, Akter et al., 2009) have considered some aspects of voluntarily purchasing carbon offsets in specific contexts. This paper contributes to this scarce literature. Although purchases of carbon offsets by households only account for a fraction of total purchases, the paper refers to individual carbon offsetting. The reason for this is that more than 70% of the worldwide greenhouse gas emissions are related to household consumption, which highlights the enormous potential of individual carbon offsetting.

Specifically, this paper draws an international comparison of the motivation of people for this specific voluntary climate change mitigation. In this respect, we particularly carve out the role of social norms, perceived freeriding, preferences for environmental quality, and a feeling of responsibility or warm glow. Our micro-econometric analysis with discrete choice models is based on unique representative data from 2000 individuals in Germany and the US. First results indicate that feeling responsible for climate protection has a strong impact on the purchase of carbon offsets in both countries. Social norms seem to play a significant role in the US, while preferences for environmental quality are more important in Germany.

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Theme: 2.2 EQUITY, ENVIRONMENT AND ECONOMIC DEVELOPMENT  
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## 1628 Cheap Fossil Fuels or energy efficiency as comparative advantages? Comparative views on "re-industrialization" and energy in Europe and USA

**Baum, Josef**

The fundamental change in the energy basis was one of the essentials of the industrial revolutions. The transformation to fossil fuels was a main source of a multiplication of productivity of labour. (An unintended side effect was the enforcing of climate change).

In North America in the last years the enforcing of „unconventional“ fossil fuels had significant effects to energy markets resulting in lower energy prices. These tendencies often are claimed to be most important sources for a “re-industrialisation” in the USA. But Shih (2013) concludes that the “US-growth is more a story of labour flexibility and increasing productivity, some improvement in factor costs and a selective return of demand”. Furthermore the re-industrialisation in the USA is a re-localisation within the USA in regions with lower wages and a stabilization of a relative low grade of industrial share.

In a broader view comparative empirical and analytical results on European countries and USA in respect to comprehensive energy costs, significance of energy costs and their sectoral relevance are given. But investments have to be seen also within global production networks and global supply chains, and last but not least in the possibilities to externalize environmental costs and effects.

In a socio-ecological view energy efficiency in the energy production has to be compared: What are the EROIs.

The results of a case study on a current investment of a steel plant in Texas by the Austrian steel company Voest is given when energy wage and land costs were alleged to invest abroad. But energy prices, especially oil and oil products have been significantly lower in the USA for a long time. Industrial wages rates per hour are significantly lower in the USA in relation to a lot of EU-countries like Germany at least since the nineties. And because of much more available land pc in the USA basically land for industry uses basically is cheaper.

The driving force in fact was the austerity policy in the EU restricted the demand in the EU for many years, so the internationalization strategy of this company was intensified.

An adequate strategy for Europe should be in general to increase investment into innovation and specifically to increase energy efficiency. Then the dynamics would be that energy can be more expensive in Europe, if at the same time innovations in energy efficiency and innovation in general become cheaper and more efficient



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Session 2.2.J  
Land, food and development



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## 1056 Unequal distribution of global land for food production: the poor in disadvantage for 2050

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Land is the main limiting factor for food production. The availability of land in a certain region is an indicator of the potential for food production. In the coming decades, global food demand is expected to increase because of population growth and change towards affluent diets. Local land availability is essential for future food security. The growth in food demand will be different amongst regions depending on their socioeconomic development. Low income countries will increase food demand due to population growth, transition countries will increase due to dietary changes, and high income countries are not expected to increase.

In this paper, we study the distribution of land throughout the global population, and the changes during the period 1960-2050. We divide the global population into seven geographical regions with 1 billion people each in 2010. We use FAO data to calculate the available total land, agricultural land and arable land per capita in the past (1960), present (2010) and future (2050). We assume no agricultural expansion to calculate the availability of land in 2050, so we use the value of land in 2010 and the population projections for 2050 (UN population prospects).

Our results show that land availability per capita is largely unequal among the regions, and the inequality is increasing in relation to socioeconomic development. In 1960, Africa had 60% more land per capita than Europe. But due to the large population growth in Africa, in 2010, Europe had 30% more land per capita than Africa; and by 2050, Europe will have more than twice land per capita. This shows the large disadvantage of the poor in respect of land availability for food production. Also, in 2010, two Asian regions had four to ten times less land per capita than Europe, and this difference will increase for 2050. These regions in Asia will change towards affluent diets. However, the strong land limitations will make a larger challenge to fulfill the increase of food demand in comparison with Europe which already has affluent diets. Thus, the middle and low income regions will have much larger challenges to fulfill future increase in food demand in comparison with the rich regions because of the unequal distribution of land.



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## 1067 WORK TIME, CONSUMERISM AND ENVIRONMENT IN THE DEVELOPING WORLD

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This paper discusses the influence of work on people's lives and consumption behaviour during their free time considering the world environmental crisis context. Some ecological economists argue that the reduction of work time may contribute to diminish the pressure on the environment by decreasing consumption in capitalist societies. According to the New Economics Foundation (NEF), more free time would mean people might be more attached to relationships, pastimes, and places that demand less money. But in a society whose values are deeply ruled by consumerism, can more free time really mean less consumption? How intense could the influence of work time be on people's lives to determine its time use? Based on these questions, this paper aims to assess the suitability of this debate in a developing world scenario focusing on the Brazilian economy. Thus, we put into perspective the positive relationship assumed between work time reduction and consumption on people's free time, present in some ecological economic approaches. Moreover, we critically review the neoclassical principles that support the growth addiction in modern societies. We highlight some important elements of Brazilian society that could represent barriers to a successful transition to a work time reduction with less consumption, as it may drive people to consume more or, even, dedicate the free time to more work in order to consume even more. Such elements can be summarized as: the income and consumption power; the resistance to work time changes; the political position about reduced work time; the planning of the cities; and the Brazilian work legislation. We conclude that, as we do not have standardized methodology about time use that can be applied to Brazil, we cannot accurately predict the impact of work time reduction on consumption behaviour during free time. Additionally, there is a serious ambiguity about the supposed effects of work time reduction, once it is seen by some Brazilian politicians as a good alternative to improve consumption and foster the economy. The debate surrounding the work time reduction is mainly conducted in wealthy nations but it is poorly explored in the developing world. These countries' peculiarities require innovative ways to prevent them to follow similar paths that may lead to unsustainability and failure in the economic growth model. Thus, it is important to establish a standard methodology and to conduct more studies in this field that can provide data to guide better political decisions in the future.



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1307 Food sovereignty, food security and democratic choice:  
Critical contradictions, difficult conciliations

**Agarwal, Bina**

FOOD SOVEREIGNTY, FOOD SECURITY AND DEMOCRATIC CHOICE:

CRITICAL CONTRADICTIONS, DIFFICULT CONCILIATIONS

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Abstract

In recent years, the concept of 'food sovereignty' has gained increasing ground among grassroots groups and practitioners, taking the form of a global movement. But there is no uniform conceptualization of what food sovereignty constitutes. Indeed the definition has been expanding over time. It has moved from its initial focus on national self-sufficiency in food production ('the rights of nations') to local self-sufficiency ('the rights of peoples'). There is also a growing emphasis on the rights of women and other disadvantaged groups, and on consensus building and democratic choice. This paper provides a critique of some of the major tenets of the food sovereignty movement. It recognizes that many developing countries may wish to pursue the goal of self-sufficiency in the context of the global food crises. It also recognizes the importance of promoting social equality and democratic choice. Taken together, however, there can be serious contradictions between the key features of the food sovereignty vision, such as between the goals of national and local food self-sufficiency; between promoting food crops, organically (even agro-ecologically) produced, and a farmer's freedom to choose to what extent to farm, which crops to grow, and how to grow them; between strengthening family farming and achieving gender equality; and between collective and individual rights, especially over land ownership. The paper also reflects on ways in which some of the food sovereignty goals could be better achieved through innovative institutional change, without sacrificing an individual's freedom to choose.



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Theme 2.3

COMPARING DEVELOPING AND DEVELOPED



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ISEE CONFERENCE ICELAND 2014

Session 2.3.A1

Social metabolism, environmental injustices, valuation  
languages; Proposed session



Theme: 2.3 COMPARING DEVELOPING AND DEVELOPED  
Session: 2.3.A1 Social metabolism, environmental injustices, valuation languages;  
Proposed session  
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## 1451 Mining conflicts in Peru and Chile, compared

**Martinez-Alier, Joan**

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Two sets of about 30 conflicts each in the mining industry from each country (often copper, but also gold and many other metals) are described and mapped (drawing on the OCMAL inventory, and updated for EJOLT). The mining industry requires water, energy and infrastructures, and therefore mining conflicts overlap with other conflicts. There is a trend towards more and more conflicts as the mining industry expands towards new frontiers. Metals such as copper are recycled only in part, therefore even a non-growing world economy would require “fresh” supplies all the time. The two sets of conflicts include those better known in the last fifteen or twenty years in both countries. A number of hypotheses will be developed, regarding the repertoires of actions and the valuation languages deployed in both countries, the relevance of the presence of indigenous populations for achieving success in stopping the projects, the degree of state violence and the criminalization of activists, the presence (or absence) of women in the leadership of the movements, the development of coordinating organizations (like CONACAMI in Peru) and the different relative importance of interventions by parliamentarians and the judiciary in both countries, the role of national and international Human Rights organizations, the alliances between different streams of environmentalism (e.g. conservationism and “the environmentalism of the poor”), the relevance (if any) of the type of materials in question and the variability of their prices in world markets for the trajectory of the conflicts, the nationality of the companies (the role of the state company CODELCO in Chile compared to private Peruvian companies such as Buenaventura; the increasing presence of Chinese companies and their attitude to environmental criticism as compared to Canadian, US, European companies), the frequency of the valuation languages deployed (from monetary compensation for externalities to sacredness).



Theme: 2.3 COMPARING DEVELOPING AND DEVELOPED  
Session: 2.3.A1 Social metabolism, environmental injustices, valuation languages;  
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## 1453 The relevance of economic evaluation tools for pursuing environmental justice

**Rodriguez-Labajos, Beatriz**

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The collaboration in deploying economic evaluation tools is a recent expression of interaction between academia and social movements in pursuing more sustainable futures. Specifically, academics and environmental justice organisations (EJOs) conduct multi-criteria analysis (MCA), monetary valuations and cost-benefit analyses (CBAs) in order to explore and reveal the unsustainability of environmentally controversial projects (e.g. Prud'homme, 2007). The effectiveness of those evaluation tools for pursuing environmental justice is still to be assessed. From the one hand, the well-established ecological economics literature criticising monetary valuation and CBA encourages rejection of those tools and adopting MCA in order to include multiple languages of valuation. From the other hand, some EJOs and environmentally-sensitive academics consider that the money and figures language is worth adopting in the course of environmental justice struggles, arguing that it can speak truth to power.

In recent work in ecological economics (Rodriguez-Labajos & Martinez-Alier, 2012; Kallis et al., 2013), the starting point is whether evaluation tools are relevant for pursuing more environmentally just futures depends on the conditions under which they are used. In this presentation, we report on recent work within the context of the EJOLT EU FP7 funded project, which focuses on bringing science and society together to confront ecological distribution conflicts. We report on: (i) project experience on developing evaluation tools between academics and EJOs in the context of specific environmental justice struggles; and (ii) the results of a mutual-learning workshop which explored the conditions under which MCA, CBA and economic valuation tools can be either enabling or disabling for EJOs in their struggles for environmental justice. Our results suggest that methods are more effectively used through carefully planned interventions supporting debates on local futures and visions and whenever there are complementarities with regulatory and institutional developments. Oppositely evaluation methods disable local mobilization when they force communities to bring their concerns into assessment schemes that do not fit their own languages and concerns, when they reproduce uneven power relations, or they operate in corrupt contexts. Insights on the benefits from science-activism collaboration are finally outlined.



Theme: 2.3 COMPARING DEVELOPING AND DEVELOPED  
Session: 2.3.A1 Social metabolism, environmental injustices, valuation languages;  
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1456 "Successful" resistance in environmental justice struggles: a definition and some examples from the EJOLT map

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The study of ecological conflicts in a framework of political ecology is a study in the deployment of power in nature-society relations. In the EJOLT project, we are particularly interested in how groups mobilize and organize in defence of the environment (and their own livelihoods) in opposition to the demands of the growing world social metabolism, and to the dominant forces of the state or multi-national capital in defence of the environment. The EJOLT Map of Environmental Justice and Resistance aims to document some 2000 cases of such mobilizations by the end of 2014. We look at the actors, their claims, their repertoires of action, and also the outcomes and the impacts of the conflict. The definition of what a successful outcome is for a group fighting for environmental security, is open to debate and interpretation. While in the past, most studies from social movement theory (Tilly, Tarrow) focussed on concrete policy and political changes, lately greater attention has focused on changes in the policy process, on the procedures for decisions making and the valuation languages deployed, as well as on political and cultural changes in society at large, spillover effects between movements, as well as internal changes and evolution within the movements themselves (Giugni, 1998) as elements in a successful outcome. We frame the analysis inside the growing debate in political ecology on whether there exists a global environmental justice movement (Newell and Sikor, 2013) and when it did come into being. Also, we look at struggles for environmental justice as forces for sustainability.

Following a discussion on the understanding of success in environmental conflicts, we will present the "Map of successes" from the EJOLT atlas of environmental justice. Of a total of 950 cases entered at present (Nov. 2013), 165 have been considered as successes by the

organization or individual entering the information. Using the map we will present some examples of different typologies of successful outcomes as well as determinants that may or may not lead to successful outcomes, including the alliances for example with conservation organizations and transnational organizations.



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Session 2.3.A2

Environmental injustices related to mining; Proposed session



Theme: 2.3 COMPARING DEVELOPING AND DEVELOPED  
Session: 2.3.A2 Environmental injustices related to mining; Proposed session  
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1445 The resistance space against iron ore mining threat at the Gandarela Mountain Range/ MG, Brazil

**Herrmann Coelho-de-Souza, Carolina**

Brazil is a giant supplier of iron ore exports for the world economy. The conflict analysed here has special characteristics. A social movement against iron mining has arisen at the Gandarela Mountain Range, Minas Gerais. The state of Minas Gerais is where Vale – a very large transnational mining company - started its operation in the 1940s. Gandarela is the last mountain range environmentally well protected in the heart of Minas Gerais, holding a huge aquifer, but it has iron ore underground. Vale threatens to mine in Gandarela, the resistance movement proposed the creation of a National Park as a instrumental strategy, and the movement goes beyond conservationism, it opposes the actual social metabolism of the world economy and believes in a different society. The mining project license process is stopped until the federal government decides on this conservationist proposal. Inspired by Lefebvre`s space theory, the article analyzes the Gandarela case. The qualitative methodology is based on two years of participant observation and in-depth interviews with the social movement. The result is the understanding of the “resistance space” representations, in other words, a characterization of thoughts and strategies for a territory using different valuation languages. The research reached three dialectic representations of the resistance space: the “instruments”, the “contrapositions”, and the “practical utopia”. First, the “instruments” are related to the policy mechanisms and legal norms provided by the State; second, the “contrapositions” are the arguments against mining and the current pattern of economic development, and third, the “practical utopia” is the belief of the possibility of winning against Vale and glimpse others forms of human-nature relations. This research is based on concepts of political ecology and environmental justice, and is related to discussions on post-development, post extractivism, and preserving the commons.



Theme: 2.3 COMPARING DEVELOPING AND DEVELOPED  
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1449 Community metal mining consultations in Latin America (2002-2012). A bottom-up value articulation institution

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Minerals production (mostly for export in the case of metals) has grown approximately by a factor of eight in Latin America in the last forty years (West and Schandl, 2013). From 2002 to 2012, 68 community consultations/referenda on large-scale mining activities have been conducted in Latin American challenging centralized decision-making procedures. Around 700 000 people have participated, expressing a massive rejection of mining activities in Peru, Guatemala, Argentina, Colombia and Ecuador. These consultations have contributed to ease local tensions, slowing down or stopping mining projects in some cases. This paper analyses the process of emergence and spread of such consultations exploring how this institution is challenging the governance of mining activities. We also try to explain why consultations have become spread in some countries and not in other countries.

Building on ongoing debates on environmental justice movements, we claim that consultations emerge as a democratic response to environmental injustices in contexts of activist repression and criminalization, and gain legitimacy as they become spaces of participation for affected populations that demand for local democracy. Such consultations appeal sometimes to indigenous rights under Convention 169 of ILO, but not by far in all cases. Consultations are a hybrid institution, promoted by alliances between social movements and local governments that reclaim and re-signify municipal, national and international participation, and indigenous rights and laws.



Theme: 2.3 COMPARING DEVELOPING AND DEVELOPED  
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## 1455 Issues in mining conflicts - collaborative research between activists and scientists

**Ozkaynak, Begum**

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with contributions from Accion Ecologica, CRIIRAD, EarthLife Namibia, CICA-UNAM, and from researchers at Bozazi University and at Autonomous University of Barcelona.

Contrary to beliefs that the economy will decouple from natural resources and environmental impacts, the mining extraction frontier continues to expand globally. The growing societal metabolism triggers new conflicts around the world involving extractive industries (Muradian et al., 2012). Concurrently, environmental justice (EJ) concerns emerge as an organising frame of claims in resistance movements. In the past decades, the EJ discourse expanded in its geographic scope, horizontally into a broad range of issues, vertically into examinations of its global nature, and conceptually to the relationship with the non-human world (Schlosberg, 2013). Alongside this, processes of knowledge development have often been led by activists.

This paper explores contemporary mining conflicts around the world in the context of increased global societal metabolism and expanded sphere of the EJ movement and hence positions mining-related activities and activism as 'glocal' processes. This is done by analysing quantitative data available in EJOLT ([www.ejolt.org](http://www.ejolt.org)) for more than 300 cases around the world, as reported by local activists and scholars. Factors such as types and roots of conflict, countries involved, intensity of conflict, project status, potential and observed health and socio-environmental impacts, and pathways for conflict outcome are examined. The commodities, associated to different parts of the production and value chain, include base metals, minerals of interest to the energy or construction industries, and precious metals linked to financialisation.

The analysis demonstrates that mineral extraction and the expansion of commodity frontiers result in various concerns about the scale of human intervention in the environment and the social and ecological impacts of globalisation. They are reflected diversely at different scales: as distributional concerns including ecologically unequal exchange; as demands to respect the human rights to life and health; as insistence on indigenous territorial rights; as introducing alternatives to or alternative visions of development and participatory decision-making; and as claims for the sacredness of nature. Issues of risk assessment, valuation and liabilities, at the core of the mining debate, are also discussed. The paper concludes by underlying policy intervention areas and hence contributes to better understand the role and significance of mining conflicts within global EJ movement and in sustainability transitions.

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Session 2.3.B

comparing D & D: general environmental policies



Theme: 2.3 COMPARING DEVELOPING AND DEVELOPED  
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## 1545 Transformation and transition of Polish environmental and sustainability policy towards dynamic institutional equilibrium based on sustainable development

**Dokurno, Zbigniew**

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Post-communist Poland as a developing country is undergoing a transition towards a market economy based on sustainability criteria. As the part of this transition is the environmental policy and national strategy for sustainable development corresponding with the objectives of the Europe 2020 Strategy and active involvement in international projects such as the COP 19 Conference in Warsaw in November 2013.

A key factor described transition is institutional change generating a new institutional equilibrium based on sustainability criteria. The paper presents the problem of the construction of such institutional changes in the form of a model of institutional solutions that generate the dynamic equilibrium for sustainable development. The authors ask whether and how to determine the dynamic socio-economic equilibrium that guarantees the fulfillment of the postulates of sustainable development. As a result was formulated the hypothesis espousing that the effective implementation of sustainable development in dynamic terms is positively correlated with the quality ( effectiveness and efficiency ) of institutions that generate the optimal system of institutional equilibrium.

In the research were used the methods of new institutional economics, new environmental pragmatism, social - ecological economics, political ecology and others within research agenda of ecological economics to analyze the transformation and transition process of environmental and sustainability policy in Poland and for design of institutional solutions. Conducted research aimed rather to critique the cognitive realism based on the correspondence model of truth. In its place was proposed a coherent model of truth based on pragmatism implying a more legally valid research program using different points of view within ecological economics for problems solution.

The result of the research was the diagnosis of the state of sustainable development in Poland and the existing system of institutional equilibrium. This enabled the construction of the initial projection of the dynamic model of institutional equilibrium for sustainable development in Poland which will be further examined and developed in the course of the grant from the National Science Centre in Poland between 2013 – 2016. The projected model of institutional equilibrium includes: criteria and premises of the system of dynamic institutional equilibrium relevant to sustainable development, relationships between quality of prerequisites and their culture context, institutional prerequisites for the model, premises for projecting the dynamics of the model.



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1382 Towards a greener and more equitable development:  
What can we learn from Brazil, South Africa and  
Germany for global transformation processes?

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<http://sd-innovation.blogspot.com/>

NEW PROJECT: [www.rethink-net.eu](http://www.rethink-net.eu)

**Background and Objectives:** Resource-intensive economic activity in the industrialised world, global environmental change and poverty are linked. The poor tend to be most affected by environmental degradation and lack of access to resources and services, often with more acute effects in the developing world.

More sustainable production and consumption have long been proposed as a solution without many clear answers to the following questions: Can a less materialistic lifestyle and a less intensive resource use in the industrialised world be catalytic enough for a real shift to a more balanced, a more sustainable and a more equitable global level development? Will rapidly emerging economies be able to leapfrog and decouple growth and environmental degradation for example through technological capability building and upgrading? Are there indications of a renewed understanding of economic development, modernization and prosperity in emerging economies – and also in the industrialized world?

**Methods:** The paper will focus on Development Intersections as key for connecting policies to



enable well-being, equity and environmental sustainability, looking at patterns of resource use, consumption patterns, economic development, inequity and environmental overuse. Then issues of inter-country and intra-country equity arising from these will be analysed with a focus on the contribution of patterns of economic growth and if the climate change problem may exert influence on these patterns and in which ways. References are made to current discourses among state and non-state decision-makers, as well as among non-governmental and or civil society organisations.

Using a public philosophy approach shaped by geography, anthropology, economics, sociology and other social sciences, the paper brings together a strong interdisciplinary perspective to the above. It is exploratory and brings together authors from very different research and policy disciplines as well as world regions in a joint research-based quest for a redefinition of (economic) development. The analysis and discussion will be based on a review of relevant policy documents, position papers and research reports from a select group of countries that represent very different world regions i.e. Latin America (with a focus on Brazil and Caribbean SIDS), South Africa (with references to the rest of the continent where relevant) and Northern Europe (with some focus on Germany) will be the main targets for this review.

Conclusion: The concluding session will explore how these new economic patterns which are national and global at the same time can also be directed to counteract inequity and environmental overuse.

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## 1721 Are autocrats more environment-friendly than democrats? Investigating the impact of regime type on environmental targets in developing countries

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The state will have to play a pivotal role in order to cope with major environmental challenges such as climate change, biodiversity loss and the degradation of ecosystems. Empirics show, however, that states deal with environmental challenges in quite diverse ways. The question that arises is whether we can attribute the differences in environmental protection to different types of political regime. The theory suggests that democratic governments need a broad support for political survival and, accordingly, invest their resources disproportionately in public goods that benefit large segments of society. Autocrats, on the other hand, generally depend on satisfying the needs of a relatively small fraction of society and, hence, can exclude the majority of citizens from political participation and ignore their needs.

When it comes to environmental protection, citizens in developing countries might demand economic development as a driver for job creation. If so, democratic regimes need to react to these demands. Many citizens in developing nations, however, earn their living from agriculture or live in densely populated urban slums and are hence more vulnerable and more sensitive to environmental degradation, suggesting a stronger demand for environmental protection. On the other hand, particularly young democracies lack not only institutional capacity but also self-confidence to head for potentially unpopular policies. Autocratic regimes, on the other hand, can impose – even unpopular – policies upon the majority as long as they satisfy the demands of their support group.

Whereas several studies exist that attempt to explore the effects of democratic or autocratic regimes on environmental quality or environmental degradation, the available evidence is far from robust. A central problem of the existing literature is the limited comparability across studies because the dependent variable lacks standardization. The indicators mostly seem arbitrarily selected and are rarely comprehensively discussed.

We contribute to the existing literature in two ways: First, we focus particularly on developing countries in comparison to earlier studies. Developing countries are a heterogeneous group with different degrees of democratization and autocratization, different levels of state-capacity, and presumably diverse popular preferences. Second, we use the ecosystem vitality dimension of the Pilot Trend EPI. Besides being a standardized index and thus allowing comparability of our results, the EPI includes time series data from 2000 till 2010 for 132 countries. The proximity-to-target method quantifies and benchmarks each country's performance on any indicator, reflecting the gap between a country's current result and the target.



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## 1162 The Improvement of Environmental Policy Instruments in Russia using Input-Output Approach

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Environmental issues are very important for Russia. Nonetheless, the Russian economy spends impermissibly little on ecological goals. A proportion of environmental protection investments in the total volume of national investments is about 1.2–2.6 % per year, in comparison with developed countries where this figure ranges from 6% to 25%.

Fundamental question is where we should find additional financial sources to improve environmental situation in the country. Collected pollution taxes can be one of such sources. But size of Russian pollution taxes does not provide necessary volumes of expenditures for the purpose of pollution abatement. To make it worse, pollution taxes are depreciating quickly because of inflation. For instance, in 2011 prices increased to the level of 2003 by 2.83 times, whereas index of pollution taxes was only 193 %. In developed countries currently there is an increase in the rates of environmental payments with the amount of collected payment about 1% of GDP (in Russia it is 0.03–0.04 % of GDP), despite the fact that the standards of pollution charges are 10-100 times higher for various ingredients.

Current system of pollution taxes needs to be refined and improved to develop standards for environmental charges. One of the approaches to solve this problem is based on the estimation of expenditures needed to prevent pollution. Assessment of environmental protection costs was carried out according to the results of predictive calculations using the dynamic input-output model (DIOM) of the Russian economy with an environmental protection block (EP block). This model complex has been developed in the Institute of Economics and Industrial Engineering (IEIE SB RAS). Functional scheme of this complex along with its main equations, hypothesis of ecological and economic development of Russian Federation and results of forecast calculations for 2013–2015 will be represented in the paper. Results of forecast calculations allows us to estimate the future pollution and protection costs corresponding to some goals of improving environmental situation in Russia, and this way to estimate average regional rates of pollution tax. We shall proceed from principle of cost recovery for the destruction of atmospheric pollution due to charges collected.

In addition, some other instruments of the economic mechanism of environmental management (the practice of granting tax reliefs, offsets of environmental payments in the amount of environmental costs incurred, provision of favourable loans, state guarantees for environmental loans and schemes of accelerated depreciation of environmental capital stock) will be discussed.



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Session 2.3.C

comparing D & D: energy sector, climate and mining  
policies

Theme: 2.3 COMPARING DEVELOPING AND DEVELOPED  
Session: 2.3.C comparing D & D: energy sector, climate and mining policies  
Time: W2 Room: R9

## 1603 Do Chinese Households Believe in Climate Change and why? An Econometric Analysis

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In order to avoid anthropogenic climate change, drastic reductions of CO<sub>2</sub> emissions are obviously necessary. As a consequence, many countries have taken several policies to address climate change. However, such policies can only be successfully implemented if individuals are aware of climate change and are willing to support these policies. Studies for the U.S. and Europe show that a strong majority of households in these regions believes that climate change is already happening. With respect to the determinants of climate change beliefs, former empirical studies particularly confirm the relevance of demographic and socio-economic factors. In addition, personal experiences with extreme weather events have also significant impacts on climate change beliefs.

However, former studies on the determinants of climate change beliefs mainly refer to Europe and the U.S. In contrast, the effects of weather experiences have not been empirically analyzed for China so far, even though China plays a pivotal role in global climate change policy (in the meantime it has overtaken the U.S. as the worldwide biggest producer of CO<sub>2</sub>) and experienced an increased frequency and intensity of heatwaves, droughts, and floods in recent decades. Against this background, we empirically examine the beliefs of Chinese households in the existence of climate change and especially how the personal experience with extreme weather events (besides socio-economic and demographic characteristics) affects these beliefs. Our unique data from a survey among 1054 Chinese individuals at the age between 18 and 60 in Beijing, Guangzhou, Chengdu, Shenyang, and Wuhan reveals that the vast majority believes that climate change is taking place. The main result of our econometric analysis with discrete choice models refers to a positive correlation between beliefs in climate change and the personal experience of extreme weather events.



In this respect, the experience with extreme weather events alone is already sufficient to increase the beliefs, even if these weather events were not accompanied by financial or physical damages. Our estimation results also suggest that heatwaves are the main extreme weather event decreasing climate change skepticism of Chinese individuals. In contrast, the experiences with windstorms, sandstorms, droughts, floods, heavy rainfalls, and avalanches have no single significant effects. Other factors that influence beliefs in climate change are age, gender, education, and location. Younger and college educated Chinese as well as people living in Wuhan, Beijing and Guangzhou are more likely, whereas females are less likely to believe in climate change.



Theme: 2.3 COMPARING DEVELOPING AND DEVELOPED  
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Time: W2 Room: R9

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1569 Regulatory Reforms and the Sustainable Use of Natural Resources: Explaining and Assessing Policy Change in Mining Countries – The Cases of Canada and Chile

**Perincek, Ruya**

Mining is considered to be a significant driver of economic growth. Regardless of the level of development, mining countries seek to attract private investment hoping to boost resource-driven growth. Even though economic growth or competitiveness seem to be the primary drivers of policies, regulators are often confronted with domestic pressures generating from the environmental consequences of mining. These consequences are also linked to the cultural and social lives of local communities. Regulators, therefore, often need to find a balance between economic gains and environmental limits as well as social or cultural rights. They respond to these identified problems with new regulations.

Since the early 90s, different regulatory responses have emerged in resource-rich countries despite a degree of structural similarities such as biodiversity, indigenous population, social issues such as equity, and fair share of revenues. This paper aims to address the question of why natural resource policies differ. What drives resource policy-making and policy reform in mining countries? This paper suggests answers to these questions by testing explanatory factors used by sociological, rational-choice and historical institutionalism on two case studies, namely Canada and Chile. It argues that national resource policies reflect environmental, economic, and socio-political considerations. The degree of such considerations depends on domestic actor constellations, institutional set-ups, and policy learning. This analysis focuses on the following six aspects of 'sustainable' mining regulations: biodiversity management, community engagement, mine closure and completion, mine rehabilitation, risk management, stewardship and water management. In order to assess these policies, it discusses the applicability of OECD regulatory management indicators to the evaluation of regulatory quality in the realm of sustainable resource management.



Theme: 2.3 COMPARING DEVELOPING AND DEVELOPED  
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1512 Poverty and Climate Change: Why climate change has an asymmetric impact ?

**Simonet, Catherine**

Theme: 2.3 COMPARING DEVELOPING AND DEVELOPED  
Session: 2.3.C comparing D & D: energy sector, climate and mining policies  
Time: W2 Room: R9

## 1608 Did Fukushima Matter? Empirical Evidence of the Demand for Climate Protection in Germany

**Löschel, Andreas**

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This paper investigates the extent to which the Fukushima Daiichi nuclear disaster of March 2011 has had an impact on the private demand for climate protection in Germany. On March 11, 2011 the Tohoku earthquake and subsequent tsunami hit Japan and the Fukushima Daiichi nuclear power plant. Within a few days, the nuclear power plant went in to melt down and released radioactive material into both the air and the ocean. The Fukushima Daiichi nuclear disaster sparked a worldwide discussion about the use of nuclear energy and the security of nuclear power plants. However, despite having major humanitarian and environmental consequences, can the Fukushima Daiichi nuclear disaster impact the private demand for climate protection in Germany?

Immediately following the disaster a debate about the use of nuclear power started in Germany. As a consequence of the disaster, the German government decreed an out phasing of nuclear power plants. This significant change in German energy policy will ceteris-paribus result in an increase in national CO<sub>2</sub> emissions as Germany abstains from one carbon free technology. Therefore, in order to ensure the same national CO<sub>2</sub> emissions the change in German energy policy implies a higher private willingness to contribute to climate protection. Another argument is that climate change is a potential driver of extreme weather events which could become a factor causing future nuclear disasters. Therefore, the increased awareness of nuclear disasters, as a direct result of the events in Fukushima, could also influence the willingness to contribute to climate protection.

Data for the demand for climate protection in this paper are taken from two framed field experiments conducted in Mannheim, Germany, before and after the disaster. Within both experiments subjects had the opportunity to invest in climate protection by purchasing and withdrawing permits from the European Emission Trading Scheme (EU ETS) using their own disposable income.

We find that the individual demand for climate protection among a sample of the residential population of Mannheim has changed significantly between March 2010 and December 2011. The demand for climate protection identified in the experiment following the nuclear disaster is significantly higher than in the experiment before the disaster. We conclude that individuals who wish to guarantee a certain level of national climate protection or who are aware of potential consequences of climate change for extreme weather events increased their private willingness to contribute to climate protection.

See: <http://www.zew.de/en/publikationen/publikation.php3?action=detail&nr=6962>



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Session 2.3.D

comparing D & D: various policy arenas



Theme: 2.3 COMPARING DEVELOPING AND DEVELOPED  
Session: 2.3.D comparing D & D: various policy arenas  
Time: T3 Room: R9

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1038 Socioeconomic Analysis Options for Pesticides  
Management in Developing Countries and Economies in  
Transition

**Solomon, Barry D.**

This paper will review more than a half dozen major socioeconomic analysis (SEA) methods that can be used to assess pesticides and their alternatives, most of which have been developed in the context of the developed world. For a comprehensive analysis, there are many economic, ecological, and social factors that must be considered by environmental officials tasked with managing pesticides, including those in developing countries and economies in transition. Among SEA methods, the most popular and commonly used tools are Cost-Benefit Analysis (CBA) and Cost-Effectiveness Analysis (CEA), and additional guidance and reference materials on these SEA techniques are readily available. However, these two techniques have serious limitations given the general lack of valuation and incorporation of environmental externalities and ecosystem services. Another alternative group of methods, know as Rapid Rural Appraisal and Participatory Rural Appraisal, can be more cost-effective to use in developing countries. Finally, qualitative decision making under uncertainty, such as through the use of the Precautionary Principle, can also be valuable. The precautionary approach requires that in order to protect the environment, where there are risks of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation. Ideally all of the quantitative techniques of SEA will need complete and reliable socioeconomic data, though in reality all of these data are often incomplete and fraught with uncertainties. In these cases, the application of the precautionary principle has the strongest justification. The application of these SEA techniques in several decision contexts for pesticides management in developing countries and economies in transition will be presented, including where their use would be most helpful.



Theme: 2.3 COMPARING DEVELOPING AND DEVELOPED  
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## 1145 A transdisciplinary approach to the economic analysis of the Water Framework Directive

**Martin-Ortega, Julia**

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One of the most innovative aspects of the European Water Framework Directive (WFD) is the incorporation of economic principles and tools into water policy. Amongst the various economic aspects stated or implied in the WFD is the cost-effectiveness analysis (CEA) of mitigation measures needed to achieve the 'good ecological status' (GES). The aim is to establish the least-costly combination of measures to be included in basin management plans. Moreover, the WFD allows the derogation of environmental objectives if meeting them has disproportionately high costs (i.e. if the costs of the measures are higher than the resulting benefits). These principles add new challenges to the management of water resources, which is already recognized to be a 'wicked problem' (a problem for which it is impossible to define an optimal solution because of uncertainty about environmental conditions and intractable differences in social values). The complex and dynamic nature of water problems requires flexible and transparent decision-making that embraces a diversity of 'knowledges' and values.

In the research presented here, natural and socio-economic sciences come together in the development of an integrated approach that is 'ground-truthed' through local stakeholders' knowledge with the use of participatory methods. This transdisciplinary approach is tested at the subcatchment level in Scotland. Firstly, we use hydro-chemical models to simulate subcatchment-scale effectiveness of measures for improving water quality, such as cropping practices, livestock management and riparian protection. The results are incorporated into a cost optimization model, which allows the selection and ranking of the most economically-efficient combination of mitigation measures. These costs are then compared with market and non-market benefits resulting from the achievement of the GES. This analysis is accompanied by iterative consultation process with local stakeholders, whose input feeds into the design of the analysis and also offers a way of contrasting scientific prescriptions with local perceptions. The research further analyses whether the selected measures are 'future proofed', in view of projected climate and land use change scenarios. Our results are used to derive specific policy implications for a more economically efficient and socially acceptable river basin planning process. We also identify key methodological challenges that still remain for a genuine co-constructed understanding of how water quality problems can be better addressed at the sub-catchment level.



Theme: 2.3 COMPARING DEVELOPING AND DEVELOPED  
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1808 The effects of rules and communication in a behavioral irrigation experiment with power asymmetries carried out in North China

**Wechsung, Frank**

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In our field experiment carried out with stakeholders from the Chinese Haihe River Basin, a group of five players located along an irrigation channel firstly decide on the amount they would invest in a public fund for channel maintenance. In the next step, they choose the amount of water to withdraw from the channel to irrigate their plots of land. We compare the effects of different rules of water distribution and communication on three types of group participants: farmers, water administrators and students.

The power asymmetry in the location along the irrigation channel was the most important factor affecting players' investment and water harvest decisions. The introduction of rules of water distribution only weakly altered the effect of power asymmetry but communication and the ability to modify the rules did reduce the effects. This result was strongest amongst the students and administrators and weakest amongst the farmers. In addition, farmers tended to break the rules more frequently and withdraw more water than agreed upon.



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Session 2.3.E

Forest conservation policies and REDD: between benefit and burden sharing; Proposed session



Theme: 2.3 COMPARING DEVELOPING AND DEVELOPED  
Session: 2.3.E Forest conservation policies and REDD+: between benefit and burden sharing; Proposed session  
Time: F2 Room: R9

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## 1664 Benefit and burden sharing in forest conservation and REDD+: A conceptual framework

**Wong, Grace Y.**

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One of the more pressing hurdles of national scale REDD+ implementation is the question of how monetary and non-monetary benefits, generated through REDD+ projects and policies, can be distributed among individuals and groups in an effective, efficient and equitable manner. Given the long drawn out time it has taken for the emergence of a predictable stream of REDD+ financing, benefit sharing discussions have also evolved to include burden sharing: the costs and risks involved in the preparation and anticipation for REDD+. We develop a framework to conceptualize how these benefits and burdens are incurred in the process of implementing a forest conservation and REDD+ policy, and how these benefits and burdens can be assessed. Firstly, we consider the REDD+ benefit sharing mechanism as one element of performance-based policy instruments designed to influence behavior through the use of incentives, in this case to achieve the specific policy objective of forest conservation. Our conceptual framework includes three components of the policy process: i) change in institutional and enabling factors required for the implementation of a REDD+ benefit sharing mechanism; ii) incentive distribution structure and targeting criteria; and iii) change in behavior of different groups towards desired forest conservation outcomes. For each of the components, indicators are identified for assessing the types of benefits and burdens incurred, how they are distributed across different groups, and their effectiveness, efficiency and equity implications. For the presentation, we will apply the framework to select case studies with differing REDD+ policies and benefit sharing mechanisms.

\* Submitted as part of the contributed session: "Forest conservation policies and REDD+: between benefit and burden sharing"



Theme: 2.3 COMPARING DEVELOPING AND DEVELOPED  
Session: 2.3.E Forest conservation policies and REDD+: between benefit and burden sharing; Proposed session  
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## 1359 Taking stock of carbon rights in REDD+ candidate countries: An assessment of rights and obligations

**Loft, Lasse**

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Taking stock of carbon rights in REDD+ candidate countries: An assessment of rights and obligations

Submitted as part of the contributed session: Forest conservation policies and REDD+: between benefit and burden sharing

The proposed international governance structure for REDD+ will ultimately take the form of a performance-based mechanism that will provide financial compensation to developing countries. The question of how this compensation will be used and which stakeholders will benefit and carry obligations at the national and subnational levels remains largely unanswered. As property rights represent the entitlement to benefit streams and assign liability, one approach to benefit and cost sharing is linking benefits and obligations to the rights to carbon sequestered and stored in trees. However, in most REDD+ pilot countries, forest users lack secure legal rights to access, use and manage forest resources. Clarity over tenure and resource rights in tandem with the carbon asset is critical to prevent disruptive conflicts between competing stakeholders within REDD+ countries. There is a need for regulatory systems to define the ownership of carbon in light of national or local conditions. It is not 'a simple task to identify what amounts to property in forest carbon', and what kind of rights and obligations are attached to it. Therefore, we firstly clarify the economic nature of carbon ecosystem services, and distinguish between the right to carbon as a property, the right to benefit, and the right to offset credits. Since the definition of property rights over natural resources is subject to national sovereignty, based on data from CIFOR's Global Comparative Study on REDD and a literature review we then analyze how carbon rights have been conceptualized under domestic carbon legislation in four potential REDD+ countries: Brazil, Peru, Vietnam and Indonesia. We find that none of these countries have passed an explicit carbon rights legislation to date. Most of them treat carbon as a natural resource or ecosystem service under existing law. State ownership with the authority to grant use rights over these resources tend to reinforce existing inequities in access to these resources, especially affecting indigenous and local communities with customary rights.



Theme: 2.3 COMPARING DEVELOPING AND DEVELOPED  
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## 1331 Accounting for REDD costs at multiple scales: the cases of Brazil and Indonesia

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The Stern Report and various multi-sectoral mitigation cost curves have consistently pointed to Reduced Emissions from Deforestation and forest Degradation (REDD) as one of the most cost-effective methods of climate change mitigation. But at what scales do different types of REDD costs (implementation, opportunity, and transaction costs) occur, and will intervention costs likely exhibit economies of scale? Which stakeholders will have to carry costs when deforestation and degradation are de facto reduced? This paper draws on detailed project data from the two tropical countries with the absolutely largest deforestation (Brazil and Indonesia) to look at prototypes of cost structures in REDD pilot projects, and analyze what structural changes in costing patterns we can expect when mitigation interventions are taken to scale – i.e. from local pilots to the level of federal states (Brazil) or provinces (Indonesia), and eventually to national-level policies. Having discussed basic costing methodologies (e.g. cash flow vs. accountancy approaches), the paper will use data from CIFOR's Global-Comparative Study on REDD (GCS-REDD) to provide spatially explicit projections of selected REDD intervention costs, with the aim to inform the debate about how expensive REDD might become when it is taken to scale.



