

Scaling and Governance Conference 2010

"Towards a New Knowledge for Scale Sensitive Governance of Complex Systems"

Conference Program and Book of Abstracts

Wageningen, the Netherlands
November 11-12, 2010

Local organizer
Wageningen University and Research Centre



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Welcome to Wageningen!

The Organizing Committee welcomes you to the Scaling and Governance Conference 2010. We are extremely excited to welcome more than 125 researchers from all over the world and to have the opportunity to share current knowledge and insights on scaling and governance research. This conference is a milestone in our Scaling and Governance Program that started in 2007 at Wageningen UR. It is excellent opportunity for exposing the results of the program to the global scientific community.

This international conference aims to:

- share the newest developments on scale and governance research in natural and social sciences
- take a step further beyond the traditional natural and social sciences divide
- discuss integrative concepts, methodologies and case studies
- contribute to scale-sensitive governance approaches to the major challenges of these times

The program offers many opportunities to reach these goals and we hope to offer a good atmosphere for vigorous communication between natural and social scientists from different disciplines.

A special welcome to the PhDs participating in the conference! We hope this conference facilitates the exchange of ideas among and between young researchers and the wider scientific community. A pre-conference for PhDs will be held on November 10th to discuss work in progress and research ideas with peer PhDs and senior faculty.

Wageningen is a historical town in central Netherlands and is called the City of Life Sciences. Wageningen UR has been the venue for many international meetings in this field. We are proud to continue this tradition with this conference and we would like to thank the Wageningen UR administration, and participating research schools to make this conference possible. We also give thanks to the Global Land Project and The Earth System Governance project for their support.

The Organizing Committee wishes you all a nice stay in Wageningen!

The organizing committee

The Wageningen UR Program Scaling and Governance is a cooperation between three Wageningen University Research Schools, the strategic research program "Sustainable spatial development of ecosystems, landscapes, seas and regions" which is funded by the Dutch Ministry of Agriculture, Nature Conservation and Food Quality. The program is led by a multidisciplinary team with members from the Environmental, Social, Animal and Plant Science Groups of Wageningen University, Alterra, LEI and Hogeschool Van Hall Larenstein, and the Competing Claims on Natural Resources Program under the partnership of Wageningen UR and EMBRAPA Brazil.

Scientific and Organizing Committees

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Organizing Committee (Wageningen UR)

- **Prof. Dr. Bas Arts**, Forest and Nature Conservation Policy Group
- **Prof. Dr. Paul Opdam**, Department of Land Use Planning & Alterra Landscape Centre
- **Dr. Frans Padt**, Alterra Landscape Centre
- **Dr. Ir. Nico Polman**, Regional Economy & Land Use, LEI
- **Dr. Ir. Stijn Reinhard**, Regional Economy & Land Use, LEI
- **Dr. Ir. Maja Slingerland**, Plant Production Systems Group
- **Dr. Ir. Sierk Spoelstra**, Systems Innovation, Wageningen UR Livestock Research
- **Prof. Dr. Ir. Katrien Termeer**, Public Administration and Policy Group
- **Drs. Wim Timmermans**, Urban Green, Van Hall Larenstein

Staff: Barbara Kolijn, Alterra Landscape Centre

Scaling and governance: introduction

Although scales and governance are no new subjects, their importance has grown over the last years in cross-disciplinary research on social-ecological systems. This can be explained by the increasing concerns for sustainability issues in the context of a globalizing world. Problems like climate change, droughts and floods, pollution, and threats to biodiversity stretch across local to global scale levels and cut across traditional jurisdictions and scopes of scientific routines and models. As a result the traditional misfit thesis – the misfit between the scale of a problem and the scope of a jurisdiction - does no longer provide adequate analyses and solutions. This program aims to develop advanced knowledge on scaling and governance that is practically relevant and scientifically sound.

We define *scale* as the analytical dimensions used to measure and study any phenomenon, and *levels* as the units of analysis that are located at different positions on a scale. Next to the classic types of scale – spatial and temporal – we consider jurisdictional, institutional, networks, management and knowledge scales.¹ Often, levels on a scale are arranged in a hierarchical fashion such that lower levels are part of more inclusive higher levels (e.g. the spatial scale of globe, regions, landscape, patches; or the knowledge scale of general and specific knowledge).²

Both the ecological and the socio-economic domain are organized across a multitude of scales and levels. It means that changes at any scale and level in either the ecological domain or the socio-economic domain have consequences at other levels. In the context of sustainable development, we consider the ecological and socio-economic domains as interdependent subsystems, where changes in the ecological functioning elicit responses in the socio-economic subsystem, and vice versa.