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## 1369 Early impacts of subnational REDD+ initiatives on forests and human wellbeing in the Amazon

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\*Submitted as part of the contributed session: "Forest conservation policies and REDD+: between benefit and burden sharing"

REDD+ has been proposed as a win-win tool for mitigating climate change and bolstering local livelihoods in developing countries. Since the Bali Road Map of 2007, many REDD+ initiatives have emerged at the subnational scale. As part of the Center for International Forestry Research's (CIFOR) Global Comparative Study on REDD+, we examined seven subnational REDD+ initiatives in the Brazilian and Peruvian Amazon in a robust Before-After-Control-Intervention study to understand the impact of these initiatives on deforestation and smallholders' wellbeing. The first phase of fieldwork was carried out from June 2010 – February 2012 (before application of REDD+ interventions) and the second from August 2013 – May 2014 (after application of REDD+ interventions) through surveys of 52 communities and 1560 households. Our preliminary findings from these sites suggest that smallholder households in the Brazilian Amazon are heavily reliant on agricultural income, and regulatory policies for promoting zero deforestation have been more important than REDD+ incentives in curbing deforestation for agriculture. In contrast, smallholders at REDD+ sites in the Peruvian Amazon are heavily reliant on forest income, and the lack of regulatory environmental policy has resulted in REDD+ incentives designed to add value to forest products having a bigger role in reducing deforestation and improving local incomes. Understanding the different implementation contexts and intervention approaches sheds some light on the potential and challenges for REDD+ as mechanism for low emissions rural development in the Amazon.



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## 1316 Cost and equity implications of integrating conservation sticks and carrots in national conservation programs in Brazil and Peru

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Many REDD+ candidate countries are currently discussing and experimenting with alternative approaches to compensate farmers for conservation actions through economic incentives, such as payments for environmental services (PES), at various administrative levels. In most countries, however, the forest conservation policy mix is still heavily dominated by command-and-control policies. A mixed carrot and sticks approach to conserve the world's largest continuous tropical rainforest poses various challenges to policy design. First, the lion's share of historical deforestation has been illegal, i.e. full compensation of opportunity costs by incentive schemes could result in perverse incentives for traditionally compliant land users. Partial compensation, however, is likely to be ineffective if not reinforced by a complementary disincentive or regulatory threat. Second, both incentives and regulatory disincentives tend to become less effective wherever liability for illegal deforestation cannot readily be established on the basis of formal land use rights. Conflicting and poorly delimited tenure claims are still common in a large part of the region. And third, the distributional effects of any policy mix will depend on the underlying distribution of land ownership and historical deforestation patterns, which largely depend on the implementation context. In this paper we apply a spatially explicit model that simulates deforestation decisions in response to policy incentives and disincentives in two such contexts: The Peruvian and the Brazilian Amazon. The model builds on elements of optimal enforcement theory and introduces the notion of imperfect PES contract enforcement in the context of avoided deforestation. We implement the simulations using official deforestation statistics and data collected from field-based forest law enforcement operations in the region. We show that a large-scale integration of PES with the existing regulatory enforcement strategy involves a tradeoff between the overall efficiency and equity effects of the policy mix. The tradeoff is less strong in Peru than in Brazil. Introducing PES as a complementary policy measure increases policy implementation costs, but tends to reduce welfare losses for those hit hardest by law enforcement. Yet, this tradeoff is heterogeneous in space and depends on spatially variable deforestation patterns and enforcement costs. Moreover, we find that enforcement effectiveness can become a key determinant of efficiency in the overall policy mix, depending on how conditionality of the PES component is imposed.

Abstract submitted as part of special session proposal "Forest conservation policies and REDD+: between benefit and burden sharing"



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Session 2.3.F

comparing D & D: various policy arenas



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## 1351 Can impact assessment improve water policies in Ukraine?

**Hagemann, Nina**

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The recognition and application of impact assessment (IA) as an instrument for better informed and "rational" policy making increased over the last two decades (Adelle and Weiland 2012). One strand of IA is regulatory impact assessment (RIA). This approach supports the ex-ante assessment of the ecologic, economic and social consequences of new policies to i) estimate the costs induced, ii) increase transparency on policies and iii) see whether a new policy is really required. Participatory approaches and transparency play a key role within such an assessment.

The objective of our paper is to evaluate in how far RIA has the potential to increase the effectiveness of policies in Ukraine taking the example of water policies: The 1995 Water Code of Ukraine aimed at improving water management and further key regulations were introduced to enhance the process. However, water pollution remained a serious issue for many river basins across Ukraine as for example the Western Bug River (Ertel et al. 2012). The reason is that the regulations are not fully implemented and enforced, because they overlap with other regulations, no budget is provided or regulations are just neglected – therefore great need is seen for improved policy making to advance water management (Khmelko 2012).

The paper analyzes the potential of RIA to tailor policy making to improve water policies and management respectively. The study is based on an in-depth literature review on RIA in Europe and Ukraine and is complemented by a series of expert interviews with Ukrainian stakeholders. Within the paper, we answer the following questions i) what aspects of RIA are already applied in Ukraine, ii) what RIA tools are required for this specific policy field and iii) how could procedures be improved to be more effective? Thereby, the study clarifies the potential and applicability of RIA for more effective water policies in Ukraine.



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## 1137 Rethinking chemical regulation: from chemical risk assessment towards deliberating chemical profiles?

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Previous research has shown that there is a need for regulatory innovations in environmental assessment problems that cannot be solved only by evidence-based reasoning (Cash et al. 2003). In some cases it is impossible to make risk assessments because reliable toxicological studies do not yet exist. At the same time, existing research provides reasonable grounds for urgent application of some type of precautionary policy to safeguard the public interest. Scientists have recently pointed to the fact that thousands of chemicals, among them hormonally active chemicals (usually referred to as endocrine disruptors, or EDCs), the risk of which cannot be assessed within a reasonable time frame, are released into the environment annually (Hyötyläinen and Riekkola 2008). During the last decades, the concern over such chemicals has received significant global as well as national attention (Maxim and Mansier 2014).

This paper addresses the perceived inability of environmental governance to address the uncertainties involved in such new generation EDCs. It suggests that in view of existing shortcomings of chemical regulation (including REACH), there is a deep need to develop new integrative methods for environmental impact analysis and assessment. A central component of such methods development is the utilization of large data streams. The suggested methods development builds on the systems biology approach (data integration) and proposes that this be combined with deliberative expert workshops (knowledge integration) to form a unified new method of environmental impact profiling capable of both meeting the demands of complexity and rapid action. It achieves the former by making full use of indications provided by existing datasets and the latter by changing the order of reasoning prevailing in environmental policy by truly allowing for regulatory containment before the actual environmental deed.

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1544 A framework for formulating a long-term coastal management plan for a sustainable coastal area: An application of "Sato-umi" in Japan

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Japanese coastal areas have been highly developed after WWII. For example, tidal flat area reduced by 40% as a sacrifice to economic growth. The sacrifice is mainly due to the lack of holistic and sustainable view by government bodies in charge that were not in coordination and the absence a long-term coastal management plan. This led to a huge loss of valuable coastal areas that used to provide multiple ecosystem services for the entire Japanese (Chino 2011). Hence, it is integral to formulate a long-term coastal management plan for a realization of a sustainable coastal area.

We propose "Sato-umi", a Japanese concept of a sustainable coastal system, as a fundamental concept for the planning. Sato-umi is defined as "a coastal zone where the livelihoods of human-beings and the blessing of nature harmoniously coexist with coastal area ecosystems" (Japanese Ministry of Environment 2013). The Sato-umi comprises not only physical spatial areas but also a human related system: it comprises five attributes: Material circulation, Ecosystem, Communication (of human and Nature), Field for activity, and Executors for activity (Japanese Ministry of Environment 2013). The first three attributes support the diversity of and the last two contribute to the sustainability of the coastal system.

We adopt a sustainability assessment (SA) approach (e.g., MESMIS framework. López-Ridaura et al. 2002) to reflect Sato-umi in the long-term management plan. While it may be an effective approach, the monetary valuation is not well-incorporated into SA which is essential for an effective implementation of the plan as de Groot et al. (2010) assert.

To develop the framework for the planning, our research comprises three parts: i) we identify potential variables affecting the human values of coastal ecosystem services, ii) investigate the relationship between monetary valuation and sustainability assessment or Sato-umi management planning framework, and iii) propose an integrated framework for making a long-term coastal management plan.

We identify the potential variables including basic demographic and economic attributes based on the previous studies about changes in the human values of coastal areas. Ecosystem services and their monetary value should be included in the SA due to its powerful role to represent diverse human and coastal area relationships. Monetary valuation of ecosystem services of Sato-umi system can strongly support both diversity and sustainability attributes of Sato-umi system. In the basis of these findings, we then show the result of iii) with further research directions for the long-term coastal management plan.



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## 1660 In search of lost time: costs of traffic congestion in Brazilian Metropolitan Regions

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This study estimates the economic losses associated with the travel time spent commuting to work in the ten largest Brazilian Metropolitan Regions (MR): Belém, Goiânia, Rio de Janeiro, Salvador, Belo Horizonte, Recife, Fortaleza, São Paulo, Curitiba and Porto Alegre. For this, we estimated the lost time in commuting to work and valued it as a proportion of the average income, using primary data provided by the Brazilian 2010 Demographic Census at the municipal level. Two alternative hypotheses were used to value the costs of commuting time: 50% (scenario 1) or 100% (scenario 2) of the average municipal income. The results indicate that these economic losses are considerable, with a minimum value of 1.4% of the MR GDP (MR Porto Alegre in scenario 1) and maximum of 4.8% of the MR GDP (MR Belém in scenario 2). Moreover, the results indicate that time costs are very regressive in social terms, and the worst results are presented by the poorest population, independently of the region of the country. These results provide strong evidence that Brazilian governments should prioritize the improvement of public transport, instead of the current policies that strongly encourage the use of private vehicles, even without considering other externalities, such as air pollution, climate change, accidents and well-being losses that are not associated with labor hours.



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Indigenous knowledge for climate change adaptation and ecological resource use management; Proposed session



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## 1197 Analysing Indian farmer's adaption strategy to climate change

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The relationship between climate change and its implication on agriculture is becoming vivid as it is posing serious concerns on sustainability of agriculture especially, in developing countries like India. Climate change not only poses stern threat on agriculture resulting into adverse impacts on crop yield and production but also enunciates series of complex challenges like food insecurity, malnutrition, rural poverty and environmental degradation. Changes in extreme climatic events and adaptation vary at farm level. The extent of adaptation depends on the affordability, access to technology, biophysical constraints, soil characteristics, genetic diversity, and topography (Rosenberg 1992, Easterling et al. 1993, Kaiser et al. 1993, Easterling 1996). Inclusion of some warmer season crops, crop migration, adjustments in crop yields, inclusion of livestock effects, mixed farming, adjustment in fertilizer use are the diverse set of adaptive strategies.

The estimated overall impact of climate change may result into 30% (Cline, 2007) and 10%-40% (Aggarwal, 2008) loss of agriculture productivity by 2080 and 2100, respectively in the Indian context. Despite of its proportionate fall in GDP, agriculture is still the chief occupational arrangement for more than 50 percent of Indian population. Therefore, with a view to avoid the unmanageable and manage the unavoidable effects of climate change on agriculture, it is imperative for the farmers to adapt to sustainable agricultural practices and mitigation strategies. Therefore, this paper evaluates adaptive strategy of Indian farmers with context to crop switching at farm level. Based on secondary data sources, this study aims to quantify climate sensitivity to specific crop choices by farmers as well as determining climate resilient crops.

Based on the 'Structural Ricardian model' developed by Kunukulasuraiya and Mendelshon (2008), this paper tries to model crop choice as an adaptive strategy of Indian farmers. The paper tries to estimate the climate sensitivity of Indian agriculture under specific crop choices. Crop selection under different climatic conditions is examined by using the Multinomial Logit Model (MNL). The impact of such crop choices on the net revenue is estimated by using Dubin-McFadden selection bias correction model. The results of the study show that Indian farmers adapt crop choices according to climatic conditions and choices are sensitive to the climatic parameters such as temperature and precipitation.



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## 1308 Managing Fisheries Livelihood along with adapting global environmental changes: A study of 'Koli' communities in India

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Coastal ecosystems are the most productive ecosystem on the planet earth. All types of economic activities including fishing, cultivation, urbanization, real estate, tourism, transport, oil exploration etc. are carried out along the coasts of India. As a result over the years the anthropological pressure on coastal ecosystem is increasing. In India the 8000 km long coastline is densely populated and with high low lying areas. There are more than 60 districts along the coastline of India belonging to 9 coastal States. Major cities in the country like Mumbai, Kolkata and Chennai are situated along the coastline which also includes several major ports, tourist destinations and economic centers. However, traditionally these areas are home to a large number of fishing communities. These communities have a traditional way of living which is getting impacted by the rise in other economic activities. Simultaneously the change in global environment and the other projected climate hazards such as cyclones, high winds, flooding, coastal erosion and deposition, SLR, storms etc may further increase the risk and vulnerability of these communities. Although the problem of climate change is extensively studied for coastal ecosystem, but in case of fisheries the studies have mostly focused on the change in fish distribution and fish stock due to climate change.

Hence major objectives of this paper are to understand the livelihood and adaptation strategies of fishing communities in the event of climate change and analyse their socio-economic implications. We collect primary data through structured questionnaire from 182 households of five fishing villages in and around Mumbai. Extensive data is related to the fishermen's physical, social, financial assets, their perception towards climate change and the adaptation measures undertaken. We use Sustainable Livelihood Approach and developed vulnerability indicators (Scoones, 1998; Hahn et al., 2009; Ekin and Tapia, 2008). We also used Stochastic Production Function (Battese and Coelli, 1995) to understand and analyse the observations and preparedness of fishing communities towards global environmental changes and also the effect of it on fish productivity. This study finds that fishermen lack awareness regarding climate change and demographic parameters like age and type of family influence the variation in their awareness. We also derived vulnerability scores for the fishing villages surveyed and compared the score with expert's by applying Analytical Hierarchical Method (Saaty, 1980).



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## 1690 Assessing Drought Impact on Forest Produce and Its Economic impact on Tribal Community in India

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### Significance

Incidence of drought in India seen various changes especially in quantity of rain fall, which in turn has significant economic impact on tribals whose incomes chiefly depends on forest produce. Tribals constitutes 10 % of Indian population. AP State having significant percentage of tribals. Eighty percent of tribals still depends on forest produce as main source of income for livelihood. Impacts on well being of forests caused by drought and its consequent economic impact on livelihood of tribals requires utmost attention in all developing countries including India. This paper investigates climate variability impact on forest produce and its related economic impact on tribals community.

### Approach

Study analyses time series of annual rainfall (June, July, August & September) impact on forest produce, and its subsequent economic impact for last 10 years. Year wise rain fall index, forest produce index, income index, and consumption index calculated by administering schedule. Randomly, 1000 tribals households included for this study. Multiple dimensions of drought impact on forest produce estimated based on statistical modeling where produce from forest estimated based on forest climate parameters (sea surface temperature, number of rainy days, daily amount of rain fall, kinds of produce, quantity and quality of produces etc.). Step wise multiple regression used to establish its impact of variability of forest produce and resulted economic impact on tribals.

### Results

Summary of ANOVA test shows significant tendency of rain fall decrease gives 60% reduction in forest produce with remarkable (68%) economic impact. Alarming decreasing trend in rain fall not only seen in number of rain days, but also so in total amount leads to substantial decrease in forest produce in tribals area. Forest produce is concerned most important climatic parameters to consider are rainfall, temperature, solar radiation and wind; all other agroclimatic variables can be derived from these fundamental parameters. Most of expected impacts of drought reported in literature concern primarily rainfall and temperature.

### Managerial Implications

Assessing economic impact on tribals due to reduction in availability of forest produce as result of variable drought dimensions is a first methodological approach in Andhra Pradesh. Indian Government and NGOs may consider findings while evolving drought adoption strategies and



promoting tribals economic support. In fact drought adoption strategies are infant stage in India and results of this study may provide some guidelines and throw some light on drought adoption strategies and to stop migration of tribals.



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## 1050 Direct and indirect effects of weather experiences on life satisfaction – which role for climate change expectations?

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This paper deals with effects of damage experience from extreme weather events and damage expectations about future climate change on subjective well-being (SWB). We hypothesize and test for different effects between these three dimensions. Firstly, according to numerous literature sources, we estimate the effect of damage experience on expectations about future climate change as well as on current SWB. Secondly and more innovatively, we test for an influence of expectations regarding the future climate change on present SWB. Thirdly, the inclusion of expectations allows for a deeper investigation of the effect of damage experience on SWB. We hypothesize that there is a direct effect from the mere damage experience, and an indirect effect via the channel of expectations, since damage experiences affect expectations and thereby also SWB.

For testing these hypotheses, we use novel data of an internet and TV-based survey amongst more than 6000 German households. Damage experience is measured by the statement of having suffered any financial or health damage from heat waves, storms, heavy rain or floods. Expectations about future climate change are measured by three different specifications: (a) the estimated likelihood of an increase in personal damage from the mentioned weather events, (b) expected consequences of climate change impacts on personal living conditions, (c) the participant's expectation of the global average temperature development by 2100. For estimating the direct effects, we employ OLS regressions. Additionally, we check the validity of our results by ordered probit regressions, since it is questionable if SWB is an ordinal rather than a cardinal variable. For disentangling direct and indirect effects of damage experience of SWB, we use Structural Equation Modelling.

The effect of experienced weather events on SWB is only significant for heat waves; not for storms, heavy rain and floods. This may be explained by the fact that heat waves cause mainly health related damage, while the other events may show material damage, which is more temporary. Concern about future climate change has a negative impact on current SWB in all specifications. The impact of heat wave experience can be separated into a direct effect and an indirect effect, which influences current satisfaction via the channel of expectations regarding future climate change. It becomes apparent that the indirect effect is significant but small compared to the direct effect. The estimated coefficients can be used for a rough monetization of the effects of weather experiences and climate change expectations.



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transfers between countries: global trade I



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## 1267 Downscaling of planetary water and land boundaries, and the role of trade in approaching these boundaries

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We have developed a consistent framework for context-specific downscaling of planetary water and land boundaries, based on the respective water and land availabilities for agriculture and competing demands by other ecosystems.

For a refined, spatially explicit bottom-up assessment of the planetary boundary for freshwater we employ the LPJmL global eco-hydrological model, which simulates water availability, agricultural water consumption and productivity, and also rivers' environmental flow requirements. From that we derive maximum allowable water withdrawals (locally and globally), and we assess how close humanity already is to the revised (lower) planetary water boundary and if local boundaries have already been transgressed.

For a refined planetary boundary on land use we apply datasets that include actual and potential land use and productivities and account for protected areas, such as the FAO/IIASA Agro-Ecological Zones (AEZ) database. From that we derive current and maximum allowable agricultural land use. With these analyses we specify the current position of specific river basins or countries to their respective water and land sustainability boundaries.

Furthermore we analyse, with the help of an environmentally extended Multi-Regional Input-Output (MRIO) database, trade flows of virtual water and virtual land with agricultural commodities, along the full supply chains from primary production through the various trade and transformation steps all the way to final consumers. With that we quantify the contributions of imports in consumer countries to stay within the "safe operating space" as defined by the downscaled boundaries, and in water- or land-scarce exporting countries to faster approach these boundaries. Moreover we quantify changes in overall resource use efficiency by substitution of domestic production with imports from more or less efficient exporting countries (and with that overall trade impact on planetary water and land boundaries). Lastly, we also quantify per-capita domestic and foreign use of water and land resources, associated with agricultural and other products (territorial and consumption-based footprints of nations).



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## 1143 Trade and countries' emissions: some conceptual and methodological aspects

**Roca, Jordi**

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Country emissions depend not only on domestic demand and domestic technologies but also on trade flows with other countries. Importing goods from other countries implies that the country does not generate the emissions which would be associated with the domestic production of these goods; at the contrary, producing goods to be exported is associated with emissions which are not due to domestic demand. The difference between these two types of emissions can be called Net Emissions Avoided by trade (NEA); in other terms, it is the difference between the pollution that would have been produced in a country if it would not have exported any product and all necessary imports to satisfy its domestic demand would have been produced internally and its actual emissions. The way to estimate the NAE is using an Environmental Extended Input-Output model applying the Domestic Technology Assumption (DTA), that is to say, assuming that imports would be produced with domestic techniques. In practice, the implementation of the DTA involves that the country analyzed should produce a quantity of products equivalent to the monetary value of the imports required to satisfy its domestic demand (i.e. 'monetary DTA'). However, due to price differences, it could be the case that the same physical quantity of goods in different countries would have a different monetary value. In that case, monetary value of imports did not adequately reflect the monetary value of goods which country would have to domestically produce to dispose of the same quantity of goods in absence of trade. In this paper we show that a 'physical DTA' model, focused on the pollution to produce domestically the imports measured in physical units, would be a better approach. Obviously, the application of input-output models in empirical analysis involves working with sectors that normally include many different goods and the monetary value by physical unit of a sector depends not only on prices but also on the goods composition of the sector. However, the 'physical DTA' approach seems to be a better approach than the 'monetary DTA' one also in empirical analysis. In its empirical part, the paper will compare the NAE by trade that results from both approaches - 'monetary and physical DTA' - for several atmospheric pollutants in Spain showing the important differences in results from both approaches.



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## 1645 Adaptive Capacity and Global Resource Flows

**Winslow, Maggie**

A population's vulnerability to climate changes is a function of its exposure to climate stresses and its ability to adapt or adjust to change. Common determinants of adaptive capacity include economic resources, level of technology and education, equity, and stability and strength of civil and government institutions. It should follow then that building adaptive capacity requires enhancing one or more of these factors. While at a given temporal and spatial scale this may be true, building sustainable and global adaptive capacity requires looking beyond the levels of specific indicators to the determinants of the levels themselves. For example, developed nations generally have greater adaptive capacity than developing regions or countries in economic transition. However, the economies of much of the developed world, which are the foundation of much of their adaptive capacity, are indirectly contributing to increased vulnerabilities in other regions and other times. This paper explores this tension through a comparison of traditional indicators of adaptive capacity with ecological footprint metrics, and suggests an approach to enhancing global adaptive capacity through altering international resource flows.



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## 1094 Ecological Footprint and International Trade: an Analysis of the Trade Balance of Brazilian Agribusiness

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Classical economists, such as Adam Smith and David Ricardo, argued that international trade was a source of wealth and a strategy of economic growth in which all participants were bound to win. Theories like that, drawing upon harmony in international trade, began to be challenged in the 20th century, when the theory of unequal exchange warned that a tendency to deterioration of barter terms of trade favoured industrialised countries and played against underdeveloped ones. Although criticisms of this sort are noteworthy, they largely rely on monetary prices, which can account for relative rather than absolute scarcity. Monetary prices have hardly proven to be able either to tackle the damages caused to the environment or to reckon them in natural resource-intensive activities, such as agribusiness. The "ecological footprint" method seeks to assess commodity trading from an environmental standpoint, by calculating the land (or water) area needed to meet certain consumption patterns. Hence, it allows to figure out what proportion of others' territory is taken over by natural resource-poor countries, as well as whether and how these pay those back. This study aims at measuring the quantity of land (in hectares) used by Brazil's agribusiness to hold a positive economic trade balance, thereby allowing to ascertain whether trade is carried out in a fair or uneven way and how much such a trade balance is financed by an ecological debt. The results lay bare that the Brazilian agribusiness trade is unfair.

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Theme: 2.4 TRANSFERS BETWEEN COUNTRIES  
Session: 2.4.A1 transfers between countries: global trade I  
Time: W1 Room: R10

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## 1693 Leakage of regional ecosystem services improvements due to global trade

**Koellner, Thomas**

Current studies often assess land use change and associated impacts on ecosystem services on a regional scale. Frequently they conclude that the reduction of agricultural land use and the increase of forested land would result on the one hand in a loss of agricultural commodity values, but in the other hand in an over-proportional gain for biodiversity and ecosystem services (e.g., erosion regulation, carbon sequestration, habitat provisioning). However, this conclusion rests on the assumption of a closed regional system. When we assume that regions are open systems with respect to the flow of commodities and the demand for commodities is constant then the agricultural production and associated impacts on biodiversity and ecosystem services are just shifted to another location, most likely in developing or emerging countries. The goal of this presentation is to show what amount of land flows is triggered by the EU agricultural trade between 1995 and 2005 and what the global environmental impacts are. The results show that EU trade is shifted mainly from North America to South America resulting in change of the global environmental impact of the EU trade. This assessment of open regional systems is contrasted with land use assessments in Life Cycle Assessment. Based on the example of Swedish milk production we show that land use is distributed globally and that a regional approach is not useful anymore. We conclude that whether the assessment is done for open regional systems or for product systems depends on the decision context.



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Session 2.4.B

transfers between countries: balances



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Session: 2.4.B transfers between countries: balances  
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## 1515 Ecologically unequal exchange and distribution conflicts: Amur river case study

**Glazyrina, Irina**

Amur (Heilong) is one of the greatest rivers on the planet, its watershed encompasses the vast areas in Russia and China. This paper presents an analysis of Hydropower development Plan for Amur river and its tributaries in the context of ecologically unequal exchange (EUE).

Ecologically unequal exchange usually considered on international level as an asymmetry in benefit distribution between Center and Periphery, extractive and manufacturing economies, North and South and so on in the framework of world-system analysis (Bunker, Hornborn, Emmanuel, Wallerstein, Jorgenson, Rice, Hermel and many others). Certainly, this is very important aspect, crucial for development issues. However, ecologically unequal exchange very often dramatically reveals on other levels: between different areas (industrial, agricultural, raw-material extractive) within one country, between local population and extractive/manufacturing companies, between sides in bilateral (for instance, cross-border) cooperation (Martinez-Alier, 2010). Ecosystem services (as climate and water regulation, assimilation facility, maintaining the habitat and biodiversity, recreational and cultural amenity etc.) are very often left out of commercial contracts and so they are the first victims of ecologically unequal exchange.

The "environmental monetarism" – an approach which claims the priority of monetary evaluations (including environmental aspects) in strategic plans elaboration – now is the main principle of decision making (connected with development problems) in Russia and, in many cases, in China. Analysis, presented in the paper, shows that it will lead to EUE on several levels and dimensions. The consequences are dangerous for ecosystem services in both countries. Adequate system of payments for ecosystem services (PES) which can be considered as a tool for ecosystem management using economic incentives, is necessary, but not sufficient condition to prevent EUE. We propose a set of alternative "valuation languages" (Martinez-Alier et al, 2010) for social discourse about hydropower development, based on significance of ecosystem services for the life-style and values of local population. One of the findings, based on in-depth interviews, is that poor local population in small rural settlements in Amur watershed area is often not ready to exchange their natural amenities for benefits from economic growth, they have some values which are not the subject for monetary compensation. Policy implication drawn by this study encourage creating of instruments to increase participation and effectiveness in deliberative processes based on different valuation languages.

The support of this work from Russian Foundation for Basic Research (RFBR, Project # 13-06-00034) is gratefully acknowledged.

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Session: 2.4.B transfers between countries: balances  
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## 1469 International material resource dependency in an input-output framework

**Bouwmeester, Maaïke C.**

Strategic resource interests coupled with increasing resource depletion have resulted in a rising concern with resource security. Material resources and strategies to ensure the supply of these resources are key factors in an internationally competitive economy. International fragmentation of production allows countries to specialize in production activities in which they have a competitive advantage, but it also creates interdependencies and increases the complexity of international trade relations. The increasing scarcity of natural resources will cause the geographical distribution of reserves to become an even stronger factor in the organization of global factor chains.

We assess natural resource use, trade linkages and material dependence among 43 countries and the rest-of-the-world region as represented in the EXIOPOL database. The material intensities of the consumption baskets of these countries are assessed and it is investigated to what extent countries are dependent on foreign-sourced material. Material requirements along the international supply chain are quantified using an environmentally extended international input-output model, which allows considering direct and indirect, domestic and international resource use. We focus specifically on fossil energy carriers, metals and mineral resource use.

Three measures of resource dependency are analyzed. Overall resource dependency is measured as total material requirements (direct and indirect) per unit output, including materials extracted abroad. International material dependency is defined as the percentage of the material requirements that is sourced from abroad. Finally, we also consider the concentration of international material dependency. When resources are mainly imported from one or a few trade partners, countries may want to reconsider whether strategic interests should be factored into their procurement strategies. A strategy of diversifying over suppliers of natural resources will decrease dependency risks.

The material intensity of a country's final demand basket is found to be largely unrelated to whether the country also extracts material resources. Countries that extract material resources mainly rely on this extraction for the production of their own final demand. The extraction of fossil energy carriers is relatively equally distributed compared to the various metal resources. For resources where the international dependency is much higher, the concentration of supply is found to be lower. This effectively represents a diversified supply pattern in case resources are sourced from abroad. However, our analysis also reveals that there is a large dependency on materials sourced from BRICS, which needs consideration given the expected growth of these countries.

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## 1232 Causal determinants of international ecological distribution

**Teixidó-Figueras, Jordi**

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Causal determinants of international ecological distribution.

Since natural resource scarcity is not a remote possibility anymore, distributional analysis on natural resources may become more pressing to global governance; business-as-usual scenarios are feasible neither in physical nor in a social sense: equity must comprehend both future but also present generations (Anand, Sen 2000). This paper consists in a distributional analysis of how a set of environmental indicators were allocated among countries in 2000. Our analyses comprehend Human Appropriation of Net Primary Production (HANPP), embodied HANPP, Material Flow accounting indicators, territorial and consumption based Carbon emissions, and Material Footprints. Our main aim is twofold: disentangle the main contributors to international environmental inequality and perform a comparative analysis among the environmental indicators used.

The study of driving forces behind the environmental pressures has been of widespread interest to researchers and policy makers in recent decades. Those empirical analyses tell us about the effect (elasticity) that a rise in affluence, population or technology (or temperature or urban population share) would have to a particular environmental indicator (York, Rosa & Dietz 2003). The international distribution of natural resources is in fact a byproduct of such elasticities. However, they do not reveal the effect these causal factors have on the environmental pressure's international distribution; to what extent driving forces contribute to such international inequality. We use a Regression-Based Inequality Decomposition approach, borrowed from income inequality analyses (Fields 2003). The methodology extends qualitatively the results obtained in standard STIRPAT regressions as it comprehends further social dimensions of the Sustainable Development concept, i.e. equity within generations. Results allow highlighting interesting insights of each of the environmental indicators used. Among other results, we found that consumption based distributions are dramatically more deeply driven by affluence factor as expected. Also demographic characteristics play a key role in some of the environmental indicators analyzed. Several interesting insights by comparing results obtained from the different environmental indicators used are highlighted in the analysis.



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Session 2.4.C

transfers between countries in the context of REDD+



Theme: 2.4 TRANSFERS BETWEEN COUNTRIES  
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Time: W2 Room: R10

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1520 Transaction Costs for establishing governance structures for REDD+. Lessons from Tanzania and Brazil

**Nantongo, Mary Gorret**



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## 1402 Instituting REDD+. An analysis of instituting REDD+ in Kilosa (Tanzania)

**Vatn, Arild**

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Reduced emissions from deforestation and forest degradation (REDD+) is being developed as a potentially core element of a future climate policy regime. Since halting deforestation and forest degradation will impair important livelihoods for poor rural communities in the South, the idea has been that the North should compensate the South for its livelihood losses.

This paper is focused at the introduction of REDD+ in the Kilosa district in Tanzania. The Kilosa project is established and managed by the Tanzanian Forest Conservation Group (TFCG) and funded by the Norwegian government. The project implies changes in the systems for land management and the establishment of a structure for compensation for lost livelihoods. There is great uncertainty regarding the functioning of REDD+ at the local level and how well the interests of the people living in forests areas are taken into account when establishing REDD+. In this regard, the paper will cover the following issues:

1. What kind of institutional and organizational changes have been undertaken in Kilosa since the pilot started and which processes have been initiated for those changes to happen?
2. How do a) people living within the area, and b) the responsible implementing organizations evaluate the changes undertaken and the associated processes?
3. How well do processes and outputs stand as evaluated against general norms of legitimacy?

The analyses are based on governance theory (e.g., Paavola 2007; Vatn 2011) and theories on legitimacy and justice (e.g., Habermas 1996; Ikeme 2003; Bernstein 2005; Bäckstrand 2006). To produce the data necessary to evaluate the project as outlined, we have undertaken 125 interviews at household level in a selected set of involved villages. Altogether 10 focus group discussions and a substantial number of resource person interviews have also been completed.

Several institutional and organizational changes have been undertaken – mainly to facilitate land use planning and establishment of village forests. Payments have also been undertaken – so far only as an experiment. Payments are low, compared to losses of livelihoods. Nevertheless, the evaluation of the project is quite positive among interviewed households. We note that expectations regarding increased payments are high. Understanding the responses, we also note that most of the costs fall on a minority of villagers. We also observe that the REDD+ system



established is adapted to a settled population, while pastoralist interests are not really taken account of.



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**1806**      **The equity of REDD+ benefit sharing mechanisms? A multilevel governance analysis in Vietnam.**

**Yang, Anastasia Lucy**

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REDD+ is based on reducing emissions from deforestation and forest degradation by providing incentives to encourage environmentally beneficial land management activities. Such activities largely center on sustainable forest management and reforestation initiatives. REDD+ has increasingly received attention by policy makers and academics due to opportunities to mitigate climate change in addition to the potential socio-economic benefits. Consequently REDD+ programs have begun to feature in national policy. The performance of implemented REDD policy programs are crucial to inform future policy and provide recommendations. Evaluation should measure both the effectiveness of REDD+ programs in reducing in carbon emissions, the efficiency of project implementation, but also crucially the equitability of incentive distribution. This final element in parallel to effectiveness and efficiency elements will contribute to the overall performance and acceptance of REDD+. This study consequently focuses on the evaluation of the 'equitability' of the benefit sharing mechanism of REDD in Vietnam. A multilevel analysis considering the in relationship of multiple actors and institutions around decision-making processes on land use and benefit sharing will be taken. This study aims to propose principles and options to improve the design of multilevel institutions, processes and tools in the implementation of REDD+ and other land use policies that reduce carbon emissions and enable more legitimate, fair and equitable benefit-sharing arrangements.



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Session 2.4.E1

Shifting Boundaries through Trade: Accounting for the  
'Upstream' Resource Requirements of Consumption I



Theme: 2.4 TRANSFERS BETWEEN COUNTRIES  
Session: 2.4.E1 Shifting Boundaries through Trade: Accounting for the 'Upstream'  
Resource Requirements of Consumption I  
Time: T1 Room: R10

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## 1672 Global human appropriation of ecosystem capacity for biomass consumption in the EU-27, 1986 - 2007

**Kastner, Thomas**

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Globalization and industrialization have led to ever-growing volumes of international trade. Land use impacts related to agriculture and forestry increasingly disappear from consumers' view. At the same time, demand side measures will be required to move towards more sustainable production and consumption patterns. To be successful, such measures need robust information on the extent to which consumption patterns of a nation or region impact other, often distant locations. In this study we locate and quantify land use impacts linked to biomass consumption within the European Union (EU27). Based on detailed bilateral trade data (covering over 450 agricultural and forestry commodities and 170 countries), we assess land requirements behind Europe's consumption patterns. We use the human appropriation of net primary production (HANPP) indicator to quantify human pressure on ecosystems and show that a considerable and increasing amount of embodied HANPP (eHANPP) linked to Europe's biomass consumption occurs outside the EU's territory. This approach enables for pinpointing global hotspots that are especially important in supplying Europe's demand, and for clearly quantifying and locating instances of problem shifting. By covering over two decades (1986 to 2009) we are able to reveal temporal trends linked to our increasingly globalized economy. We find South America being the largest supplier of EU import demand, with growing eHANPP flows from this region throughout time. We highlight the impact of certain product categories for which Europe exhibits high import dependencies, such as oil crops and tropical cash crops. Our numbers make it clear that any comprehensive EU level policy on land use has to comprehensively account for global impacts of EU consumption.

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## 1665 Global biomass flows and associated land requirements – A comparison of accounting approaches

**Bruckner, Martin**

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Various approaches exist for quantifying land footprint of biomass consumption by estimating the virtual land embodied in international trade flows. These can be classified into a) economic accounting approaches, applying land use extended input-output analysis, and b) physical accounting approaches, using information on physical trade quantities combined with land intensity coefficients. The results of recent studies vary widely, thus hampering their application in policy making.

In order to study the disparities a literature review on recent land footprint studies was performed and differences in the applied methodologies and base data were identified. In order to empirically analyse these differences, a multi-regional input-output model based on the GTAP database (GTAP-MRIO) was set up and used to calculate global virtual land flows and footprints. The results were then compared to results generated with IIASA's LANDFLOW model, a comprehensive physical accounting model. The land use data were harmonized in order to exclude differences in environmental data as a source of divergence.

The literature review has shown that the two approaches have evolved strictly separated during the past decade within various research communities. Differences in the base data and methodologies have wide impacts on the land footprint results. The greatest divergences result from variations in the coverage of crops, processed products and supply chains. The use of differing data sources and weighting procedures for the land use data in some cases may also result in deviations up to an order of magnitude. Technical specifics such as the application of monetary versus physical accounting or variations in the handling of re-exports still cause differences of often more than 100%.

A hybrid accounting approach combining the advantages of both methodologies could provide a framework for the robust and transparent assessment of land footprints associated with global biomass flows. Such an accounting framework should be based on international statistics reporting crop production, trade and use in physical units, supplemented by monetary data for the sectors and supply chains otherwise not covered.



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1668 Cropland ecological footprint of the US: a detail comparison of process analysis, and simple and hybrid multiregional input-output analysis

**Weinzettel, Jan**

Kjartan Steen-Olsen, Norwegian University of Science and Technology (NTNU), Industrial Ecology Programme (IndEcol) Alessandro Galli, Global Footprint Network

Ecological footprint became a sound indicator of environmental pressure on multiple scales, ranging over nations, cities, and individuals. Global footprint network (GFN) established national accounts on a process based approach, utilizing detail data on physical production and trade provided by Food and Agricultural Organization (FAO) and using world average production technologies. Contrary, a multiregional input-output analysis (MRIOA) has been widely used to account for carbon footprint on national level, applying country specific technology on a broad product groups. MRIOA can be applied to calculate also ecological footprint of nations, however, the product detail is much lower than what can be taken from FAO statistics (FAOSTAT). Therefore, a hybrid approach was developed tracking international trade of primary biomass products on the same level of detail as in the GFN process method.

In this contribution we compare the cropland ecological footprint of the US calculated by process based method represented by GFN method, the simple MRIO model, which assigns primary crop products to the producing sectors and the hybrid MRIO, in which the primary crop products are assigned to the first user sectors. We chose cropland ecological footprint because of data availability and its relevance for real land related part of the ecological footprint. We provide a detail analysis of the differences.



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Session 2.4.E2

Shifting Boundaries through Trade: Accounting for the  
'Upstream' Resource Requirements of Consumption II



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Session: 2.4.E2 Shifting Boundaries through Trade: Accounting for the 'Upstream'  
Resource Requirements of Consumption II  
Time: T2 Room: R10

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## 1669 Mapping the Ecological Footprint of Nations

**Moran, Daniel**

Dr. Richard Wood, NTNU  
Prof. Edgar Hertwich, NTNU

As international supply chains become more numerous and more complex consumers are growing increasingly disconnected from the environmental impacts their purchases ultimately drive. Consumption-based accounts, based on global multi-regional input-output (MRIO) databases, elucidate international supply chains linking producers and consumers. MRIOs trace the total upstream environmental impacts of purchases making it possible to calculate a product's carbon, water, and land footprints. In this study we use the results of a global MRIO database to spatially map and visualize the changing Footprints of each of 187 countries over the last 30 years. During this time increased globalization has dramatically changed the way goods are produced. We present a series of maps showing how each country's footprint falls in trade partners around the world. Each Footprint map consists of several layers, using choropleth, probability-weighted scatterfill, and spatial models of water withdrawals to visualize the carbon, land, and water footprints, respectively. The aim is to illuminate areas on the map where water, land, and CO<sub>2</sub> emissions are being used to produce goods bound for consumption in the target country. The spatialization methods used, individually and in a composite map, provide an as-yet unseen view of how consumers are linked to environmental impacts around the world. While the underlying data are not precise enough to link a particular purchase to a particular point on the map, data visualization can still provide a compelling communication tool for motivating and explaining research into consumption-based accounting of environmental footprints



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Resource Requirements of Consumption II  
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## 1670 Projected future developments of environmental impacts embodied in trade – the next 40 years

**Wood, Richard**

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Ambitious development goals have been set for the future that accommodate projected population growth, whilst hopefully both allowing continued increases in quality of life and limiting or even reducing impacts on natural ecosystems. As such, we expect to see major changes in technology as well as in consumption habits. These changes are systemic, and will affect all industries and products. Coupled to this are strong regional growth patterns that will influence the bilateral trade links around the world. Scenarios can help to understand the impact of development and globalization for the global trade of goods and services. In this paper we utilize the multi-regional input-output (MRIO) based THEMIS model to investigate future changes of impacts embodied in trade. THEMIS is built using a combination of the IEA World Energy Outlook and an environmentally-extended MRIO framework. Input-Output (IO) analysis has the advantage of being systemic in nature – comprehensively covering both the production and consumption perspective. The THEMIS model couples the completeness of IO, with exogenous data on life-cycle consistent process descriptions of technological change, growth in productivity, shifts in decarbonizing inputs, changes in consumption habits, and regional growth patterns, in order to arrive at a series of estimates of future consumption and production scenarios [This last clause is confusing – you can't estimate a scenario]. In this work we look at a range of material impacts and environmental emissions embodied in the trade patterns as projected through a number of scenarios out to 2050. We focus analysis of results on the major trade flows, and where consumption based policy should be focused given the expected shift between domestic and foreign production.

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## 1667 Environmentally Extended Input-Output Analysis: Examining the Impact of a Paradigm Shift

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At the beginning of the 21st century, trade is more relevant than ever. Increased spatial differentiation occurs both along more highly fragmented supply chains and between production and consumption. Through these physical exchange relations between societies, globalization has added and continues to add complexity to the study of society-nature relations. Analyses of global resource use induced by national final demand are increasingly required. Such accounts necessitate opening the 'black box' of production in order to be able to account for the upstream material and energy use associated with domestic final demand and exports, respectively. Applications and adaptations of Leontief's work on input-output (IO) analysis are currently treated as one of the most suitable tools in making the transition from production- to consumption-based accounts.

Currently, analyses of upstream material and energy requirements are almost exclusively based on linking data on the (biophysical) indicator of interest with monetary input-output tables which provide information on the structure of both production and final consumption. The use of monetary data in allocating biophysical flows constitutes an important paradigm shift for environmental accounting for which the initial move away from monetary to physical data was an important accomplishment. It can be argued that monetary data is not a good proxy for biophysical flows. In order to link the two types of accounts (monetary and biophysical), a number of assumptions must be made as to the relations amongst the two types of data. These pertain to the integration of non-market flows, price structures, data aggregation, and the treatment of investments and stocks. Using an input-output model, we illustrate how these assumptions impact the results for the 'upstream' material requirements of domestic and foreign final demand.

In order to contribute to well-advised policy measures to curb the impact of human societies on the environment, it is essential that we gain a better understanding of global resource consumption. The efforts undertaken on the basis of IO analysis are a leap forward in this direction. However, as we show, it cannot yet be ensured that the results these methods produce in terms of 'upstream material use' or a 'material footprint' really reflect resource consumption in an unbiased manner. Before policy recommendations are made based on these results, we have to better understand how physical flows are allocated through monetary structures and which limitations exist therein. Only then can we make the necessary methodological adaptations to gain better tools in answering the prevailing questions on global resource use.