Governance encompasses all those structures and activities of social, political and administrative actors that can be seen as purposeful efforts to guide, steer, control, or manage sustainable development or other moral principles like good governance, accountability or environmental justice. The governance system is organized around scales and levels also. Traditionally the jurisdictional (of state, province, municipality) and the institutional scale (of constitutions, laws and operating rules) are central in governance studies. Externalities on temporal scales bring with them some specific but less studied governing problems, as the future is surrounded by uncertainties and as most politicians focus upon showing results within their terms of office. This situation is challenged by the rise of a digitalized network society and the assumed shift from monocentric, hierarchical and well-institutionalized forms of government towards less formalized forms of governance in which state authority makes way for an appreciation of mutual interdependent stakeholders.

In Scaling and Governance we investigate how governance can be positioned and developed in between the ecological and socio-economic domains across a range of scales and levels (Figure 1). Our assumption is that in this analytical position governance studies can better contribute to sustainable change of socio-ecological systems. From the point of view of governance, we

¹ Cash, D.W., Adger W.N., Berkes, F., Garden, P., Lebel, L., Olsson, P., Pritchard, L. & Young, O. (2006). Scale and cross-scale dynamics: governance and information in a multilevel World. *Ecology and Society* 11 (2): 8.

² Gibson, C., Ostrom, E. & Ahn, T.K. (2000). The concept of scale and the human dimensions of global change: a survey. *Ecological Economics* 32: 217-239.

search for scale-sensitive governance. From the point of view of scaling in the ecological and socio-economic domains, we search for a governance-sensitive scaling. Key concepts to analyze and develop scales sensitive governance and governance sensitive scaling are multi-scale linkages, connectivity, sensemaking, fit and interplay across levels and scales.

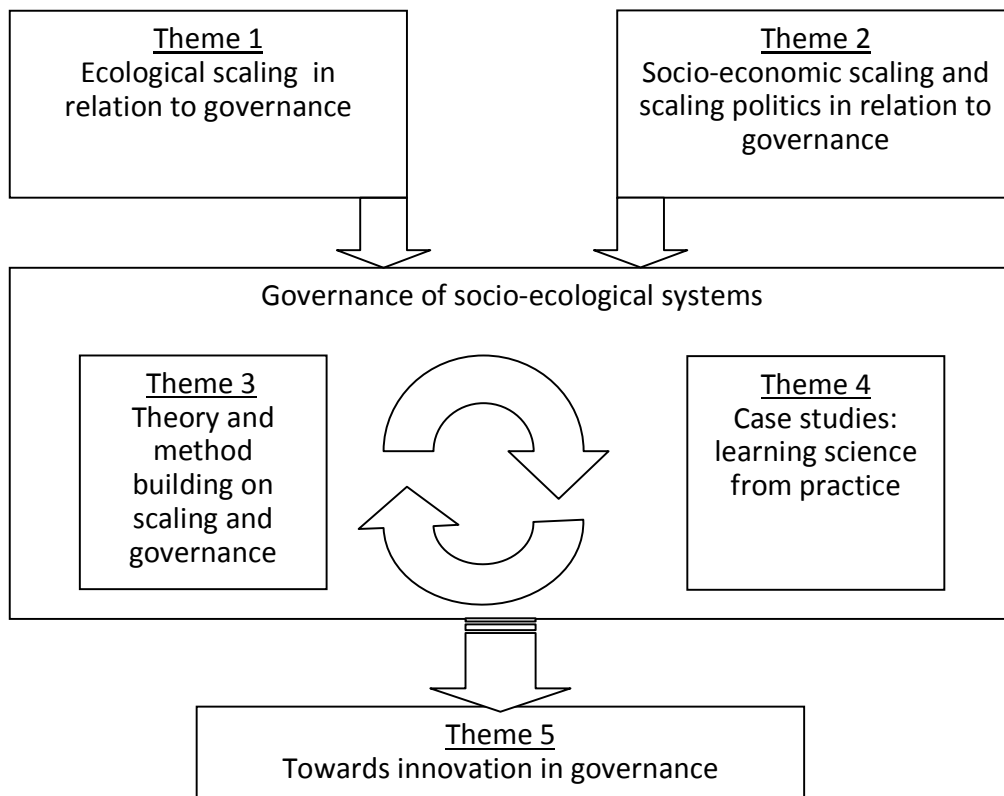


Figure 1: Scaling and governance themes.

Conference themes

The conference is organized along five main themes:

1. Ecological scaling in relation to governance
2. Socio-economic scaling and scaling politics in relation to governance
3. Theory and method building on scaling and governance
4. Case studies: learning science from practice
5. Towards innovation in governance

These themes are introduced below.

Theme 1: Ecological scaling in relation to governance

Ecological systems and processes are described at different scale levels: for example from gene to species to ecosystems and from field to farm to landscape to agro-ecosystems. Many systems are nested, for example different rivers making up a delta, with a large watershed encompassing

many small ones. In addition the mentioned processes take place at different temporal scales. For example soil erosion through run-off occurs during one extreme rainfall event whereas soil formation takes millions of years. Looking at these scales and levels four sets of questions arise.

1. About the relations between scales in ecological processes. Should we consider time and space separately or not? Which other scales are important? How do they relate?
2. About the relations between levels on a scale in ecological processes. Can we understand the same ecological processes at different levels? How can levels be connected? Does it make a difference whether a scale consists of a gradient or a discontinuity? Which data can be translated from the global level to the field level (or the other way round) and which cannot?
3. What does all this mean for governance? Does every ecological level need its own governance level? How can mismatches between governance levels and ecological levels be addressed? Does governance distinguish other scales and how do these interact with temporal and spatial scales of ecological processes?
4. About networks. There is a relation between ecological and socio-economic domain through networks (e.g. population networks, food webs, social networks). How can such networks be described in terms of scale and level?

Theme 2: Socio-economic scaling and scaling politics in relation to governance

In socio-economic systems scales and levels are not 'naturally pre-given' but 'named and framed' in various social practices. Political and economic institutions (and science) play an important role in this process. This theme explores the framing and institutionalization of scale and the relation of these processes with the ecological domain. How, for example, does scale framing interact with physical realities? How does scale framing anticipate the allocation of costs and benefits related to land use, attractive landscapes, environmental pollution and the like? This theme also discusses the normative consequences of scale framing processes, including sustainable development and social justice. In short, this second theme aims at:

1. Analyzing how scales and levels are produced, reproduced and transformed in various social practices, including science.
2. Understanding how these various scaling practices are culture-specific, interrelate and might have external effects on each other.
3. Analyzing the current governance of these scaling practices – or lack thereof – by various power holders (governments, firms, NGOs, universities), including its normative consequences.

Theme 3: Theory and method building on scaling and governance

Whereas themes 1 and 2 consider scaling in the ecological and socio-economic domain separately, theme 3 links the two domains and constructs their interaction as a socio-ecological system. Farms, landscapes, towns, rural municipalities and watersheds can be described as socio-ecological systems. Focusing on one level of spatial scale, mostly the local level, the interactions between a society and the physical space on which it depends are emphasized. Two interactions prevail: (1) use and perception of values, goods and services provided by the ecological component, and (2) interventions the actors decide upon as a response, aiming to improve the functioning of the ecological component and thereby its user value. These interventions cause changes in the ecological component.

Within the scaling and governance perspective the emphasis in theme 3 is on theory, concepts and method building. More specific it deals with the following issues:

1. How the local level system is affected by higher level processes, both in the ecological domain, for example climate change, and in the socio-economic domain, for example (inter)national legislation.
2. How the dynamics of local level socio-ecological systems affect the structure and functioning of socio-ecological interactions at higher levels of scale.
3. Developing new concepts and methods to describe and analyze the interaction of socio-ecological systems across levels of spatial scale, for example the application of network theory on analyzing the complex responses by interacting actors.
4. Modeling the response of locally interacting land users to higher level events, for example fluctuations in world market food prices or changes in subsidies for ecosystem services. Such models allow experiments on the impact of higher level incentives, of events on the socio-ecological system, or of introducing new knowledge.

Theme 4: Case studies: learning science from practice

Case studies can either lead to emerging new insights or be used to test pre-set assumptions. In this theme we look at case studies from both perspectives. Theoretical concepts and methods provided by research in theme 3 are applied in a real world perspective by using case studies. In reverse, emerging insights from case studies are built into theory.

1. What does this mean to scaling and governance? It seems to imply different levels of socio-ecological systems along temporal, spatial and other scales. Does this make sense? Or are different levels encompassed within a socio-ecological system?
2. Which scales are important? What will be the connections between different scales within a socio-ecological system?
3. What will be the connection between levels on the scales relevant for socio-ecological systems?
4. Which competencies do researchers or policy makers need to deal with scaling and governance in socio-ecological systems?

Although many questions arise we hope that in this theme we can especially learn from the case studies in how scaling and governance work out in practice.