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## 1666 Water footprinting - how trade can shift the burden of increasing water consumption

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Issues related to the availability and use of water, such as water scarcity or over exploitation, are often localized phenomena to be dealt with not on the national but on the watershed level. However, in a globalised economy, local water depletion is often closely tied to consumption in other countries and world regions, as water used to produce exported products is 'embodied' in traded commodities.

Multi-regional input-output (MRIO) models can track the distribution of water use within and across countries on a sectoral level and allow for modelling the interactions between the economy and the environment in order to quantify the relative benefits of mitigation measures on the political level.

The present paper for the first time applies the MRIO database EXIOBASE, developed in several European research projects, not only extended by national blue and green water consumption data but also with the option to break down these data to the watershed level. By that means indirect ("virtual") water consumption in one country can be traced back to the watershed it was extracted to produce the finally consumed goods. This information can then further be combined with analyses regarding the assessment of the impact of the water withdrawn. Hence, it can be illustrated to what extend the consumption in one country results in pressure on the water resources in a specific watershed and its impacts.

In this paper we will show the results of our analyses, discuss methodological issues as well as political implications and indicate the main points of further development. The main consumers of foreign water across all countries world-wide will be identified and their consumption set into relation with the impacts created in specific domestic and foreign watersheds. Moreover, we will explain the political relevance of aiming for water consumption data on the highest level of spatial resolution possible.



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Session 2.4.F1

Transformation of Money and Finance for Sustainability I;  
Proposed session



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## 1467 Monetary systems for well-being and equity within planetary boundaries

**Farley, Joshua**

Modern monetary systems are based on fiat currencies backed by the productive capacity of whoever accepts them. Citizens must accept these currencies for the goods and services they produce in order to pay taxes. Governments create fiat money by spending it into existence, and destroy money when revenues (e.g. taxes) exceed expenditures. Most money however is loaned into existence by banks as interest-bearing debt that grows exponentially, and destroyed when loans are repaid. On a finite planet, bank-created money drives unsustainable economic growth, redistributes wealth towards the financial sector, and creates speculative bubbles and busts that generate misery, poverty and unemployment. Looming planetary boundaries can stimulate speculation. When the supply of an asset is fixed, price is determined by demand, which in turn is largely determined by the availability of low interest loans. Consumer demand for essential resources is insensitive to price. Planetary boundaries limit our ability to increase the supply of food, fossil fuels, minerals and other essential resources. When low interest loans drive up asset and commodity prices, supply does not increase and consumer demand does not contract. Instead, rising prices attract speculators, increasing speculative demand and price. Banks collect much of the increased asset value in interest charges as the system spirals upward. When asset prices stop increasing, banks loan less, reducing the money supply and decreasing demand. Speculators sell off assets to repay loans, and prices plunge, creating massive debt defaults. Banks acquire the assets used as collateral on loans stop loaning new money that productive businesses require in order to function. Governments efforts to bail out the financial sector are futile, because claims to wealth were never matched by real production. Only a new speculative bubble will allow banks to balance their books. A speculative economy transforms the price mechanism into a positive feedback loop, disequilibrium system. The solution is to revoke the right of banks to create money and restore public sector control with 100% fractional reserve banking. The public sector must then replace bank money with debt-free government money. To promote sustainability, governments can create money through expenditures on ecological restoration and open-source green technologies, and destroy money with taxes on pollution and resource depletion; to promote well-being and equity, governments can spend on job creation and poverty alleviation, and tax rent and excessive wealth.



Theme: 2.4 TRANSFERS BETWEEN COUNTRIES  
Session: 2.4.F1 Transformation of Money and Finance for Sustainability I; Proposed session  
Time: F1 Room: R10

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## 1176 Role of money and finance in a post-growth-society

**Seidl, Irmi**

This abstract is submitted in relation to the session proposal: The transformation of money and finance for sustainability

The financial sector is a major driver to economic growth: money creation, interest rates, expected return on investments, and international finance trade impact on the extent of existing and on new economic activities and on the kind of economic activities. In the last decades, also the financial sector has neglected the real-world economy by focussing on highly profitable large scale economic activities and financial instruments which deteriorated the financial services for not or slow growing enterprises.

The paper will identify the growth driving activities and provisions within the financial sector and will discuss which measures would reduce the pressure on economic growth such as 100% money, limited interest rates, increased equity capital base, local currencies, or support of regional / local and business development banks.



Theme: 2.4 TRANSFERS BETWEEN COUNTRIES  
Session: 2.4.F1 Transformation of Money and Finance for Sustainability I; Proposed session  
Time: F1 Room: R10

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## 1102 Financialisation, economic growth and biophysical limits

**Rezai, Armon**

Sigrid Stagl

This abstract is submitted in relation to the session proposal: The transformation of money and finance for sustainability.

Over the past decades, researchers have gained sound understanding of how the real economy interacts with its environmental basis. Concurrently, a growing literature has developed which investigates the interactions between financial markets and the real economy. We aim at combining the two bodies of knowledge to understand how finance can serve a just, resilient, and sustainable economic system that improves lives and respects biophysical limits. Specifically, this project proposes to analyse the interactions between the financial, the real, and the "real-real" side of the economy to explore avenues toward a financial system that channels resources into socially useful, productive, and environmentally sustainable activities. We are convinced that questions of growth and income distribution are core to any environmentally viable solutions.



Theme: 2.4 TRANSFERS BETWEEN COUNTRIES  
Session: 2.4.F1 Transformation of Money and Finance for Sustainability I; Proposed session  
Time: F1 Room: R10

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## 1030 Financialization and Sustainability

**Hermele, Kenneth**

This abstract is submitted in relation to the session proposal: The transformation of money and finance for sustainability.

Financialization and Sustainability.

Taking as the point of departure a strong understanding of sustainability – that is, one where the various spheres of sustainability are analysed separately, without any attempt to bring them together into one single metric – the impact of financialisation on economic and social sustainability is discussed.

First, it is demonstrated how financialisation endangers economic sustainability through the increasing economic costs associated with financial crises, one of the effects of the increasing role of finance in the economic processes. As a case in point: financial crises have come to constitute one of the main systemic risks identified by the World Economic Forum.

Secondly, it is shown that financialisation weakens social sustainability via contributing to widening class and wealth gaps as well as to high levels of unemployment during prolonged periods of crises, leading, inter alia, to social protests, food riots and similar defensive moves by the most affected populations. As a result, social cohesion is endangered.

The impact of financialisation on economic and social sustainability, it is concluded, is of such magnitude, and the effects have such longevity, that they threaten the very fabric – social and economic – of nations.



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Session 2.4.F2

Transformation of Money and Finance for Sustainability II



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Session: 2.4.F2 Transformation of Money and Finance for Sustainability II  
Time: F2 Room: R10

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1141 Economic 'laissez faire' and ecological breakdown. Three jigsaw pieces to explore the relation between disembedding and weakening sustainability

**Hollander, Ernst**

This abstract is submitted in relation to the session proposal: The transformation of money and finance for sustainability.

The themes in my contribution are connected to a line of causation which can be read into other contributions to the session: Neoliberalisation / disembedding -> weakened social sustainability / social cohesion > weakened ecological sustainability. I will below call this the Neolib< >Unsust nexus. By using the word disembedding I of course relate to K. Polanyi.

Theme 1) How 'bottom-up-innovation' is hampered by the Neolib< >Unsust nexus. This i.a. relates to Carlota Perez's TECHNOLOGICAL REVOLUTIONS AND FINANCIAL CAPITAL.

Theme 2) How science – particularly social science – traditions hamper discussions about the Neolib< >Unsust nexus. The lack of debate about the Swedish neoliberal turn is a case in point.

Theme 3) The tenacity of the present global financial architecture. This i.a. relates to Eric Helleiner's work.



Theme: 2.4 TRANSFERS BETWEEN COUNTRIES  
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## 1017 Discourses on finance and sustainability

**Roepke, Inge**

This abstract is submitted in relation to the session proposal: The transformation of money and finance for sustainability.

Following the financial crisis, the issue of finance has become much more 'hot', also in research communities that focus on the environment and until recently took limited interest in topics related to finance. There are exceptions, such as Herman Daly who has long argued for full reserve banking and limits to international capital flows, and early contributions on complementary currencies, but in general, the interest has been limited until the last few years. The debate includes various topics, such as the role of money, full reserve banking, complementary currencies, various critiques of how the financial sector has exploited the opportunities in the market for carbon emission quotas (e.g. Clive Spash), the regulation of international capital flows, restrictions on some kinds of financial products, the introduction of a financial transactions tax to reduce high frequency trading, and limitations on tax havens. The purpose of this paper is to provide an overview by identifying key positions in the debate, highlighting whether and how the different topics are combined in more integrated positions, and how the positions relate to sustainability issues. Furthermore, the intention is to discuss the radicality of various proposals and their chance of realisation.



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1377 The macroeconomics of financial systems and sustainable development

**Sawyer, Malcolm**

This abstract is submitted in relation to the session proposal: The transformation of money and finance for sustainability.

The macroeconomics of financial systems and sustainable development

The paper opens with analysis of the macroeconomic conditions which would need to operate for economies to combine full employment with sustainable growth (rates of growth significantly below recent levels) in terms of levels of investment, savings, profits, budget deficits etc.. The required adjustments in macroeconomic terms are sketched, and the implications for the size and structure of the financial sector drawn.

Financialisation in the past three decades or more has involved financial sector of much greater size which are more unstable and which have not been conducive to sustainable development. The focus of the paper is on structures and roles of the financial sector which would be consistent with sustainable development and a stable financial system. These structures would include 'narrow banking' and smaller banks with diverse ownership forms (public, mutual), specialist banks (e.g. provision of funds to specific sectors) and requirements on composition of loans (e.g. along lines of US Community Reinvestment Act).



Theme: 2.4 TRANSFERS BETWEEN COUNTRIES  
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1653      **Beyond carbon pricing: The role of banking and monetary policy in financing the transition to a low-carbon economy**

**Campiglio, Emanuele**

Transitioning to a low-carbon society will require an adequate amount of investment. In order for economic resources to flow to low-carbon sectors credit must be made available to firms and households operating in them. This could be via either the reallocation of existing credit held by investors or the creation of new credit by the banking system. However, the exclusion of ecological goods from the market pricing system makes the risk-return profile of low-carbon sectors unattractive to both private banks and investors, while the current deleveraging process affecting the private sector further complicates the situation. This paper argues that a wide range of regulations could be put in place to redesign the structure of incentives private banks face in favour of low-carbon productive activities. The implementation by central banks of a wider and more diversified set of macroprudential policies appears to be a critical condition for the expansion of credit to low-carbon sectors and the achievement of a sustainable economy. For instance, differentiated reserve requirements and other quantitative measures can be employed to induce commercial banks to lend to specific activities. The application of these “unconventional” policies is far from unprecedented and a number of current and past experiences are presented from both emerging and advanced economies. Finally, the merits and limitations of development banks are discussed, arguing that an extension of their ability to leverage could help in providing an ample amount of finance to low-carbon investments, and work as a catalyst for the private sector involvement.



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## 1769 Environmental Performance, Economic Growth, Equity and Poverty in India

**Saxena, Rakesh**

India stands at 125th position as per Environmental Performance Index 2012. Another report has estimated the annual cost of environmental degradation in India as 5.7 per cent of its GDP and it is shown that how India can reduce such environmental degradation by slightly reducing its annual economic growth rate. Within India, the environmental performance varies significantly across its different States. Similarly, the annual growth rates of Net State Domestic Product, the values of Gini coefficients indicating inequity in income distribution, and poverty ratios vary significantly across different States of India. This paper attempts to (1) analyse relationship of environmental performance with economic growth rates, Gini coefficients, and poverty levels across Indian States, and (2) to accordingly explore suitable strategies to promote green growth in different States of India.



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## 971 Poverty, Environment and Willingness to Preserve in Rural India

**Sen, Alok**

Poverty, Environment and Willingness to Preserve in Rural India

The existence of poverty- environment trap in a developing economy ? endowed with high natural resource base and increasing population? is likely to have severe consequences for their self-reliance, income distribution, and future growth potential. In rural India 25.7% ( 216.5 million) of the population are poor. In this context, this present study of Lakhipur sub-division of Assam state of India, is an attempt to clarify the factors leading the poor to degrade their environment, their responses to environmental degradation and the incentives required to induce conservation.

The population of Lakhipur is 2,56,742 and area is 456 sq. K.M . 95% of the total population here are rural and 61.8% of the households are in BPL( Below Poverty Line) category. This sub-division has altogether four Development Blocks and three of them are very adjacent to forest.

Objectives:

- 1) To study the Poverty—Environment relationship and its determinants in the Lakhipur sub-division.
- 2) To study the extent of awareness among the poor people towards the preservation of environment.
- 3) To examine whether dependence on easily available environmental resources makes the poor people reluctant to search for other employment.
- 4) To examine the likely changes in poverty estimates when environmental goods are included in National Income Accounting.

Hypothesis

The null-hypotheses set accordingly are :

- 1) Higher the household income, higher is the proportionate share of consumption of non-marketed environmental goods in the household budget.
- 2) Higher the poverty level, higher is the ability and willingness to counteract degradation of environmental resources.
- 3) Dependence on CPR is making the poor evasive of other options of income earning.

Methods

. The sample size is 442 , drawn randomly from the list of BPL households of each of the four blocks. Hosmer-Lameshow Goodness Fit test was applied to examine the suitability of the model. To test the hypothesis OLS technique and qualitative regression techniques like Logit regression

model (both Coefficients and Odd-Ratios) were applied.

The explanatory variables are household per capita income, education, proportion of female members in each household, number of children per family, other means of occupation, awareness about environmental conservation, change in distance in collect environmental goods and time in environmental goods.

#### Findings

- i) There is a positive correlation between poverty and environmental degradation.
- ii) There is a negative relation between awareness and the income of the people i.e., poor people are more concern and aware about the degradation of the resources.
- iii) There is a negative relationship between search for other means of occupation by the rural poor and their collection of freely available environmental goods.
- .iv) Inclusion of environmental goods in the household's income accounting reduces the poverty ratio in the study area by 43.9%.
- .v) This study also finds that women are better preserver of environment.

It is now concluded that provision of more environmental goods by better preservation would be an effective poverty eradication measure in developing countries .



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## 1225 Inequality and Common Pool Resources: Evidence for a Causal Mechanism from India

**Thapliyal, Sneha**

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Substantial decline has been consistently recorded in Common Pool Land Resources (CPLRs) in developing nations. It is crucial to examine the factors that contribute to such decline as CPLRs play a pivotal role in rural economies. Using nationally representative data collected in India by the National Sample Survey Organization in 1998, we establish a causal pathway demonstrating that higher social and economic inequalities lead to greater erosion of CPLRs. We analyse two outcomes for land under Commons at different geographical aggregations: (a) whether the land is lost to privatization, and (b) the size of such losses. Our analysis includes various forms of CPLRs including de jure (village forests, community pastures, barren land and threshing floors) and de facto (protected and unclassified forests) areas. CPLRs are multi-tier systems (Ostrom, 2009), with a host of factors operative within a region and bigger administrative boundaries, while being embedded in larger ecological systems. Accordingly, we account for internal factors (including, CPLR-related institutions, resource extraction within villages), external factors (for e.g., infrastructure within a district), and fifteen agro-climatic zones across the country. We also factor in the historical institutions that may, directly or indirectly, influence the subsequent development of rural economy and local institutions. We estimate Gini index and social heterogeneity index as measures of economic and social inequalities respectively. We also estimate Theil index for land-based inequalities within and across administrative units. To address endogeneity of economic inequalities with CPLRs-related outcomes, we exploit the variation in harvesting techniques used by households as an instrument. Households' decisions to not crop, harvest crops manually, or to use harvesters provide a gradient of economic well-being within a region and, ultimately, quantify the effect of inequalities on CPLRs' erosion. We present a series of tests to demonstrate the robustness of the instrument. Results show that increase in economic and social inequalities by one standard deviation is associated with an increased likelihood of loss of CPLRs by 5% and 2% respectively. Increase in one standard deviation of social inequalities results in 10 standard deviations increase in percentage of land lost.

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## 1231 Evidence-based policy-making in the support of short food supply chains. A case study from Hungary

**Benedek, Zsófia**

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In the last years a rapid spread of short food supply chains was witnessed worldwide and also an increasing political interest to relocalize food. Data from transitional countries are sparse; this paper aims to bridge the gap by analysing patterns and processes of local food systems development in Hungary. In order to promote evidence-based policy-making we employ quantitative analysis, a rare approach in the local food context. Previous achievements of Ricketts Hein et al. (2006) on the Food Relocalization Index (FRI) is used and applied to Hungary to map local food activity. We focus on different indicators of production to consider where small-scale food-related activity occurs, and to point to the possibilities of policy-making supporting short food supply. We suggest a methodological development by calculating the prevalence of local food activity to contribute to the assessment of how fast a certain policy goal can be achieved.

Results show that Eastern Hungary has the highest potential for further development as current activity is relatively active and food production capacity is high as well. The most developed area, Budapest has bottom scores for most of the indicators, but prevalence seems to be the highest there: the few small-scale farmers operating in Budapest area has been already engaged in the local food movement to enjoy the various benefits (and higher profit). In general, local food movement in Hungary is still in an early stage, saturation is not expected in the near future.

Several difficulties emerged when the Index of Food Relocalization was applied in Hungary. In some cases it was possible to find similar indicators from statistics or by integrating available datasets to the indicators, but some stayed without the necessary cultural equivalent form, such as the Women's Institute co-operative markets. Similarly to the original study, data availability was a limiting factor. Still, we can conclude that the Index is easily adaptable and it proves to be a valuable tool for mapping local food activity and so it can support policy-making.

Future research includes the analysis of background indicators (such as socio-economic characteristics of urban and rural populations, features of tourism etc.) to understand the current distribution of the local food production potential. In the future we also aim to consider marketing possibilities and the spatial pattern of consumer demand to fully understand the potential for the local food sector development in Hungary.



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1576 The CO<sub>2</sub> emissions of the European electricity sector: an analysis of the factors explaining the emissions' trend and the climate and energy policies' contribution

**Cheze, Benoit**

- Nicolas Berghmans : Phd Student at CIRED/EHESS and research fellow at CDC Climat Research.
- Emilie Alberola : PhD Research Unit Manager of Carbon markets, CDC Climat Research and Affiliate professor, HEC Paris.
- Julien Chevallier : Professor of University Paris 8 et IPAG/ Associated researcher ECONOMIX Paris 10, CGEMP-LEDa, LED.

This article deals with the 2020 climate and energy package and the effectiveness of European climate policies on the power sector. We develop an ex-post analysis of the effects of the EU ETS on CO<sub>2</sub> emissions in the electricity sector during Phases I and II (eg, 2005-2012). We study the factors explaining the evolution of CO<sub>2</sub> emissions from European utilities that use fossil fuels. Besides, we analyze the contribution of different variables (including climate and energy policies) in the evolution of CO<sub>2</sub> emissions from electricity production plants in Europe.

In the wording of the EU Commission in November 2012, "the EU ETS is facing a challenge in the form of an increasing allowance surplus, primarily due to the fact that the economic downturn has reduced emissions by more than was expected". It is indeed likely that the slowdown of economic activity in the EU since 2008 has impacted the trend of CO<sub>2</sub> emissions. Nevertheless, can we argue that the downturn was the main reason behind that fall? Other factors can play a role, especially efforts to decarbonise the economy, and to increase renewable energy's share in the energy mix. Can we estimate to what extent these efforts contributed to reducing CO<sub>2</sub> emissions?

From an original database of 1,438 electricity generation plants running on fossil fuels in Europe, the focus of this article is to provide quantitative answers to these questions, based on panel data econometrics for the EU 27. We attempt to link CO<sub>2</sub> emissions with a series of explanatory variables that have an impact on emission trends, and to gauge their relative contributions.

The empirical results allow drawing a number of conclusions regarding the possible causes of the downward trend in the carbon emissions generated by the electricity sector installations covered by the EU ETS between 2005 and 2012. First, we show that the increased use of renewable energy in electricity production has played a role. Indeed, the decrease of carbon emissions apparently results from the policies implemented in connection with European targets. Second, the analysis confirms that the economic downturn has played a significant role, although not a dominant one, in the fall in CO<sub>2</sub> emissions in the electricity sector. Third, price substitution effects between coal and gas also seem to have affected carbon emissions. Last but not least, we identify that the price of carbon has also played a role in the recorded fall of emissions.



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## 1425 Green economy in Europe: A real Green New Deal or just new green dream?

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After the 2008 crisis, the concepts of Green economy and Green growth have appeared as possible solutions to the economic, environmental and inequality problems. After the Green New Deal proposal presented at the G20 Washington meeting, many states have prepared their own Green New Deals or merged the ideas of green economy into their economic and environmental policies to support the shift from brown into green economy. The core ideas of green economy, reviving growth, improving of human well-being and social equity, while reducing environmental damages, correspond with the ambitious EU plans for low carbon transition and increase of global competitiveness, put together under the term "sustainable growth". These plans are part of the EU 2020 Strategy along with the "smart" and "inclusive growth". However, there is no common green/sustainable growth policy and each state employs the greening process in a different way.

The aim of this paper is to analyze the socio-economic situation and real steps towards green economy within EU countries. The particular questions include, among others, the differences between old and new EU countries and green economy opportunities for countries in serious economic problems, like Greece or Spain. The method of secondary data analysis is employed. Analyzed data include political documents, and social, economic and environmental statistical data, such as green jobs and green investments, share of renewable energy sources, ecological footprint etc.

The results suggest that there are many risks connected with the concept of green economy: 1) the distribution of green investments and policies among EU states is unequal, which could lead to even bigger differences between states' competitiveness and ecological demands; 2) mainly the new EU members have experience with bad management of governmental green investments, which can significantly hinder future green economy policies; and 3) the "growth" imperative in the concept of green/sustainable growth can easily hypertrophy and thus override the fact, that green growth should be part of sustainable development process.



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regional futures: energy systems



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## 1189 Citizen Acceptance of new fossil fuel infrastructure: Value theory and Canada's Northern Gateway Pipeline

**Axsen, Jonn**

Proposals to build infrastructure for unconventional fossil fuels are increasingly generating controversy among citizens. This study explores the case of Canada's proposed Northern Gateway Pipeline (NGP), which would transport unconventional oil (bitumen) 1,172 km from Alberta's oil sands to British Columbia's northern coast for export. The NGP has received extensive media coverage in the two most affected provinces (Alberta and BC). Critics argue that NGP proponents overstate the economic benefits and understate environmental risks such as the potential for oil spills in sensitive ecosystems. Another criticism is that the NGP's facilitation of the expansion of Alberta oil sands counters Canada's greenhouse gas emission goals—analysis suggests that oil sands operations will have to inevitably decrease if Canada or oil sands importing countries enact stringent climate policy.

The research objectives of this project were to assess: 1) how citizen perceptions of the NGP vary by region, and 2) how citizen acceptance within each region, and between regions, varies according to personal values, beliefs and lifestyle. The goal is to understand the extent citizen resistance to such projects. I implemented a web-based survey (n = 2,628) in 2013 to collect data on citizen acceptance, values and beliefs related to two common frames of the NGP: economic benefits and environmental risks. I draw from value theory to explain variations in citizen acceptance within and between the two regions, constructing value-based clusters of respondents based on survey data.

Results show that NGP acceptance varies considerably among clusters in each region; the highest acceptance is among citizens with strong traditional (conservative) values and acceptance is lowest among citizens with strong biospheric-altruistic values. Contextual or regional effects are also substantial; NGP acceptance is higher in every one of Alberta's value-based clusters relative to BC. Differences in media and stakeholder framing between the regions may help to explain why citizens with the same core values hold different perceptions of the NGP. These results hold implications for policymakers considering further expansion of fossil fuel infrastructure in various regions.



Theme: 3.1 REGIONAL FUTURES  
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## 1511 What are the best selling points of renewable energy technologies? – results of a residential survey

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Renewable energy technology is not easy to be sold without massive financial support schemes provided. While renewable technologies achieved their full market potential in several countries of the EU, there are still many countries, mostly in Eastern Europe, where there is still a lot of potential for RET. The paper raises the question of finding the best selling point of RET in a country where no significant financial support is available. It argues for using different selling points for different segments of the society, non-green arguments dominating in most cases.

The case of Hungary was used as an example, where there is still a lot of potential for residential renewable technologies. While Hungary possesses a huge potential of renewable energies, the share of renewable energy sources (RES) was only 6.3% in 2008 even though the national target is to reach 13-15% by 2020. In order to raise the share of RES on total energy supply, social acceptance from both politically and publicly need to be increased.

In this study, a representative survey was conducted at 1000 households in Hungary in 2013, in order to reveal the energy consumption characteristics and attitudes and willingness to invest in RES of households. The survey was also designed to gather information on attitude towards renewable energy technologies (RET) and the willingness to invest in RET.

Latent class analysis has been performed to identify social groups with different preferences towards RET investments. Results were then cross-classified along socio-demographic characteristics. Green technologies are particularly important to a significant cluster of respondents with distinct socio-demographic characteristics (environmentally conscious, higher educated, higher income level, younger etc.).

Survey results draw attention to two main selling points of RET among green. Not surprisingly, the first one is the favourable environmental performance of such technologies on climate change. The other aspect of RET investments is the possibility to cut themselves adrift from energy provider companies and produce their own energy at home. More than the half of respondents would like to switch to renewable energy and 38.6% of them would rather invest in RET than purchase green energy from their energy provider (18.7%). These findings indicate two different marketing strategies aiming at two different social groups within greenish people, namely placing more emphasis on the communication of financial aspects of RET investments among residential consumers.



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1433      **Accounting for the Utilisation of Renewable Energy Resources within the Genuine Progress Indicator – A Methodological Review**

**Cook, David**

The transition to a sustainable energy system faces more challenges than a simple replacement of fossil energy sources by renewable ones. Since current structures do not favour sustainable energy generation and use, it is indispensable to change the existing infrastructure. A fundamental change of the energy system also requires re-organizing spatial structures and their respective institutions and governance structures. Especially in Austria, urban sprawl and unsustainable settlement structures are regarded as one of the main developments leading to increased energy demand. One of the aims within the project E-Trans 2050 was to identify socio-economic constellations that are central to the further transformation of the energy system and to focus on actors and their socio-technical framework conditions. Based on a sustainable future vision for the year 2050 a backcasting workshop was conducted to identify necessary steps for the envisaged transition to a more sustainable energy system. Backcasting has gained increasing attention in energy studies because it is a normative and goal-oriented form of scenario analysis and it addresses the aspect of transformation of a whole system. Methodological challenges lie in combining forecasting elements necessary for the future vision with backcasting, in the development of alternative pathways and in the heterogeneity of the workshop participants. The results shed light on the necessary changes for a transformation towards sustainability in the specific Austrian situation. Critical issues are region-specific production of energy and its use, settlement and regional structures and values and role models, which all have a determining influence on energy demand. One of the main findings is that a better coordination between energy policy, spatial planning and land-use regulations is urgently needed to be able to reach the sustainable energy vision. Combining the knowledge of extensive energy use with available energy resources in spatial planning decisions is a main challenge towards a long term sustainable energy system.



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## 1362 Sustainable Agrofuels? Analyzing a Vicious Cycle

**Plank, Christina**

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It is obvious that humanity is nowhere near proposing a viable solution to, much less solving, the pressing sustainability issues of our time. In the course of our interdisciplinary work on the multiple social, environmental, and economic conflicts associated with the production of agrofuels, we have often revisited the seeming inertia of an increasingly unsustainable global socio-ecological system pushing hard on planetary boundaries and endangering its own survival. Global material and energy use and the associated environmental pressures have been on a steady path of growth for all of the 20th and 21st century. With a very few exceptions, this material growth accompanied any and all monetary growth and improvements in average incomes. At the same time, it can be shown that increased wealth drives resource consumption (which in turn drives wealth). We have found this same type of feedback loop to influence the dynamics of agrofuel production and the associated, often dramatic, land use changes.

We argue that a sustainability transition at large or for agrofuel production in particular would have to be based on a successful intervention into this feedback loop. In trying to identify what hinders the success of such interventions, we have circled in on the missing feedback between the negative socio-environmental effects caused by increased resource consumption and perceived quality of life. Here, a crucial factor comes into play which keep these effects from breaking the loop we previously described: the disconnect between consumption and its socio-environmental impacts. This disconnect may be spatial as is the case when consumption occurs somewhere else than production (metabolic rift) but it may also be temporal (i.e. impacts occur later than consumption and are the concern of another generation). This spatial and temporal disconnect is based on the underlying (non-)decision-making processes of actors and institutions which have to be taken into account by any and all efforts to break out of this vicious cycle when striving for sustainability.

Based on two case studies of agrofuel production in Ukraine and Indonesia, we present an illustration of the elements and feedback loops of this vicious cycle. We conclude that "sustainable agrofuels" have to be considered as a strategy of the dominant actors and institutions to preserve the disconnect between consumption and its socio-environmental impact. Thus, agrofuel production reinforces social inequalities along the value chain. Rather than challenging already existing patterns of production and consumption, agrofuels production aggravates the ecological crisis.



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Session 3.1.D  
regional futures: China



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Session 3.1.E

REGIONAL FUTURES PANEL: PATHS TOWARD  
SUSTAINABILITY IN LATIN AMERICA



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Session 3.1.F  
regional futures: North America



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Session 3.1.H  
EXPLORING SUSTAINABLE FUTURES – PERSPECTIVES FROM  
AUSTRALIA



WELLBEING AND  
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ISEE CONFERENCE ICELAND 2014

Theme 3.2

VISIONS, INDICATORS AND MODELS OF  
TRANSITIONS



WELLBEING AND  
EQUITY WITHIN  
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ISEE CONFERENCE ICELAND 2014

Session 3.2.A

Environmental Innovations; Proposed session



Theme: 3.2 VISIONS, INDICATORS AND MODELS OF TRANSITIONS

Session: 3.2.A Environmental Innovations; Proposed session

Time: W1 Room: R12

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## 1027 Measuring the greening of innovation systems

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Research on technology and sustainable development has shifted upwards from individual artefacts to entire technological regimes. The development of green technologies has been the focus of several studies including those with an evolutionary perspective (NELSON & WINTER, 1982) in which the green technology is analyzed through an innovation system framework that consists of multiple interacting elements, such as firms who supply innovations, the demand for innovation, knowledge infrastructure, and institutions that support or hamper innovation (HEKKERT et. al., 2007).

Although the interaction between such elements is central in innovation research, many studies have limited to a descriptive understanding of the innovation system and the characteristics of the green technologies. Nevertheless, a proper definition of what greening of innovation is, and beyond this, how could the term "green" be defined among the products and processes in innovation systems is still required. Another main problem is the difficulty to estimate the development and dynamics of innovation systems regarding green versus conventional innovations, especially when we take into account firm-level strategies and normative suggestions for greening of innovation (LUNDVALL,1988).

In this sense, our paper aims to provide a comprehensive overview of selected empirical methods to measure the greening of innovation system. We elaborate a review of the main studies such as agent-based modeling; ARIMA modeling, among others, that tries to accommodate the complexity inherent to an innovation system (KEMP et. al.,2007; ELEFThERIA & KAROLINA, 2010; MEADE & TOWHIDUL, 2006). Further, we discuss how these empirical studies can improve our understanding of green paths towards sustainable future.

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Theme: 3.2 VISIONS, INDICATORS AND MODELS OF TRANSITIONS  
Session: 3.2.A Environmental Innovations; Proposed session  
Time: W1 Room: R12

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## 1112 An evolutionary approach of sectoral eco-innovative dynamics

**Andersen, Maj Munch**

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Eco-innovations' research is still in its earlier phases, and both conceptual and empirical studies in this field are scarce and divergent, generating a lack of theoretical consistency and analytical rigor (ANDERSEN, 2008). Most definitions also implicitly or explicitly consider "unintended" environmental gains as one defining feature of eco-innovations (OECD, 2009; ARUNDEL & KEMP, 2009) while, in fact, they tend to overly extend the scope of the term while neglecting the importance of economic performance.

One of the main gaps on eco-innovation studies is on the sectoral patterns and features and their effect on eco-innovative performance. Indeed, to our knowledge, few studies deal with generation and diffusion of eco-innovations in a sectoral perspective (OLTRA & SAINT JEAN, 2009). Eco-innovations comprise a specific group of technologies which could have different "responses" to sectoral features, also being affected by factors that could be neutral for traditional innovations' development, such as the "environmental sensitivity" of the sector (MALAMAN, 1996).

In the present paper, we conduct a theoretical, appreciative analysis based on core evolutionary ideas, comparing eco- and traditional innovations concerning their technological imperatives and focusing devices (ROSENBERG, 1976), the role of sectoral innovation systems (MALERBA, 2002), technological characteristics (DOSI, 1988) and life cycles (UTTERBACK & ABERNATHY, 1975), in order to highlight the role of sectoral boundaries on eco-innovative activity.



Theme: 3.2 VISIONS, INDICATORS AND MODELS OF TRANSITIONS

Session: 3.2.A Environmental Innovations; Proposed session

Time: W1 Room: R12

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## 1671 Attribution of temperature change to economic sectors

**Karstensen, Jonas**

Glen P Peters, CICERO  
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Climate mitigation and policy has become framed around the Kyoto Protocol's concept of territorial emissions of long-lived greenhouse gases, weighted together with the Global Warming Potential (GWP). As climate policy is now routinely developed in terms of keeping the global average temperature to less than 2°C above pre-industrial levels, this framing may limit mitigation opportunities in three key areas: 1) the GWP does not directly relate to temperature change, 2) short-lived climate forcers have a warming and cooling effect on climate, and 3) there is utility of alternative methods of allocating emissions at the sector and national level. We incorporate these three aspects into a single analytical framework using the Global Temperature change Potential (GTP), include short-lived climate forcers and a consumption perspective at the sector level, and contrast the results to the conventional Kyoto Protocol framing for the year 2007. We show that the importance of each sector from a mitigation point of view is strongly dependent on the metric, the metric's time horizon, the mix of short- and long-lived climate forcers, and the method of allocating emissions to economic sectors. Approximately half of the global emissions are reallocated to a different sector when changing perspective from territorial to consumption, and the net effect of multiple pollutants and GTP significantly change the allocations to sectors compared to when only considering CO<sub>2</sub> and using GWP. This sectoral consumption perspective using temperature brings to light alternative mitigation options, thereby providing a complementary method to target emissions reductions.



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Session 3.2.B

Learning to manage contradictions of sustainable consumption  
and economic growth; Proposed session

Theme: 3.2 VISIONS, INDICATORS AND MODELS OF TRANSITIONS  
Session: 3.2.B Learning to manage contradictions of sustainable consumption and economic growth; Proposed session  
Time: W2 Room: R12

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## 1355 Participatory modelling at the science-policy interface: insights from two sustainable food consumption knowledge brokerage events

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Abstract included in the proposal for a special session on "Approaches and tools for learning to manage contradictions of sustainable consumption and economic growth". Session chair: André Martinuzzi (Institute for Managing Sustainability, WU Wien)

Abstract:

Recent work on science-policy interfaces has pointed out the need for new approaches to facilitate and sustain mutual understanding of researchers and policy makers throughout policy-making and assessment cycles. Participatory modelling has been proposed in the past as an approach that fosters active collaboration of broad stakeholder groups in the construction of scoping models addressing complex sustainability issues. In this paper, we aim to explore the role of Participatory Systems Mapping (PSM), as a form of participatory modelling oriented towards promoting learning and co-production of knowledge among researchers and policy-makers. We developed a set of analytical criteria to describe the main features of the PSM method (e.g. selection of participants; scheduling and sequencing of tasks, modelling tools and methods; outputs and evaluation of outcomes). We illustrate this approach with results from two knowledge brokerage events on sustainable food consumption conducted in Lisbon in 2012 and 2013, within the context of the EU-FP7 RESPONDER project. A discussion on the strengths and limitations of this novel participatory modelling technique follows, building on results from the two events and the



comparison with previous collaborative modelling experiences described in the literature. Insights gained reveal that PSM provides two complementary group-modelling contexts for interaction between researchers and policy-makers. In 'elicitation mode', the focus lies on sharing mental models and building a joint understanding of the feedback processes responsible for the analysed sustainable consumption issues. Subsequently, in 'exploratory mode', the constructed causal maps revealed potential to be used as a platform to facilitate structured deliberation on sustainable food consumption policies and associated research implications. We conclude with a reflection on the challenges in using participatory modelling for planning and implementing successful science-policy interfaces.



Theme: 3.2 VISIONS, INDICATORS AND MODELS OF TRANSITIONS  
Session: 3.2.B Learning to manage contradictions of sustainable consumption and economic growth; Proposed session  
Time: W2 Room: R12

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## 1508 Participatory system mapping for social learning on sustainable consumption and production: Findings from five cases in Europe

**Lunda, Vivien**

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As Sustainable Consumption and Production (SCP) systems are inherently complex, potential side-effects of interventions are difficult to discern and the consequences of interventions are far from certain. It is well documented that humans have difficulties in understanding and coping with complex systems (Moxnes, 2000; J.D. Sterman, 1989; Sweeney & Sterman, 2007). Moreover, decision-making processes on SCP tend to involve a variety of stakeholder groups all of which contribute different perspectives and mental models about the respective system at hand. Supporting greater understanding of SCP systems and fostering social learning among different stakeholder groups is supported by participatory methods.

This paper analyses the potential of participatory system mapping (PSM) to foster social learning and mutual understanding among scientists, policy-makers and other stakeholders in various contexts of SCP. While the potential of PSM on SCP has already been discussed by various authors (Sedlacko et al., 2012), empirical evidence of social learning processes, however, is scarce. Quantitative survey data have been collected in five knowledge brokerage events across Europe framed around on different contexts of SCP (i.e. Food, Mobility, Housing, Household Savings, and ICT). The events were embedded in the EU-FP7 project RESPONDER that aims to link different communities in the SCP and growth debates. Preliminary findings show that participants perceive PSM as a useful tool and report experienced learning effects. However, we also faced some measurement challenges of, especially long-lasting, impacts.

This abstract is submitted to the special session "Approaches and tools for learning to manage contradictions of sustainable consumption and economic growth".

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Theme: 3.2 VISIONS, INDICATORS AND MODELS OF TRANSITIONS  
Session: 3.2.B Learning to manage contradictions of sustainable consumption and economic growth; Proposed session  
Time: W2 Room: R12

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## 2024 Constructing elements of a functional knowledge brokerage process: lessons learned

**Martinuzzi, André**

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The RESPONDER project ([www.scp-responder.eu](http://www.scp-responder.eu)) has developed and tested an innovative method for knowledge brokerage between research and policy making based on a transactional network understanding of knowledge brokerage that goes beyond pure knowledge transfer and adds a network element of allowing science and policy-making to enhance their connectivity through a social process. As a result, scientific knowledge cannot be perceived as pure facts, but as broadened by contextual information, world views, values and judgements. RESPONDER combined on-site-events and online-information-services and focused on contradictions between sustainable consumption and economic growth. Three European Dialogues dealt with the growth debate; the green economy; and the role of innovation. Ten thematic workshops highlighted different fields of sustainable consumption: food, mobility, housing, finance, and communications technology.

The key challenge of the project was to improve the mutual understanding of research and policy making on the one hand and of the "pro-growth community" and the "beyond-growth community" on the other. We chose a systems thinking approach and applied participatory system mapping in an attempt to link the high-stake policy areas of sustainable consumption and economic growth, while supporting the inclusion of mindsets, paradigms and rationalities of different actors.

In the first round of events, participants jointly created system maps on particular topics of relevance to the overall theme of the workshop. For example, in the first European Dialogue, one group focused on the topic of food and generated a system map addressing the question: "How does increasing consumption of regional products affect the employment in domestic agriculture?" In the second round of events these maps were used to discuss further questions such as "Where are the job opportunities?", "Where are research needs?" or "What policies could lead to a transition of the system?" Both the mapping process and its results were documented and further processed in the EU dialogues and project meetings. In a number of cases the system maps were developed to a point where several different world views were made explicit, colour-coded and embedded into a single map.

The project has demonstrated the importance of process design for effective knowledge brokerage. Tools and methods need to be embedded in a process that opens up an attractive space in which participants learn about the perspectives of others and move towards finding joint solutions. Furthermore, RESPONDER has demonstrated particular needs for moderation skills and expertise for effective knowledge brokerage.

Theme: 3.2 VISIONS, INDICATORS AND MODELS OF TRANSITIONS  
Session: 3.2.B Learning to manage contradictions of sustainable consumption and economic growth; Proposed session  
Time: W2 Room: R12

## 1364 Linking sustainable consumption and economic growth debates: development of the RESPONDER research agenda

**Sedlacko, Michal**

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There is overwhelming evidence that one of the most important challenges facing society today is the growing scale and unequal distribution of consumption of natural resources. Both the socio-economic implications of resource scarcities and the documented decline in provision and rising threats to ecosystem services have spurred large parts of the academic and policy communities into identification of problems and solutions. Some of the most fundamental debates centre around economic growth (e.g. the possibility of absolute decoupling of economic growth from resource consumption, social institutions underlying economic growth, or the possibilities of zero-growth, steady-state economy or 'degrowth') and sustainable consumption (e.g. the roles of social, cultural and economic drivers of consumption, limits to change at the level of individual behaviour, strong vs. weak sustainable consumption), conducted by researchers from various disciplines. However, there is a lack of knowledge exchange between these various researchers as well as between researchers and policy makers, resulting in slow policy progress.

In this paper, we seek to address this knowledge gap and contribute to the dialogue and understanding between sustainability science and policy by identifying a set of important research questions that link the challenges of sustainable consumption with economic growth debates and critiques. The research questions have been identified with the help of an extensive participatory process involving leading researchers and policy makers responsible for sustainability policies throughout the whole EU and cover six areas (economic growth and consumption, sustainable food, sustainable housing, sustainable mobility, sustainable ICT, sustainable household saving). The aim of the research questions is to orient researchers towards important research priorities as



well as guide policy makers and public authorities (e.g. research agencies, research ministries) in funding of research and use of sound scientific evidence and policy advice to inform decision making. We anticipate that addressing these questions will contribute to rethinking of societal institutions and forms of consumption towards sustainability, while improving the synergy between policy and sustainability science. This research presents the results of the RESPONDER project, Linking Research and Policy Making for Managing the Contradictions of Sustainable Consumption and Economic Growth, funded by the European Commission's 7th Framework Programme, 2011–2014.

This abstract is submitted to the special session "Approaches and tools for learning to manage contradictions of sustainable consumption and economic growth".