Theme 5: Towards innovation in governance

This theme aims to incorporate the insights of themes 1-4 into recommendations for research and policy. It does so by developing innovative tools, methods, processes and arrangements for scale sensitive governance and governance sensitive scaling. It addresses three subthemes:

1. Developing criteria to evaluate and guide the development of scale sensitive governance and governance sensitive scaling.
2. Developing a 'catalogue' of scales sensitive governance processes and arrangements. Scale sensitive governance processes include for instance concepts to help actors in policy processes to better make sense of different scales; process designs to organize interactions across scales and levels; or a specification of boundary spanning roles. Scale sensitive governance arrangements include for instance financial arrangements to prevent spillovers; boundary arrangements to facilitate cross-level and cross-scale interactions; temporary authorities; multilevel structure; or science-policy arrangements to organize legitimate down- and up-scaling.

3. Developing a 'catalogue' of governance sensitive scaling tools and methods For instance, these tools and methods aim, to inform decision making on one level or scale about implications of their decisions to the functioning of socio-ecological systems at other levels or scale, and also about how benefits for the area at stake may be achieved by taking into account social or biophysical processes at other scale levels.

Program overview

Wednesday November 10, 2010

17.00 – 17.30	Bus transfer PhDs from University to Hof van Wageningen	
17.30 – 19.30	Registration and reception	Room: Lounge

Thursday November 11, 2010

8.00 – 9.00	Welcome and registration		Room: Lounge
9.00 – 9.15	Welcome to the conference on behalf of Wageningen UR by Kees Slingerland Introduction to conference by Paul Opdam		Room: Ir. Haak zaal
9.15 – 10.00	Plenary key note speech by Thomas Elmqvist		Room: Ir. Haak zaal
10.00 – 10.30	Coffee break		
10.30 – 11.30	Parallel sessions conference themes:		
	<i>1.1.I Ecosystem management</i>	<i>Moderator: Maja Slingerland</i>	<i>Room: Nieuwlandzaal</i>
	<i>2.1.I Policy and institutional analysis</i>	<i>Moderator: Nico Polman</i>	<i>Room: Jagerskampzaal</i>
	<i>3.1.I Socio-ecological systems</i>	<i>Moderator: Stijn Reinhard</i>	<i>Room: Hoevesteinzaal</i>
	<i>4.1.I Regional environmental governance</i>	<i>Moderator: Marian Stuiver</i>	<i>Room: Peppelzaal</i>
	<i>5.2.I Scale negotiations and governance</i>	<i>Moderator: Katrien Termeer</i>	<i>Room: Tarthorstzaal 1</i>
11.30 – 11.45	Change of sessions		
11.45 – 12.45	Parallel sessions conference themes:		
	<i>1.1.II Ecosystem management</i>	<i>Moderator: Maja Slingerland</i>	<i>Room: Nieuwlandzaal</i>
	<i>2.1.II Policy and institutional analysis</i>	<i>Moderator: Nico Polman</i>	<i>Room: Jagerskampzaal</i>
	<i>3.1.II Socio-ecological systems</i>	<i>Moderator: Stijn Reinhard</i>	<i>Room: Hoevesteinzaal</i>
	<i>4.1.II Regional environmental governance</i>	<i>Moderator: Marian Stuiver</i>	<i>Room: Peppelzaal</i>
	<i>5.2.II Scale negotiations and governance</i>	<i>Moderator: Katrien Termeer</i>	<i>Room: Tarthorstzaal 1</i>
12.45 – 14.00	Lunch		Room: Terraszaal
14.00 – 14.45	Plenary key note speech by James McCarthy		Room: Ir. Haak zaal
14.45 – 15.15	Coffee break		
15.15 – 16.15	Parallel sessions conference themes:		
	<i>1.2.I Land use dynamics</i>	<i>Moderator: Maja Slingerland</i>	<i>Room: Nieuwlandzaal</i>
	<i>2.2.I Scale framing</i>	<i>Moderator: Nico Polman</i>	<i>Room: Jagerskampzaal</i>
	<i>2.4.I Politics of scale in the governance of natural resources (organized session)</i>	<i>Moderator: Esther Turnhout</i>	<i>Room: Hoevesteinzaal</i>
	<i>3.3.I Scaling and governance methodologies</i>	<i>Moderator: Sierk Spoelstra</i>	<i>Room: Peppelzaal</i>
	<i>5.2.III Scale negotiations and governance</i>	<i>Moderator: Katrien Termeer</i>	<i>Room: Tarthorstzaal 1</i>
16.15 – 16.30	Change of sessions		
16.30 – 17.30	Parallel sessions conference themes:		
	<i>1.2.II Land use dynamics</i>	<i>Moderator: Maja Slingerland</i>	<i>Room: Nieuwlandzaal</i>
	<i>2.2.II Scale framing</i>	<i>Moderator: Nico Polman</i>	<i>Room: Jagerskampzaal</i>
	<i>2.3.I Linking scales: scale jumping and rescaling</i>	<i>Moderator: Bas Arts</i>	<i>Room: Tarthorstzaal 1</i>
	<i>2.4.II Politics of scale in the governance of natural resources (organized session)</i>	<i>Moderator: Esther Turnhout</i>	<i>Room: Hoevesteinzaal</i>
	<i>3.3.II Scaling and governance methodologies</i>	<i>Moderator: Sierk Spoelstra</i>	<i>Room: Peppelzaal</i>