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Session 3.2.C

Teaching renewable energy economics; Proposed session



Theme: 3.2 VISIONS, INDICATORS AND MODELS OF TRANSITIONS  
Session: 3.2.C Teaching renewable energy economics; Proposed session  
Time: W3 Room: R12

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## 1471 Macroeconomic Perspectives on a Renewable Energy Transition

**Harris, Jonathan M.**

Macroeconomic Perspectives on a Renewable Energy Transition

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How feasible is a transition to renewable energy? This question is of great current relevance to students. Some argue that it should easily be possible for renewables to displace fossil fuels, and the main barrier is resistance by the fossil fuel industry; others suggest that the technical barriers are too great, and that economic systems will continue to be dependent on fossil fuels for the foreseeable future. A good analytical perspective on this issue is badly needed to enable students to grasp both the potential and the barriers.

Placing this issue in a macroeconomic context indicates the daunting nature of the task. Economic growth has been strongly associated with increased fossil fuel consumption and increased carbon emissions, with a significant increase in the rate of growth since 1950. Yet reports from the Intergovernmental Panel on Climate Change (IPCC) indicate the need for a reduction in carbon emissions of 80% or more by 2050. On initial examination, it seems impossible to achieve this goal without significant reduction in economic growth, including in currently developing countries.

A closer consideration of energy and carbon intensity suggests some glimmers of hope. Current carbon intensities of GDP vary across major world regions by about a factor of four, and least-carbon intensive region (Western Europe) has about half the global average intensity. This suggests that simply achieving current best-practice energy efficiencies could reduce carbon emissions by 50% or more, and that further efficiency improvement could do significantly better.

If the "ceiling" of future energy demand can be lowered through greater energy efficiency, the "floor" of renewable energy can be raised through greater investment in renewables. Currently this floor is very low for non-hydro renewables – less than 2% for wind, solar and geothermal. But wind and solar have been expanding at exponential rates. Can this continue? What is the economic potential, what are the economic barriers, and what policies are most important to promoting the development of renewable energy?

These questions should engage students, and a wealth of data and economic analysis points toward some answers. Appropriate policies can make a critical difference between insignificant modification of the "business as usual" path and a major alteration in global energy futures towards high efficiency, greatly expanded use of renewable energy, and drastically reduced carbon emissions.



Theme: 3.2 VISIONS, INDICATORS AND MODELS OF TRANSITIONS  
Session: 3.2.C Teaching renewable energy economics; Proposed session  
Time: W3 Room: R12

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## 1193 Teaching microeconomics of renewable energy

**Timmons, David**

Note that this paper is part of the proposed session "Teaching renewable energy economics".

This paper first applies standard microeconomic principles to teaching students about renewable energy. For example, biomass energy use demonstrates the concept of opportunity cost, since land used in biomass energy production could often be used for growing food crops, or could provide more ecosystem services with other vegetation. The principle of increasing marginal costs is exhibited by hydropower and on-shore wind resources: the best sites have the greatest energy potential and lowest costs. Additional sites can provide more energy, but at higher marginal costs. The equimarginal principle from microeconomics suggests that in an optimal allocation, marginal costs of all renewable energy sources in portfolio should be equal to each other and equal to the marginal cost of energy conservation. If marginal cost of renewable energy is also greater than for fossil fuels, this implies a greater role for energy conservation in a future renewable energy economy. These and other standard microeconomic principles can be combined to describe an optimal future renewable energy economy.

This paper also highlights the role of the public sphere and especially of government in optimizing welfare with respect to energy usage. For example, Pigouvian taxes reflecting full costs of fossil fuels will likely be needed to accomplish a transition from fossil fuels to renewable energy sources. Also, renewable energy can be capital intensive, and private investors requiring market rates of return may under-invest in renewable energy projects that would be economical when judged using lower social discount rates. In these and other cases private markets will fail to maximize welfare with respect to renewable energy use, and the role of government will be crucial in making a transition to renewable energy sources. Iceland's experience in replacing coal and oil heated buildings with geothermal district heating systems is an instructive example: though national welfare is unambiguously improved with widespread use of geothermal heating, market forces alone would never have accomplished this transition, which required substantial involvement by government and other public-sphere institutions.

The need for reducing carbon emissions through renewable energy development thus provides a chance for students to both apply microeconomic principles to a real-world problem, and an opportunity to improve understanding utilizing renewable energy in a modern economy. This session is based in part on a recently released instructional module on renewable energy economics, which is available for free download.



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Session 3.2.D

Negotiating Boundaries: The Sustainability of Island Systems;  
Proposed session



Theme: 3.2 VISIONS, INDICATORS AND MODELS OF TRANSITIONS  
Session: 3.2.D Negotiating Boundaries: The Sustainability of Island Systems; Proposed session  
Time: T1 Room: R12

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1728 Analysing and promoting island sustainability: the case of Samothraki (Greece) (Part of special session - Negotiating Boundaries: The Sustainability of Island Systems)

**Fischer-Kowalski, Marina**

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Their very “insularity” makes islands excellent focal points for sustainability studies that systematically analyse the interactions between human activities and the environment. This contribution will seek to explore the factors that cause island societies to prosper and sustain themselves and those that lead to collapse. On the island we investigate (Samothraki, Greece), a number of historical cases of collapse have occurred, in the sense of breakdown of complexity and rapid population decline (Tainter 1988). At present there is a fragile situation of slow decline of population and ecological challenges that might possibly be brought to a “tipping point” by impacts of the Greek economic and governance crisis and climate change. In a multi-stage process supported by our research, the island community has decided to apply for the whole island to become a Biosphere Reserve by UNESCO standards, thus going for a vision combining nature conservation and sustainable livelihoods.

By the use of a model of the island’s socioecological system, we seek to generate insights about how to avoid critical demographic tipping points as occur in many rural settings, but may hit much harder on an island with a limited potential for mobility. We analyze criticalities of the land use system (e.g. overgrazing, fostered by EU-CAP subsidies) and opportunities to maintain income while reducing livestock, and opportunities to maintain income from tourism while reducing its environmental burden (wastes, emissions, and infrastructure). Methodologically, we use material and energy flow analysis, and look at flows of income and of population. On the basis of qualitative interviews and focus group discussions, we analyse factual and potential modes of collaboration between stakeholders and their chances of improving self-governance.

Beyond an analysis of the local conditions, we reflect upon our dual role in the transdisciplinary research approach employed, a role of detached observers on the one hand and involved and interested actors on the other. Drawing from several years of research and communication efforts on Samothraki, we outline the challenges as well as the synergies of doing, at the same time, research on a sustainability transition and research for a sustainability transition.

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Theme: 3.2 VISIONS, INDICATORS AND MODELS OF TRANSITIONS  
Session: 3.2.D Negotiating Boundaries: The Sustainability of Island Systems; Proposed session  
Time: T1 Room: R12

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2019 The Intimacy of Human-Nature Interactions on Islands:  
The Case of Hawaii

**Chertow, Marian**

Islands provide a place to conceptualise human-nature interactions in socio-ecological systems and to explore how such phenomena occur within decisive boundaries. Isolation, vulnerability to disruption, and constraints on the availability of natural resources add urgency to island sustainability questions with limited solution sets. This paper presents findings using Material and Energy Flows in time series for Hawai'i Island, also known as "The Big Island". Over the course of the twentieth century, the island became heavily dependent on imports such as water, food, or fuel to sustain basic human needs and modern economic functions. Within the last decade, Hawai'i Island has consciously sought to restructure its socio-ecological configurations by using more locally available resources in one or more of its metabolic linkages. This pattern has the potential to reconnect island economies with their natural systems while simultaneously enhancing relationships and increasing resilience.



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## 2018 Complex Disasters: Nicobar Islands in the Aftermath of the 2004 Tsunami

**Simron, Singh**

The Asian tsunami has clearly revealed the vulnerability of coastal communities with respect to dealing with ecological hazards. An area that was highly affected was the Nicobar Islands, an archipelago belonging to India located in the Bay of Bengal. Critiquing disaster management and humanitarian aid structures, the paper looks at how an indigenous, subsistence, island community of hunters-and-gatherers were transformed into an aid dependent, monetary economy embedded in the regional market. Using empirical results from a computer simulated model, the paper illustrates unsustainable trends triggered off in terms of material and energy flows, land use, time use requirements for the local population to meet its present consumption. The new metabolic profile brings in a high potential for social conflicts in terms of access to resources, land, leadership, social coherence, family structure, and continued access to aid flows. In introducing the notion of 'complex disaster' the presentation reveals the inherent metabolic traps in terms of the islands' sustainable future, both ecologically and socially, and the role of disaster response in driving them to their biophysical limits as islands in the aftermath.



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## 1776 Prospects for sub-national environmental accounting

**Rok, Jakub**

n/a

Conventional measures of economic development fail to consider environment, thus threatening the sustainability of the current mode of development. Unprecedented level of environmental damage triggered a global endeavor to find a robust measure of human-environment interactions. Among many indicators attempting to gauge this relation, the environmental accounting stands out as an economically sound and holistic measure. There is an on-going discussion on the most appropriate solutions in this field, including recent attempts to apply a regional focus (i.e. by employing a multi-regional input-output approach). Sub-national development processes constitute a distinct field of analysis, and a growing political discretion at this level highlights the need to fill in this gap.

There are two distinct streams of research in the area of environmental accounting, which might be attributed to weak or strong paradigm of sustainability. The former relies on 'greening' the GDP, and is based on the assumption that sustainability requires non-declining per capita wealth. Economic valuation of environmental goods and services is required. Second stream uses biophysical categories to assign a common unit to flows between environment and economy, e.g. energy (embodied energy) or land-use required by different human activities. However, there is a considerable lack of a comparative approach, including both comparisons between methods and spatial comparisons at the sub-national level.

Hence, the objective of this study is to critically review and compare the existing methods of environmental accounting, with special focus on sub-national applications. Also, the potential linkages and complementarities between two research streams will be explored.

The planned inquiry relies on an extensive literature review of existing methods of environmental accounting, covering both research streams. An emerging field of sub-national applications will receive a special attention. The focus will be both on the methodological issues, and usability of different approaches. The review will include most popular journal databases as well as selected non-serial publications. The MaxQDA software will be used for a systematic literature analysis. Bibliometric tools will be applied in order to identify key trends and recent developments in the discipline.

Mapping different approaches and putting recent developments in a broader context will provide a more detailed and up-to-date picture of the field, as well as it will help to single out the critical future research paths. Results will contribute to establishing a framework for assessing the appropriateness of given methods of environmental accounting, especially in the sub-national perspective.



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## 1565 The future we really want

**Costanza, Robert. Presented by Kristin Vala Ragnarsdottir**

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As resource scarcity and climate change continue to affect world economies at ever-increasing rates, the world stands on the cusp of enormous socio-politico-economic change. That change can be met, but not really improved, with reactive, ad hoc policies rooted in old paradigms. The continuation of business-as usual will most likely ensure that we will fail at ever-increasing rates, while it will certainly deny large numbers of future generations of humans the wherewithal they will need to live truly happy lives. We believe that a wiser, more effective, more efficient, and – ultimately – more humane path lies in reconceptualizing the relationship between humans, human economic life, and nature along the lines sketched here. A New Development Paradigm, predicted on the reality of a finite planet and dedicated to articulating the appropriate strategies for achieving the maximum feasible sustainable well-being for humans and the rest of nature is, in the present circumstances both a practical and moral necessity. The New Development Paradigm builds upon the domains of happiness, integrating these in a broader conceptual framework in which the needs of humans and the rest of nature are met. Economic activity draws down or replenishes different forms of assets or capital (natural, human, social and built). These assets must be managed sustainably if we are to provide for the needs of current and future generations. Elements of the New Development paradigm include: 1. Recognition of a different purpose for development: the achievement of human happiness, equitable and sustainable well-being; 2. Acceptance of the deep interdependence of humans with the rest of nature; 3. Re-embedding the economy within society; 4. Creating a sustainable economy based on full-cost,



integrated accounting; 5. Reducing the differences in living conditions and other well-being outcomes and inequalities between countries; 6. Encouraging the flourishing of living and inclusive communities; 7. Developing education for happiness and well-being; 8. Leveraging the positive effects of human happiness, which include physical health, pro-social behavior and care for the environment; and 9. Realizing that the global capacity, understanding, material abundance, and opportunities to achieve these objectives have never been greater. In order to realize the future we all want, the New Development Paradigm builds on the enormous amount of prior work and thinking in this area to develop the following five dimensions: Ecological sustainability, equitable society, sustainable economy, living and inclusive communities to lead to well-being and happiness of all people and nature.



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## 1063 New Visions, New Models and New Ecosocial Policies

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Our epoch has been designated as the Anthropocene. It is an era where human action affects the Earth with unparalleled and devastating force. This can be observed, for instance, in climate change, in the loss of biodiversity and in the acidification of the oceans. However, not much attention is paid to the fact that the Anthropocene is caused by anthropocentric thinking, especially by the idea of "human exemptionalism". In it, economic growth is an undisputed goal and the far-reaching implications of our actions on an interrelated and finite planet are not taken seriously enough.

The idea of human exemptionalism also guides our policies. Therefore, ecologically and socially sustainable policies (and, thus, also economically sustainable policies) will not be achieved by mere incidental measures. Instead, a change of paradigm is needed. In our paper we lay out the tenets of an ecocentred paradigm resting on relational and holistic thinking and deep ecology. We argue that on the basis of this paradigm, the principles, conceptions and goals specific to any given policy – e.g. economic policy, food policy ? could be formulated and put into practice. In the paper we apply the paradigm to social policy. The general aim is to show that in order to make wellbeing within planetary boundaries possible for all, we first need a clear vision, then clear principles founded on this vision, and then a scheme for turning these visions and principles into concrete solutions.

Being a child of the anthropocentric paradigm and a twin brother of economic policy, social policy conceives its primary goal, wellbeing, in narrow and material terms. Accordingly, social policy has the inbuilt objective to raise the standard of living – to the detriment of the ecosystem. We discuss how a change of paradigm could affect these in-built tendencies. After this we present a multidimensional and relational conception of wellbeing (the HDLB model), which is a modification of sociologist Erik Allardt's theory of Having, Loving and Being. We continue by illustrating how this model could provide the foundation of an integrated ecosocial policy in the case of the Finnish welfare state. In conclusion, we stress the importance of integrating all policies in our societies under a common denominator, so that their strivings will not contradict each other.



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## 1711 Launching the spaceman economy: How much service can we get out of a globally constrained economy?

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Climate change and resource scarcity limit the amount of emissions and extractable materials in the future. These physical limits pose constraints to economic activity related to material and energy production.

The link between service provision, the ultimate goal of economic activity, and material and energy throughput is represented by in-use stocks of buildings, infrastructure, and products.

In-use stocks are built and maintained to provide service to people, and in a globally constrained 'spaceman' economy (Boulding 1966), throughput is to be kept low in line with the global emissions and resource extraction targets.

In the spaceman economy, the following questions arise: What level of service can be provided with a given set of technologies and under given emissions constraints? How can we design micro- and macro-economic principles that are in line with global constraints?

Starting with a stock-version of the IPAT equation, we refine the latter into an age-cohort based model to provide a framework for analysing the energy and material metabolism of the spaceman economy.

We present a case study on the global vehicle stock, where we maximize different service parameters such as number of cars, km driven, or passenger km driven under given constraints for emissions and material throughput.

We then connect the physical service parameters to simple transportation models to quantify the connection between quality of life (travel time budget, etc.), physical service, and emissions.

The result will be a physical model torso with interfaces to economics, technology modelling, climate science, urban and transport planning, and behavioural science.

Different potential applications are explored.



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## 1356 Rethinking sustainable development: Towards a biocentric process

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Sustainable development is usually defined as a change process, the aims of which are determined based on equal consideration of the economic, social and environmental dimensions. The traditional triangle of sustainable development is based on the environmental economics notion of three distinct categories of capital that can be substituted for each other when aspiring towards sustainable development. In criticizing this approach, ecological economists have pointed out that the dimensions are not separate but economic systems are embedded in social systems which in turn form part of the biological and ultimately physical systems. However, this perspective is also problematic as it conflates animals and plants, even though these are ontologically different beings requiring distinct consideration in moral terms. Moreover, viewing the various spheres as nested systems de-emphasizes the interactions and tradeoffs between the different elements and does not fully explicate the role of economics in promoting sustainable development. Based on these considerations, in this paper we develop a novel, actor-based definition of sustainable development that incorporates elements from both environmental and ecological economics. In order to do so, we first present those targets that have traditionally been associated with the dimensions of sustainable development. We question the role of economics as one of the dimensions and argue that the elements of sustainable development could be defined based on identification and moral consideration of three types of actors: humans, non-human animals, and plants. The inclusion of non-human animal ethical considerations can be justified by appealing to the centuries-long discussion, which has arrived at the conclusion that the consumption of animal-derived products is more or less morally questionable. Thus, the framework of sustainable development would comprise two nested fauna groups, i.e. the human (i.e. social) objectives and the (ethics-based) objectives related to non-human animals; and the flora (i.e. plant) group related objectives. We feel that only an actor based approach to sustainable development can pave the way for a transition from anthropocentric thinking to the development of a truly life-centric vision. Such a life-centric framework could also be employed to guide research in the field of ecological economics towards inter-species justice and inter-generational equity.



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1744 Well-being and degrowth society, An Empirical study of  
the Ends-Means Continuum

**Vaziri, Amirali**



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## 1594 Structures of a welfare-oriented sustainable impact assessment model

**Ahlert, Gerd**

Prof. Dr. Bernd Meyer, academic director at the Institute of Economic Structures Research, Heinrichstr. 30, 49080 Osnabrück (Germany), +49 541 40933 140, meyer@gws-os.com,

In recent years, the criticism on gross domestic product (GDP) as a measure of welfare (e.g. at the OECD conferences, at the EU Conference "Beyond GDP" 2007 in Brussels, in the work of the Stiglitz Commission) led to the formulation of a variety of new welfare concepts committed to the principle of sustainable development. The various transition strategies and practical policy recommendations are discussed under labels such as Growth", "Zero Growth" and also "Degrowth".

Starting point for this conceptual work on the necessary complexity of measuring welfare by applying a comprehensive impact assessment model was a systematic comparison of the various transition studies within the research project "Cornerstones of an ecologically sustainable welfare concept as a basis for eco-political innovation and transformation processes" funded by the German Ministry of Environment (Meyer et al. 2013a). The reflections presented here are directly related to the shortcomings identified in the synopsis (Ahlert et al. 2013). Typically the applied models are too simplistic for estimating the impacts of the recommended policy measures on environmental, economic and social sustainability in a holistic modelling perspective. Besides there is also often no explicit statement as to which normative basic assumptions and particularly environmental objectives the authors have used for their policy recommendations.

The proposed sustainable welfare model consists of a normative decision and a positive impact model. Its basic structures have been discussed in detail by Meyer et al. 2013b. The intended presentation will focus on key features of the positive model. It provides a description of the "world" with which the effects of the various options for action on the environmental, social and the economic systems can be assessed in an understandable and reliable holistic modelling framework. The starting point for all the reflections presented here is the human being as part of nature. In accordance with Daly (1992) the socio-economic system is represented as a part of the larger planetary ecosystem. In a gradual approach the necessary detail structures of a sustainable impact assessment model are shown by discussing the relevant interdependencies between the economic, the social and the planetary limited ecological spheres.

### Literature

Ahlert et al. (2013): Synopsis of Approaches to Welfare and of Green Growth Concepts Currently under Discussion. GWS Discussion Paper 13/1, Osnabrück.

Meyer et al. (2013b): Basic Structures and Political Implications of a Sustainable Welfare



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1275 **BHUTAN'S DEVELOPMENT CONCEPTION: AN UNCOMMON APPLICATION OF THE PRINCIPLES OF ECOLOGICAL ECONOMICS**

**Cavalcanti, Clóvis**

Without copying any system elsewhere in the world, Bhutan's development ideas constitute an uncommon application of Ecological Economics. They also show original features, proper to a non-westernized society. The purpose of Bhutan's model, which refuses to bow down to the worldwide importance given GDP, is to promote human happiness and the wellbeing of all life forms. It aims at doing that within the limits of the planet, without degrading nature or depleting the world's valuable resources, and with a view to a fair distribution and efficient use of resources. Bhutan's development conception came about in 1972. It was proposed by the Fourth King when he ascended the throne. The Bhutanese prime minister laid it bare in a talk he gave in ISEE 2012, in Rio. It is well explained in the rich bibliography available on the web, as well as in the document from Bhutan's government setting up a working group, requested by the UN, to elaborate the details of its proposal. Bhutan's is a very interesting case of Ecological Economics in practice. The latter represents a basis for the country's national project, which is also framed by the spiritual dimension of Buddhism, an aspect that has been decisive in shaping its unique characteristics. If there is a possibility to conceive of a world guided by Ecological Economics, Bhutan is a case in point to be examined and evaluated.



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## 1550 A non reductionist use of composite indicators: ranking the EU-27 countries sustainability and reassessing HDI rankings

**Luzzati, Tommaso**

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### AIMS

The present paper illustrates a non-reductionist approach to composite indicators. Such an approach is intended to communicate the uncertainty and the epistemological problems that arise when information about different dimensions is synthesized into a single number.

### METHODS

Starting from the guidelines for constructing composite indicators elaborated by the OECD and JRC (Nardo et al., 2008), we put the robustness check phase at the centre of our approach.

Actually, rather than building a single composite indicator (score) for each country, we combined different normalization and aggregation rules, and different weighting systems to calculate many different composites. As a result, we obtained a frequency distribution of the ranks and a plausible rank range for each country. The reasons for our results were scrutinized.

### CASE STUDIES

We used the previously described method both to build a ranking of the sustainability of the EU-Countries, and to reassess the Human Development Indicators ranking.

For the EU-countries case, we based our work on a widely agreed theoretical framework, the one developed for the Sustainable Development Strategy of the European Union. In accordance with it, the dataset Eurostat has made available (Sustainable Development Indicators) groups indicators into the following ten themes

1. socio-economic development, 2. sustainable consumption and production, 3. social inclusion, 4. demographic changes, 5. public health, 6. climate change and energy, 7. sustainable transport, 8. natural resources, 9. global partnership, 10. good governance.

For the HDI ranking reassessment, we used the dataset which is available on the HDI website.

### CONCLUSION

The approach we propose looks as a good compromise between the need of synthesis when looking at many variables and the loss of relevant information that occurs when indicators are aggregated into a single composite indicator. New policy indications also can emerge when such an approach is used.



## REFERENCES

Nardo M., Saisana M., Saltelli A., Tarantola S., Hoffmann A., Giovannini E., 2008, Handbook on Constructing Composite Indicators – methodology and user guide. OECD publishing



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## 1756 The New Zealand Treasury's Living Standards Framework: A Model for Holistic Policy Advice

**Blake, Hilary**

The New Zealand Treasury's Living Standards Framework: A Model for Holistic Policy Advice

This paper describes the New Zealand Treasury's Living Standards Framework, its implementation trajectory and key project outcomes.

In its Ministry of Finance role as the Government's lead advisor on economic and fiscal issues, the Treasury provides primary policy advice on how New Zealand's natural, economic, human and social resources can best be applied to produce income and jobs. To assist in developing the sustainable and equitable growth policies its Statement of Intent commits it to, the Treasury has developed a Living Standards Framework, a holistic and voluntary tool for assessing the determinants of living standards for New Zealanders. The Treasury's Living Standards Framework articulates a much broader set of determinants of living standards than those measured by GDP alone, and provides a mechanism by which an understanding of the complex determinants of living standards can be incorporated into the Treasury's policy processes and advice.

The Treasury's Living Standards Framework draws on international frameworks including the Brundtland definition of sustainable development and the OECD Better Life Index. It is based on four capitals – Natural, Economic (physical and financial), Human and Social - and five specific, but interrelated, perspectives for assessing the capitals: Economic Growth, Sustainability for the Future, Increasing Equity, Social Infrastructure and Managing Risk. These perspectives recognise the broad range of material and non-material determinants of living standards (beyond income and GDP), the importance of freedoms, rights and capabilities, and the need to understand limits and long-term (intergenerational) impacts. The distribution of living standards across different groups in society is an ethical concern for the public, and a political one for governments, which also has efficiency implications.

Since 2011, Treasury has undertaken a series of steps to develop and apply the Living Standards Framework and the concepts that underlie it. The Treasury has published guidance and supporting documents, re-assessed previous policy advice, and applied the Framework in the preparation of key economic documents, such as the Long Term Fiscal Statement (a requirement of the Public Finance Act 1989 to consider fiscal sustainability over at least 40 consecutive financial years). An evidence base for the Framework is being developed, including an assessment of resilience, and a joint work programme is underway with Statistics New Zealand to obtain a more comprehensive picture of living standards in New Zealand than that provided by GDP alone.



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## 1389 Integrative Wellbeing of Nations: From Theory to Implementation

**Hardy, Derrylea J.**

An integrative approach to wellbeing, which captures the economic, environmental, social/psychological, and cultural domains, is critical to any meaningful Ecological Economics perspective that captures the inter-linkages between societal problems and can help transition society towards wellbeing and equity within planetary boundaries. However, uptake of policies related to integrative wellbeing at national and regional levels is spasmodic.

“Wellbeing” is a term that is referenced widely in the literature from a plethora of academic disciplines. There is a vast empirical and theoretical literature on wellbeing, with knowledge on the subject mainly coming from the psychology and economics disciplines, which frame the concept in quite different ways. Additionally, the concept of wellbeing is applied to the natural world and it is thus considered in terms of ecological wellbeing of ecosystems and associated environmental domains. Wellbeing discussion can also be found within the fields of sociology, philosophy and related areas. Furthermore, the growing literature bases associated with ‘sustainable development’, including environmental and ecological economics, also incorporate discussion and analysis of wellbeing, thereby attempting to draw from approaches in economics, ecology and psychological literatures, to consider the concept from a more holistic and integrated perspective. Each of these schools of thought has their own definition(s) and measure(s) for “wellbeing”, which makes it difficult to draw comparisons.

This paper analyses the main schools of thought regarding wellbeing, particularly from the fields of psychology, economics, and ‘sustainable development’, in order to provide clarity regarding what is meant by the term when it is used in these disciplines that tend to have a focus on wellbeing in their literature. The paper then goes on to examine factors that impact on the uptake of integrative wellbeing by decision makers responsible for policy development and uptake. What factors determine successful knowledge uptake and transfer of ‘integrative wellbeing’ concepts, frameworks tools in practice? The paper considers ethical issues associated with integrative wellbeing, and the impact of wellbeing when considered from different scales. Finally, the paper looks at effective ways to facilitate uptake of integrative wellbeing frameworks at tools by policy makers.



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## 1391 Analyzing subjective wellbeing and its determinants: a case study in Shanghai

**Uwasu, Michinori**

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Human wellbeing constitutes one of the most important components in sustainable development. Though wellbeing itself is not an operational concept, it can be divided into constituents of wellbeing and its determinants. Former stems from opportunities of free actions and expressions, human security and safety, to subjective wellbeing. There are two major approaches in existing literature. Social sciences have studied subjective wellbeing measurements such as happiness and stress, focusing on its determinant factors including income, age, family members, and health conditions. On the other hand, engineering studies in the field of urban planning examined physical attributes regarding residence as proxies of quality of life (QOL), measuring housing quality, green space, and access to transportation, cultural facilities, hospital and school. Meanwhile, only few studies on wellbeing have dealt with developing countries. What is unique in developing countries is however that they face so rapid changes in their physical living conditions regarding QOL. This paper demonstrates a survey research in Shanghai, China to collect subjective wellbeing measurements as well as determinant factors of socioeconomic and QOL attributes of individuals and delve into the meaning of wellbeing itself as well as the mechanism of wellbeing determinants.

Specifically, we conducted an interview survey in sixteen districts of Shanghai, China. Our data consist of 300 samples, each of which reports information on subjective wellbeing, demographic attributes, and living condition information. We also develop spatial information using GIS and our survey data to make additional data as determinant of wellbeing. Our econometric analyses first reveal that while we confirm the positive effect of income on the enhancement of wellbeing with a systematic pattern, its effect can possibly be overestimated due to endogeneity of other determinant factors particularly in the physical attributes. We thus build upon our analytical model to integrate the social science and engineering approaches based on the instrument variable estimation method. Preliminary results show that demographic and individual attributes such as social relations and health are important for many of the wellbeing measures. Income still is an important factor for wellbeing measures though its impacts can be less after considering physical living conditions. This is a new insight into wellbeing in the sense that income effects on wellbeing can be decomposed into the self-evaluation part and the physical part.



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## 1076 Why patterns of agricultural development and farm modernization matter for resilience and well-being

**Knickel, Karlheinz**

What type of farm modernization can be considered positive in view of the multiple crises that agriculture and rural areas face? Are specialized capital-intensive systems more 'advanced' than farming systems that combine crop and livestock production? What changes in farming contribute to prosperous rural areas, and how? Do we need to rethink, and reorient, agricultural research and development? Agriculture is characterised by close links between social and ecological systems, is very diverse, and has strong connections with policy, markets and consumption. To ask the kind of questions posed at the beginning seems long overdue.

The contribution is based on central ideas elaborated in the international and transdisciplinary RETHINK research programme as well as a review of the relevant statements in the European Commission's 'Europe 2020' and 'Bioeconomy' strategies, and the Communication on the European Innovation Partnership 'Agricultural Productivity and Sustainability'. It includes references to related research, policy and practice as well as the work of the Standing Committee on Agricultural Research and the International Assessment of Agricultural Knowledge, Science and Technology for Development. The review is grounded in agricultural, environmental and social sciences with a strong interdisciplinary perspective.

Some key conclusions are:

- It is time to overcome simplistic viewpoints of what agricultural modernization entails. Time and again they still follow the same simple innovation-is-progress logic: technological innovation, increasing capital-intensity, rationalisation and specialisation foster economic development and growth, and contribute to overall well-being. Indebtedness in agriculture, path dependency, rural poverty and massive environmental problems show that the modernization trajectories of the past have in many respects failed.
- Industrialized agriculture tends to be characterized by monotonous production landscapes, a disproportionate use of natural resources (in particular fossil fuels and minerals like potassium and phosphorus), an increase in emissions and a standardization of food qualities. At another level, we can see a concentration of farming in lowland plains and or regions with better access to (imported) feed, fertilizers or markets and a marginalisation of less favoured areas.
- The bio-based economy has been suggested as a smart way to overcome resource constraints and to make production systems more sustainable. There is a very substantial risk that the related structural changes will further aggravate the concentration of power in up- and downstream industries, and dependencies. Terms like "sustainable growth", "sustainable competitiveness", "sustainable intensification" or "the bio-based economy" tend to obscure motivations, and hinder a differentiated debate, common understanding and consensus building.
- "Eco-functional intensification" might become an effective response to the increasingly important call for production increases while building on an improved understanding of the functioning of ecosystems. In the full paper, connections between alternative trajectories of modernization are related to the multiple mechanisms that bring about rural prosperity and resilience. More systemic perspectives like 'resilience', 'synergy' and 'adaptive capacity' might be much more meaningful identifying desirable changes.



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ISEE CONFERENCE ICELAND 2014

Session 3.2.G  
transitions: indicators of progress



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## 1349 GDP vs. 'Beyond GDP' – Measuring progress, wealth and wellbeing of nations

**Balana, Bedru**

The system of national accounts largely ignores the productive value of natural assets and 'sink' functions of the environment and hence doesn't adequately measure the impact of human activities on environment. Thus, over the last two decades, the search for alternative measures ('beyond GDP') has attracted the attention of national governments and international agencies. Since the release of the 1987 Brundtland Commission report and 1992 UN 'Earth Summit' recommendations (contained in Agenda 21 – Programme of Action for Sustainable Development), dozens of handbooks, manuals, accounting frameworks, concepts and classifications were developed and many nations have attempted to incorporate environmental accounts into their national accounting systems. The Millennium Ecosystem Assessment (MEA), System of Environmental-Economic Accounting (SEEA), The Economics of Ecosystems and Biodiversity (TEEB), Wealth Accounting and Valuation of Ecosystem Services (WAVES) initiative, UK National Ecosystem Assessment (UKNEA), European Environment Agency's work on 'ecosystem accounts', UNEP's green economy initiatives, and President Sarkozy's 'Stiglitz Commission' are some of the major global developments in response to the need to go 'beyond GDP' in measuring sustainability, wealth and wellbeing of nations.

By collating key information from various green accounting literatures since the release of the Brundtland Commission report, the objective of this paper is to synthesize the challenges and progresses achieved so far in conceptual, methodological, and implementations of green accounting as an alternative or supplement to GDP measure. The paper also highlights future challenges and opportunities in the implementation of green accounting as an alternative measure. Experiences from both developed and developing countries are included in order to shed light on the differences/similarities of approaches and practices across nations.

Results indicate that: (1) there hasn't been a common standard approach to green accounting, as a result international comparisons are difficult; (2) lack of common international definitions and classifications of ecosystem services is one of the major problems; (3) monetary valuation of ecosystem services is another major challenge in green accounting; (4) no countries have fully integrated environmental-economic accounts (most attempts to date were either for a specific asset or sector or satellite accounts); (5) applied green accounting works so far focus on physical materials and energy flows; and (6) the adoption of SEEA2012 Central Framework as an international statistical standard is a significant step forward for green accounting. Its two augmented components – SEEA Experimental Ecosystem Accounts and SEEA Extensions and Applications – provide further opportunities for developing 'ecosystem accounts' and various monitoring and analytical approaches.



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## 1438 Applying a Systems Approach to Genuine Progress Indicators

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Genuine Progress Indicators (GPIs) have been developed because Gross Domestic Product (GDP), the proxy most used to measure well-being, does not include many non-market activities that make a significant contribution to well-being. Moreover, GDP includes, and therefore counts as positive, many activities that are detrimental to societal well-being.

For the GPI to be an improved measure of societal well-being, it is imperative that key factors that contribute to well-being are included and that intra- and intergenerational impacts on the sociosphere and ecosphere are taken into account. With the present GPI methodology variables incorporated do not have a strong theoretical foundation and criticisms is that: (i) selection of what to include is largely data/researcher driven; and (ii) no account is taken of the inter-relationships between variables which is essential for what is in fact a dynamic system.

A systems modelling method developed by Vester (2007) is used to address these issues for a New Zealand based GPI case study of the Greater Wellington region. For Vester the right approach to dealing with complexity is not greater data capture for more detailed analysis but a more holistic understanding of the system and inter-relationships. A high-level model incorporating the key variables that contribute to well-being shows the nature, strength and direction of the interactions between the variables and potential leverage points. With the Vester (2007) methodology variables are evaluated against biocybernetic rules and other procedures for relevance checking to ensure they represent an actual rather than theoretical system. The outcome objective is a high-level system-based model requiring a reduced amount of data that is easily communicated to the general public (rather than an expert model).

The hypothesis tested is: A smaller number of dynamic interlinked indicators will provide a better understanding of leverage points to improve well-being than a larger static set of indicators. An important goal of a GPI is to integrate social, economic and environmental realities to show their interdependence. As understanding inter-relationships between various indicators is limited with the conventional static version of a GPI a dynamic approach is applied. A comparison of static and



dynamic GPI accounting results is used to assess the explanatory and integrative power of this alternative GPI accounting/modelling approach.

Vester, F. 2007 *The Art of Interconnected Thinking. Tools and concepts for a new approach to tackling complexity.* MCB Publishing House, Munich.



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1623      **Genuine Development in the States: a Comparative Analysis of 50 State Economies Using the Genuine Progress Indicator**

**Fox, Mairi-Jane**

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The shortcomings of gross domestic product (GDP) as an economic policy guide and measure of sustainable economic welfare have long been recognized by a substantial body of scholarship. One of the most comprehensive alternative macroeconomic measures is the Genuine Progress Indicator (GPI), which adjusts national income accounts for twenty-four economic, social, and environmental indicators. The GPI has been tested and refined in countries across the world and in recent years has advanced at the state-level in the USA to guide policy. At a June 2013 "GPI in the States Summit" 18 states with initiatives to develop GPI accounts gathered, pushing for broader state government adoption and new standards for state-to-state comparability. This state-level effort is being consolidated into a national GPI standard and database with an estimate of GPI for all 50 states for the 2012 base year. This paper will present preliminary results from a 50-state GPI comparative analysis, including correlation with key demographic, policy, and environment characteristics.



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## 1129 Index of Sustainable Economic Welfare (ISEW) for rural and urban area: A case study in Japan

**Hayashi, Takashi**

Index of Sustainable Economic Welfare (ISEW) is regarded as a measure to assess people's objective and aggregated (macro) welfare. It is applied to not only at national level, but also at state, provincial, and county level (Posner and Costanza(2011), Bagstad and Shammin(2012), Clarke and Lawn(2008)). However, these studies are only focus on assessment of specific areas. I think further analysis is needed such as aggregating areas which have similar characteristics (e.g. rural and urban area). This study aims to estimate ISEW in both rural and urban area in Japan, and compare its growth trends with that of GDP.

The first step of the analysis is to distinguish rural and urban area. Distinction is made at prefectural level due to data availability for ISEW estimation. All 47 prefectures in Japan are grouped into three: rural, urban, and neutral area. Categorization is made using the share of both GDP and workforce in agriculture, forestry and fisheries sectors. As a result, 9 out of 47 prefectures are categorized into rural, and 10 are urban. To estimate rural and urban ISEW, 9 rural prefectures and 10 urban prefectures are aggregated respectively. Estimation of ISEW is implemented according to the methodologies in previous ISEW studies in Japan and Belgium (Makino (2008), Brent (2008)). Estimated period is 1975-2008.

The results show that during "bubble economy" period (late 1980's to around 1992), disparity between rural and urban GDP enlarged. On the other hand, disparity between rural and urban ISEW is smaller than that of GDP. After late 1990's, ISEW was relatively stable, but GDP fluctuated since 2000. From these results, I found following three facts: i)when we look at ISEW, disparity between rural and urban was smaller than that of GDP, ii)"bubble economy" did not contribute to welfare promotion in both rural and urban area, iii)although rural welfare is stable, urban welfare was unstable after 2000.

By estimating rural and urban ISEW, additional information which is not obtained by economic indicators such as GDP is provided. The information contributes to rural development and policy design in rural area as well as urban area.

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Makino(2008) in Lawn, Clarke eds. Sustainable Welfare in the Asia-Pacific pp.153-190.

Posner and Costanza(2011) Ecological Economics 70(11), pp.1972-1980.



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2032 Measuring countries' environmental sustainability performance – A review and case study of Iceland

**Cook, David**

Evaluating the environmental sustainability performance of a nation is complex. This paper considers the merits of environmental indices, and how effective they are when assessing the environmental sustainability of any nation. The simplicity and generic qualities of environmental indices currently necessitates a much broader analysis in order to evaluate any nation's genuine environmental sustainability credentials – ultimately the development of a synthetic Environmental Sustainability Index is required to fulfil this task. Using Iceland as a case study, this paper reviews the usefulness of four selected environmental indices (Environmental Vulnerability Index, Environmental Performance Index, Ecological Footprint and Happy Planet Index) for governance institutions when formulating reasoned responses to challenges. By adopting a holistic methodology, Iceland's environmental sustainability credentials are critically examined in this paper, with particular focus given to the impacts deriving from expanded renewable energy utilisation in recent years. Abundant geothermal and hydropower energy resources have been increasingly used to power heavy industry, particularly aluminium production. The wider health implications and long-term environmental sustainability consequences of renewable energy utilisation have not been analysed in depth within any of the indices. Socio-economic progress in Iceland has also been attained alongside the imposition of the highest ecological footprint of any nation in the world. As such, economic activities in Iceland have not occurred in accordance with commonly accepted notions of sustainable development, which is focused upon the reconciliation of economic, environmental and social objectives, together with recognition of current and future need across these domains.



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## 1555 Status of sustainability of the Brazilian agri-food system

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The FAO (2009) has estimated that a 70% increase in food production will be needed to feed the future global population in 2050. Hence, the consumption and production of food can be expected to result in positive and negative impacts on the economy, society and environment around the world, with specific consequences for producing countries like Brazil. The challenge to simultaneously increase food production and reduce its negative impacts is immense for the present and the future. The IAASTD report (2009) concludes that sustainability in agri-food system requires shift in science and technologies, policies and institutions. This shift has to recognize the multi-functionality, multidimensionality of agriculture, maintain the environmental quality for increased agriculture production and other goods and services. However, this vision is not incorporated in the current agriculture knowledge, science and technology. In order to contribute to the development of this vision, this research will assess the current status of sustainability of the Brazilian agri-food system adapting the perspective described by Ericksen, (2008). In the author's definition the agri-food systems are all interactions involving the activities from production through to consumption of food, from field to table; the stakeholders involved, as well as outcomes of these activities that influence the status of food security, environmental and social welfare. Firstly, a systematic literature review will be executed to identify the most applicable indicators to assess sustainability for the agri-food system with special attention to what researchers have considered as sustainability and how they have assessed it. Five elements will be considered as the main aspects to be evaluated: robustness, policy relevance, applicability, as well as multi-functionality and multidimensionality of the agri-food systems. Finally, the sustainability status will be obtained through the assessment and compilation of an indicator framework, compound by the selected indicators from the systematic literature review. In order to improve the policy relevance and applicability of this research, feedbacks and insights from experts and practitioners will be carried out by the use of a semi-structured questionnaire.

The authors gratefully acknowledge the financial support provided by CAPES.

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## 1517 Transitions towards more sustainable agri-food chains: a conceptual framework

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Our resource base is increasingly under pressure due to demographic, economic and environmental changes. This evidence suggests the need for a transition towards a new, more sustainable production system. To facilitate this transition, we developed and applied a new conceptual framework that follows an integrated chain approach. Transitions in complex socio-technical systems can be studied using transition theory (Geels & Schot, 2007).

Our food production system is an example of a complex socio-technical system in which resources are transformed across many chain actors. These resource transformations can be analysed following the linear throughput model of Lawn (2007). In this model, five elements are distinguished that explain the dynamics between the economy, the social system and the ecosystem, which are natural capital, throughput, human made capital, net psychic income and the cost of natural capital services. Coordination within the agro-food system on its turn can be captured with the framework of global chain value analysis (GCVA) developed by Gereffi (2005), which is rooted in neo-institutional economics. This framework identifies five governance types, i.e. market, modular, relational, captive and hierarchy.

Our integrated conceptual framework, which combines the above three frameworks, enables the analysis of all dimensions of sustainability (ecological, social and economic) from a chain perspective. However, important questions remain relating to the interrelation between governance type and sustainable capital use as well as to the identification and measurement of sustainability boundaries for capital stocks and flows. This paper illustrates, by means of an empirical study of the Flemish agri-food chain, the integrated conceptual framework and how these questions can be addressed.

First, an integrated system analysis of the Flemish agri-food chain is performed based on the developed framework, indicating the current state of the capital forms as well as the different governance structures. Data is collected from national (e.g. Belfirst) and European (e.g. Eurostat) statistical databases, secondary data resources, and in-depth interviews with the various supply chain actors. Next, the current state of the various capital forms is linked to pressures arising from the identified governance types. The current state is then compared to sustainability thresholds for the various capital forms. This allows us, in a final section, to explore possible transition pathways and governance structure modifications which transform current capital use into more sustainable capital use.

By implementing this framework in a tangible case-study, lessons can be learned for future research on transition towards sustainability within complex socio-technical systems.



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## 1781 Meanings and values of Faroese whaling and sheep-rearing: localising incentives for sustainable degrowth

**Skardhamar Olsen, Elisabeth**

The aim of this paper is to explore and discuss to what extent meanings and values embedded in two Faroese traditional economic relations are useful for thinking about a sustainable degrowth transition on the Faroes.

On the basis of participant observations, interviews, and auto-ethnography, as well as secondary sources (Joensen 1987; Gaffin 1996; Hoydal & Haldrup 1994), the paper presents a human ecological study of Faroese whaling and sheep-rearing.

The theoretical approach is influenced by anthropological studies of human-environmental relatedness (Ingold, 2000; Hornborg 2006; Pálsson 1994), the concept of diverse economies (Gibson-Graham 2006), and sustainable degrowth (Schneider, Kallis, Martinez Alier 2010).

The paper argues that the economic relations related to Faroese whaling and sheep rearing are diverse and distinct from the formal monetary economy. These practices are neither driven by capitalist profit accumulation, nor by ideologies of alternative sustainable living. Instead whaling and sheep-rearing are eco-cultural practices (Escobar 2008) that have been part of Faroese subsistence for hundreds of years and which manifest meaningful relationships between Faroese people and their environment.

It is argued that exploring the values and meanings attached to such eco-cultural practices is an important source of inspiration and a crucial step for an eco-culturally sustainable degrowth transition.

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## 1240 From valuation of environmental processes to technological change: A sraffian analysis of the French food production system

**Verger, Yoann**

Ensuring an ecological transition means finding a way of valuing the environment, and developing technologies able to stop his destruction. I argue that the neo-ricardian way of analyzing systems of production and systems of value is a good framework to analyze these current challenges. I will highlight my position looking at the French agriculture and the development of the methanisation technology.

My article's goal is to:

- Show the possibility of a Sraffian empirical analysis of a real system of production, the French food production system, using an input-output model of joint production, following the formalisation of Pasinetti.
- Investigate the value creation and the value repartition inside the system, i.e. profit, prices, wage and rents. What is done with the surplus? How does the repartition process influence prices?
- Show what are the environmental processes involved, and which treatment they could deserve within the value system.
- By considering the environment and the workforce as 2 stocks exploited by the production system, compare two types of compensation:

Exchange value flow to "buy" the exploitation: money or something taking as a numéraire within the system. The system can give this money as long as there is a surplus, like a rent;

Physical flow in order to replenish the stocks: some food for example, to replenish the workforce stock.

- Show that we can analyze the development of methanisation technology as a process able to reverse the physical accumulation of a waste (organic waste). This also allows a circular flow of value creation for the energy production sector, escaping from the fossil fuel trap.
- Finally, refine our approach of an ecological transition, by looking at sustainable value creation through processes that do not allow physical accumulation (of wastes AND of goods), i.e. having an ecosystemic view of the process of value creation. This implies that the capitalist way of accumulating profits is threatened, because in a sustainable system, there would be no accumulated surplus.

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1185 Exergy and useful work analysis for UK, US and China  
1960-2010: will exergy efficiency constrain economic  
growth and energy transitions?

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Exergy analysis and useful work accounting relates the quality of energy (exergy) inputs through the energy conversion chain to different end (useful work) uses at both sectoral and aggregate levels. This overcomes limitations of traditional energy analysis, which fail to relate the quality of input fuels to end use outputs. Ayres and Warr<sup>1</sup> have pioneered an exergy-based approach to study energy linkages to economic growth, via useful work as a factor of production and exergy efficiency as a growth dynamic.

The future transitions of global energy and economic systems mean we need to better understand their building blocks.

This paper has two aims: to progress the useful work accounting methodology towards a common analysis framework, and then to study how future growth and energy consumption may be



constrained by limits to exergy inputs (e.g. peak oil) or thermodynamic exergy conversion efficiencies.

First, 1960-2010 time-series exergy and useful work analyses for the UK, US and China are constructed. Building on past national exergy and useful work accounting analyses, new techniques for electricity end use and mechanical drive efficiencies were developed. Post analysis techniques (e.g. structural decomposition and Grainger causality tests) then studied useful work and efficiency results in detail. Second, future limits to supply and conversion efficiencies were tested to examine their effect as a constraint to overall energy consumption and economic growth.

The results show overall (2nd law) exergy efficiencies for these countries are around 8-10% - much lower than found by traditional (1st law) energy analysis, and also suggests micro energy efficiency gains may not be wholly translated to macro-scale gains, due to 'energy rebound' and 'efficiency dilution' effects. Furthermore, constraints to exergy inputs or exergy conversion efficiencies could have a significant impact on future economic growth and energy consumption. Given the urgency of policy making in the energy and growth arenas, a more mainstream take-up of exergy analysis is therefore desirable.

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## 972 Modeling the Energy Transition in the State of Vermont, U.S.A

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One of the most important dilemmas confronting the developed world this century is determining how to adapt our current energy infrastructure system to meet the demands of modern civilization. The energy infrastructure that enabled the unprecedented economic development of the past 75 years is increasingly ill suited to cope with decentralized and intermittent energy generation, net energy supply constraints, shifting demand dynamics, and weather volatility due to climate change. Reconceptualizing the energy system, including realizing the promise of renewable energy systems and smart grid technology and information systems, is crucial for the future development and prosperity of regions, states, and nations far beyond the state of Vermont.

Vermont has set forth an ambitious vision for the transformation of the energy system – 90% renewable energy generation (currently at 23%) and a 75% reduction in GHG emissions from the 1990 baseline by 2050. Precisely how this transformation occurs is a matter of intense debate among many stakeholders, with many differing views of what long-term policy scenarios are most feasible and desirable for Vermont.

To address the need to evaluate complex policy and planning scenarios, the Energy Futures Simulation (EFS) system dynamics model was developed. Using a mediated modeling process soliciting input from a range of expert and non-expert stakeholders, EFS simulates the long-term dynamics of different scenarios aimed at contributing towards the energy transition. The strength of this model is that EFS incorporates interrelationships, feedbacks, and time lags related to energy prices, energy intensity, population, and economic activity. Recognizing that Vermont's energy system is a complex dynamic system, the EFS allows for the exploration and analysis of the non-linear dynamics of supply and demand at a time when the fundamental structure of this system is starting to undergo a transformation with the proliferation of decentralized renewable energy generation, the roll-out of the first wave of smart grid technology and information systems, and the escalation of energy conservation programs.

In this session, I will describe the theory and general structure of EFS, which is designed with the ability to be redeployed for different geographies. Following this EFS primer, I will demonstrate the mediated modeling process in which EFS is employed as a decision support system for state level policy makers. I will conclude the session with a review of the efficacy of the tool, a synthesis of policy outcomes, and reflections on employing system dynamics models as decision



support systems.



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## 1420 Useful coevolutionary modelling of the energy-economic implications of low-carbon transitions

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Better theories and models of processes of long-term systemic change are needed to identify strategies for a transformation of global socio-economic systems towards enhanced social wellbeing within planetary boundaries. This paper seeks to develop a useful systemic modelling approach for a sustainable low-carbon transition, building on a framework for analysing coevolution of ecosystems, technologies, institutions, business strategies and user practices (Foxon, 2011; Foxon and Steinberger, 2013).

The paper starts by identifying key theoretical insights that energy-economic modelling needs to take into account:

- the role of high quality energy inputs and their efficient conversion to useful work as key drivers of economic growth (Ayres and Warr, 2009);
- the existence of long waves of techno-economic change, driven by the coevolution of new energy technologies and new institutional frameworks (Perez, 2002);
- the socio-metabolic transformation associated with the step-change in economic activity due to dependence on fossil fuel inputs (Haberl et al., 2011).

The paper then reviews past modelling efforts and results which seek to incorporate the above theoretical insights, in each case outlining the broader paradigm and assumptions of the modelling frameworks, alongside their weaknesses and omissions. This includes the following types of models:

- Coevolutionary, including agent-based models that address the behaviour of individual, institutional and industry actors;
- Energy, including models of energy technology innovation and integrated techno-economic models, such as MARKAL and Integrated Assessment Models;



- (Partially) coupled energy, environment and economic models, that take into account trends in energy extraction (EROI) and end-use efficiency (exergy analysis), or radical changes in consumption patterns.

We conclude with specific recommendations and tests for the next generation of coevolutionary models suited to the challenge of low-carbon transitions.



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## 1433 From vision to reality – Backcasting for a sustainable energy future

**Wächter, Petra**

The transition to a sustainable energy system faces more challenges than a simple replacement of fossil energy sources by renewable ones. Since current structures do not favour sustainable energy generation and use, it is indispensable to change the existing infrastructure. A fundamental change of the energy system also requires re-organizing spatial structures and their respective institutions and governance structures. Especially in Austria, urban sprawl and unsustainable settlement structures are regarded as one of the main developments leading to increased energy demand. One of the aims within the project E-Trans 2050 was to identify socio-economic constellations that are central to the further transformation of the energy system and to focus on actors and their socio-technical framework conditions. Based on a sustainable future vision for the year 2050 a backcasting workshop was conducted to identify necessary steps for the envisaged transition to a more sustainable energy system. Backcasting has gained increasing attention in energy studies because it is a normative and goal-oriented form of scenario analysis and it addresses the aspect of transformation of a whole system. Methodological challenges lie in combining forecasting elements necessary for the future vision with backcasting, in the development of alternative pathways and in the heterogeneity of the workshop participants. The results shed light on the necessary changes for a transformation towards sustainability in the specific Austrian situation. Critical issues are region-specific production of energy and its use, settlement and regional structures and values and role models, which all have a determining influence on energy demand. One of the main findings is that a better coordination between energy policy, spatial planning and land-use regulations is urgently needed to be able to reach the sustainable energy vision. Combining the knowledge of extensive energy use with available energy resources in spatial planning decisions is a main challenge towards a long term sustainable energy system.



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Session: 3.2.J2 Transitions: focus on the nnergy system II

Time: F3 Room: R13

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## 1572 Possible futures towards a wood based bioeconomy in Central Germany

**Hagemann, Nina**

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Driven by the growing awareness of the finite nature of fossil raw materials and the need for more sustainable ways of industrial production, the biobased economy is expanding. Several strategies such as the European Union bioeconomy strategy and the German Hightech Strategy which is the basis for the German bioeconomy strategy aim at fostering this process. The bioeconomy intends to substitute fossil resources in the industrial processes by using renewable biological resources such as wood.

The advantages and risks of the bioeconomy development are uncertain, as many influencing factors play a role such as climate change, technological development, economic development. Here, scenarios provide a tool for policy makers as well as investors to take long-term oriented decisions. To provide policy makers and businesses involved in the wood based bioeconomy in Central Germany with information on possible future framework conditions of the bioeconomy in this region scenarios are developed.

Based on GEO 4 (UNEP 2007) and Hauck and Priess (2013) we chose two basic assumptions: i) The role of the state that ranges from proactive/creative and inactive/passive and ii) Society that acts in the range between open-minded/creative and uninterested/directionless. Taking account of these, four scenarios are developed that represent combinations of the outlined extremes. In a literature review technological development, climate change, resource use, energy and climate policies and consumption patterns were identified as key drivers for change. Against the background of the key scenario assumptions these are discussed in a participatory process together with scientists and practitioners from the region. The aim of the integration of expert knowledge for the scenario development is to ensure that these scenarios are plausible, credible and relevant for potential users. This paper presents the answer to the question of the workshop "What are possible framework conditions for the wood based bioeconomy in Central Germany in 2050"? The derived storylines tell four different stories, how the wood based bioeconomy could look like in 2050 and as such provide a basis for decision makers and businesses.

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926 Energymetrics

**Rock, Greg**



Theme: 3.2 VISIONS, INDICATORS AND MODELS OF TRANSITIONS

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## 1563 Green change - renewable power generation in an input-output framework

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Globally, increasing renewable power generation deployment of wind and PV is accelerated by strongly decreasing costs of these technologies. This effect can be captured in learning curves making it possible to endogenize technological change regarding renewable power generation technologies (RPGT) in economic models. Introducing endogenous technological change is necessary to adequately analyze not only the direct effects of technological change, but also the indirect effects on important macro-economic indicators such as growth, employment, welfare and trade as well as their feedback to the electricity sector.

The learning concept is modeled in the renewable power generation module (RPGM, Wiebe&Lutz, 2013), which determines global cost development for wind and PV and corresponding national investment costs development. The development of investment costs, together with the renewable energy policy mix (Rogge&Reichardt, 2013), determines new capacity installations. The RPGM is introduced into the econometric input-output models GINFORS-E: First, RPGT capacity is determined endogenously and not set exogenously according to deployment plans. Second, the switch from fossil fuel power generation technologies to RPGT implies a changing structure of intermediate demand and, hence, a change in the composition of sectoral production. Thus, the transformation of the electricity sector feeds back into the economy via the intermediate input-output structure of the economy.

Important model outcomes are the effects on sectoral production and corresponding environmental effects and labor market effects as well as the share of renewables in total electricity production. As RPGT do not need fossil fuels as inputs for electricity generation, we expect that total fossil fuel demand and associated GHG emissions will be reduced. However, the production of wind mills and PV modules require very different inputs compared to fossil fuel technologies. These inputs may be more energy and emission intensive than those required for the 'old' technologies, thus partly or completely offsetting the reduction in fossil fuel use and emissions during the production of electricity. Introducing RPGM into GINFORS-E will contribute to a better understanding of the direct and indirect effects of the deployment of renewable energy technologies on macro-economic and environmental indicators.

Acknowledgements: The authors thank the participants of the 2013EuropeanIAEEconference for their valuable comments on the RPGM.

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Theme: 3.2 VISIONS, INDICATORS AND MODELS OF TRANSITIONS

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## 1134 Sustainability assessment of national electricity systems: A case study of India

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India needs to significantly increase its electricity and energy consumption, in a sustainable manner, if it is to ensure rapid economic development- a goal that remains the most potent tool for delivering adaptation capacity to its poor who will suffer the worst consequences of climate change. Resource/supply constraints faced by conventional energy sources, techno-economic constraints faced by renewable energy sources and above all, the bounds imposed by climate change on fossil fuel use are likely to undermine India's quest for continuing rapid, sustainable and inclusive growth.

In the context of national electricity systems, the above constraints cause electricity generation capacity augmentation problem. We first formulate and subsequently answer the question: What is and what should be the electricity system for India? We define the sustainability of the national electricity system and this leads us to the development of an indicator based hierarchical multidimensional framework. This framework is built upon the indicator literature in this domain along with expert discussions and several brain storming sessions. Indicators at the lowest level in the hierarchy are all system observable. Through this framework we address the issue of measurement of different impacts associated with the national electricity system.

We evaluate Indian electricity system using this framework by bench-marking the indicator values against upper and lower bounds. We use the framework to examine the social, economic and environmental implications of the recent and potential developments in Indian electricity system. The analysis with the indicator framework provides a deeper understanding of the system, identifies and quantify the prevailing sustainability gaps and generates specific targets for interventions. We use equal indicator and equal dimension weighting schemes on the framework to compute national electricity system sustainability index (NESSI) for India and present its implications.



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transitions: focus on lifestyle and behavioural change



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## 1190 Transitioning to sustainable lifestyle practices in Canada

**Axsen, Jonn**

The goal of this research is to better understand and characterize opportunities for a transition to sustainable consumer lifestyles. Inevitably, transitions towards sustainability will require significant shifts in consumers' purchase, use and disposal of goods.

"Sustainable" practices may include a wide array of activities such as buying a fuel-efficient passenger vehicle, reducing water use, or buying organic food—and perceptions of sustainability will vary across individuals. I follow a conceptual framework based on social theories of lifestyle; lifestyles are packages of activities and objects that consumers experiment with and adopt (or reject) in an ongoing attempt to determine and express their identity. Consumers are heavily influenced by motivations to communicate and negotiate their identity with others in their social network—in part through the consumption of goods and services.

To date, most research on lifestyle and consumption is limited to speculative theory and in-depth case studies. In January 2013, we collected quantitative empirical consumer data through representative web-based surveys of U.S. ( $n = 1000$ ) and Canadian ( $n = 1200$ ) households. The survey instrument used several novel question scales to assess consumer engagement in general lifestyle activities (47 items), and engagement in and perceptions of different "green" activities (45 items) addressing issues such as energy savings, water consumption, and purchase of "green" products. We also assess consumer attitudes, values, and liminality (openness to change). We use this data to address these research objectives: 1) using factor analysis to identify "packages" of activities that align with particular aspects of consumer identity, 2) using cluster analysis to identify consumer groups based on lifestyle and openness to change, and 3) using lifestyle segments to statistically predict the adoption of emerging "sustainable" technologies and support for sustainability-oriented policies.

Results inform the conceptual framework of lifestyle and sustainable consumption, guiding understandings of resource consumption and waste behaviour as well as informing sustainable policy design. Knowledge of the social context of sustainable lifestyle practices is highly valuable to policymakers, sustainability researchers, and industry as well as behaviour change practitioners in utilities and non-governmental organizations. The unique survey design will enhance research methods in the field of sustainable consumption, and results will help develop policy-relevant behavioural theory.

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## 1551 Hectors and actors of sustainability: Can we make a distinction?

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Being green is in line with trend. Recently there are too many hectors of sustainability who talk green and act brown. They carry out easy actions with only marginal impact. This has lead to the behaviour-impact gap (BIG) problem described by recent literature, where no significant difference in the ecological footprint of green and brown consumers could be detected. The BIG problem may lead to scepticism regarding the effectiveness of environmental actions unless we find a way to distinguish green actors from green talkers.

The research is based on the assumption that green actors do exist and their carbon footprint is bellow the value predicted by their economic circumstances. It presents a method for separating them from hectors using the combination of regression analysis and cluster analysis.

The empirical analysis is based on a 1012 respondent representative survey carried out in 2013.

Regression analyses was used to predict the carbon footprint as explained by economic situation, including income, number of persons in the household and home size. Then environmental actions and environmental impact variables were used as inputs for clustering.

Hectors are featured by their large carbon footprint and the large number of environmental actions reported. Only 19% belonged to this cluster but their carbon footprint widely exceeded the predicted value. Green actors form a big group of 24%, they carry out many environmental actions and their carbon footprint stays bellow the predicted level. Other variables were used as evaluation fields only and did not enter the cluster analysis as input. They also show the highest level of responsiveness of green actors: preference for renewable energy, waste separation, buying local products.

Findings indicate that hectors and actors are clearly distinguishable when impact oriented measures are used besides action or attitude questions. The achievements of green actors may fade away when the two groups are merged based on their reported environmental actions only. Thus, using impact oriented measuring techniques is of utmost importance for environmental policy.



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## 1202 Smart meters and the household economy of energy: New frontiers for behaviour change policy and technology

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The UK has joined a growing number of countries aiming to install smart meters in homes to provide fine grained data on gas and electricity use. One aspect of the rationale of such programmes is to provide households with access to these data through in-home display (IHD) technology, with the intention of empowering them to identify, and then alter, 'inefficient' energy uses in the home, thus reducing household energy costs and carbon emissions. This complements longer-standing interventions intended to change behaviour that take the form of information campaigns encouraging 'greener' behaviours (such as lowering the thermostat) and promotion of energy efficient technologies. However, existing research on most IHD systems suggests only moderate and often short term energy use reductions occur, and that maintaining householder engagement is problematic. The potential for adverse impacts on particular groups, such as the low income and vulnerable for whom energy use reductions may not be appropriate, has also been raised. In this paper we investigate these issues, looking at how the underlying philosophy of the UK smart meter programme is shaping this new, technologically-enabled, home economy of energy efficiency, and at alternative models that could result in more effective behaviour change. We present early findings from a UK government research council (EPSRC) funded project, 'IDEAL', which is developing and trialling new ways of providing targeted, personalised feedback to householders about their energy use. Documentary analysis and stakeholder interviews illuminate the influence of behavioural economics and market philosophies on the policy and technology being developed for the UK's smart meter programme, and their likely impacts on energy use. We discuss how the ecological economics concept of the environmental efficiency of wellbeing could be a valuable alternative framing to apply. This, we argue, allows behaviour change interventions to focus on how home energy use can be influenced to simultaneously reduce carbon emissions and improve wellbeing, by encouraging low energy intensity activities that are also associated with improved levels of wellbeing. The inclusion of an explicit focus on the impacts on householders' wellbeing (rather than just impacts on their finances) is largely absent in existing behaviour change policy and technology, and we argue that it can potentially (i) enable more significant and lasting behaviour change opportunities to be identified, and (ii) reduce the risks of adverse impacts on particular groups. Early results from the IDEAL project are presented to illustrate how this approach is being tested in practice.



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1227      **Supporting technology transition in the mobility sector:  
Analysis and evaluation of political and economical  
support schemes for electric vehicles**

**Bickert, Stefan**

Mobility represents a fundamental function of the economic and private life today. At the same time limited fossil energy resources and emissions from vehicles require the transformation of mobility systems towards sustainability. To meet these challenges, electric vehicles became more important in recent years. Despite numerous advantages of this innovative technology in the mobility sector, several obstacles and in this context especially the high purchase price of electric vehicles pose a significant barrier to the market success.

One way to overcome these obstacles is to set up incentives to support the market integration of electric vehicles. Incentives can be used as monetary and non-monetary support. The use of incentives differs significantly between several countries. While in many European countries a variety of incentives for electric vehicles exists, they have so far been promoted in Germany solely on special conditions in annual car taxation. Based on this situation, the analysis aims to evaluate incentives to ensure an efficient support of electric vehicles in different target dimensions. These dimensions result from the potentials of electric vehicles, if advantages can be realized. The dimensions comprise: economic efficiency, environmental sustainability, grid integration.

The methodology follows a three-step-approach: Firstly, an overview of political and economic incentives of various countries is created. Secondly, these incentives are analyzed and categorized in terms of their modes of action. Thirdly, incentives are evaluated regarding their effectiveness to achieve certain goals in the target dimensions.

With this, the analysis points out the potentials of different incentives and recommends special ones or combinations of them to achieve certain targets.

First results suggest, that incentives have to be especially selected regarding their target dimension. To ensure an economically and environmentally efficient integration of electric vehicles in existing mobility and energy structures - and with this an efficient transformation of the mobility sector towards sustainability - incentives have to address all three pillars of sustainable development: economic factors, ecologic factors, and social factors.

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## 1444 Wages and profits in Daly's "inverted pyramid" economy: A Post-Keynesian and view

**Kemp-Benedict, Eric**

In 1995 Herman Daly introduced the image of an economy as an "inverted pyramid" balanced on its tip (Daly, 1995). At the tip are the resources that flow into the economy; the rest of economic output is value added to those inputs. This viewpoint is incompatible with the marginalist notion that value arises from trade-offs at the margin among scarce resources, but it is consistent with Post-Keynesian pricing theory, in which most inputs are abundant and prices are set as a markup on costs (Lavoie, 2001). This presentation gives a formal expression to the inverted pyramid view of the economy, deriving an aggregate expression from disaggregated input-output relationships. Then, focusing on energy resources in the United States, it explores the implications of the theory for the distribution between wages and profits under fluctuating energy prices and compares to observations. First, the theory is used to explain the surprisingly large macroeconomic impact of an oil price shock (Hamilton, 2008). It is then used to argue that the falling wage share in the U.S. from the 1980s to the 1990s can be explained as a consequence of lengthening supply chains, while after the 1990s the falling wage share can be explained by rising energy costs as a share of GDP.

While the presentation reaches specific conclusions about energy costs, wages, and profits, it argues more generally that the formal expression of the inverted pyramid view of the economy is a fruitful way to think about economies during a sustainability transition and gives a short summary of further applications. The presentation therefore responds to Kronenberg (2010), among others, by explicitly bringing Post-Keynesian analysis to problems of Ecological Economics. The combination leads to new views on old problems and can support new analyses of sustainability transitions.

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1040 An evolutionary ecological-economics model - How does environmental policy influence the economy?

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The current discussion around sustainable development is characterized by a lack of complexity regarding the ecological and economic system, and their connections (Faber /Frenken 2009; Foxon et al. 2013). Decisions on environmental policies are based on mono-disciplinary and rational actor models (Gowdy 2008). The paper aims to close this gap by integrating sustainability in an ecological-economic context where the economic and ecological systems follow an endogenous as well as interdependent internal dynamic (Rammel et al. 2007).

Our work focuses on the question whether and how the economy can be steered towards a sustainable development (van den Bergh 2007; Kallis/Norgaard 2010). For this purpose we apply the NEWUM-model, based on the Model of Dynamic Competition and Technological Progress by Nelson/Winter (1982) and extended by a system of a renewable resource (Beckenbach 2001).

First results suggest that there is no linear relationship between the two systems but rather highly complex interdependencies. It becomes obvious that neither the economic nor the ecological system evolve in a foreseeable (linear) way.

A second aim of the paper is to extend the model by an endogenous demand (Palacios-Huerta/Santos 2004). The enhanced model shall then be used to analyse the impact of environmental policy on the modelled consumers' and firms' behaviour with the aim to



understand the real impact of political measures in complex systems.

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**1381 USING THE AIR EMISSIONS COMPONENT OF THE  
"YEARS TO SUSTAINABILITY" INDICATOR TO DETERMINE  
SUSTAINABILITY TRENDS IN THE UNITED KINGDOM –  
HEALTH IMPACTS**

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The "Sustainability Gap" methodology is used to measure whether or not economic activity is environmentally sustainable along a suite of environmental impacts. The methodology is used to establish sustainability trends described by the "Years to Sustainability" (YS) indicator. In 2000, this YS indicator was calculated and published for several important sources of air pollution, comparing current emissions levels with sustainability targets for the United Kingdom. [1]

At that time, current levels of air emissions were compared to target levels built upon the concept that anthropogenic air emissions impacts on the environment should be reduced to protect important environmental functions. In the case of air quality, these functions can be related broadly in two categories - the impacts of air pollution as a driver of global climate change and the adverse effects of certain types of air pollution on human health. For these categories, target levels for individual air pollutants are established based on scientific evidence for sustainable emissions levels.

This paper sets out to update the previous work completed on the air emissions component of the "Sustainability Gap" (SGAP) methodology and output "Years to Sustainability" (YS) indicator. In particular, this update will focus on the YS indicator's targets relating to health impacts of particulate matter (PM10 and PM2.5), ground level ozone, and nitrogen dioxide (NO2). These targets will be updated and discussed in the context of the 2013 World Health Organization review of evidence on the health aspects of air pollution. This report provided a detailed review of newly accumulated scientific evidence on the adverse effects of air pollution on human health. [2] Emissions trends in the United Kingdom will be discussed to calculate new YS indicator trends given these updated targets.



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## 1417 End-users in a sustainable infrastructure transition: Towards integrated infrastructure services

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Reliable provision of vital infrastructure products, such as water, energy and transportation, is necessary for the most basic human and economic development to occur. Such development however, is not enabled by the infrastructure products per se nor by the physical infrastructure assets but rather through the infrastructure services provided. On either end of the spectrum, both physical infrastructure and sustainable consumption and production have been the subject of considerable research. However, infrastructure services are far less understood, both in terms of their possible quantitative metrics, as well as their relation to a more sustainable type of infrastructure operation.

The present form of infrastructure operation consists of separate supply systems provisioning unconstrained demand, with higher consumption corresponding to larger economic revenue. Providing infrastructure to meet unmanaged growing demand of is ultimately unsustainable, both in environmental and budgetary terms. In contrast, a sustainable consumption perspective would prioritize coordinated infrastructure operation focused on essential service delivery at the lowest possible level of resource consumption. However, such transition requires the integration of end-users, in terms of their crucial role in selecting and using technological options, and the variety of their wants and behaviours.

This paper conceptually outlines the key points of an end-user centred infrastructure operation, quantitatively describes the infrastructure services provided by different and combined infrastructure streams, applied to the UK domestic sector as an illustration, followed by insights into infrastructure integration at the end-user level. We further present a review of mainstream and alternative arrangements delivering these services, which could encourage uptake of the most promising (i.e. cost- and resource- efficient) configurations of technologies and operation modes. Such configurations might not only deliver single utility services, but also include solutions across infrastructure streams (e.g. water & energy, transport & energy) which are currently hampered by separate and parallel infrastructure service delivery. We finally outline and discuss end-users' motivation and barriers for a broader uptake of such arrangements.



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## 1126 Contractualizing functionality

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### ABSTRACT:

The transition to a more sustainable society is now at the top of numerous political agendas. With a view to putting this concept into practice, models based on a functional economy have been developed during recent decades. From the writings of Stahel and Giarini (1990) to the product-service system approach (Mont, 2004), much work has therefore focused on decoupling the satisfaction of human needs from pressures on natural capital. This work involves seeking to optimize use value above all, rather than constantly renewing the physical dimension of the capital.

Although the model shows promise, certain contradictions should be noted, such as the presence of rebound effects and the difficulty of achieving this decoupling. To overcome this, our approach attempts to strengthen the theoretical framework of the functional economy with contributions from ecological economics. This transposition of the science of ecosystems into a service-based context makes it possible to develop the notion of a service ecosystem (Lauriol, 2007). The latter involves considering new methods of transaction between the actors involved.

Our methodology addresses a process in two stages. Contractualizing functionality involves developing an agreement based on a use cost, via consultation, then negotiation. The same item subjected to multiple uses then becomes the subject of shared valorization, i.e. of a collective, but differentiated, internalization of externalities. This process of monetizing functionality makes it possible to ensure that the models developed in this way are sustainable.

In the context of new solutions incorporating companies, users and regional or local authorities, some first results from the mobility sector will deal with the switch to a functionality economy. The evolution from a linear and transitive approach to forming value to a socio-economic and ecosystemic approach re-examines notions of capital and transaction costs.

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## 1629 Networked Structure and Linked Prosperity: Winners and Losers in Sustainability Governance Collaborations.

**Nash, Julie**

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Globalization was trumpeted as a global growth mechanism. Yet for many in developing markets, the promised economic and social benefits have fallen short of expectations. In addition, globalization has challenged national government's environmental command and control policies. This has led many to assert that state-driven governance systems are not up to the challenge of today's global social and environmental issues.

In this context, non-state sustainability governance collaborations have blossomed. Industry roundtables, third party certification, and product transparency initiatives are all common forms of these collaborations. These collaborations attempt to mitigate harmful business practices by creating a governance apparatus to attain improved sustainability outcomes. Yet different collaboration types have fundamentally different market reconfiguration goals, stakeholder participation aims, and accountability mechanisms. These contrasts result in vastly different value-chain impacts. In order to navigate the expanding area, environmental actors and industry stakeholders need greater understanding of competing collaborations implications on value-chain structures. This research paper seeks to fill this need by analyzing the governance networks of multiple collaboration forms.

The marine cultured-pearl industry provides an illuminating example of underlying value-chain dynamics and positive sustainability outcomes. Marine-cultured pearls have a compelling environmental story and contribute positively to economic development in remote coastal communities. This environmental story's strength has resulted in powerful actors within the jewelry industry actively engaging in the sustainability system debate and seeking out environmental governance collaborations.

Drawing on fieldwork and interviews conducted in the marine cultured pearl industry, a current value-chain network model (tracing the product from producer to consumer) was developed. Then utilizing Provan and Kenis (2008) Models of Interorganizational Form, hypothetical network models were developed for each of the main sustainability collaboration types. By comparing the current and future value chain networks, links are made between governance collaboration types and potential sustainable development outcomes.

This type of forward-looking assessment can also uncover previously hidden barriers for environmental governance adoption. By better understanding potential value-chain changes, it is possible to hypothesize which market actors will support or inhibit different sustainability governance forms. This research contributes to environmental policy by taking a dynamic network view that evaluates institutional implications of these collaborations.



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## 1477 Environmental-economic account as a base of greening economy

**Pakina, Alla**

Environmental-economic account as a base of greening economy

Transition to a green economy is a major idea of Russian economy's modernization. According to [1], total annual economic damage from environmental degradation in Russia reaches 4-6% of GDP. In order to improve ecological situation and economic growth, there was adopted the National Program "Environment Protection" on 2012-2020. Among its expected results – "effective system of ... environmental protection, encouraging the modernization of the economy based on the principles of "green growth". The main research objective is a rationale of a complex approach, focusing on account of ecological services on a par with a resource value.

Relevant methodological approach is based on the concept of total economic value and a "cost-benefit analysis". Along with this it is necessary to develop a system of environmental-economic accounting, where physical measurement of natural resources is a priority. Research on accounting of environmental services we started at the Baikal region (Eastern Siberia) in 2011. First results have shown that the traditional approach to economic growth doesn't account social benefits from natural landscapes' conservation, and leads to GHG emissions increase. Preliminary analysis for the area of deforestation (2.000 ha) shows increase of CO<sub>2</sub> emissions on about 860 tons/year [2]. In subsequent research we expect to assess the balance of costs and benefits of traditional and "green" approaches to economic development, and to make recommendations on its priorities. Many authors in Russia and abroad [3, 4] conclude that benefits from the conservation of natural ecosystems may greatly exceed revenues from resource extraction – a result often depends on a time perspective. Researches in this field must continue to define priorities in transition from raw dependence to green standards of the Russian economy and to improve a methodology of sustainability measuring.

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## 1659 Reconceptualising and measuring absolute decoupling taking planetary boundaries into account

**Umpfenbach, Katharina**

Conventionally, decoupling is conceived as a delinking of resource use and its environmental impacts from economic growth, with the latter measured through changes in GDP. The 'green growth' concept assumes that resource efficiency and climate change mitigation can not only be reconciled with growth in GDP, but are themselves – through eco-innovation and the establishment of green industries – important drivers of increased competitiveness and growth. However, it is increasingly being questioned whether it is feasible to reduce industrialised countries' resource use and its environmental impacts to a sustainable and fair level within the paradigm of perpetual economic growth.

Based on in-depth analysis of this debate, the paper proposes to reconceptualise the 'absolute decoupling' referring to well-being instead of GDP and extending the concept to by taking planetary boundaries into account. Geared towards the EU policy arena, the paper proposes a pragmatic set of targets and indicators for measuring both dimensions: changes in the resource use and its environmental impact on the one hand and changes in well-being on the other hand, with the focus being on the resource use dimension.

For the resource use dimension, a pragmatic set of five 2050 targets for guiding EU resource efficiency policy is developed, covering metal, land and freshwater use, nutrients input, and greenhouse gas emissions. The targets are derived by first defining clear criteria for target selection: coverage of most critical environmental impacts and looming resource scarcities, reflecting available evidence on planetary boundaries, grounding in a global equity perspective, limiting overlap between targets, data availability, neutrality to the choice of abatement measures and political acceptability. In a second step, strengths and weaknesses of target proposals in more than 30 recent publications were analysed according to the criteria set to derive the proposed key targets. A methodological approach for measuring progress towards the targets is proposed and limitations of the target set are discussed in detail. The five proposed targets allow overall resource efficiency to be tracked by focusing on a limited and manageable number of key areas that have wide influence on different types of resources and environmental impacts in the EU.

Reflecting limited possibilities of many economic models used for policy assessment, the paper proposes to apply a basket of quantitative and qualitative indicators to gauge impacts on well-being in a pragmatic manner.

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## Theme 3.3

### Facilitating transitions drivers and barriers



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Session 3.3.A

Policy: Climate, Low carbon



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## 987 Behavioural Climate Policy – How bounded rationality can foster the energy transition. The idea of “Nudging”

**Geisendorf, Sylvie**

### Aim

Human beings are far from being as rational as economic theory assumes. This insight from behavioural economics is not new (Samuelson und Zeckhauser 1988; Knetsch 1989; Kahnemann et al. 1991) but has rarely been integrated into environmental policy design. The political instruments applied to foster the German energy transition (“Energiewende”), with the objective to enhance the percentage of renewable energy in electricity production and reduce energy consumption, are no exemption from that.

But at least part of the individual energy consumption behaviour could be qualified as “irrational”, in the sense that people are not deciding according to given preferences. It could, e.g., be observed that electricity customers faced with the traditional fossil electricity mix as default, rarely switch to green electricity. However, if green electricity is presented as default, only few customers switch to the fossil mix (Chassot et al. 2013).

Such behaviour, which has been described as “default-bias”, “endowment effect” or “loss aversion” (Kahneman et al. 1991; Samuelson und Zeckhauser 1988) offers possibilities for the concept of “Nudging” (Thaler und Sunstein 2008). A nudge is the framing of a decision context in a way which intends to give the addressed person a friendly push in a certain direction.

The paper aims to analyse relevant “irrationalities” in energy consumption patterns and investigate the possibilities to introduce nudges.

### Methodology

Deviations from rational behaviour are identified and categorized. In a second step, possibilities to work with them by using nudges are investigated.

### Results

The paper identifies nudges to foster the German energy transition that are likely to work. The use of nudges is assumed to be a cheaper and socially more acceptable way to enhance climate protection than traditional environmental policy working with financial incentives or forfeits.

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## 1045 Prospect Theory, Mitigation and Adaptation to Climate Change

**Osberghaus, Daniel**

Climate change is one of the most pressing challenges in current environmental policy. Appropriate policies intended to stimulate efficient adaptation and mitigation should not exclusively rely on the assumption of the homo oeconomicus, but take advantage of well-researched patterns from behavioural economics. Prospect theory – as a descriptive theory for decisions under uncertainty – provides a number of climate-relevant insights, such as the notion that evaluations of outcomes are reference dependent, and the relevance of perceived certainty of outcomes. After evaluating the conditions under which prospect theory is a valid and applicable theory for explaining climate policy, the paper systematically reviews what the theory can offer to analyse climate adaptation and mitigation.

Inter alia, these aspects emerge: First, the attractiveness of climate-related action can be reference dependent. The reference point implies whether benefits of climate action are perceived in the domain of losses or in the domain of gains. This is crucial for the evaluation of outcomes by the decision maker. It is shown that reference dependence can contribute to explain why some actors prefer intense climate action, while others are more reluctant. More concretely, decision makers who perceive the current climate as the reference point tend to ascribe a higher value to climate policies than those who have already shifted their reference point to the future climate. Second, probability weighting in prospect theory suggests a certainty bonus for some climate actions. Outcomes which are perceived as certain get a disproportionately high decision weight, higher than expected utility theory with plausible risk aversion can accommodate. Certainty effects may play a role for the choice between technical vs. financial adaptation, such as the decision whether to adapt to flood risk by structural measures or by insurance. Third, certainty effects may also be present in intransparent, sequential decision problems, such as the ex-ante evaluation of proactive adaptation measures with uncertain benefits.

These and other linkages of prospect theory and climate-related action are illustrated by hypothetical, but realistic case studies. Building on these generic examples, concrete approaches for novel empirical research on the mentioned effects are proposed.



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## 1191 Socio-technical transitions to low-carbon consumption: Developing markets for electric mobility

**Axsen, Jonn**

Societal transitions to low-carbon consumption require substantial changes in technological development and consumer behavior. This study applies a socio-technical perspective to study transitions—assessing opportunities and obstacles that are political, technological and social, and how they develop and influence one another. The present focus is the deployment of plug-in electric vehicles (PEVs) in Canada, a technology that is powered by electricity solely or in part. PEVs could reduce greenhouse gas (GHG) emissions in the transportation sector, which currently accounts for 28 percent of Canada's emissions.

The goal of this research is to characterize Canada's readiness for a socio-technical transition to PEVs and inform national and provincial GHG policy. Key uncertainties include Canadian consumers' awareness, perceptions, attitudes and values relating to PEV technology. Uncertain technical constraints include consumer driving patterns, access to PEV recharge infrastructure, and the GHG-intensity of electricity sources.

Data were collected via an in-depth, multi-part consumer survey completed by representative samples of vehicle buyers in Canada ( $n = 1,754$ ). Social readiness is assessed via questionnaire scales of awareness, attitudes, values and lifestyle. Consumers' technical readiness is assessed via a diary of driving behavior, and a questionnaire assessing home electrical infrastructure. Consumers' PEV design preferences were elicited via an innovative series of design exercises. Regionally and temporally explicit models of PEV market penetration and use were constructed from disaggregated consumer data. These demand models were matched with provincial electricity generation data to estimate energy and GHG emissions impacts.

Results highlight opportunities and barriers for a transition to electric mobility. Opportunities includes findings that most car buyers already have access to some form of home based charging for these vehicles, and that at least one-third want to buy some form of PEV under realistic price conditions. Barriers include a broad lack of familiarity with PEV technology, and controversies about the true (lifecycle) environmental impacts of PEV usage. Knowledge of PEV impacts, readiness and policy priorities is highly valuable to policymakers considering PEV deployment to meet GHG goals, as well as electric utilities, urban planners and automakers. These results also enhance knowledge regarding the social and technical challenges of low-carbon societal transitions.



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## 1740 Moving towards low carbon operations: highlighting the challenges in transforming the Australian built environment sector

**Wilson, Kimberley**

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Achieving a significant reduction in global carbon emissions is a priority in confronting and rapidly responding to increasing environmental pressures and there is significant potential to reduce overall contributions by targeting the built environment sector. The construction and use of buildings in particular, is said to account for around 23% of all emissions in Australia. Moving beyond the incremental progress in building performance, transformational solutions and large-scale action is required to transition the Australian built environment sector to low carbon operations. Considering this complex and 'wicked' sustainable development challenge, this paper will explore the barriers to such environmental innovation in the Australian built environment sector. In this study, a review of pertinent literature provides a foundation of theoretical barriers in moving towards low carbon operations. Expanding on the documented challenges and using existing knowledge as the basis for provocation, discussions with key stakeholders in a workshop will add a contextual dimension to the knowledge base. Crossing traditional professional boundaries, workshop participants are drawn from various fields within the Australian built environment to share their respective barriers to achieving carbon reductions. This exploratory paper will present the emerging consensus around the current challenges to achieving a transformational shift to low carbon operations in the Australian built environment sector. This research will catalyse government, industry and academia to take collaborative action in reducing carbon emissions in this sector.

### Acknowledgements:

This research is being undertaken alongside a larger project of the Sustainable Built Environment National Research Centre (SBEnc) – Project 1.24 "A Roadmap for Carbon Structural Adjustment in the Built Environment Sector" of Program 1: Greening the Built Environment.



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1499 A Post-Keynesian model of a transition from a brown capital to green capital dominated economy

**Kemp-Benedict, Eric**

A sustainable economy will look different than the ones currently in place or being pursued. While behavioural changes, demand-side measures, and retro-fitting can lower environmental impacts on the margin, a sustainability transition will require structural changes in energy and transport infrastructure, industrial capital equipment, the organization of cities, and the bulk materials on which the economy is based. Abstractly, this can be represented as a transition from a "green-capital" to a "brown-capital" economy. Such a transition has been studied using the Ramsey model, but this is problematic for at least two reasons. First, the Ramsey model assumes optimization over an infinite (or very long) time horizon with known probabilities of possible future states of the world. This is implausible in any case, but is especially implausible under the highly uncertain conditions of a major transition. Second, the Ramsey model is inherently unstable. Stability is achieved by imposing transversality conditions, but these again require infinite foresight, by assuming that actors will not do what seems the best option at the moment, and instead will sacrifice short-term gain for long-term security.