17.30 – 19.00	Free time		
19.00 – 21.30	Conference dinner; speeches by Herman Eijsackers (Ministry of LNV) and Tom Veldkamp (University of Twente) (program founder)		Room: Terraszaal

Friday November 12, 2010

9.00 – 9.45	Plenary key note speech by Joshua Farley		Room: Ir. Haak zaal
9.45 – 10.15	Coffee break		
10.15 – 11.15	Parallel sessions conference themes:		
	<i>2.3.II Linking scales: scale jumping and rescaling</i>	<i>Moderator: Bas Arts</i>	<i>Room: Tarthorstzaal 1</i>
	<i>3.2.I Integrating networks and hierarchies</i>	<i>Moderator: Frans Padt</i>	<i>Room: Jagerskampzaal</i>
	<i>4.2.I Transnational governance</i>	<i>Moderator: Daniel Compagnon</i>	<i>Room: Nieuwlandzaal</i>
	<i>5.4.I Governance authorities, leadership</i>	<i>Moderator: Katrien Termeer</i>	<i>Room: Hoevesteinzaal</i>
	<i>5.5.I Governance support tools</i>	<i>Moderator: Stijn Reinhard</i>	<i>Room: Tarthorstzaal 2</i>
	<i>5.6.I SCALES and governance for innovation in biodiversity conservation (organized session)</i>	<i>Moderator: Irene Ring</i>	<i>Room: Peppelzaal</i>
11.15 – 11.30	Change of sessions		
11.30 – 12.30	Parallel sessions conference themes:		
	<i>2.3.III Linking scales: scale jumping and rescaling</i>	<i>Moderator: Bas Arts</i>	<i>Room: Tarthorstzaal 1</i>
	<i>3.2.II Integrating networks and hierarchies</i>	<i>Moderator: Frans Padt</i>	<i>Room: Jagerskampzaal</i>
	<i>4.2.II Transnational governance</i>	<i>Moderator: Daniel Compagnon</i>	<i>Room: Nieuwlandzaal</i>
	<i>5.4.II Governance authorities, leadership</i>	<i>Moderator: Katrien Termeer</i>	<i>Room: Hoevesteinzaal</i>
	<i>5.6.II SCALES and governance for innovation in biodiversity conservation (organized session)</i>	<i>Moderator: Irene Ring</i>	<i>Room: Peppelzaal</i>
	<i>Results of Side event</i>	<i>Moderator: Wim Timmermans</i>	<i>Room: Tarthorstzaal 2</i>
12.30 – 13.45	Lunch		Room: Terraszaal
13.45 – 14.30	Plenary key note speech by Joyeeta Gupta		Room: Ir. Haak zaal
14.30 – 15.00	Coffee break		
15.00 – 16.00	Parallel sessions conference themes:		
	<i>4.3.I Knowledge management</i>	<i>Moderator: Wim Timmermans</i>	<i>Room: Hoevesteinzaal</i>
	<i>4.3.II Knowledge management</i>	<i>Moderator: Maja Slingerland</i>	<i>Room: Tarthorstzaal 1</i>
	<i>5.1 Governance sensitive scaling</i>	<i>Moderator: Bas Arts</i>	<i>Room: Nieuwlandzaal</i>
	<i>5.3 Governance of global flows</i>	<i>Moderator: Sierk Spoelstra</i>	<i>Room: Jagerskampzaal</i>
	<i>5.5.II Governance support tools</i>	<i>Moderator: Stijn Reinhard</i>	<i>Room: Peppelzaal</i>
	<i>Results of Side event</i>	<i>Moderator: Wim Timmermans</i>	<i>Room: Tarthorstzaal 2</i>
16.00 – 16.15	Change of sessions		
16.15 – 17.00	Plenary session Scaling and Governance: essences and future challenges by Katrien Termeer and Paul Opdam		Room: Ir. Haak zaal