This presentation introduces a brown-green capital model within a Post-Keyensian framework in which myopic investors decide whether to invest in green or brown capital in the near term. Either brown capital or green capital is productive in an environment in which that type of capital dominates, but green capital is unproductive in a brown-capital dominated economy, and vice versa. The model therefore features a form of lock-in. Investor decisions are based on expectations about the actions of other investors and the government. Short-term changes in employment and the wage share depend on investment decisions, and the volume of investment is affected by aggregate demand. The resulting model has a richer set of possible paths than are provided by the Ramsey model. Developments in the economy are path-dependent and are affected by expectations. One implication of the model is that the plausibility of a transition to a green-capital dominated economy is a significant determinant of whether it will happen, so the transition can be seen as a collective-action problem.



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## 1541 Ralph Waldo Emerson's Philosophical Perspectives and their Potential to Transform Environmental Thought

**Konchak, William**

This presentation will focus on the philosophy of Ralph Waldo Emerson, exploring how his perspectives may inform a transition towards a new type of environmental thinking. Emerson is unique in that his philosophy reflects both a profound respect for nature and for the value of human individuality and creative possibility. In a time where environmentalism seems to be searching for an inspiring message to help affect societal change, it is suggested that there may be something to learn from Emerson. His profound spiritual approach to life and nature and inspiring vision of human potential will be explored.

Environmental thinkers have often contended that the excessive focus on individualism, greed, and economic growth has been detrimental for man's relation to nature. This presentation will explore how Ralph Waldo Emerson's conception of individual potential and development is far more profound, incorporating self-knowledge, spiritual and holistic perspectives. It will also be considered how holistic conceptions could be further emphasized and integrated into his thought to productively inform a vision for contemporary environmental thought. Given current concerns over the lack of success in creating an environmental vision to promote necessary changes in societal practices that negatively impact the environment, it is suggested that a compelling environmental vision may need to increasingly incorporate a positive perspective towards abundance in a broader sense; that is, material and spiritual abundance, where low-impact economic growth could be part of a holistic approach encouraging the growth and cultivation of wisdom, valuing nature, and broader progressive societal goals. This could be developed within a paradigm of respect for and profound interconnection with nature.

I am not sure which section this paper would be presented under, perhaps 3.3 Facilitating Transitions or 2.1 Degrowth for the Rich or elsewhere, but I have submitted it under 3.3 Facilitating Transitions.



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## 1773 Spiritual Capital

**Kenter, Jasper O.**

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Sustainable livelihoods are underpinned by a diverse set of 'capitals', including natural, human, social, manufactured and financial capital. These capitals are the asset stocks that, if preserved and expanded, will continue to generate flows of benefits to human wellbeing. This paper will consider the novel concept of Spiritual Capital (SC), which consists of the capabilities that enable individuals and society with the freedom to respond and adapt intelligently and appropriately, informed by spiritual practice and experience.

Perspectives on what constitutes valid stocks have become increasingly inclusive of intangible types of capital (e.g. cultural, emotional capital), and capitals are increasingly being considered communally as well as individually (e.g. social capital as the bonds of trust within and between communities). This wide range of capitals is essential in enabling human freedoms and capabilities, maintaining them for the future, and adapting to environmental change. However, even where there are substantial levels of these capitals, institutions, values and behaviour have become increasingly embedded in short-term, consumer-oriented culture. Most development is still predicated on 'mining' natural and social capital to meet consumerist wants. It is extremely challenging to make decisions where short-term benefit flows need to be sacrificed for long-term capital gains. Culturally and psychologically, we have been unable to effectively deal with major environmental issues, expressing a mix of denial, anger, blame, mistrust, despair and offloading responsibility to others.

SC provides guidance to respond more appropriately and effectively. It does not constitute a specific knowledge base in the sense of information or skills that can be memorised or learnt. Instead, it is a degree of attainment and capacity to be 'present' as the depth of oneself, one's ability to simply be, to experience connection and identity with the ground of reality, and to enact this in one's everyday life and relationships. Religious or non-religious spiritual beliefs and practices do not constitute SC by themselves, but are valuable insofar as they support these capacities. Examples of this are given from the authors' own practices. Development of SC enables a search for meaning within, rather than through excessive material accumulation and acquirement of status symbols. A community with a high level of SC exhibits high degrees of social capital and trust, but also includes openness and adaptiveness. Examples of Findhorn (Scotland), and the Oromo (Ethiopia) are provided. Thus, recognition and fostering of SC provides an effective lever and pathway for transition to a more sustainable society.



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## 1490 Designing Happiness-oriented Policies to Achieve Wellbeing and Environmental Sustainability

**Zhou, Sophie Lian**

Both Easterlin's happiness paradox and the modern society's increasing ecological overshoot have caused increasing appeal for redirecting policy goals from economic growth to happiness and human wellbeing. While many research studies have corroborated the importance and potentials of this appeal, rather little research can be found in providing systematic guidance and practical recommendations on such happiness-oriented policies. Drawing upon the work of Hsee and colleagues on hedonomics (Hsee, Hastie and Chen, 2008; Hsee, Xu and Tang, 2008), this paper looks into this gap by discussing how policies can be designed to promote both wellbeing and environmental sustainability. The paper argues that to achieve sustainable happiness and reduce environmental impact at the same time, policies need to distinguish between what the author calls absolute and relative wellbeing needs. While absolute wellbeing needs are desirable outcomes that are inherently evaluable and often more resistant to hedonic adaptation, relative wellbeing needs cannot be evaluated by individuals inherently but are generated through social learning, and they are likely more prone to hedonic adaptation (Hsee, Hastie and Chen, 2008). The paper recommends differential policy treatments to the two wellbeing need categories, and discusses approaches that can be used to achieve these goals. In particular, the government's role in public good provision, technological innovations, and investment to increase environmental efficiency will be studied in the case of absolute wellbeing needs. For the relative wellbeing needs, special attention will be given to various policy possibilities in influencing social norms, such as via education and green marketing. A brief comparison of the applicability in developed vs. developing countries then concludes the discussion.

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Session 3.3.C  
Policy: Industrial, energy



Theme: 3.3 Facilitating transitions drivers and barriers  
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## 1108 Germany's Energiewende: a case of successful green industrial policy?

**Pegels, Anna**

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In this paper, we address the fiercely debated challenge of Germany's energy transition ('Energiewende') and review the policy measures taken in support of moving towards a higher share of renewables in the country's energy mix. We frame the analysis by using the concept of 'green industrial policy' with its complex system of interdependent environmental, economic and social aims. We place special emphasis on solar photovoltaics (PV) and wind energy, analyse the evolution of both sectors in Germany, assess the costs and benefits associated with support policies and draw some conclusions and lessons concerning the need to reform the feed-in tariff approach and to consider broader issues of green industrial policy. We find mixed evidence that Germany reaches its green industrial policy aims at reasonable costs. Wind energy seems to perform better against all policy objectives, while the solar PV sector has come under intense pressure from international competition. However, this is only a snapshot of current performance, and a dynamic and systemic perspective may nonetheless make the support of various renewable energy sources advisable.



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## 1562 The Discount Rate: A Global Policy Error

**Gagne, Lynda G.**

How economists calculate economic growth has an enormous impact on policy decisions affecting intergenerational equity. The expected per capita economic growth (PCEG) rate is used to calculate the social discount rate (SDR) for use in cost-benefit analysis. Overstated PCEG leads to a higher SDR, undervaluing the benefits of environmental investments. Gross domestic product (GDP) series are typically used to assess growth for SDR calculations (Boardman, Moore & Vining, 2010; Evans & Sezer, 2004; Stern, 2008). However, the GDP does not reflect negative environmental externalities, the depletion of nonrenewable resources and ecosystem services, and is poorly related to welfare and its growth, given its sole focus on exchange transactions and lack of accounting for household production. Muller, Mendelsohn, and Nordhaus (2011) propose a framework to include gross external damage from pollution into national economic accounts. While that framework accounts for damage flows, it does not account for depletion of stocks of non-renewables and may omit the depletion of certain environmental services, arguably much larger issues for the determination of the appropriate growth rate.

In this paper, I argue that measures of the growth rate and SDR are systematically overstated in policy guidance for and academic and policy applications of cost-benefit analyses for environmental investments, and that even the lower proposed SDRs are too high, reflecting unfounded growth assumptions. This systematic bias reduces environmental investments and resources available for future generations, compounding the expected growth error and raising the specter of an imminent Malthusian catastrophe as the world's population continues to grow and GHG emissions remain largely unabated. I then estimate the consequences of revising the SDR's expected growth parameter on the social cost of carbon. Finally, I review policy-prescribed social discount rates currently in use in major world economies to evaluate the extent of the global policy error.

Boardman, A., Morre, M., and Vining, A. (2010). The social discount rate in Canada based on future growth in consumption. *Canadian Public Policy*, 36(3), 325-343.

Evans D., and Sezer, H. (2004). Social discount rates for six major countries. *Applied Economics Letters*, 11, 557-560.

Muller, N.Z., Mendelsohn, R., Nordhaus, W. (2011). Environmental accounting for pollution in the United States economy. *American Economic Review*, 101, 1649-1675.

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Theme: 3.3 Facilitating transitions drivers and barriers  
Session: 3.3.C Policy: Industrial, energy  
Time: T1 Room: R14

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## 1583 What if Science follows Policies? The case of advanced biofuels

**Cheze, Benoit**

Laure Patouillard: Ph.D. student at CIRAI, École Polytechnique de Montréal

This article presents the results of a literature review performed with a meta-regression analysis (MRA) that focuses on the estimates of advanced biofuel Greenhouse Gas (GHG) emissions assessed with a Life Cycle Assessment (LCA) approach. 47 LCA studies are included in the database, providing 593 estimates. Each study estimate of the database is characterized by i) technical data/characteristics, ii) author's methodological choices and iii) typology of the study under consideration.

Using statistical description, we notice that 82% of GHG emissions results from North American (NA) authors are compliant with their more restrictive GHG emissions minimum threshold whereas it is the case for only 59% from European (EU) authors. This systematic difference between NA and EU observations may come from the use of a different set of technical variables, for instance, but it may also reveal the existence of a potential publication bias in the literature.

Then, we conducted a MRA in order to identify the key factors influencing the results. Among others, we set the geographical location of authors as well as some technical data (type of technology, mass yield, etc) as explanatory variables. Results show that the geographical location of authors always has an influence on the LCA GHG emissions whatever the sample considered and that NA observations are always lower than EU ones.

Investigating more in-depth a potential bias linked with the geographical location of authors, the Funnel graphs reveal the existence of an asymmetrical publication bias of NA vs. European studies. This publication bias is then statistically tested by proposing an adaptation of the Funnel Asymmetry Test (FAT) of Stanley (2005). This test reveals a systematic publication bias of NA studies to publish results under the minimum thresholds for life cycle GHG emission savings specified by the RFS2, which is not the case for European Studies. This result is of primary importance as it highlights the influence of the design of some public policies on the very scientific research and/or publication process. Policy makers have to be aware of this potential bias when designing new policies.

Finally, we perform harmonisation after correction from those biases. Our results indicate a hierarchy between advanced biofuels. Mean value of LCA GHG emissions weighted by the influence of its main drivers and its corresponding Confidence Interval associated to BtL, G2 ethanol and G3 biofuel production are estimated to 19.5 and 60.0 gCO<sub>2</sub>eq/MJ of biofuel respectively.



Theme: 3.3 Facilitating transitions drivers and barriers  
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## 1066 Is Alberta's bitumen industry really "good for the economy"?

**Kits, Gerda J.**

One of the world's largest proven reserves of oil is located in Alberta, Canada. Much of it is in the form of bitumen, a heavy oil that is found mixed with sand, water, and other substances. Although the process of extracting and refining bitumen is energy- and technology-intensive, high oil prices in recent decades have fuelled an investment boom in the Alberta oilsands (or tarsands). Such developments have been highly controversial, both within Canada and on the international stage.

Despite all the furore, there is surprisingly little solid analysis of the economic desirability of the bitumen industry. Proponents base their arguments on economic impact assessments that model the positive effects on GDP, jobs and government revenue, while opponents detail negative environmental, social and macroeconomic impacts. Almost no analysis has been done to systematically evaluate these impacts, whether positive or negative, on the basis of any of the three socio-economic goals identified by Herman Daly (1992): efficient allocation, just distribution, and sustainable scale.

This presentation aims to draw attention to the need to more thoroughly evaluate the pros and cons of the bitumen industry from an economic perspective before continuing on the present course of development. It does this by drawing on a variety of published studies to identify concerns related to each of Daly's three goals. The study concludes that due to the lack of systematic analysis, we simply do not know whether the oilsands are "good for the economy," regardless of the positive findings of economic impact assessments that consider neither economic costs nor distributional effects nor the carrying capacity of the biosphere.

An important question remaining is why this economic analysis has not been done, despite the significant influence that the oilsands have in the Canadian economy as well as their international importance. While this paper cannot answer this question definitively, it proposes a number of possible explanations including political factors, debates about methods of analysis, and, most importantly, fundamental disagreements about social and economic goals and priorities.

Reference:

Daly, Herman E. 1992. Allocation, distribution, and scale: Towards an economics that is efficient, just, and sustainable. *Ecological Economics* 6: 185-193.



WELLBEING AND  
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ISEE CONFERENCE ICELAND 2014

Session 3.3.D

Policy: taxes, sustainability

Theme: 3.3 Facilitating transitions drivers and barriers  
Session: 3.3.D Policy: taxes, sustainability  
Time: T2 Room: R14

## 1259 Brazilian tax policy: proposing a financial mechanism to low carbon practices in São Felix do Xingu

**Mello de Queiroz, Julia**

Andreia Mello - Project Analyst at Funbio, Financial Mechanism Unit  
Manoel Serrão - Coordinator of Financial Mechanism Unit at Funbio  
Leonardo Geluda- Project Analyst at Funbio, Financial Mechanism Unit

The actual Brazilian tax policy is aimed to incentive carbon intensive activities and highly resource use, what goes in the opposite direction of what is written in the Constitution about a different tax treatment to environmental protection. In this context, the paper presents a financial mechanism to contribute to low carbon practices in the municipality of São Felix do Xingu (Pará, Brazil), proposing a tax policy to incentive a more sustainable activity.

The idea is based on a document made in partnership with CLUA, FUNBIO and The Munden Project , that suggests economic instruments to reduction of deforestation in the Brazilian Amazon region. The document proposes nine issues about how the federal, state and municipalities' governments could work together in a Forest Base Active Program (FBAP).

The present paper tries to bring the idea described by the FBAP into a territory in order to propose a financial mechanism that supports the suggested stimulus, especially with regard to tax exemptions.

São Felix do Xingu has been chosen due to its environmental, economic and social dynamics. It is the sixth largest municipality in Brazil, more than 70% of the territory is under some form of protection (protected areas and indigenous land) and it has the biggest cattle in Brazil. The municipality has a high historical deforestation level, what led its inclusion in the list of top deforestation municipalities of Brazilian Environmental Ministry.

Besides the recent progress of diminishing the deforestation level, there are still some steps forward in order to leave the list. So, the present paper aims to propose a financial mechanism based on fiscal incentives to the region to induce the adoption of best livestock practices.

First, the paper calculates the costs of implementing these best livestock practices. Then, it tries to show that the implementation of best practices increases the productivity of economics agents. It also calculates the value of existing incentives from tax exemptions. Finally, the paper develops scenarios to compare these costs and benefits.

The fundamental premise of the study is that the adoption of best livestock practices has high costs. However, the tax exemptions can act as an incentive mechanism in a scenario with high yields, because the exemptions can cover part of the costs of best practices adoption. The economics incentives are necessary to induce a behavioral change in the dynamics surrounding the environmental issue, contributing significantly to a change to a green paradigm.



Theme: 3.3 Facilitating transitions drivers and barriers  
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1375      **The role of science and the science–policy interface in transitions to sustainability. Lessons from the use of science in water resource management in South East Queensland, Australia**

**Morgan, Edward Alexander**

It is clear that humans are over-exploiting natural resources, creating substantial damage to ecological systems and the accompanying risk of their collapse. One of the barriers to living equitably within planetary boundaries is the interaction between science and policy, and science and society more widely. Science provides knowledge and understanding of planetary boundaries and resource constraints, and our understanding of these issues continues to expand, but to achieve transitions to more sustainable ways of living this understanding has to be used effectively by governments and society. However, the interface between science and policy is problematic. Increased scientific knowledge does not seem to be leading to increased policy action on sustainability. The interface is further complicated the by hollowing out of governments and moves towards multi-stakeholder governance arrangements. All of these stakeholders are utilising scientific knowledge in different ways and for different means; hence, there is not one science–policy interface to understand but many. Also, the nature of the science process, especially in salient areas of ecology and environmental science dominated by complexity and uncertainty, can complicate the use of science in policy.

The aim of this research is to better understand the use of science in water resource management (WRM), in order to improve the science–policy interface for sustainable resource management. This research uses a case study approach to analyse the use of science in attempts to create sustainable WRM in South East Queensland (SEQ), Australia. Moves towards integrated WRM in the region have led to decentralised collaborative governance arrangements in some areas (environmental water quality management) and the rise of the private sector and application of market forces in other areas (supply/demand management). Interviews with stakeholders, document analysis and triangulation with existing theory on the use of science in policy provide a detailed analysis of how and why science is used in WRM, and what roles of science are effective in what contexts. This understanding is then used to draw more general lessons about improving the science–policy interface to help with transitioning to more sustainable systems. The research suggests that science can have a number of different roles, and the most effective role of science is influenced by both these governance arrangements and the nature of the science. It argues that better understanding of the link between science and governance can help improve the science–policy interface.



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## 1408 Paying enough taxes already? Testing the Acceptability of carbon taxes with survey data

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International negotiations aim at stabilizing greenhouse gas to prevent dangerous interferences with the climate. However, increasing evidence shows that current efforts are not enough. For instance, powerful instruments such as carbon taxes are barely implemented. A large strand of literature addresses this issue by looking at lobbying. Instead, we exploit the Swiss semi-direct democratic context to identify barriers and drivers of climate policy's public acceptability. We formulate hypotheses on the acceptability of carbon taxes focusing on private costs and benefits, social norms (trust in other people and the government), moral motivations, behavioral effects, perceived effectiveness and inequality aversion, and then test their validity with a sample of 300 adults surveyed in the Canton of Geneva. Questionnaires differ in the policy label, i.e. "carbon tax" vs. "climate contribution".

Several factors make the Swiss context interesting. Switzerland lobbies beside the EU for ambitious targets in the post-Kyoto era. However, its policy can be challenged by the population, possibly creating a gap between government's targets and implemented policies. For instance, following the rejection of three energy-tax proposals, Switzerland decided to rely on voluntary agreements and only in the late 2000s introduced a carbon tax, covering only heating fuels. Since current targets are already not achieved, increasing them would probably imply extending the carbon tax to all fuels. This opportunity may come soon, since a pending popular initiative seeking to replace the VAT by an energy tax will reopen the debate on climate policy. Furthermore, Switzerland decided to exit nuclear energy after Fukushima. Since it represents 40% of electricity, the room for maneuver for replacing it without increasing carbon emissions looks limited, suggesting drastic reductions in consumption. Higher prices are then expected from tighter climate policy and electricity. Consequences on poor and rural households represent a public concern, calling for social cushioning. Carbon taxes and relative revenues represent an attractive option for the government, but resistance needs to be successfully addressed.

This paper aims to determine which policy features impact acceptability, besides socio-demographic characteristics. Indeed policymakers can design effective and acceptable policies but hardly modify the population composition. According to our findings, policy design (including labeling) can be very relevant for acceptability, as well as perceived effectiveness and awareness of co-benefits, whereas competitiveness does not represent a concern. Hence, the transition towards sustainability seems politically feasible, provided that policymakers communicate how policies work and how revenues are used. Indeed acceptability is increased when revenues are earmarked, with the preferred recycling ways being through environmental projects or social measures compensating poor households. Therefore, individuals may be generally willing to accept reductions in consumption in exchange of improved global well-being, but more efforts may be necessary to have both policy and policymakers trusted.



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Policy: municipal



Theme: 3.3 Facilitating transitions drivers and barriers  
Session: 3.3.E Policy: municipal  
Time: F1 Room: R14

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## 1503 Facilitating a transition in community infrastructure governance

**Roelich, Katy**

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Infrastructure represents a crucial interface between social and ecological systems influencing the level and composition of society's resource demand and the institutional and social organisation of society. Despite this, it is rarely addressed in most analyses of socio-ecological systems. A socio-metabolic transformation is unlikely to occur without a radical transformation of the infrastructure systems that underpin our systems of production and consumption. Therefore, in this paper we focus on the facilitation of infrastructure transitions as a condition for a wider sustainability transition.

We argue that a resource-efficient relation between consumers and infrastructure providers is an essential precursor of robust socio-ecological systems; a condition which is clearly absent when infrastructure is operated by large, international firms. There has been a great deal of work of the role of rural communities in governing natural resources, but less on community governance of infrastructure, a clear research gap. In this paper we build on the work of Ostrom and colleagues and explore the benefits of community infrastructure governance for society (including the infrastructure users) and ecological systems (including preservation of energy resources). Using the UK as a case study we analyse the barriers to a more prominent role for communities in infrastructure provision and management. We find that there is a series of institutional barriers which limit the potential of community management to contribute to an infrastructure transition. We conclude with a discussion of actions and policies that might enable communities to overcome these barriers and facilitate the scaling up of community infrastructure governance.



Theme: 3.3 Facilitating transitions drivers and barriers  
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1641 Barriers to ESV Use: A Study of Municipal and Regional  
Decisions Making in the U.S.

**Winslow, Maggie**



Theme: 3.3 Facilitating transitions drivers and barriers  
Session: 3.3.E Policy: municipal  
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## 1678 Linking multi-scale adaptive capacity to sustainability transitions of urban water systems

**Bettini, Yvette**

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Transitions research has provided a perspective on sustainability problems which offers applied techniques for their solutions. Building extensively on historical cases, transitions theory has progressed rapidly into a active scholarship of system change and governance for sustainability. However, there is a limited empirical harvesting from on-going cases of transitions. With persistent problems luring society away from a just, inclusive and sustainable future, there is a need to identify and examine transitions-in-progress; in order to generate applied insights for governance, and to understand how the creative capital of society can be tapped to steer clear of unsustainable lock-ins. With this in mind, we bring together the scholarships of transition management (Loorbach 2010; Frantzeskaki et al 2013) resilience (Holling and Gunderson, 2001) and institutional theory (Scott, 2008; Lawrence and Suddaby, 2006) to examine how incremental instances of adaptation—utilizing adaptive capacity—can be better linked at multiple governance levels. We address the following research question; how can we diagnose the potential for transitions of social-ecological systems, without relying on historically informed patterns of change?

We propose a conceptual model of socio-ecological systems capable of diagnosing the potential for multi-scale and inter-scale adaptations, by recognizing the system's adaptive capacity. The starting proposition is that this capacity consists of the dynamic between the institutional-bound conditions and agency-dominated behaviours of the system (Bettini et al, forthcoming). The conceptual model specifically relates the four transition governance levels (tactical, operational, strategic and reflexive) to different forms of adaptive capacity over four system trajectories: locked-in, crisis, reorganizing and stabilizing.

The conceptualization is supported with multiple case studies of urban water system transitions: Brisbane for the reorganizing trajectory, Ghana for the crisis trajectory, Perth and Jakarta for the locked-in trajectory, Rotterdam and Adelaide for the stabilizing trajectory. For each case study, extensive desktop research in combination with in-person interviews with key change agents, institutional entrepreneurs and institutional stakeholders have been conducted. The paper builds on a large empirical basis combining conceptual and empirical work on urban water transitions over the past 8 years.

This paper proposes a solution to the question of how an on-going transition can be studied, by identifying the dynamics within a progressing transition process. This allows the case to be positioned within the broader suite of transitions theories and frameworks, thus connecting it to the scholarly legacy, while maintaining focusing on the practices and processes being observed. This provides the ability to identify the agency beneath a transition and link these activities to



broader transition processes.



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## 1504 Is nudging unethical?

**Hukkinen, Janne I.**

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Nudging, or the design of policies aiming at unconscious cognitive reinforcement of specific behaviors by individuals and groups, divides the ecological economics and environmental policy communities. Our superficial observation from recent scientific conferences of these communities is that the disagreements usually boil down to consideration of ethics. Nudging in environmental policy is either seen as manipulative, propagandist, a violation of the free will and therefore unethical; or it is considered a necessary component of contemporary environmental policies struggling to facilitate significant behavioral sustainability transitions. In this paper we outline an informed answer to the question: Is nudging unethical in environmental policy?

We begin by outlining the theoretical background of nudging with reliance on theories of embodied cognition, cognitive linguistics, social psychology, practice theory and behavioral economics. We find considerable multidisciplinary support for the notion of a double view of cognition: the human mind operates both consciously, intentionally and slowly (accommodating conventional policy instruments), and unconsciously, unintentionally and rapidly (accommodating nudging). We also lay out a framework for conducting an evaluation of the ethics of nudging. We move on to display some of the existing nudging policies. Our conception of nudging is not restricted to behavioral economics but is broader, incorporating a wide range of textual, visual and material redesigns with which individual and group behaviors are influenced without the subjects being aware the influence. We then compare nudging with the environmental policy instruments used widely today, including command and control, economic instruments, agreements and information-based instruments. Finally, we conduct a preliminary assessment of the ethics of nudging.

Our preliminary conclusions point toward a necessity to take nudging seriously in environmental policy. Nudging takes place all the time, regardless of human design, because it is an evolutionary cognitive adaptation mechanism. Environmental policies based on nudging raise difficult ethical questions that will not be answered with the seriousness they deserve by simply neglecting nudging. Consideration of nudging should be incorporated in the design of a broad range of textual, visual and material environments, making it an integral component of sustainability transitions.



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Session 3.3.F  
Policy: Water, coastal



Theme: 3.3 Facilitating transitions drivers and barriers  
Session: 3.3.F Policy: Water, coastal  
Time: F2 Room: R14

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## 1739 The functional approach – an answer to conceptual flaws of the European Water Framework Directive

**Klauer, Bernd**

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The European Water Framework Directive (WFD) is a benchmark in water legislation worldwide. It can be seen as a successful operationalization of an Integrated Water Resources Management (IWRM) and sets ambitious environmental objectives. It particularly demands a 'good ecological status' for surface water bodies. The 'good ecological status' is conceptualized as an only slight derivation from an assemblage of species that can be found in pristine waters.

Nevertheless, the implementation of the WFD suffers from directive's conceptual flaws. As a matter of fact Germany and other European Member States are far from achieving the 'good ecological status'. One higher reason for this is that these countries have cultural landscapes. Water bodies have been consciously changed and adapted to human usage for centuries. Flood protection, land reclamation, urbanization etc. have lead to changes in hydro-morphology and water ecology. More specifically besides scarcity of financial resources and deficient acceptance of measures the main reason for failing the good water status is that the effects of management measures on the assemblage of aquatic species are typically unclear or turn up only in the middle and long run. Consequently neither modeling nor monitoring provide a reliable basis for the assessment of measures in many cases.

The WFD takes care of human interests to use and modify waters by allowing exemptions from the goal of a good water status under certain conditions (Art. 4.3, 4.4, 4.5, 4.7 WFD). However, the excessive use of these exemptions bears the risk of diluting the core objectives of the WFD. What is needed is a concept that guides (i) the identification, selection and implementation of water management measures and (ii) the application of exemptions and particularly the definition of the 'highest possible ecological status' (Art. 4.5).

Here, we propose a functional approach to water management. The idea is to assess the functionality of an ecosystem in consideration of use interests on the one hand and the requirements of near natural conditions on the other hand. For this, main functions (e.g. biomass production, discharge, self-purification) have to be identified and parameterized and criteria for a well-functioning have to be defined. Hence, they (i) could serve as intermediate objectives for selecting measures and (ii) might guide the definition of the 'highest possible ecological status'. In this presentation a conceptual approach to assess the functionality of aquatic ecosystems and its usability in the implementation process of the WFD will be presented.



Theme: 3.3 Facilitating transitions drivers and barriers  
Session: 3.3.F Policy: Water, coastal  
Time: F2 Room: R14

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## 1783 Territorial governance in coastal zones: an institutional multiscale approach

**Vinha, Valéria**

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FOR SPECIAL SESSION: "POLICYMIXES" TO CONSERVE BIODIVERSITY IN PRODUCTIVE LANDSCAPES IN BRAZIL 'S ATLANTIC AND AMAZON FORESTS

The coastal zone represents about 20% of the earth's surface and hosts about 50% of the global population. Approximately 70% of the cities greater than 8 million people are located in the coastal zone. This intense occupation is explained by the fact that the coast zone concentrates ecosystem and economic functions, maintains reproductive habitats and migratory routes, as well as genetic diversity. This diversity of functions produces a variety of human and socio-economic interrelations, generating conflicts associated with access, forms of resource use and competencies. As a result, the institutions active in coastal zone management act in multiple scales. The role of governance of coastal territories and their coordination mechanisms can be understood as "the interactions among structures, processes and traditions that determine how power is exercised, how decisions are taken, and how citizens or other stakeholders have their say" (Graham, 2003). That is, governance involves power, relationships and accountability: who has influence, who decides, and how decision makers are made responsible. Governance can be seen as an end in itself, as a process that can be realized by any number of actors and is distinct from government institutions. To ensure governance between different actors and levels of government, multiscale and sustainable territorial approaches in directives and practices of institutions and organizations that act in the coastal zone should be adopted. This approach presupposes that the multiscale formats and institutional dynamics should contemplate the following attributes: articulation, integration, resilience (adaptive management) and social empowerment. This paper seeks to systematize the literature on governance and socio-ecological systems in the coastal zone, the alternative strategies for management of natural resources and multiple use territories. It will then apply variables encountered in the analysis of institutions and organizations that are active in the region of Itaguaí, in the state of Rio de Janeiro, selected due to its petrochemical plants, nuclear power stations and ports, as well as traditional fishing communities. Special emphasis will be given to the resilience variable, in view of its inherent multi-scale communication attribute, in the identification of norms and rules that facilitate communication and interaction among different actors, institutions and organizations, so as to identify multiscale connections and their influence on resource sustainability.



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Session 3.3.G1  
Innovation Entrepreneurship I



Theme: 3.3 Facilitating transitions drivers and barriers  
Session: 3.3.G1 Innovation Entrepreneurship I  
Time: W1 Room: R15

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## 1091 Determinants of eco-innovation from a European-wide perspective – an analysis based on the Community Innovation Survey (CIS)

**Horbach, Jens**

Eco-innovations lead to less environmental impacts or to a reduction of energy use and are therefore crucial for climate protection. They help to remedy negative external environmental effects of economic activities. In many cases, these negative external effects have to be internalized by regulation measures so that the corresponding eco-innovation activities are not realized because of market opportunities. On the other side, especially young and dynamic eco-innovation fields such as the development of renewable energies are also economically benign because these eco-innovations may lead to cost-savings. Recently, the determinants of eco-innovation activities have been widely explored for single countries but there is still a lack of country comparisons mainly because of data restrictions.

In 2009, a special module on eco-innovation has been included in the Community Innovation Survey (CIS) allowing a comparison of the determinants of eco-innovation in 19 different European countries. Firstly, our analysis shows the specialization of these countries with respect to nine different eco-innovation fields. In a second step, the determinants of these different eco-innovation activities in the involved countries are analyzed using adequate econometric methods. Do different policy styles are important, which influence does the sector structure play, how important is the availability of information sources for eco-innovation, do different development levels affect eco-innovation activities?

Our analysis especially focuses on Eastern European transformation countries because the determinants of eco-innovation in these countries have not yet been systematically analyzed. Some first and interesting results show that especially Hungary and the Czech Republic seem to use the chances of eco-innovation. Hungary specializes in eco-innovation activities within firms to reduce energy use and in replacing materials with hazardous substances. The Czech Republic seems to specialize in recycling activities. The Baltic countries, Bulgaria and Romania are still much less eco-innovative compared to the European average. For all considered East-European countries cooperation activities and subsidies seem to be more important compared to the European average. Furthermore, eco-innovations in Eastern European countries are much more regulation-driven compared to the European average whereas except Hungary, market demand plays a less important role.

The detailed analysis of eco-innovation determinants by countries and different eco-innovation fields can be used to derive country-specific policy recommendations aiming at the improvement of the eco-innovation performance in the respective countries.



Theme: 3.3 Facilitating transitions drivers and barriers  
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Time: W1 Room: R15

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## 1199 Sustainability-driven Entrepreneurship as a contributor to socio-economic transitions to sustainability

**Scharbert, Annika**

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Socio-ecological transitions require changes in the business sector. Economists tend to focus on regulatory options for greener and fairer business environments, while firms are expected to exhibit profit-maximizing behaviour. In recent years, an increasing number of enterprises were started with sustainability as their primary goal. These sustainability-driven enterprises (SuEs) still need to survive economically, yet profit becomes a means for achieving sustainability rather than an end in itself. As such, SuEs integrate economic, social and environmental dimensions of conducting business. This includes their holistic ethical motives (Dunham, 2010); acting as agents for sustainability education (Rodgers, 2010); reasoning processes within organisational design (Parrish, 2010); and the role of social contexts (Clifford and Dixon, 2006). As a result, sustainability can be said not only to take shape in products and services and in organizational forms, but also in business models, culture and networks SuEs embody.

So far, SuEs have established themselves only within niches. However, SuEs do not act in isolation. For a move beyond the niche, structures need to actively support the creation of all dimensions of wealth and wellbeing. Enabling conditions include the creation of 'value articulating institutions' for sustainability (Jacobs, 1997; Vatn, 2009) and acknowledgment of diverse knowledge for greening the economy (Seyfang and Smith, 2007). From a theoretical perspective, we are interested in understanding the co-evolutionary mechanisms of translations between niches and the regime (Smith, 2007). Based on 15 company cases, plus supplementary data collected in 2 educational institutions and 5 regulatory institutions, our project analyzes the diffusion of sustainability-driven entrepreneurship from a multi-level perspective in the Vienna-Bratislava region. Our research includes the investigation of firm practices as well as an exploration of the supporting institutional scenery to enable a better understanding of challenges and success factors of SuEs and their diffusion into the regional economy.

The paper addresses the following:

- How can sustainability-driven entrepreneurs and their networks contribute to socio-economic transitions to sustainability?
- Which structural factors are currently hindering successful sustainability-driven entrepreneurs from widening their influence in the Vienna-Bratislava region?
- Which measures could support sustainability-driven entrepreneurs and therefore enhance the mainstreaming of sustainable products and services in the Vienna-Bratislava region?



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## 1272 Evaluating the contribution of innovation networks to resilient farming systems

**von Muenchhausen, Susanne**

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Agricultural innovation networks can play a major role in enhancing a productive cooperation between farmers, processors, scientists and other stakeholders in the food producing sector. A close cooperation within the sector is seen as a precondition for the development and uptake of more efficient processes and technologies which are needed for securing the expected increase in production and consumption within planetary boundaries. Innovation networks already exist. Supported by innovation policy schemes in the upcoming funding period 2014-2020 of the European Commission, new networks will emerge and the existing networks are expected to become stronger and work more effectively.

Eberswalde University has been involved in an innovation network for organic farming and processing in the Federal State of Brandenburg and the city of Berlin in the north-eastern part of Germany. During the last decade, the network enabled several cross-disciplinary study and research projects. Organic farmers, small and medium-sized organic food processors and trade businesses, research institutes, advisory services as well as governmental and non-governmental organisations contributed to the development of this network. The projects that are jointly implemented focus on strategy development and practical problem solving for organic food value chains.

In this paper we are asking how the effectiveness of the innovation network and its contribution to the resilience of the organic farming and food sector in the Berlin-Brandenburg region can be evaluated.

The applied methodological approach focuses on the ability of a socio-ecological system to cope with changing or threatening conditions. Central in the assessment is the adaptive capacity of individuals, groups (e.g. cooperations, societies) and organisations such as businesses or initiatives. Key criteria in the assessment are: the ability for "self-organisation", the "capacity to support and accept changing framework conditions", the "learning capacity", the ability to "make connections", to jointly agree and effectively move toward "specific goals", to maintain a "hopeful outlook" and to take "care of own interests" while "respecting" those of others. These criteria are operationalized through parameters.

The empirical data for the paper are obtained from interviews with key actors in the network and the results of a series of multi-stakeholder workshops as well as the outcome from research projects related to the network. Based on this, the organic farming and food network has been tested systematically for resilience. Results show the strengths resulting from the criteria "making connections" and "helpful outlook" while weaknesses relate mainly to the "capacity to accept changing framework conditions".



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Innovation Entrepreneurship II

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## 1368 The role of paradigm shifts in systemic innovation: ecological economics as a high leverage point in transition management

**Göpel, Maja**

Ecological Economics has been instrumental in highlighting the shortcomings of traditional economics in a systematic way. In this function it plays an important role in arguing for sustainable development pathways and in defending integrative, longer-term cost-benefit calculations in policy-making. The main criticism at the time seems to be that it has not developed a comprehensive macroeconomic theory or model. But the system description or model of traditional economics amounts to no more than a "stark utopia of a market society" (Polanyi).

So this paper argues that just as traditional economics has always been work in progress to match reality with theory, ecological economics can also provide guidance towards concrete solutions. It does so by embedding it in transition or transformation frameworks that acknowledge the role of mindsets or paradigms in their approach to systemic innovation.

Building on some of Karl Polanyi's insights on The Great Transformation it embeds Antonio Gramsci's historical materialist concept of hegemony into sustainability transition management approaches, namely the Multi-Level-Perspective (Frank Geels) on system transformation.

This combination acknowledges the structural power of worldviews and expert knowledge when conceptualizing regime changes as socio-technical transitions. Tying the resulting framework back to Donella Meadows's seminal work on leverage points one can identify the crucial role that ecological economics as a paradigm and narrative (even if more fuzzy than traditional economics) can play: it is repurposing what economies are supposed to deliver on and can therefore serve as a reference framework for multiple pioneer activities with the potential to drive systemic governance innovations. The example of the "common-good business network" (Gemeinwohlökonomie) in German-speaking European countries will be drawn on to show how this strategy is unfolding in a practical experiment.

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## 1386 The role of energy cooperatives and behavioural change in sustainability transition of rural areas

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In Germany, the renewable energy act (EEG) allowed for investing in renewable energy projects with high investment security and limited bureaucracy. While the largest share of renewable energy capacities is owned by private persons and farmers organised in limited liability companies (GmbH), projects realised in energy cooperatives have become more important in recent years. In Germany and Denmark, two of the most progressing countries in the development of renewable energies, over half the renewable energy generation is community owned with co-operatives playing a significant role in enabling citizen participation.

In our paper, we present the results from a case study in Northern Bavaria (Germany) where we investigate the role of energy cooperatives in the German energy transition and in which way their organisational structure could be beneficial for participation, the motivation of people and for behavioural change.

The theoretical background of the study is the transition management (TM) concept, which assumes, that while societal transitions are long-term and very complex, they can be steered to some extent by supporting policy measures. A key component of TM is to scrutinise the dynamics of niche actors within the dominant structures, cultures and practices (called "regimes"), which will be taken up in the study. We enriched the TM by other theoretical approaches like practice theory and diffusion of innovations theory (DOI) in order to highlight the role of agents and the behavioural component in sustainability transitions.

The study consists of three major components:

- 1) To examine how energy cooperatives are embedded in rural actors networks and which effect they have on rural development and transition towards more sustainable energy production.
- 2) To specify the key characteristics (strengths/weaknesses) and governance structures (objectives, decision taking, participation) of energy cooperatives based on practical experiences made in Northern Bavaria.
- 3) To unveil the inner drivers of people engaged in the networks promoting rural transition and of those participating in energy cooperatives, also to find out to which extent such engagement leads to further sustainable action in other fields such as transport/mobility, food consumption, etc.

Based on a literature analysis and the case study, which included on-site visits, interviews with change agents and regional actors as well as a questionnaire to over 100 members in energy cooperatives for data collection, recommendations for policy makers will be derived, how beneficial governance frameworks can be established to foster transition to more sustainable energy production and behavioural change in rural areas.

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## 1363 Composting: the solution to closing cycles and improving soil quality in the transition towards a bio-economy?

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Europe is strongly encouraging the development of a bio-economy, which produces renewable biological resources and converts them into valuable products ranging from food to bioenergy. To maximize the efficient exploitation of the available biomass, the biomass-cascade principle is often put forward. This entails organizing the processing of biomass to first produce the application with the highest socio-economic value (food and feed) with usable by-products that can cascade down as feedstock for other applications (bio-based products and bio-energy).

With the bio-economy expected to grow exponentially, the demand for biomass will significantly increase. This, given the limited land availability, implies that higher agricultural yields will have to be pursued. Furthermore, crop residues that now remain on the field, will increasingly be removed to be used as a feedstock in the biomass-cascade, reducing organic matter and nutrients in the soil. This removal leads to reduced soil quality and fertility, which is incompatible with the need for higher yields. Remedying this decreased soil quality with more fertilizers is a suboptimal solution, as they are produced with finite resources and require a high energy input, which does not match the sustainable vision of the bio-economy. Therefore, sustainably maintaining soil quality and fertility is an important, yet underexposed, challenge in the transition towards the bio-economy.

Compost has the potential to be a sustainable soil improver in agriculture within the bio-economy. This because the composting process can be integrated into the biomass-cascade principle, as it uses biomass that has no or no further application. Moreover, nutrient and material cycles are being closed. Also, it has a sustainable, low impact production process which requires little energy input. Furthermore, compost provides nutrients and improves organic matter content. However, despite the well-established beneficial aspects of compost on soil quality and fertility, it is currently not often used in agriculture. Therefore, the aim of this paper is to uncover what the inducing, and more importantly, the hindering mechanisms are for compost-use in agriculture. To identify these mechanism, we combined elements from the Sociotechnical Systems approach and the Technological Innovation Systems approach to analyze a combination of quantitative and qualitative data that was gathered in Flanders (Northern Belgium) using a mixed-methods approach. Furthermore, we analyzed the economic feasibility of three promising production methods for agricultural grade compost. Based on these outcomes the general feasibility of compost applied in agriculture within the bio-economy is discussed and a number of (policy) recommendations are formulated.



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Agents of change: Social movements

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## 1008 Interest, désintéressement or indifference? Problems with participation in public consultation concerning Plans of Conservation Tasks for Natura 2000 areas in Wielkopolska Province (Poland).

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### Background

The importance of communities and stakeholders engagement in biodiversity protection is widely acknowledged (O'Riordan and Steel-Kleemann 2002). Studies on co-management (Berkes 2009), public participation (Beierle and Cayford 2002), citizens science (Cooper et al. 2007), indigenous knowledge (Gadgil et al. 1993) show both potentials of the engagement and shortcomings (Niemelä et al. 2005). Studies on implementation of Natura 2000, the European network for biodiversity protection, show conflicts and difficulties related to establishment and management of protection areas (Grodzińska-Jurczak, Cent 2010; Hiedanpää 2002; Young et al. 2005) based on eg. (a) perceived negative impact of protected areas on economic development; (b) the centralized character of the management; (c) vaguely defined participation requirements; (d) weak history and experience of participatory governance; (e) undefined responsibility for the resources management, (f) poorly defined property rights; (g) lack of financial compensation system. Public participation is regarded as a method to resolve difficulties with biodiversity protection.

### Objectives

The purpose of the research is to identify reasons for weak participation of stakeholders in public consultations meetings concerning implementation of Plans of Conservation Tasks for Natura 2000 sites in Wielkopolska Province (Poland). The consultations are required by regulations and organized by the administration. To the frustration of the organizers they meet little interest and engagement of local stakeholders and inhabitants. In the research, it is investigated why public involvement is poor and whether this can lead to problems in biodiversity protection management.

### Methods and expected data

The research is qualitative and based on several methods of data collection. Firstly, participatory observation was used to picture actual participation and conduct of meetings. Secondly, content analysis of meetings records was done which provided general overview about level of participation. Thirdly, interviews with representatives of stakeholders invited but not attending were carried in order to determine the reasons for nonattendance. Fourthly, in-depth interviews with representatives of environment protection administration, and other experts were carried in order to identify the undertaken participation procedure, the assumptions, the expected outcomes.

### Conclusions



The research results show several explanations of the weak performance of the consultations. (1) Time pressure, in terms of preparing and conducting the consultations undermines their effectiveness. (2) Low density of stakeholders in rural areas where Natura 2000 sites are usually located makes the procedure hollow. (3) Lack of resources) reduce many stakeholders willingness to participate. (4) Lack of experience with participation and lack agency sense among stakeholders refrain them from participating.



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## 1167 Norms, ethics and climate policy. The case of Klimavalg2013, a Social movement in Norway.

**Rapp Nilsen, Heidi**

Manmade environmental problems are mounting, first and foremost through the seriousness of climate change. International attempts have not succeeded in remedying this overall negative development, leaving an even heavier responsibility on countries, firms and people to address these challenges in a proactive manner. This paper addresses a social movement in Norway named 'Klimavalg2013' ([www.klimavalg2013.no](http://www.klimavalg2013.no)), translated to 'Climate Election 2013', where 100 organizations joined together and formed 6 political demands on how to mitigate climate change. The demands were communicated to political parties as well as to the public before the election in September 2013 for the Norwegian Parliament.

The aim of the study is to analyse the values, norms and corresponding ethical theories which unite such different organizations as labor unions, major and minor religious communities, environmental organizations, society for artists, researchers, bicyclists, architects and so on. The organizations core values are categorized, as far as possible, into teleological ethics, deontological ethics and non-anthropocentric theories (DesJardins, 2006), and we search for what within these theories unite the organizations in 'Climate Election 2013'.

The political demands of 'Climate Election 2013' can be summarized into cutting more and faster in inland greenhouse gases. This is in many respects in contrast to the ruling Norwegian climate policy which is based on choosing the most cost-effective instrument, and thereby maximizing utility. John S. Mill and John M. Keynes both argued utilitarianism was a transitional phase until the state of abundance is reached (Nelson, 2006). This paper discuss whether part of the common platform of 'Climate Election 2013' is that the state of abundance is reached in Norway, and that the transitional phase of maximizing utility must end.

We also discuss if the organizations are united through the less demanding existence of an overlapping consensus (Rawls & Kelly, 2001), although with several restrictions on Rawls' criteria as the time span of a consensus. Either way, the broad social movement 'Climate Election 2013' represents a break with the current Norwegian climate policy. The conclusion of this study will show how radical and deep the breach is.

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## 1429 Looking for Change Agents: A Precondition for Strong Sustainable Consumption Governance

**Wilén, Kristoffer**

### Background and objectives

This paper draws and builds on the work by Lorek & Fuchs (2005; 2013) by taking a step back: to look at weak and strong sustainable consumption governance from the perspective of actors/individuals/change-agents (Note, not "consumers") who function on all levels in society. These are individuals who, in one way or another, are pushing for a weak or a strong form of sustainable consumption governance. The aim of the paper is to distinguish between weak and strong sustainable consumption mindsets and behaviours. We are using "mindset", in lack of a better word and umbrella term, for referring to such things as: worldview, values, beliefs, ideology, identity, self – all those things that matter and that come before behaviour (Crompton & Kasser, 2009).

### Method

This is both a theory and data driven paper. I use the existing literature on strong and weak sustainable consumption governance and my own empirical material consisting of interviews with 22 environmentally conscious persons for drawing the (cultural) distinctions between the weak and the strong version.

### Main results

- 1) The weak version mainly revolves around green consumerism and stems from a consumerist mindset where sustainable consumption practices merely function as means for buying a green identity and social status, and where environmental and social problems can be addressed through acting in the role as consumers by buying green products. Positive environmental and societal effects are a nice plus. Environmental problems and the solutions to them are technical, private/personal/individual (as consumers). Not only fails to create the political space needed for strong sustainable consumption governance, but effectively takes it away.
- 2) The strong version, on the other hand, sees the aggregate level of consumption as the overarching problem and tries to minimize consumption, while also placing more weight on acting democratically as citizens for achieving sustainability. Obtaining a "green identity" is nice plus. Environmental problems and the solutions to them are structural and collective (as citizens). It thus aims at creating the political space needed for improving the possibilities for stronger and socially equitable sustainable consumption governance.

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## 969 Survival strategies of eco-social enterprises

**Johanisova, Nadia**

The aim of this paper will be a discussion of the survival strategies of eco-social enterprises in conditions of economic globalisation. While mainstream enterprises such as share companies focus on profit and growth, eco-social enterprises have a different operation strategy: they opt for a tripple-bottom line and often remain small by choice (1,2). This gives them an obvious disadvantage in a competetitive market. How then do they survive and -in -many cases - thrive? This paper will suggest some answers to this question based on field research in the United Kingdom and the Czech Republic. Respondents from seventy-one social enterprises (including many with a green remit) in both countries were interviewed in 2002 - 2003 and questioned on their operation, structure, goals and financial and other survival strategies. The strategies were then grouped into fifteen categories including: direct selling and adding value, marketing and buying groups, share-issue, internal cross-subsidies, voluntary work/sweat equity, subsidised rent and ethical landlords, etc (2). These categories will be conceptualised in terms of non-market capitals as presented in Johanisova et al. (3) and their implications for policies in support of economic localisation will be discussed.

(1) Vickers, I., Lyon, F. (2013): Beyond Green Niches? Growth Strategies of Environmentally-motivated Social Enterprises, in: Third Sector Research Centre: Seminar Two :Social Enterprise and Environmental Sustainability, 16 April 2013, ESC TSCR Seminar Research Series, TSCR, Birmingham, U.K., pp.10-13.

(2) Johanisova, N. (2005): Living in the Cracks: A Look at Rural Social Enterprises in Britain and the Czech Republic. Feasta, NEF, Dublin, also available at:  
[http://www.feasta.org/documents/living\\_in\\_the\\_cracks/](http://www.feasta.org/documents/living_in_the_cracks/)(accessed 1 July 2014).

(3) Johanisova, N., Crabtree T., Fra?ková E. (2013): Social Enterprises and  
Non-Market Capitals: a Path to Degrowth? Journal of Cleaner Production, Vol.  
38, No. 1, pp. 7-16

The paper is submitted to the proposed Economic Localisation and Alternative Economic Practices Session



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Session 3.3.I1

Agents of change: Public, Grassroots I



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## 1482 Success factors of grassroots movements for sustainability

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Grassroots organizations as a form of civil society movements may play a crucial role in sustainability transitions toward a global economic order that respects our ecological boundaries. They are in a unique position to beneficially influence consumers' consumption patterns through peer-to-peer education, awareness-raising, empowerment, and due to their power to develop cutting-edge social practices. Hence, they are integral actors supporting the transition toward more environmentally benign consumption patterns. They pursue a variety of goals that are mutually reinforcing, including a shift toward the purchase of more sustainable products, an absolute decrease in levels of consumption (e.g. the voluntary simplicity movement) and increase in product usage (e.g. through encouraging sharing initiatives), and encouraging participation in more comprehensive city- and regional-level projects such as Transition Towns. Despite their similarities regarding the overall goal (shift peoples' lives towards sustainability) they differ dramatically in their accomplishments in engendering change and often struggle to keep their organizations relevant and their members engaged.

The purpose of this study is (i) to know why individuals become a first mover and (co)-found a grassroots initiative, (ii) to identify success factors as well as barriers that lead/constrain grassroots actors to effectively support individuals' sustainable consumption decisions, and (iii) to analyze the relative importance of these factors in different thematic and institutional contexts.

For this purpose we reviewed theories stemming from psychology, sociology, behavioral economics and organizational management. The review indicates that organizational capacity and infrastructure, framing abilities and political relevance, and the provision of psychological and social payoffs to members ("warm glow" effect) among others are of particular importance in predicting organizational success. However, the literature review also revealed the disjointedness of current research efforts in more broadly defined sustainable consumption initiatives and the disproportionate categorization that warrants further interdisciplinary meta-analysis. Based on the findings, our second step will be to analyze three initiatives that differ in size as well as in particular objective (Carrot Mobs – utilizing consumer power to encourage sustainable business behavior, Food Sharing initiatives – tackling food waste through facilitating the exchange of groceries, and second-hand clothing swaps – inducing consumers to rethink recycling in a more stylish context) and determine which success factors are most relevant to their specific context. This will be done in Winter 2013/2014 through in-person interviews with the leaders of the respective movements.



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## 1518 Agendas for Transition: Attitudes, Values and Roles of People, Business and Government

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We live in times marked by change and uncertainty, where societal and individual wellbeing are increasingly dependent on a fragile equilibrium that should secure sustainable economies. As Europe seeks its way out of the latest financial and economic crisis, we ask representatives of the general population, business and local government in Portugal: "what future do we want" and what should be the role of the economy, of government and business in delivering it? We seek to answer these questions by exploring the attitudes and values of the three groups of key actors towards what might be called the "Agendas for Transition", arising from overlapping discourses of sustainable and green growth that propose elements for a new economic model, largely in response to the crisis. The paper is based on research carried out between 2012 and 2013 in Portugal. It begins by outlining a definition of such "Agendas for Transition", based on the critical review of proposals in more than twenty prospective documents produced since 2008 by international entities, the EC, and national think tanks. The resulting Agendas include three main directions: economic growth including green investment, green economies and new economic welfare models. Second, the paper draws on elements of the Agendas to define questionnaires for the three groups of key actors intended to elicit their preferences and their degree of acceptance to the Agendas' proposals. Third, it compares responses by the three groups surveyed along three lines of inquiry: 1) exploring the level of support for the three different possible directions of the "Agendas for Transition" and their modes of government, 2) seeking to identify patterns and specific profiles based on Ronald Inglehart's distinction between materialistic and post-materialistic values, and 3) seeking to identify similarities and differences with transition management literature. Fourth, the paper concludes with a discussion in two parts: 1) reflections on the potential role of each of the three groups in facilitating transition, the existing and potential drivers for change, as well as the barriers that arise from the surveys and analysis; and 2) a more general reflection on the strength and weakness of existing proposals for transition, both in policy documents and in the theory of transition management.



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## 1735 Should environmentalists be concerned about materialism?

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Western societies have grown increasingly materialistic in the last four decades, and there are also signs of similar trends in other parts of the world. A growing body of research suggests that materialistic values are negatively related to caring for the environment and performing pro-environmental behaviors. Taken together, these circumstances indicate that the continuing fostering of materialistic values could undermine efforts aimed at moving society in a more sustainable direction. But before any firm conclusions can be drawn we need to confirm the relationship between materialism and the environment using more reliable environmental measures.

In this study we analyze the relationship between materialism and individuals greenhouse gas emissions, and put this in relation to different pro-environmental attitudes and everyday environmental behaviors using a sample of 1000 Swedish respondents. Preliminary results suggest that materialism is related to larger GHG emissions, primarily caused by increased long distance air-travels. We find no robust difference in materialist's concern for a range of environmentally relevant attitudes and behaviors, except for a weak negative relationship between materialism and household energy savings. The findings are discussed in the light of recent theoretical development within environmental psychology and sustainable consumption literature.



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1754 Action research for sustainability: Using modified World Café and systems analysis to increase sustainability and social equity within a community's food system

**Kristinsdóttir, Sigrún María**

Transdisciplinary action research can be used to create and test a public participatory process that connects scientific knowledge with community action. This presentation outlines the use of transdisciplinary action research in developing and testing the public participatory Convergence Process, whose aim is to stimulate both local and global sustainability and social equity within three case study communities. Systems thinking was applied to modified World Café public participatory workshops in Iceland, Bristol City, UK and Tamil Nadu, India in the years 2010 to 2012. During these, a group of pre-identified local stakeholders in the communities were taught to map and analyze their local food system with causal loop diagrams, thereby identifying realistic solutions to current and foreseeable sustainability and social equity problems. These stakeholders are intimately involved with each food system in question, and therefore collectively know it better than outsiders. Consequently, they can suggest viable solutions that may be unpredictable to outsiders. The solutions identified apply both to policy and lifestyle choices. The communities can use them to move towards increased sustainability and social equity; locally and worldwide.

The Convergence Process was created as a part of a FP7 funded four-year transdisciplinary research, the Converge Project. This presentation discusses a section of the work undertaken by the University of Iceland, one of nine partners in the project.



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Agents of change: Public, Grassroots II



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## 1561 Sustainability and making a living – performing greenness in working life

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On the path towards a sustainable future, sustainable work and working life will play a key role. In this study we have applied the model of cultural worldviews from the cultural theory literature, which in sustainability contexts, has previously mainly been applied for understanding sustainable consumption. We have applied it in a green work and working life context, where our aim was to explore how environmentally conscious individuals make sense of discursive struggles surrounding greenness and working life.

Data was collected through interviews with people who identified themselves as environmentally conscious. We employed discourse analysis to analyse our data.

Our findings indicate that there is a lack of available model narratives regarding green work, in comparison to the plenitude of green consumption and life style choice narratives. Yet, it was also found, that our interviewees were able to use the discursive polyphony that surrounds greenness and work in order to construct green identities and possibilities for performing greenness in different contexts, also in working life surroundings.

Furthermore, our study showed that greenness was mainly constructed through the egalitarian ideals of greenness, thus seeing nature as vulnerable and threatened by the unsustainable development of industrialism and capitalism. This was the most salient worldview discursively drawn to when constructing or neglecting a green identity. However, when studying how greenness was performed in different contexts, we found that the discursive polyphony surrounding greenness could be used to form different kinds of tactics for performing greenness. Salient in our data was a search of an alternative (degrowth) lifestyle, where discourses of meaningful work were interplayed with an egalitarian discourse of non-harmful work and settling for modest income and consumption level. Also other tactics were found, such as being indifferent about environmental problems (fatalist), disconnecting environmental concerns from the working life context, yet using solid income as means for acting as citizen-consumers and activists, and describing greenness through professional identity as environmental experts.

In conclusion, there is a need to promote different kinds of model narratives of green work, in order to improve our traditional and in many ways unsustainable work systems and working life practices.



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1558 Does individuals' perception of international climate policy affect their domestic climate protection efforts? Empirical evidence from an international survey

**Schwirplies, Claudia**

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The international community of countries generally agrees that to prevent dangerous man-made interference with the climate system, the increase in average global temperature needs to be limited to 2°C compared to its pre-industrial levels. While the topic global warming has received considerable public and political attention, international climate policy has only made limited progress so far. Most of the literature on international climate policy has focused on distributional justice; procedural justice has attained considerably less attention.

Procedural justice means that decision processes are fair and transparent. In the climate policy context, this requires adequate representation of all countries in the climate negotiations and presupposes legitimacy of international climate policy and trust. Against this background, the question arises to what extent individuals' adoption of domestic climate protection measures is affected by perceptions of international climate policy. To the best of our knowledge, citizens' perspectives on procedural justice and trust in the context of international climate policies have not been analyzed empirically yet. Similarly, these aspects have not been explored empirically in a cross-country comparison.

Inspired by the literature on privately provided public goods and the public-good crowding-out hypothesis, this paper determines the interrelation between individuals' perception of international climate policy (i.e. justification of climate policy in general, distributive justice, procedural justice, and trust) and their stated willingness to engage in eight domestic individual climate-conscious activities. The main objective of this paper is to answer the question, whether successful climate negotiations and agreements will motivate or rather 'crowd out' private contributions to climate protection.

Our micro-econometric analysis with discrete choice models is based on unique data from recent representative surveys in China, Germany, and the United States. First findings suggest that individual climate-conscious activities are generally positively associated with higher perceived justification of international climate policy in all three countries. Individuals' perceived level of information, trust, and success of previous climate negotiations are also related with domestic activities, but the direction of the effects differs across countries and activity type.



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1661 ANALYSIS OF TERRITORIAL SOLIDARITY IN FINANCING  
ADAPTATION TO CLIMATE CHANGE IN COASTAL AREAS

**Rulleau, Bénédicte**



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Session 3.3.J

Agents of change: Private sector

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## 1580 Self-reported sustainability, the ecological footprint and subjective well-being

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In this paper we address two main research questions using survey data. First, we investigate whether respondents are able to self-assess the sustainability of their life styles. Second we explore the link between living a sustainable life and the level of subjective well-being reported by the respondents.

The data we use in our analyses come from a survey we conducted in Flanders, Belgium (n = 1196). The survey includes two variables on subjective well-being (happiness and life satisfaction), a series of socio-economic variables and personality traits of the respondents, both a subjective and an objective assessment of the sustainability of the life style of the respondents and a number of environment-related variables (environmental concerns, knowledge of environmental problems and being a member of an environmental organization).

To answer the first research question we compare the data for the subjective assessment of sustainability (SS - "To what extent would you describe your lifestyle as sustainable / environmentally friendly?" using a rating scale from 0 = not sustainable at all, to 10, totally sustainable) with the data for the objective assessment (OS - ecological footprint calculated according to the WWF methodology using 11 subquestions). In a preliminary analysis (subsample with n = 481) we found a correlation coefficient of -0,012 (p=0,01) indicating that respondents are not very able to self-assess the sustainability of their lifestyles. When the SS-values are corrected for personality traits, the correlation with the ecological footprint increases. A further analysis of who's unable to self-assess the sustainability of his or her lifestyle surprisingly points to a negative impact of knowledge of environmental issues: respondents who claim to know more about environmental problems, report a significantly higher level of subjective sustainability, yet their ecological footprint is not significantly different from the others.

As for the second research question, regression models using either life satisfaction or happiness as the dependent variable reveal that the ecological footprint does not impact on the reported scores, while the self-assessed sustainability values have a significant positive impact on



subjective well-being ( $p < 0,01$  for both happiness and life satisfaction). The impact of the other control variables (socio-economic characteristics and personality traits) in our models is in line with what could be expected from the subjective well-being literature. As we argue that sustainability is best measured objectively, we conclude that having a more sustainable lifestyle (having a low ecological footprint) does not lead to a happier life.



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## 1540 What drives corporate environmental responsibility? Case of mining company in Odisha, India

**Sindhi, Sumita**

What drives corporate environmental responsibility? Case of mining company in Odisha, India

Aim of the study – Environmental performance is a multidimensional construct with factors including environmental impact on the biosphere, customers, employees, the local community, and other stakeholders. Corporate Environmental Responsibility (CER) is the strategic organizational approach to mitigate environmental externalities for business sustainability. Mining is one of the most polluting and environmentally hazardous activity. With recent spurt in international demand of minerals, this sector is growing fast in developing countries despite social and ecological resistance.

Organizational field is a complex network of stakeholders. Stakeholders provide social license to organizations and hence are important factors in influencing organization's decision to adopt environmental practices. The stakeholders for mining sector vary from rich mine owners to poor local community members and many other internal and external stakeholders. Study aims to assess how and by what means stakeholders exert influence on environmental responsibility of a mining company in Odisha, India and also assesses the drivers and barriers for environmental decision making for a mining company.

Methods – In-depth case study of a mining company namely Jindal Steel and Power Limited (JSPL) is conducted to assess stakeholder influence. Diverse stakeholder interviews were conducted and top level managers of the organization were interviewed and their responses were analyzed and evaluated. Case was analyzed using 'explanation-building' technique, in the light of theoretical institutional framework.

Main results - Classifying different stakeholder and their responses along with manager's interviews helped in triangulation of data and also provided interesting insights as rationale for organization's environmental strategies. It was found that on the face of it, regulators seem to be exerting greater influence. But on further analysis it emerged that cognitive influence by market forces; competitors, and issues of reputation were more effective in urging organizations to undertake active environmental responsibility. Coercive forces usually induce a reactive output or 'end of the pipe' solutions whereas cognitive influences urge organizations to adopt longer lasting solutions. Normative forces as community pressure and elements as accountability and transparency have the lowest motivation for organizations to look into issues of environmentalism.

The prominent barriers to environmentalism that emerged in the study were 'corruption' and 'short term profiteering'. Corruption at all levels affects organizations environmental approach. Mining is seen as a short term activity and so quick profits in a short period is the major concern of the mine owners and contractors.



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## 1552 Concealed collaborators: Environmental sustainability and role of non-life insurers

**Johannsdottir, Lara**

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Size of the insurance sector and widespread interconnectivity in the society, realized through insurance policies, claims handling processes, and investments makes insurers vulnerable to environmental risks. These same factors make insurers powerful agents and collaborators in dealing with environmental issues, because the insurance industry interacts with almost every part of the economy including individuals, corporations, suppliers, trade associations, governments and others. In this presentation we will discuss the findings of authors two recently published paper on insurers' role in dealing with environmental issues, but these roles are not very well known by other stakeholders. This has both to do with the potential and demonstrated role of insurers in helping authorities fulfilling climate commitments, as well as insurers' role in enhancing development and utilization of environmentally sound technologies. Using case study methods the papers in question explored environmental actions of a sector considered to relatively low-polluting, addressing a gap in the literature as studies of this nature are skewed towards large heavy polluting firm and producers of tangible products. The findings of the papers suggest that climate change is an important strategic issue for the insurance sector. Furthermore, insurers can be powerful allies when fulfilling climate commitments, and are also vital players in proliferation of environmental sound technologies, and their size can be leveraged to promote such technologies. However, barriers for actions are identified for instance companies' size meaning that the smaller companies included in the study are inactive in terms of climate-related actions, and isolated from the climate change debate. Reviewing the literature, furthermore, suggest that expected contribution to climate commitments of the industry is more extensive than demonstrated industrial reality evident in climate-related actions.



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Session 3.3.M

Smart, Inclusive growth, wellbeing and the greening of economies: redefining development; Proposed session



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## 1838 Measuring progress towards a 'Green Energy Economy': Who is really winning the race?

**Mundaca, Luis**

There is substantial cross-sectional heterogeneity in economic growth, energy supply mix and resulting CO<sub>2</sub> emissions across all the regions of the world. Conversely, to our surprise, a review of scientific material reveals that there is still a lack of (up-to-date) knowledge about regional discrepancies, in absolute and relative terms, regarding drivers of CO<sub>2</sub> emissions from a historical perspective. This is despite the fact that, for instance, the causes and/or impacts of climate change are mostly framed in regional (or sectoral) terms (e.g. as reflected in IPCC Assessment Reports). In addition, since the global financial crisis, there is also a lack of quantitative knowledge regarding the effectiveness of the numerous economic recovery packages that were implemented to stimulate green economic growth through the deployment of low-carbon technologies.

Covering eight regions of the world, this paper provides the first regional econometric decomposition analysis of CO<sub>2</sub> emissions from fuel combustion. Using the best publically available time series data (1971-2010), the analysis is undertaken to unravel key 'Green Energy Economy' determinants for (1) Africa, (2) Asia, (3) Latin America and the Caribbean (LATAM), (4) the Middle East, (5) Non-OECD Europe and countries from the Former Soviet Union (FSU), (6) Oceania, (7) OECD Europe, and (8) OECD North America. Building upon the IPAT equation and Kaya Identity, an econometric model is defined for each region, with CO<sub>2</sub> emissions (as dependent variable) representing the level of emissions from fuel combustion and industrial processes. Independent variables for each region include Population (P), Gross Domestic Product (GDP) per capita (GDP<sub>PPP</sub>/P) (\*!), energy supply intensity of GDP (TPES/GDP<sub>PPP</sub>), and the CO<sub>2</sub> intensity of Total Primary Energy Supply (TPES) mix. Variables are estimated in relative and absolute terms for the period 1971-2010. I take the 2010 global surge in CO<sub>2</sub> emissions as an entry point for the analysis.

Overall, preliminary results show some level of continuous improvement for certain regions, for example, reduced energy intensity in Asia or reduced carbon intensity in OECD Europe. However, this relative progress is incapable of offsetting the larger absolute negative effects of economic growth and increased energy use. In fact, these two variables are critical to explain the 2010 global surge in CO<sub>2</sub> emissions across OECD Europe, OECD North America, Non-OECD Europe and the FSU, and LATAM than in the rest of the world. Estimated indicators reveal that most regions have recently performed worse than their historical trends and lack of meaningful progress is identified. Statistical tests show that variability of CO<sub>2</sub> emissions in most cases is largely explained either by GDP per capita ('affluence') or population growth – as compared to any other tested variable. Contrary to any initial expectation, Africa seems to be the only region that shows signs of grabbing the green energy economy opportunity. As for the rest, most regions appear to have missed the opportunity provided by the 2008-2009 global financial crisis. Results suggest a lack of serious environmental effectiveness of regional policy portfolios aiming at a green energy economy. Quantitative estimates seem to support earlier concerns about the effectiveness of green economic recovery packages, particularly in the United States, the European Union and Asia.

In all, this first regional econometric decomposition analysis of CO<sub>2</sub> emissions strongly suggests that absolute reductions in CO<sub>2</sub> emissions and energy use from fossil fuels are urgently required



in rich regions. This is rather fundamental to make meaningful progress towards a global green energy economy. Absolute reductions in emissions and energy use are critical so there is more 'environmental space' for economic growth in regions where the needs are evident. In addition, it is also concluded that it is a delusion to continue talking about 'decoupling'. For a truly green energy economy to emerge, CO<sub>2</sub> emissions must be reduced and cannot continue to rise forever, even if at a slower rate than GDP. If we are to align production and consumption patterns with maintaining global warming below the 2°C threshold, very ambitious energy efficiency and renewable energy policy portfolios across all regions are more needed than ever.

\*1: GDP is measured in units of purchasing power parity (ppp), as for the year 2000.



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## 1839 Steering the mainstreaming of the Poverty-Environment Nexus in Tajikistan

**Challe, Sarah**

Stamatios Christopoulos, Michael Kull, Louis Meuleman, UNDP/UNEP Programme of Environmental Mainstreaming in Tajikistan (Poverty Environment Initiative)

By aiming at mainstreaming environmental considerations into economic and development planning, the UNDP/UNEP Poverty and Environment Initiative (PEI) in Tajikistan addresses a major governance challenge for sustainable development. The view that environmental concerns would slow down economic growth, at least in the short term, and that these two goals were incompatible, has been a major obstacle to the rational management of natural resources. However, by providing evidence-based data that highlight the strength of the poverty-environment nexus (PEN) in Tajikistan and integrating its concerns into strategic development plans, PEI attempts to give shape to a development paradigm that goes beyond economic growth and builds upon the synergies existing between preservation of natural capital and poverty reduction.

Because of the low level of awareness and capacity, as well as the lack of functioning cross-sectoral working platforms, the institutionalization of tools that integrate the environmental dimension in legal and policy frameworks is very slow. Furthermore, terms such as EIA and SEA require careful use as they represent a sensitive issue of the country, due to their trans-boundary dimension.

From a governance perspective, environmental considerations and commitments have often been endorsed separately within economic and development planning. However, the limits of such governance arrangements and the linkages between pro-poor economic growth and environmental conservation are becoming more and more obvious. Due to its cross-sectoral and multi-dimensional character, sustainable development requires coordination of all key societal actors, at various levels. This article studies the governance and the governance coordination (meta-governance) aspects of PE mainstreaming in Tajikistan. The research exercise involves semi-structured interviews to collect primary data on the elements of governance utilized for integrating the PE concerns in the country's planning and policy frameworks.

Environmental aspects are seemingly, thus far, mainstreamed through complementary top-down and bottom-up approaches. At the local level, PEN is integrated into the District Development Plans (DDPs) and through the allocation of micro-grants for environmentally-friendly rural businesses by district trust funds. Enhancing the (meta)governance and coordination mechanisms in the field of environment in Tajikistan should be able to communicate clearly the PEN issues and engage multi-stakeholders in further integrating and implementing mainstreaming aspects at district and national level. Such approach seems to offer particular potential in enhancing the level of involvement and influence of the poorer communities and their civil society representatives in defining development priorities and processes, integrating the protection of natural resources and ecosystem services.



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## 1840 User fees and access fees to promote prosperity, sustainability and equity.

**Rybeck, Rick**

Sprawling urban development patterns harm the environment in terms of excess energy consumption associated with transport and excess energy consumption associated with detached buildings. Productive farmland is lost directly (from the conversion of farmland to residential or commercial uses) and indirectly (from the isolation of scattered undeveloped sites that can no longer be farmed efficiently or that no longer are extensive enough to support agricultural infrastructure such as farm supply and equipment dealers). Both energy and materials are wasted in the duplication of expensive infrastructure systems which must be much more extensive to reach outlying areas. Low-income households and individuals are extremely disadvantaged because the most affordable residential locations are often at the far edges of the metropolitan region where they are burdened with expenses associated with automobile ownership and operation in order to access most activities outside the home.

If compact "smart-growth" development patterns are so much more beneficial – in terms of the environment, municipal costs (both absolute and per capita tax burdens) and social equity (providing low-income households with greater access to educational, recreational and employment opportunities), then why is there so much "dumb-growth" sprawl?

The causes for sprawl are numerous and complex. This paper will explore causes related to economic externalities. Infrastructure is generally created to help facilitate development. But if that infrastructure is well-designed and well-executed, the result is higher land prices near infrastructure facilities and services. These higher land prices chase development (particularly affordable development) to cheaper, but more remote sites. As these remote sites are developed, their lack of infrastructure becomes a hindrance. In the event that infrastructure is extended to these more remote development areas, land prices rise and the cycle begins again, chasing develop to even more remote locations.

A combination of infrastructure user fees and access fees can help internalize these externalities and promote more compact, sustainable and equitable development patterns. Infrastructure access fees (often referred to as "value capture") can help make infrastructure self-financing, motivate development and redevelopment near existing infrastructure (instead of at remote locations) and make the ensuing development more affordable – not just in the short run, but over the long run as well. This approach to infrastructure finance promotes more compact land use that reduces per capital infrastructure tax burdens, energy consumption and pollution while also helping to preserve rural lands for agriculture, recreation and conservation.

The paper will review:

- The economic theory of infrastructure user fees and access fees (value capture);
- How user fees and access fees can make transportation infrastructure self-financing;
- How they facilitate compact, transit-oriented development (TOD);
- How value capture makes TOD more affordable



- Distinguish between “value capture” and other techniques that masquerade as such.
- Real world examples of where these techniques are being used successfully.
- Practical steps related to implementation:
  - Administrative issues
  - Political issues.



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## 1841 Thematic villages – an example of inclusive growth?

**Kłoczko-Gajewska, Anna**

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Poverty and social exclusion are seen as important barriers for sustainable development, taking into account economic, social, and ecological issues. Social exclusion is a complex and multi-dimensional phenomenon, defined in many various ways. Usually definitions include reduced participation and solidarity in social life, as well as insufficient access to resources, rights, and services available to the majority of people in a society, whether in economic, social, cultural or political arenas (see: The Multi-dimensional Analysis of Social Exclusion, Levitas et al. 2007). Such inequality affects both the quality of life of individuals and cohesion of society as a whole.

Differences in definitions are followed by problems with their operationalization and an accepted set of measures. Organisations dealing with this issue try to capture this phenomenon with a variety of indicators, including the level and duration of poverty, unemployment, education, healthcare, living conditions, safety, social contacts, etc.

Social exclusion is an important issue in the development of rural areas. For example, in Poland present global trends of specialisation and intensification of agricultural production have an influence both on incomes and on social life of the inhabitants of rural areas. Due to mechanisation the need for neighbour help declines, and because of specialisation there are less common topics to discuss. As a consequence, village citizens are no longer a unity in the way of living, work, and interests. It happens that farmers socialize more with those with the same specialization no matter the distance than with their neighbours, which was not common a couple of years ago. Moreover, it is estimated that in the future many inhabitants of peripheral rural areas will not be able to make a living from farming, which can lead to deepening socio-economic problems. Both financial problems and decline of the sense of unity can lead to social exclusion.

One of the ideas to overcome some of these problems is creating a thematic village, where inhabitants jointly decide on a topic and prepare unique tourist attractions based on local cultural, natural, and social heritage. Usually this kind of community tourism is organised in very remote areas, where there are no other possibilities for development.

Preliminary research done in the majority of thematic villages in Poland revealed that (according to the respondents) creating a thematic village made its inhabitants more socially active (3/4 of the villages), changed the look of the village (80%, in most of the cases increase in the tidiness of the common space and private courtyards), helped to get additional income (60%) and external contacts (35%). Most of the leaders of the villages had plans for future development, which means they are able to think strategically and prepare development goals.

What is important is that this activeness is usually harmless to the nature, because the villages take advantage of already existing resources. The offer is based more on emotions and participation (games, workshops, picnics), than on production and using natural resources; usually the products are traditional meals or souvenirs self-made of various natural materials such as straw, stones, bones, etc. Additionally, such activeness makes villagers proud of themselves and gives the tourists from cities an opportunity to learn from them and perceive less wealthy villagers as partners.



In-depth case studies of few chosen thematic villages (that operate for at least 5 years) revealed that some aspects of social exclusion can be reduced thanks to creating thematic villages. These include at the first place improving the level of social participation (both activeness within the village and external contacts , not only with other thematic villages), and to a lesser extent, lowering economic exclusion, through creating opportunities for additional income.



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## 1842 Towards a greener and more equitable development: What can we learn from Brazil, South Africa and Germany for global transformation processes?

**Perch, Leisa**

The key to understanding the Anthropocene is that humanity has affected all aspects of the World we live in. The sheer mass of humans and our livestock dominates animal biomass. Already our hunting, agricultural and forestry activities have changed the face of the Earth with profound effects. The removal of top predators and the selection of species created through our activities has fundamentally modified species composition through cascading effects down to the very smallest organisms. The scale of our economic activities is such that we have profoundly altered the major biogeochemical cycles that hold the preconditions for Earth's ecosystems. We have even profoundly altered the chemical composition of the atmosphere and thereby the radiative balance that determines our climate.

For the sake of completeness, we must state that our economic exploits are not without success. There are more people living long and fairly healthy lives, free of abject poverty than ever before. Many resource constraints have been dealt with in ingenious manners. It is no small accomplishment that dozens of millions of people in crowded areas like that of the London, Tokyo or Beijing areas get high quality drinking water and treat their waste water fairly well. Hundreds of millions of people have in the last decades been able to lift from poverty and even many local environmental problems have been resolved or at least ameliorated. The air in major European or American cities provides many examples.

Yet, it would seem sometimes as if we do not really solve environmental problems but move them. A term sometimes used among economists for this is the shifting of externalities. Visualize a downstream neighbour who is affected by smoke or waste water from a polluter. Instead of solving the problem, he may be able to build a duct of some kind and move ("shift") the pollution simply to the next neighbour further downstream. Much of early environmental policy was of this character as was the OECD official policy back in the 1970s of requiring "tall smokestacks". For someone who is thinking at a global scale, the policy of actually investing real dollars in tall smokestacks is a considerable irony since it is so clear that you are wasting money actively not solving a problem but just spreading it around to people (and ecosystems) who are so far away as to not have the knowledge or political ability to defend themselves.

We have come to a point where we can no longer hope that our effects are marginal and where we can rely on nature's inherent ability to balance our actions. Humanity is absolutely forced to assume stewardship, to understand and to manage consciously the major processes on our planet. At the same time, we also live in an age when population numbers, modern communication, media, technology and weaponry have transformed the preconditions for policy making. Social justice and inequality at a global scale have always been important but their increased visibility makes a difference.

In this precarious situation we can and should look for new and "alternative" models of development. There is a long tradition of utopian, naturalist, Illyrian, decoupling, decentralization and other ideas. The research tradition of Elinor Ostrom shows how well local communities have sometimes been able to organize to manage the complex local environment in which they live and

operate. There is much to be said for Territorial User Rights to local reef fisheries for instance. There may in some cases be analogies where modern technology in communications, data and energy allow some functions to be nicely decentralized, such as the small scale operation of a small group of computerized but gridless workers who are not supplied by a centralized power system but a local solar one. However we cannot afford to be naïve. If these systems require rare elements that are polluting or scarce then strong global policies will be needed to ensure proper allocation and to avoid us bouncing up against the very planetary boundaries for our wellbeing.

This brings us finally to our subject which is vast and difficult: The formulation of policies for the anthropocene. This is a field of inquiry that needs to be treated at the level of books and research programs rather than just the abstract of a short article so we can but sketch some directions here. This is in fact one of the most important tasks of the entire field of environmental or ecological economics. We know that we need to affect both individual and firm behaviour, production technologies and consumption patterns. The whole arsenal of conventional economic instruments is a good starting point to internalize externalities and to provide and care for public goods.

Advances in behavioural economics have greatly contributed to nuancing our understanding of how policies need to be formulated and implemented. Often a dichotomy is created between cultural or behavioural changes on the one hand and economic instruments on the other. This can be misleading. Prices are strong determinants of our behaviour: If energy is cheap people will waste it and it is expensive that will promote both thrifty behaviour and energy saving innovations. There are however many examples where major social changes came about not because of economic instruments or cost benefit analyses. The abolition of slavery was finally undertaken largely on moral and political grounds. Smoking has in our lifetime, in many countries, decreased rapidly. Cigarette taxes played a role as did physical restrictions but most importantly information and a cultural change seem to have been decisive. We know that eating less (red) meat would be good for dealing with climate change. It is theoretically possible that this could be achieved through taxation but maybe vegan culture will ultimately prove more important?

Policy instruments for the Anthropocene must be both local and global. They will take as a starting point conventional economic policy design but somehow we need to complement it with a sense of urgency and scale. Researchers will need ecology, physics and chemistry skills to understand nature's complexities at different spatial and temporal scales, behavioural sciences to understand how to communicate and get round boundaries when it comes to perception and motivation, political science and economics when it comes to dealing with lobbies, vested interests and the inherent difficulties of collaboration across space and time (generations). The complexities – both social and scientific are so intertwined that the problems cannot be neatly compartmentalized so that one group describes the problem and another designs solutions - they will require collaboration between economists, other social scientists and natural scientists. One part of the problem is that so few actually do understand both natural and social systems and the complexities are such that real collaboration and integration of knowledge is needed.



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Session 3.3.N

Economics and institutions: evolution in the antropocene;  
Proposed session



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## 1788 Bringing back Darwin: Evolution and the Limits to Human Intentionality

**Gowdy, John**

The radical idea in Darwin's theory of evolution by natural selection was "philosophical materialism". Darwin's "one long argument" was a refutation of the Rev. William Paley's Natural Theology, the idea that the incredible order and complexity in nature must be the result of a creator. For Darwin, the order and complexity we see around us, including that seen in human affairs, is the result of the purely mechanical forces of natural selection. Most scientists today reject theological explanations of reality but oddly, most seem to accept some notion of human uniqueness and intentional control over our destiny. The prevailing belief is that humans are different because of culture, language, foresight or some other form of intentionality. If we are to successfully challenge the growth imperative of the global economy we must recognize that the system now operates as a "thing-in-itself" driven highly evolved rules that operate largely outside the realm of human control. Gaining intentional human control of the global economy is a necessary step if our species is to survive the coming few centuries.



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## 1789 The Challenge of Rethinking the Economic Evolution of Humans

**Krall, Lisi**

This abstract is submitted in relation to the session proposal: Economics and Institutions: Evolution in the Anthropocene. With the agricultural revolution that began some 10,000 years ago the structure and dynamic of the human economy fundamentally changed and altered the relationship between humans and each other and between humans and “the others” that share the planet with us. In the words of Wes Jackson “We became a species out of context.” The hallmark of agriculture was a shift from the production for livelihood to the production for surplus. This legacy is with us now in a more pernicious and dramatic form. It is now structured around the imperative of accumulation and the attendant contradictions and interdependencies inherent in global capitalism. The challenge of once again becoming a species in context requires that we confront a 10,000 year path of economic evolution which is to say that we challenge the basic structure of our present global economic system.



Theme: 3.3 Facilitating transitions drivers and barriers  
Session: 3.3.N Economics and institutions: evolution in the antropocene; Proposed session  
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## 1787 Adapting to prisoner's dilemmas: economic institutions for the anthropocene

**Farley, Joshua**

This abstract is submitted in relation to the session proposal: Economics and Institutions: Evolution in the Anthropocene. Different economic institutions are suitable for solving different types of problems and allocating different types of resources. For example, fossil fuels are both rival and excludable, hence readily allocated through competitive markets. The most serious problems currently faced by human society, ranging from peak oil (resulting from either source or sink limits) to biodiversity loss can be characterized as prisoner's dilemmas. As a result of their physical characteristics, such problems are best solved through cooperation or pro-social behavior. For example, solar energy is non-rival between countries and generations and also non-excludable, while technologies required to capture solar energy actually improve through use. Firms competing to develop solar technologies will not share their breakthroughs with others, slowing the advance of knowledge and leading to the wasteful replication of research. If the resulting technology is patented, price rationing will reduce use and hence value. Economic institutions based on cooperative research and development and open access to the resulting technologies are therefore likely to be more efficient for developing a solar powered economy. Both market economists and evolutionists have traditionally assumed that humans are inherently self-interested, with limited capacity for purely cooperative behavior, in which case it would be foolish to design economic institutions based on cooperation. Recent advances in behavioral economics and evolution (in particular the theory of multi-level selection) suggest that human populations exhibit a wide distribution of pro-social tendencies. Furthermore, human behavior is strongly affected by social institutions, and strongly affects those institutions in turn: it is possible to develop economic institutions that make pro-social individuals behave selfishly, or selfish individuals behave pro-socially. Capitalism is an institution that promotes self-interested, non-cooperative behavior, and thus is poorly suited for solving prisoner's dilemmas. Market-based solutions for many global environmental problems may be an oxymoron. The challenge for economists is to develop economic institutions that promote reciprocity and cooperation within groups and that can be scaled to solve local, regional and global problems. Research from various fields suggests a number of promising solutions.