Key note speakers

Thursday morning, 9.15: Thomas Elmqvist, Department of Systems Ecology, Stockholm University, Sweden

Title: "Urban social-ecological systems and scale mismatches"

Thomas Elmqvist is a professor in Natural Resource Management. His research is focused on ecosystem dynamics, ecosystem services, land use change, natural disturbances and components of resilience including the role of social institutions. He is coordinating two major interdisciplinary research themes as part of the new Stockholm Resilience Centre (www.stockholmresilience.su.se) at Stockholm University. The first focus on governance and management in urban landscapes, the other on adaptive governance of dynamic land- and seascapes. He was involved in the Millennium Ecosystem Assessment and in the two sub-global assessments in Sweden. He is also principal investigator of multidisciplinary projects in Madagascar and in the south Pacific. He serves as associated editor for the journals *Ecology and Society* and *Conservation and Society*. He is currently chair of the Man and the Biosphere Program within UNESCO (www.unesco.org/mab) and member of the Science Committee bioSustainability, as part of Diversitas (www.bioSustainability.org)

Thursday afternoon, 14.00: James McCarthy, Department of Geography, The Pennsylvania State University, USA.

Title: "Scale, shale, and governance: perspectives from human geography"

James McCarthy is an Associate Professor of Geography at Penn State University. His research explores the relationships between environmental politics and the political economy of capitalist societies, with particular emphases on scale, property relations, rural areas, community-based resource management, and the history of environmental social movements. Much of his recent work has examined the evolving relationships between neoliberalism and environmental governance. He received his B.A. from Dartmouth College and his M.A. and Ph.D. from the University of California at Berkeley.

Friday morning 9.00, Joshua Farley, Community Development & Applied Economics and Public Administration and Gund Institute for Ecological Economics (GIEE), University of Vermont, USA

Title: "Economic Institutions and Governance for the Global Commons"

Joshua Farley is Associate Professor in Community Development & Applied Economics and Public Administration and fellow of the Gund Institute for Ecological Economics (GIEE) at the University of Vermont. Dr. Farley holds degrees in biology, international affairs and economics. He has previously served as program director at the School for Field Studies, Centre for Rainforest Studies (CRS) and as Executive Director of the University of Maryland International Institute for Ecological Economics. He recently returned from a Fulbright fellowship in Brazil, where he was a visiting professor at the Federal Universities of Santa Catarina (UFSC) and Bahia (UFBA).

His broad research interests focus on the design of an economy capable of balancing what is biophysically possible with what is socially, psychologically and ethically desirable. More specifically, his research focuses on mechanisms for allocating resources under local control and national sovereignty that generate global public goods, developing transdisciplinary case study approaches to environmental problem solving as an educational tool, ecological restoration of rainforest ecosystems, economic globalization, and the valuation and finance of restoring natural capital.

Friday afternoon, 13.45: Joyeeta Gupta, Institute for Environmental Studies, Free University Amsterdam, Netherlands.

Title: "The politics of scale in environmental governance"

Joyeeta Gupta is professor of climate change law and policy at the Vrije Universiteit Amsterdam and of water law and policy at the UNESCO-IHE Institute for Water Education in Delft. She is editor-in-chief of *International Environmental Agreements: Politics, Law and Economics* and is on the editorial board of journals like *Carbon and Law Review*, *International Journal on Sustainable Development*, *Environmental Science and Policy*, and *International Community Law Review*. She was lead author in the Intergovernmental Panel on Climate Change which recently shared the 2007 Nobel Peace Prize with Al Gore and of the Millennium Ecosystem Assessment which won the Zayed Second Prize.

Abstracts

Theme 1: Ecological scaling in relation to governance

Session 1.1, Ecosystem management I: Thursday 10.30-11.30

12. Loweswater: a case study on the importance of 'local' scale for ecosystem management

Lisa Norton, Centre for Ecology and Hydrology, Lancaster Environment Centre, UK

'Catchments' are essentially hydrological units, but provide useful landscape units for environmental management in which land activities can be seen to directly contribute to contingent water issues. From social and institutional perspectives, hydrological catchments may appear to have limited relevance, but could they form a useful unit for the local-level governance of ecosystem services?

This paper describes an interdisciplinary approach taken towards understanding the causes of unsightly and potentially toxic blue-green algal blooms in Loweswater, a small lake in the Lake District National Park in England. The work described here forms part of an action research project which is experimenting with community- and institutional stakeholder involvement in catchment management. The project builds on farmer-led initiatives to tackle the algal bloom problem and recognises the key roles of those and other stakeholders in catchment management.