Theme: 3.3 Facilitating transitions drivers and barriers  
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## 925 Economism and the Econocene

**Norgaard, Richard B.**

The Econocene is our cosmos. Artifacts of the economy and market relations define our reality. Like our ancestors, we still need the comfort of myths that provide meaning in a still unfathomable world, reduce anxiety, portray our "realistic" options, guide our personal choices, and rationalize the econocene overall. This "sustaining" realm of modern culture is "economism".

To the extent that academic disciplines help us understand the Econocene, economics clearly leads. It describes how decisions are made, the economy grew, why we go to school, our standing in the system, why some earn more than others. Economics justifies how we relate to each other and interact with nature.

Yet economics cannot justify the particular economy we have. When we invoke economics in our rationalizations of the way things are, we are immediately in the realm of economism, participating in the cultural process of building and sustaining myths that comfort and give personal meaning in the Econocene.

The Econocene of today was built upon the economism of our parents, as their world was built on the myths of their parents too. Economic theories contributed to the process. And as the economy coevolves with our economism, new economic theories are needed to help us see them. The facts of today emerged out of the contexts of the myths and theory of yesterday. Thus economists are intimately entwined the coevolution of economism and the Econocene.

Economism is a faith of religious proportions. What if we did not believe the economy was going to work tomorrow? If we thought that food markets were not really working and about to collapse, we would each immediately plant grains in our gardens, though some only have flowerpots. But acting individually would instigate and accelerate economic collapse and disaster. Economistic faith keeps us alive.

We distinguish between environmentalism and environmental science. Environmentalists selectively draw on the environmental sciences to support their environmental objectives rather than strive to be objective. Environmentalists use out-of-date science if it better suits their objectives and gloss over complexities of environmental systems. "Economism" has not come into common use because it is extremely difficult to distinguish economism from academic economics.

Shining a floodlight in this way on the Econocene and highlighting the way it has coevolved with economism gives us a new picture of the human predicament and what is needed to change course.



Theme: 3.3 Facilitating transitions drivers and barriers  
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## 1790 Beyond the Fiscal Cliff

**Klitgaard, Kent**

This abstract is submitted in relation to the session proposal: Economics and Institutions: Evolution in the Anthropocene. Congress battles almost continually about the fate of future economic policy. Both liberals and conservatives believe their strategies will be the most effective in promoting economic growth. Conservatives believe in a reduction in government participation in the economy, regulations, budget deficits and taxes. Liberals contend that the government is a vital part of the modern economy and call for a greater degree of stimulus in order to reduce unemployment. Both miss vital points. Economic growth rates have been in decline since the 1960s and neither liberal nor conservative policies can reverse this trend, as stagnation is built into the mechanisms of a globalized economy dominated by monopolies and financial interests. Furthermore, beyond the fiscal cliff lie other, and far more dangerous, cliffs: An energy cliff composed of declining energy returns on investment; a climate cliff driven by increases in atmospheric carbon dioxide, a biodiversity cliff; a water cliff; a biogeochemical cliff, to name but a few. Attempting to solve the economic problems by increasing material consumption only makes the other problems worse. To solve our economic and environmental problems and live well within nature's limits we need a more equal society that uses far less energy than the one in which we currently live.



WELLBEING AND  
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ISEE CONFERENCE ICELAND 2014

Session 3.3.0

Behavioural methods to tackle environmental stressors



Theme: 3.3 Facilitating transitions drivers and barriers  
Session: 3.3.O Behavioural methods to tackle environmental stressors  
Time: F3 Room: R14

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2026      The effect of price and information frames on  
environmental technology adoption: A natural field  
experiment in Switzerland

**Gsottbauer, Elisabeth**

This paper aims to understand economic and behavioral factors explaining investments in energy efficient technologies in Switzerland. To encourage adoption of those technologies, price subsidies and rebates are typical available policy instruments. In addition to those monetary incentives, non-monetary approaches such as environmental information campaigns containing normative messages to protect the environment are increasingly applied to leverage the potential for energy and water demand reductions. Norm-based messages has been reported to promote behavioral changes and influence individual energy and water demand (e.g. Ferraro and Price, 2011; Dolan and Metcalfe, 2012). Yet, it is still unclear if similar appeals can encourage the adoption of new technologies promoting water- and energy-savings.

For this purpose we conduct a natural field experiment to estimate the effects of two levels of monetary incentives and an environmental information frame on sale and usage of a smart, water-saving metering technology. Using telephone marketing targeting Swiss households, we offered a water-saving smart shower meter for sale, randomly varying both the price subsidy and the environmental, normative information about the product. This allows us to assess the influence of price and normative information on purchase decisions, while we are also able to estimate the impact of normative information on the effectiveness of price subsidies. In order to obtain additional characteristics of the participants, customers are asked to respond to a follow-up survey and could declare to register online in order to transmit usage date of the shower meter for a deployment phase of three months. Among those who comply with this request we are able to read out consumption patterns and quantify savings.

Our findings have important considerations for the use of monetary and non-monetary incentives to promote energy efficient technologies. Furthermore, our results contribute to the broader literature on the role of behavioral economics, framing and social norms for environmental policy making.



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## 2027 The Effect of Winter Fuel Payment on the Renewable Energy Installments in the UK

**Lange, Ian**

Ian Lange, Mirko Moro, Mohammad Mahbubur Rahman  
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Previous research has shown that UK households spend a higher proportion of a cash transfer, the Winter Fuel Payment (WFP), on energy expenditures due to its label (Beatty et al., 2011). In this paper we study if the WFP has distortionary effects on related markets. Using a regression discontinuity design, preliminary analysis finds that the WFP causes a reduction in the propensity to install renewable energy technologies at home. The label has the unintended consequence to induce households to consume energy from sources which generate more pollution. Policies that seems at first effective, may ultimately lead to socially inefficient outcomes.



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## 2028 Delegation and Public Pressure in a Threshold Public Goods Game: Theory and Experimental Evidence

**Iris, Doruk**

Doruk Iris, Alessandro Tavoni, Jungmin Lee

Provision of global public goods, such as climate change and fisheries, require coordination of national contributions, which depends on the elected government and the public pressure on the matter. In an experimental setting, we distribute subjects into four teams, and then ask them to elect a delegate to represent their team. The elected delegates successively play a one shot public good game in which they could only avoid possible negative outcomes if the sum of their contributions exceeds a threshold, and failing to reach the threshold means that they lose part of their remaining wealth with some probability. In our setup, any team earnings are split evenly. We find that delegation slightly reduces the overall group contributions due to some responsibility effect, which is not statistically significant. Teammates' messages to delegates, on the other hand, have significant effect. Delegates take either the average of the opinions or the low/no contribution opinions into account, but not the high contribution opinions. Our experimental findings are consistent with our theoretical model in which we introduce some anticipatory feelings of the delegates using psychological expected utility model.



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## 2029 Coalition formation games with threshold and spillover effects

**Tavoni, Alessandro**

Alessandro Tavoni, Melanie Heugues, Valentina Bosetti

In an experimental setting, groups of seven subjects played one of three treatments designed to capture the potential of first-mover investments in catalysing cooperation in a threshold public goods game. We compare the outcome of these to a benchmark treatment, where subjects played a voluntary contribution mechanism game without the option to form a coalition of early movers. In all treatments, subjects decided how to split the endowment between a high-return, but socially costly, investment (A) and a lower-return investment in an innovative technology which does not cause negative externalities (B). Furthermore, groups were exposed to a large probabilistic loss, in the event that investments in the damaging technology (A) were above a given threshold. We find that innovation by early adopters can promote group-wide cooperation, especially when its benefits spill over beyond the initial coalition.



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Theme 3.4

THE ROLE OF CITIES IN TRANSITIONS



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ISEE CONFERENCE ICELAND 2014

Session 3.4.A  
The role of cities in transitions



Theme: 3.4 THE ROLE OF CITIES IN TRANSITIONS  
Session: 3.4.A The role of cities in transitions  
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## 1115 Conceptualizing the spatial correspondence between different modes of life and related patterns of resource consumption in Germany

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In the relevant literature, increasing urbanization is often seen as solution to ecological crisis (Glaeser/Kahn 2010, Glaeser 2011). However, as argued by Bettencourt et al. (2007), the ecological advantages associated with an urban way of life cannot be taken for granted. Analyzing the ecological and economic performance of cities on a global level, they detect two effects of scale which – from an ecological perspective – work in opposite directions: Increasing city-size simultaneously results in higher material efficiency (e.g. due to more compact building physics and more advantageous surface-to-volume ratios) and accelerated economic growth (especially due to positive effects of social contagion). Whereas rising physical compactness results in decreasing CO<sub>2</sub> emissions (measured in tones per capita and year), growing incomes (and respective levels of consumption) go hand in hand with increasing levels of resource consumption. Thus, there is good reason to doubt the alleged ecological superiority of urban agglomerations.

Inspired by these insights and using a nationwide dataset containing socio-structural data for all German municipalities (N = 11.192), this paper tries to shed some more light on the intricate relationship between spatial structures, related modes of life, and corresponding levels of resource consumption in Germany. Thereby, we not only account for physical compactness, but also for spatial position in terms of accessibility (used as a proxy for market proximity). This results in a fourfold typology which is used to describe and explain observable correspondences between spatial positions, related modes of life and socio-structural peculiarities as well as corresponding levels of resource consumption.

Our present analyses apparently corroborate the findings of Bettencourt et al.: Just looking at energy consumed by building operations (e.g. supplying warm water and heating), urban cities clearly have the lowest CO<sub>2</sub> emissions. Looking at income-driven resource consumption, the



opposite seems to become true: Consumption-triggered CO<sub>2</sub> emissions of city-dwellers exceed those of rural residents by approximately 30%. In sum, the ecological saving potentials of compact buildings are counteracted by comparatively higher incomes within urban areas whereas saving potentials associated with comparatively lower incomes are almost fully eaten up by physical dispersion in rural areas. In the view of these findings, the general hope that the ecological crisis could be solved by increasing levels of urbanization appears to be untenable – prosperity grows faster than physical compactness.



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1468 THE ROLE OF URBAN COMMONS IN SOCIAL  
ECOLOGICAL SYSTEMS TRANSFORMATION. : First  
Results of Case Studies in 40 European Cities

**Sauer, Thomas**

The paper presents first results of case studies in 40 European cities, exploring the potential of applying the socio-ecological systems (SES) approach by Elinor Ostrom and her colleagues systematically on the green spaces, energy and water systems in the urban context on such scale for the first time – after being applied mostly in rural ecosystems like forestry, fishery, and irrigation systems. The leading idea behind this methodological transfer of the SES approach into the urban context is that it would be worth to explore the research question how far a third sector of non-profit and non-governmental organisations and networks could play a key role in sectors relevant for the socio-ecological transition. Besides national environmental regulations as well as market driven price shocks the evolution of social norms and corresponding new institutional arrangements concerning the linkages between the production and the consumption of critical resources might play a major role in driving this transition.

So it might be assumed, that the de-carbonisation of the energy system could have significant spatial implications, in the sense that a more decentralised production of renewable energy would re-unite the local production and consumption of electric power. The technological shift from fossil fuels to renewable energies could enhance the opportunities of a spatial re-coupling of energy transformation and energy consumption, and improve the overlapping of resource and governance systems at local level. Thus, it could be expected, that the ratio of energy transformation to its total final consumption inside the city limits would increase, if the share of renewable energy harvesting increases, and if the chosen path of renewable energy technology development is in favour of miniaturized and decentralises energy generation. In other words: major functional urban areas should rely less on long-distance energy imports.

This spatial re-coupling of energy transformation and energy consumption on the local level might be a chance for an increasing role of non-profit activities in the so called third sector beyond market and government activities in this great transition: So we could assume more general, if self-organized and co-operative forms of management of common pool resources emerge, in terms of numbers, shares, duration, and growth rates in the urban context under consideration this is due to favourable conditions for developing self-organization capabilities. The paper will explore these conditions systematically.

The research has received funding from the European Community's Seventh Framework Programme FP7/2007-2013 under grant agreement n° 290647.



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## 1319 Evaluating the Biophysical Urban Sustainability

**Stossel, Zeev**

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Evaluating the Biophysical Urban Sustainability

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Cities are perceived as the source of most state's economic wealth and the core of social and cultural activities. At the same time, from a biophysical perspective, cities consume vast quantities of energy and material resources and generate wastes which influence the local / urban, regional and global environments. These facts require reducing the overall human load on the world's ecosystems and increasing the urban sustainability.

A major step in promoting the urban sustainability requires measurement of urban 'environmental performances'. In recent years, several sets of urban sustainability indicators and indices have been developed. However, only few have attempted to consider the large number and complex interactions between urban activities and the environment at the local, regional and global scales. Furthermore, most of the existing indices embrace a relative evaluation approach in which the value of a particular measurement is expressed relatively to the other measurements instead of the absolute approach which is needed when dealing with ecological thresholds.

The Presentation will introduce a new urban sustainability index which has been examined on various cities in Israel. The framework of our index includes defining the relevant issues for biophysical urban sustainability at the local, regional and global scales (e.g., environmental quality, the use of natural resources, and impact on climate change) and the specific indicators included (e.g., air quality, solid waste generation, land footprint, GHG emissions etc.). For each indicator we set standard and optimum levels. We then developed a formula which allows grading each measurement based on the urban performances. Integrating those grades allows generating an overall urban sustainability performances grade which can then be used to identify specific challenges and to compare the studied city to others.

Keywords: Biophysical Assessments, Environmental Indicators, Carrying Capacity, Urban



Sustainability Index



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1498 GOING HYPER-LOCAL? EXPLORING MARKET-ORIENTED URBAN FARMS AS SOCIAL INNOVATIONS FOR SUSTAINABLE FOOD PRODUCTION AND CONSUMPTION.

**Dobernig, Karin**

Generally defined as “the growing of plants and the raising of animals within and around cities” (RUAF Foundation, 2013), urban farming has received growing interest from academics, policy makers, government and the public in recent years (e.g. Guitart, Pickering, & Byrne, 2012; Jarosz, 2008). While over the last decades, urban food-growing projects have been mainly framed around community development, job training, or food justice, agriculture is increasingly seen as an emerging business opportunity in urban areas (Hanson & Marty, 2012). In that market-oriented urban farms seem to ultimately bring consumers and producers together, they represent a form of “hyper?local” and as such fit into the broader debates of alternative agro-food networks (AAFN) that signify forms of food provisioning which are different from mainstream models dominant in developed countries (Tregear, 2011).

This paper explores the prospects for and barriers to the further diffusion of market-oriented urban farming and aims to draw implications for the up-scaling of social innovations in the area of food and agriculture more generally. Empirical research has been conducted in New York City in the period from March to November 2013. The analysis builds on data generated from participant observations, document reviews, and a total of 38 semi-structured interviews with urban farmers, regular volunteers, stakeholders along the supply chain, as well as representatives of support and policy organizations. Preliminary findings show that urban farms can operated as viable businesses mainly by developing multiple-revenue stream models. However, identified puzzles include the partial reliance on volunteer labor and/or free or below-market rate rents, the negotiation of food justice accounts, and the dependence on authenticity marketing built around the narratives of hyper-localism and experiential production.

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Theme: 3.4 THE ROLE OF CITIES IN TRANSITIONS  
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## 1597 Transitioning into a Green & Just Future: the Case of Greenworks Philadelphia

**Sorrentino, John A.**

The quest for sustainable societies, large and small, may be just the foundation on which to strengthen a movement toward economic, political and social justice.

In the US today, there is an antagonism at the federal level between those generating wealth on the high-tech side of the economy and citizens who want to help those who find it difficult even to survive. As with action on climate change, the impetus for a transition from the status quo is coming from local governments, businesses, non-government organizations and individual citizens.

Greenworks Philadelphia "...describes a city in which residents and businesses benefit from lower energy costs, cleaner air, greener neighborhoods, better transit and new jobs." (Sustainability Working Group, 2009) The program is inspired by the Triple Bottom Line of Economy, Environment and Equity, but also explicitly includes Energy and Engagement. Among the residential initiatives in the program are: (i) a 10 year forgiveness of property taxes for new residential houses in the city; (ii) increased tree coverage citywide to 30% by year 2025; (iii) local food within 10 minutes walking time of 75% of city residents by 2015; (iv) park and recreation resources within 10 minutes walking time of 75% of city residents by 2025; (v) retrofit of 15% of existing housing stock with insulation, air sealing and cool roofs immediately and (vi) 80% of the city's infrastructure in good repair by year 2015.

The residential initiatives are singled out here because they touch most directly on the conference theme of wellbeing and equity. Goleman (2010) implores us to become more ecologically aware, and to note the impacts of our green choices on society. Agyeman (2013) vividly points out that green movements must become more explicit in their assessment of the economic, social and political justice implications of their actions.

As a follow-up to previous work (Meenar & Sorrentino, 2006), the present research will examine the progress of Greenworks Philadelphia in achieving its goals, and to assess how such achievements impact measures of inequality (Milanovic, 2005) and poverty (Shepherd & Blunt, 2013) in the quest for "just sustainabilities." (Agyeman, 2013) The results will be used to judge whether a program such as Greenworks can or should be applied to other cities around the world.

Selected References (omitted due to word count)

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## 1736 The Gothenburg congestion tax: a pre-post analysis of individual behavioural change

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A transition towards the long-term climate targets is likely to require active policy making that drive significant shifts in both technology and behaviour. Such changes also require support among citizens. There are several examples of radical pro-environmental changes of technical systems, such as the massive introduction of wind power in Denmark or transformation of the Swedish heating sector from oil to district heating and biomass, but it is more difficult to find recent examples of corresponding changes in behaviour. The introductions of congestion tax schemes are interesting as natural experiments in this respect, since they change the rules for private transport overnight with the aim to change the behaviours of individuals.

In this study we designed a pre-post survey around the introduction of congestion taxes in Gothenburg in January 1, 2013. The first survey was distributed two months before (November, 2012) to a sample of 3500 persons residing both inside and outside of the congestion tax borders in the Gothenburg region. The second survey was distributed one year later to the persons that responded to the first survey. The two surveys reached response rates of 50% and 73% respectively. The following types of variables were measured in both surveys:

- Travel behaviours: total car travel, modes of transport, commuting times, car ownership.
- Attitudes related to the congestion tax.
- Quality of Life indicators: time pressure, satisfaction with transport situation, overall subjective well-being.
- Geographical variables: location of home and work, access to public transport.
- Socio-economic variables.

Based on the pre-post changes in travel behaviour we then identify individuals with different mixes of adaptation strategies (e.g. reduction of total transport, changing mode of transport, changing travel times, keep behaviour/pay tax). The following questions are addressed and analysed during the winter of 2013/2014:

- What socio-economic and geographical groups are likely to change different types of travel behaviours?
- In what ways are changing behaviours related to attitudes and attitudinal change?



- To what degree do changing behaviours affect Quality of Life indicators?



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## 2023 The great carbon challenge of urbanization

**Heinanen, Jukka**

Urbanization is one of the large-scale ongoing global transitions with already over 50% of the global population living in urban areas and the share increasing rapidly. At the same time we are facing the ever-growing challenges set by the climate change. Furthermore, there seems to be a conflict in how we see the two current phenomenons to be related. On one hand, regarding the developed countries the prevailing belief seems to be that urbanization automatically reduces the greenhouse gas GHG emissions if associated with increased density. On the other hand, it has been recognized that the rural-urban migration in the developing world sets a huge challenge for climate change mitigation targets due to the associated heavy infrastructure development and increased mobilization of people. Of these, the second aspect certainly is challenging, but even in the developed countries the role of cities may actually be very controversial from the climate change perspective. Cities are often specialized consumption centers for affluent people with most of the utilized goods being imported from outside a city. Thus the cities actually often create an illusion of low emissions, whereas the emissions are actually just outsourced. In this presentation evidence from several high-income countries is shown to demonstrate how the city living may actually easily cause the highest emissions when the outsourced production and imports are taken into account. The case is often that in a production-based assessment the GHGs from cities seem low in comparison to the surrounding areas, but when a consumption-based perspective is taken the situation often turns another way round. It is also discussed how strong the influence of affluence is, and how any type of urban structure might have little impact on the emissions due to the rebound effects in consumption, that is, the reallocation of consumption from one category to another when the living environment changes.



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T2	R2	1.2.B2	1361	Busch, Jonathan
W1	R7	2.2.C1	1163	Busck, Ole
T1	R4	1.3.E	1200	Caixeta Andrade, Daniel
F3	R6	3.1.E		Calderón, Alberto López
F1	R3	1.3.L1	1709	Calvet-Mir, Laura
F2	R10	2.4.F2	1653	Campiglio, Emanuele
T2	R14	3.3.D	1408	Carattini, Stefano
T1	R13	3.2.F1	1275	Cavalcanti, Clóvis
F3	R6	3.1.E		Cavalcanti, Clóvis
F1	R1	3.3.M	1839	Challe, Sarah
T1	R12	3.2.D	2019	Chertow, Marian
W2	R11	3.1.B	1576	Cheze, Benoit
T1	R14	3.3.C	1583	Cheze, Benoit
T2	R4	1.3.F	1184	Chobotova, Veronika
F2	R13	3.2.J1	972	Clement, Christopher
F3	R11	3.1.C	1433	Cook, David
W2	R13	3.2.G	2032	Cook, David
T1	R7	2.2.E	1084	Cordier, Mateo
W1	R6	2.1.A	1164	Cosme, Inês



W1	R13	3.2.E	1565	Costanza, Robert
F1	R3	1.3.L1	1737	Costedoat, Sébastien
W2	R1	1.1.B	1238	Csutora, Maria
F1	R12	3.2.K	1551	Csutora, Maria
W2	R11	3.1.B	1425	Cudlínová, Eva
T2	R4	1.3.F	1243	D'Amato, Dalia
W2	R9	2.3.C	1603	Dai, Jing
F2	R6	1.4.F	1757	Davenport, Rob
F2	R6	1.4.F	1676	Del Arco Zuñiga, Pablo
T3	R3	1.3.I	1440	Dendoncker, Nicolas
W1	R8	2.2.A	1256	Dillard, Carter
T2	R1	1.1.D	1724	Ding, Xiaohui
F3	R12	3.4.B	1498	Dobernig, Karin
F1	R6	2.1.F	1522	Dokurno, Zbigniew
W1	R9	2.3.B	1545	Dokurno, Zbigniew
T3	R5	1.3.O	1220	Droste, Nils
F1	R6	2.1.F	1426	Dupoux, Marion
T3	R5	1.3.O	1778	Dupras, Jérôme
T1	R2	1.2.B1	1786	Eisenmenger, Nina
T1	R2	1.2.B1	1785	Eisenmenger, Nina
W1	R8	2.2.A	1435	Engelman, Robert
W2	R5	1.4.B	1487	Ertor-Akyazi, Pinar
T1	R7	2.2.E	1330	Ertör, Irmak
F1	R3	1.3.L1	1706	Esteve, Corbera
F1	R3	1.3.L1	1422	Ezzine-de-Blas, Driss
F1	R10	2.4.F1	1467	Farley, Joshua
F2	R1	3.3.N	1787	Farley, Joshua
T1	R11	3.1.D		Fawen Yu Karin; E. Limburg
W2	R6	2.1.B	1494	Ferrari, Sylvie
W1	R2	1.2.A	1484	Fetzel, Tamara
F2	R7	2.2.G	1212	Filcak, Richard
W2	R4	1.3.N2	1900	Finka, Maros
W2	R8	2.2.B	1723	Fischer-Kowalski, Marina
T1	R12	3.2.D	1728	Fischer-Kowalski, Marina
W3	R3	1.3.K2	991	Fisher, Janet A.
W2	R13	3.2.G	1438	Forgie, Vicky
W2	R13	3.2.G	1623	Fox, Mairi-Jane
F2	R13	3.2.J1	1420	Foxon, Timothy J.
T2	R1	1.1.D	1655	Frickmann Young, Carlos Eduardo
F1	R9	2.3.F	1660	Frickmann Young, Carlos Eduardo
F2	R3	1.3.L2	1748	Froger, Géraldine
F3	R4	1.3.J	1708	Gaasland, Ivar
T1	R14	3.3.C	1562	Gagne, Lynda G.
T1	R11	3.1.D		Gao Honggui
W3	R5	1.3.D	1196	Gasparatos, Alexandros
W2	R14	3.3.A	987	Geisendorf, Sylvie
F3	R3	1.3.M	1820	Ghermandi, Andrea
T1	R8	2.2.F	1092	Giacomelli-Sobrinho, Valny
W1	R10	2.4.A1	1094	Giacomelli-Sobrinho, Valny
F3	R10	2.4.B	1515	Glazyrina, Irina
W1	R4	1.3.N1	1898	Gomez-Baggethun, Erik
W2	R3	1.3.K1	1106	Gómez-Baggethun, Erik
W2	R15	3.3.G2	1368	Göpel, Maja
T1	R3	1.3.G	1345	Gori Maia, Alexandre
F2	R2	1.2.G	1568	Gorostiza Langa, Santiago
F1	R13	3.2.I	1555	Goulart da Silva, William
F3	R3	1.3.M	1821	Gowdy, John



F2	R1	3.3.N	1788	Gowdy, John
F1	R11	3.1.F		Gowdy, John
T1	R4	1.3.E	1354	Greiner, Romy
F2	R7	2.2.G	1675	Griewald, Yuliana
T2	R5	1.4.D	1120	Grimsrud, Kristine
F3	R14	3.3.O	2026	Gsottbauer, Elisabeth
F3	R9	2.3.G	1197	Gupta, Vijaya
T1	R2	1.2.B1	1285	Haas, Willi
T1	R6	2.1.D	1318	Hafner, Robert
F1	R9	2.3.F	1351	Hagemann, Nina
F3	R13	3.2.J2	1572	Hagemann, Nina
F1	R5	1.4.E	1725	Håkansson, Cecilia
T2	R13	3.2.F2	1389	Hardy, Derrylea J.
W3	R12	3.2.C	1471	Harris, Jonathan H.
T3	R11	3.1.H		Hatfield Dodds, Steve
W2	R13	3.2.G	1129	Hayashi, Takashi
F1	R2	1.2.E	1612	Häyhä, Tiina
T1	R1	1.1.C	1337	Heijungs, Reinout
T1	R3	1.3.G	1395	Hein, Jonas
F3	R12	3.4.B	2023	Heinananen, Jukka
W1	R13	3.2.E	1063	Helne, Tuula
F2	R3	1.3.L2	1733	Hendrickson, Cary Yungmee
F1	R10	2.4.F1	1030	Hermele, Kenneth
T2	R9	2.3.A2	1445	Herrmann Coelho-de-Souza, Carolina
F1	R6	2.1.F	1462	Hiedanpää, Juha
T3	R3	1.3.I	1779	Hirschfeld, Jesko
W1	R10	2.4.A1	1267	Hoff, Holger
F2	R10	2.4.F2	1141	Hollander, Ernst
T2	R5	1.4.D	1117	Holtsmark, Bjart
F1	R9	2.3.F	1137	Honkela, Nina
W1	R15	3.3.G1	1091	Horbach, Jens
T1	R8	2.2.F	1475	Hota, Padmanabha
T3	R11	3.1.H		Howarth, Richard
F1	R11	3.1.F		Howarth, Richard
T1	R11	3.1.D		HU Wendi
T1	R11	3.1.D		Huang Juan
F1	R13	3.2.I	1517	Hubeau, Marianne
F1	R14	3.3.E	1504	Hukkinen, Janne I.
F3	R7	2.2.J	1056	Ibarrola Rivas, Maria Jose
F3	R14	3.3.O	2028	Iris, Dorus
W3	R3	1.3.K2	986	Jakub, Kronenberg
W1	R2	1.2.A	1652	Jelinek, Ladislav
F3	R15	3.3.K	969	Johanisova, Nadia
F2	R15	3.3.J	1552	Johannsdottir, Lara
F3	R4	1.3.J	1775	Jónsson, Jón Örvar G.
W2	R5	1.4.B	1418	Kahmann, Birte
F1	R11	3.1.F		Kakovitch, Tom
W1	R3	1.3.A	1385	Kaphengst, Timo
W2	R15	3.3.G2	1386	Kaphengst, Timo
T2	R13	3.2.F2	1076	Karlheinz Knickel
W1	R12	3.2.A	1671	Karstensen, Jonas
T1	R10	2.4.E1	1672	Kastner, Thomas
W1	R7	2.2.C1	1510	Keating, Adriana
W1	R5	1.4.A	954	Kemkes, Robin J.
T2	R12	3.2.L1	1444	Kemp-Benedict, Eric
W2	R14	3.3.A	1499	Kemp-Benedict, Eric
W2	R3	1.3.K1	1166	Kenter, Jasper O.



W1	R14	3.3.B	1773 Kenter, Jasper O.
W1	R7	2.2.C1	958 Kestemont, Bruno
F1	R2	1.2.E	1593 Kimmich, Christian
T1	R14	3.3.C	1066 Kits, Gerda J.
F2	R14	3.3.F	1739 Klauer, Bernd
T2	R12	3.2.L1	1040 Klippert, Christian
F2	R1	3.3.N	1790 Klitgaard, Kent
F1	R1	3.3.M	1841 Kloczko-Gajewska, Anna
W1	R4	1.3.N1	1895 Kluvankova-Oravska, Tatiana
W2	R4	1.3.N2	1902 Kluvankova-Oravska, Tatiana
T3	R12	3.2.L2	1417 Knoeri, Christof
T3	R3	1.3.I	1638 Kocian, Maya
F2	R4	1.3.C	1636 Kocian, Maya
W1	R10	2.4.A1	1693 Koellner, Thomas
T2	R4	1.3.F	1393 Kolinjivadi, Vijay
W1	R14	3.3.B	1541 Konchak, William
W2	R8	2.2.B	1411 Köppl, Angela
T2	R6	2.1.E	973 Kothari, Ashish
F2	R7	2.2.G	1599 Kowalski, Benjamin
F2	R1	3.3.N	1789 Krall, Lisi
W2	R8	2.2.B	1715 Kratena, Kurt
W1	R2	1.2.A	1121 Krausmann, Fridolin
T1	R15	3.3.I1	1754 Kristinsdóttir, Sigrún María
F3	R14	3.3.O	2027 Lange, Ian
W2	R3	1.3.K1	1722 Langemeyer, Johannes
T1	R15	3.3.I1	1482 Langen, Nina
F1	R3	1.3.L1	1692 Lapeyre, Pirard, Leimona, Renaud, Romain, Beria
W2	R1	1.1.B	1413 Lawn, Philip Andrew
F2	R3	1.3.L2	1752 Le Coq, Jean-Francois
F2	R3	1.3.L2	1753 Le Coq, Jean-Francois
F1	R7	2.2.H	506 Le Coq, Jean-François
F2	R6	1.4.F	1373 Lima, Guiltherme
T1	R1	1.1.C	1705 Limburg, Karin E.
T2	R5	1.4.D	1118 Lindholt, Lars
F2	R9	2.3.E	1359 Loft, Lasse
T1	R7	2.2.E	975 Logar, Ivana
W2	R9	2.3.C	1608 Löschel, Andreas
T2	R12	3.2.L1	1381 Lott, Melissa C.
W2	R12	3.2.B	1508 Lunda, Vivien
T1	R2	1.2.B1	1400 Lutter, F. Stephan
T2	R10	2.4.E2	1666 Lutter, F. Stephan
F1	R11	3.1.F	Luzadis, Valerie
T2	R8	2.2.I	1537 Luzzati, Tommaso
T1	R13	3.2.F1	1550 Luzzati, Tommaso
T3	R15	3.3.H	1008 M_czka, Krzysztof
F3	R11	3.1.C	Maack, Maria
W1	R5	1.4.A	1379 Maco, Michal
W2	R1	1.1.B	1360 Malghan, Deepak
W1	R6	2.1.A	1168 Malghan, Deepak
F3	R2	1.2.F	1283 Marccone, Océane
T1	R6	2.1.D	1269 Marin-Burgos, Victoria
F2	R9	2.3.E	1331 Marinho, Eduardo
F3	R6	3.1.E	Mario, Perez
F3	R2	1.2.F	1146 Martin-Ortega, Julia
T3	R9	2.3.D	1145 Martin-Ortega, Julia
W1	R8	2.2.A	1930 Martin, Roger
T1	R9	2.3.A1	1451 Martinez-Alier, Joan



T2	R6	2.1.E	Martinez-Alier, Joan
W2	R12	3.2.B	2024 Martinuzzi, André
T1	R4	1.3.E	1614 Matzdorf, Bettina
T1	R1	1.1.C	1926 Mauerhofer, Volker
T1	R5	1.4.C	1925 Mauerhofer, Volker
F3	R6	3.1.E	May, Peter
F1	R5	1.4.E	1738 McRae, Louise
T1	R1	1.1.C	1606 Mechler, Reinhard
W1	R6	2.1.A	1500 Meira, Teresa
T2	R14	3.3.D	1259 Mello de Queiroz, Julia
T1	R4	1.3.E	1794 Ménard, Sophie
W3	R5	1.3.D	1340 Meya, Jasper Nikolaus
T3	R3	1.3.I	1566 Meyer, Ina
W1	R1	1.1.A	1370 Monasterolo, Irene
F3	R7	2.2.J	1067 Monteiro Klein, Monica
T2	R10	2.4.E2	1669 Moran, Daniel
T2	R14	3.3.D	1375 Morgan, Edward Alexander
T3	R12	3.2.L2	1126 Morlat, Clément
F1	R6	2.1.F	1237 Movik, Synne
F1	R1	3.3.M	1838 Mundaca, Luis
W2	R10	2.4.C	1520 Nantongo, Mary Gorret
W3	R5	1.3.D	1601 Nash, Julie
T3	R12	3.2.L2	1629 Nash, Julie
F3	R12	3.4.B	1736 Nässén, Jonas
W1	R2	1.2.A	1214 Niedertscheider, Maria
W1	R1	1.1.A	1077 Nonhebel, Sanderine
F1	R11	3.1.F	Norgaard, Richard
F2	R1	3.3.N	925 Norgaard, Richard B.
W1	R8	2.2.A	1755 O'Brien, Luke Joseph
W2	R6	2.1.B	1181 Ohlund, Erika
F3	R9	2.3.G	1050 Osberghaus, Daniel
W2	R14	3.3.A	1045 Osberghaus, Daniel
F1	R9	2.3.F	1544 Ota, Takahiro
F2	R2	1.2.G	1188 Ozkaynak, Begum
T2	R9	2.3.A2	1455 Ozkaynak, Begum
T3	R12	3.2.L2	1477 Pakina, Alla
F1	R7	2.2.H	1410 Pande, Saket
T2	R1	1.1.D	1766 Pastoret, Corinne
T1	R8	2.2.F	1764 Pastoret, Corinne
W3	R3	1.3.K2	1054 Patterson, Murray Graham
W1	R13	3.2.E	1711 Pauliuk, Stefan
T3	R11	3.1.H	Pearson, Leonie
T1	R14	3.3.C	1108 Pegels, Anna
F3	R6	3.1.E	Pengue, Walter
T2	R2	1.2.B2	1081 Pengue, Walter Alberto
W1	R9	2.3.B	1382 Perch, Leisa
F1	R1	3.3.M	1842 Perch, Leisa
W2	R9	2.3.C	1569 Perincek, Ruya
W2	R5	1.4.B	1128 Pétursson, Jón Geir
F3	R11	3.1.C	1362 Plank, Christina
F1	R3	1.3.L1	2030 Polard, Audrey
W1	R2	1.2.A	1161 Powell, Tom
W1	R4	1.3.N1	1896 Primmer, Eeva
F1	R12	3.2.K	1202 Pullinger, Martin
W2	R2	1.2.C	1532 Raberto, Marco
F1	R7	2.2.H	1547 Ragnarsdottir, Kristin Vala
T3	R15	3.3.H	1167 Rapp Nilsen, Heidi



F1	R10	2.4.F1	1102	Rezai, Armon
W1	R4	1.3.N1	1897	Ring, Irene
W2	R4	1.3.N2	1899	Ring, Irene
T3	R2	1.2.D	1290	Ritchie, Justin
W1	R10	2.4.A1	1143	Roca, Jordi
F3	R13	3.2.J2	926	Rock, Greg
T1	R9	2.3.A1	1453	Rodriguez-Labajos, Beatriz
F1	R14	3.3.E	1503	Roelich, Katy
F2	R10	2.4.F2	1017	Roepke, Inge
T1	R1	1.1.C	1322	Rogers, Deborah Lawrence
F3	R15	3.3.K	1012	Rogers, Deborah S
T1	R12	3.2.D	1776	Rok, Jakub
W2	R6	2.1.B	1090	Rosenbaum, Eckehard
T2	R15	3.3.I2	1661	Rulleau, Bénédicte
F1	R1	3.3.M	1840	Rybeck, Rick
T3	R5	1.3.O	1712	Saarikoski, Heli Virpi
T2	R1	1.1.D	1521	Safonov,Paul
T3	R2	1.2.D	1782	Sarcinelli, Oscar
T2	R3	1.3.H	1397	Sattler, Claudia
F2	R12	3.4.A	1468	Sauer, Thomas
F2	R10	2.4.F2	1377	Sawyer, Malcolm
W1	R11	3.1.A	1769	Saxena, Rakesh
T2	R10	2.4.E2	1667	Schaffartzik, Anke
W1	R15	3.3.G1	1199	Scharbert, Annika
T2	R15	3.3.I2	1561	Schmidt, Tiina
F2	R12	3.4.A	1115	Schubert, Johannes
T2	R15	3.3.I2	1558	Schwirplies, Claudia
W2	R12	3.2.B	1364	Sedlacko, Michal
W1	R6	2.1.A	1178	Seidl, Irmi
F1	R10	2.4.F1	1176	Seidl, Irmi
F2	R4	1.3.C	1643	Seidler, Reinmar
W1	R11	3.1.A	971	Sen, Alok
F3	R9	2.3.G	1308	Senapati, Sibananda
W2	R2	1.2.C	1758	Shafiei, Ehsan
F2	R3	1.3.L2	1295	Shapiro-Garza, Elizabeth
F3	R13	3.2.J2	1134	Sharma, Tarun
W2	R2	1.2.C	1731	Shortall, Ruth
W2	R9	2.3.C	1512	Simonet, Catherine
T1	R12	3.2.D	2018	Simron, Singh
F2	R15	3.3.J	1540	Sindhi, Sumita
F1	R13	3.2.I	1781	Skardhamar Olsen, Elisabeth
T2	R3	1.3.H	1463	Smith, Darrell Jon
T3	R9	2.3.D	1038	Solomon, Barry D.
F3	R12	3.4.B	1597	Sorrentino, John A.
W1	R3	1.3.A	1570	Spangenberg, Joachim H.
T1	R6	2.1.D	1579	Spangenberg, Joachim H.
T2	R6	2.1.E		Spash, Clive (by remote participation)
W2	R6	2.1.B	1602	Stagl, Sigrid
W1	R1	1.1.A	1493	Steinberger, Julia K.
W1	R9	2.3.B	1721	Stepping, Katharina M. K.
F2	R4	1.3.C	1080	Stoll-Kleemann, Susanne
F2	R12	3.4.A	1319	Stossel, Zeev
W3	R6	2.1.G	994	Strunz, Sebastian
F2	R9	2.3.E	1369	Sven , Wunder
W2	R7	2.2.C2	1543	Sverdrup, Harald Ulrik
T1	R6	2.1.D	1264	Szaboova, Lucy
F3	R11	3.1.C	1511	Tabi, Andrea



W1	R9	2.3.B	1162	Tagaeva, Tatyana
F1	R4	1.3.B	1407	Tanvir Hussain, Abul Maala
F3	R14	3.3.O	2029	Tavoni, Alessandro
T2	R8	2.2.I	1262	Teixidó-Figueras, Jordi
F2	R7	2.2.G	1218	Teixidó-Figueras, Jordi
F3	R10	2.4.B	1232	Teixidó-Figueras, Jordi
T1	R9	2.3.A1	1456	Temper, Leah
W2	R5	1.4.B	1253	Thapliyal, Sneha
T1	R8	2.2.F	964	Thapliyal, Sneha
W1	R11	3.1.A	1225	Thapliyal, Sneha
W3	R12	3.2.C	1193	Timmons, David
W2	R2	1.2.C	1405	Toikka, Arho
F1	R2	1.2.E	1082	Uehara, Takuro
T3	R12	3.2.L2	1659	Umpfenbach, Katharina
W2	R1	1.1.B	1107	Urhammer, Emil
T2	R13	3.2.F2	1391	Uwasu, Michinori
W2	R4	1.3.N2	1903	Vackar, David
F3	R2	1.2.F	1061	Van Passel, Steven
F1	R5	1.4.E	1140	Van Rooij, Wilbert
W2	R10	2.4.C	1402	Vatn, Arild
T1	R13	3.2.F1	1744	Vaziri, Amirali
F1	R13	3.2.I	1240	Vergger, Yoann
W2	R15	3.3.G2	1363	Viaene, Jarinda
W2	R12	3.2.B	1355	Videira, Nuno
F2	R14	3.3.F	1783	Vinha, Valéria
W1	R13	3.2.E	1356	Vinnari, Markus
W1	R5	1.4.A	976	Vitari, Claudio
W2	R6	2.1.B	977	Vitari, Claudio
T2	R3	1.3.H	1353	Völker, Marc
T1	R3	1.3.G	2021	von Korff, Heidi
W1	R15	3.3.G1	1272	von Muenchhausen, Susanne
F2	R13	3.2.J1	1433	Wächter, Petra
W2	R1	1.1.B	1153	Wäckerle, Manuel
F2	R2	1.2.G	1442	Walter, Mariana
T2	R9	2.3.A2	1449	Walter, Mariana
T1	R11	3.1.D		Wang Songpei
T3	R9	2.3.D	1808	Wechsung, Frank
T1	R10	2.4.E1	1668	Weinzettel, Jan
F3	R13	3.2.J2	1563	Wiebe, Kirsten Svenja
T2	R2	1.2.B2	1154	Wiedenhofer, Dominik
T3	R15	3.3.H	1429	Wilén, Kristoffer
W2	R14	3.3.A	1740	Wilson, Kimberley
T3	R5	1.3.O	1642	Winslow, Maggie
W2	R7	2.2.C2	1644	Winslow, Maggie
W1	R10	2.4.A1	1645	Winslow, Maggie
F1	R14	3.3.E	1641	Winslow, Maggie
T1	R5	1.4.C	1529	Winter, Etti Maria
F2	R9	2.3.E	1664	Wong, Grace Y.
T2	R10	2.4.E2	1670	Wood, Richard
W1	R3	1.3.A	1270	Wu□nscher, Tobias
F2	R4	1.3.C	1149	Wu□nscher, Tobias
W2	R10	2.4.C	1806	Yang, Anastasia Lucy
W2	R7	2.2.C2	1083	Yee, Chow Fah
T1	R11	3.1.D		Zhang Junbiao; Li Peng
W1	R14	3.3.B	1490	Zhou, Sophie Lian
T2	R8	2.2.I	1573	Ziegler, Andreas