The natural science aspects of the research have involved the integration of various different types of data and science. These include data from householders, farmers, an agricultural consultant, land use scientists, lake ecologists and freshwater and algal modellers. Natural science approaches are typically focused either at a micro or a macro scale and tend to avoid focusing on case studies, preferring the identification of underlying principles of broad relevance. There are relatively few studies which attempt to piece together data from multiple aspects of the same local landscape unit in order to understand relationships between ecosystem services. Consequently tools for working scientifically at the local scale are limited, for example, hydrological catchment models are generally designed for large catchment areas and use relatively coarse information on land cover and use. The Loweswater work required the adaptation of a generic hydrological model to make it possible to incorporate the detailed land use/cover data available for the catchment.

Working at the local scale in an integrated way for natural scientists is novel and challenging, though potentially rewarding if the science can be used to contribute towards more sustainable resource management by environmental managers. A shift towards environmental governance which engages with communities at a local scale will require scientists to identify approaches and develop tools which can facilitate effective integrated management of local landscape units.

20. Deforestation in settlement-projects: exploring an integrated approach of livelihood and land-use dynamics in the Brazilian Amazon frontier

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The Amazon biome is the largest and most valuable tropical forest in the world. Sixty-nine percent of this biome is within Brazil, covering an area of about 5.1 million km², being home to 22.5 million people or 12.5% of the Brazilian population, approximately. One of the major problems in the region is – as is widely known and recognized – deforestation.

Amid multiple factors responsible for deforestation, the Agrarian Reform program has been highlighted as considerable underlying cause. Although the conversion of forest areas to family agriculture is, to a certain extent, allowed by the Brazilian Forestry Code (20% of forest areas in properties), in some settlement projects, the deforestation rate is much higher than allowed (49% of forest in properties). The patterns of the deforestation in the region have mainly been researched by spatial analyses and remote sense monitoring. Although these investigations are important in providing spatial representation of the course of deforestation, they are limited by a lack of understanding of how socioeconomic factors affect forest dynamics and land use change. Thus, a more detailed actor-based approach has to be used to understand the social process involved in the conversion of the forest. Milk production has been an intense livelihood strategy in small farms in the converted areas, even though most studies of deforestation in the region do not distinguish beef and dairy beef cattle.

In brief, the challenge of the Agrarian Reform program is to assure the access to land for landless people, providing livelihood security, and at the same time conserve Amazon forest resources (environmental sustainability), this being a clear case of competing claims on natural resources. Therefore, the general objective of this research aims at a better understanding of the role of milk production in livelihood security processes, land use change and forest dynamics in Amazon settlements, i.e. whether milk production contributes to livelihood security AND deforestation, or whether it can integrate economic, social and environmental sustainability at the same time. Theoretically, the present study builds upon the Sustainable Livelihood Approach.

62. Scalar challenges to the governance of sediment on transitioning rural landscapes

Anne Short, Boston University and University of California, USA

This paper uses the lens of scale to investigate the challenges of governing nonpoint source pollution on changing rural landscapes. To do so, I review interdisciplinary work on rural land-use change and the governance of nonpoint source pollution, and report on a multiscale study of the governance of nonpoint source pollution on private lands in the rural North Coastal Basin of California, USA. Rural areas in the United States and throughout much of the post-industrial world are undergoing significant ecological, socio-economic, and political transformations. Since the mid-1970s, the migration of urban and suburban dwellers into rural areas has led to the subdivision of large tracts of land into smaller parcels, which can complicate efforts to govern human-environmental problems. Nonpoint source (NPS) pollution from private rural lands is a particularly pressing humanenvironmental challenge that may be aggravated by changing land

tenure. In general, the diffuse and intermittent nature of NPS pollution is incompatible with the spatial and temporal scales of traditional regulatory tools. Increased fragmentation and changing ownership boundaries exacerbate the mismatch between the biophysical scale of the NPS problem and the institutional scalar capacity of local, state and federal agencies. The North Coastal Basin study examines if and how regulatory and non-regulatory efforts to control sediment (a common NPS pollutant) at the watershed and regional scale affect actual land management practices on individual parcels. I find that the spatial and temporal aspects of the nonpoint source pollution problem are generally mismatched to the institutional scale of response by governing agencies and non-regulatory actors. Despite these challenges, the governance of sediment pollution is somewhat effective on parts of the landscape. In particular, regulatory agencies and non-regulatory actors more successfully govern sediment pollution on working landscapes than on residential and non-working lands. The spatial characteristics of the different landholdings contribute to this disparity. I conclude by considering the implications of these findings on transitioning landscapes and address the importance of identifying and investing in other social and cultural factors that influence the actual land management practices on residential and other non-working lands

Session 1.1, Ecosystem management II: Thursday 11.45-12.45

80. Pasture degradation in Brazilian Cerrados understood: driving forces and definitions

Murillo Rodrigues de Arruda^{1,2}, Maja Slingerland¹, Ken Giller¹, Marc Corbeels²,

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Brazil claims to have large areas of degraded pasture, especially in Cerrados ecosystem, that can easily be upgraded by highly profitable soy or sugarcane production, thereby preventing the need for conversion of natural areas. In the Cerrado, farmers with farming systems based in pastures, low productivity and incomes, tend indeed to shift land use or sell their properties. Some migrate to cities but others buy cheaper land in Northern regions, covered by forests or savannas, to start pasture based production on larger stretches of land. To assess the potential relation between pasture degradation, land use change and migration, the forces driving pasture establishment and management, the definition of pasture degradation and its causes, and the comparative advantage and drawbacks of cropping will be assessed at international, national, farm and field levels.

Cerrados are dominated by oxisols and ultisols covering 125 millions of hectares. These soils are highly weathered, acid, with large Al content, low available nutrients concentration and organic matter. For these soils, cattle production is the first option after land clearing, based on pastures cultivated with African grasses, with local cattle breeds, no liming or fertilization. The explanation comprises low implantation costs of the activities coupled with easy trade of meat and milk allowing incomes at different time scales depending of the pasture/soil management. As a result pasture occupies 68 % farming land in the Cerrados. Different authors estimate that 50 to 80% of Cerrados pastures are degraded or in degradation process but there is no consensus, mainly due to a lack of a clear definition and indicators, non-explicit spatio-temporal scales, and because pasture and soil degradation are not disentangled. To complement the picture, degradation and erosion under crop cultivation needs to be considered as well. Another important element is whether “degradation” is reversible and if so against what costs. Over time, no tillage and establishment of contours have been introduced to mitigate or prevent specific aspects of degradation. This article aims to unpack the term degradation and to

contribute to the discussion on degraded pastures being readily available to be upgraded by soybean or sugarcane production, by disentangling the biophysical processes from the political and economic driving forces leading to “degradation” or land use change.

124. High-Mountainous Pastures Soil Inhabitants: Biodiversity and Trophic Structure

Mzia Kokhia, Manana Lortkipanidze, Nino Melashvili, Institute of Zoology, Ilia State University, Tbilisi, Georgia

Study of High-Mountain soils mesofauna structure and estimation of their role in trophic chain should be the most effective method of ecological monitoring of such type ecosystems. Saprophytic complex of soil inhabitants is the basic group which action determines the rate of biological cycle and the level of primary productivity, and what is essential, as sensitive indicator of soil regime they may be used for soil diagnostics. The aim of this work is to study the quantitative parity of soil organisms' dominant groups on High-Mountainous pastures of the South Caucasus and their role in decomposition and mineralization of plant that is urgent.

Estimation of High-Mountain meadows' primary productivity needs a complex investigation of all components of the ecosystems and their interactions, moreover soil invertebrates affect directly on plant productivity. Soil mesofauna structure stability greatly depends on pastures' loading. An excessive overloading of pastures often leads to unrecoverable results which are revealed in tamping and packing of soil and destruction of plant cover. All these events cause withdrawing of important species actively involved in soil forming processes from faunistic complex. In research plots with the highest population of invertebrates, millipedes made 50.6 % from an aggregate number. The second place in abundance has earthworms – 31.4 % and insects- only 18 % from an aggregate number of soil invertebrates. In the first plot quantity of earthworms – 50 %, but their absolute quantity is 1.5 times more in comparison with the third plot dominate. The other plot is the least occupied and differs with sharp domination of earthworms. One species of diplopods - *Anuroleptophyllum Caucasicum*, six orders and eleven families of insects' were discovered in soil probes.

The carried out researches showed a leading position of earthworms both on ennobled and on depression plots. But it should be noted that in depression a number of all representatives of mesofauna is several times less in comparison with raised sites that in our opinion is caused by higher humidity of soils. In trophic structure of mesofauna complexes prevalence of sarpophages is obviously expressed. Earthworms, millipedes are the active destroyers of the plant remains. Naturally, in meadow soils the basic food resource for these saprophages is the remains of roots, and for millipedes - decaying parts of plants. Among larvae there were representatives of saprophytic complex, namely – larvae of lamellicorn bugs. In investigated pasturages plots there is a considerable quantity of bugs-earth-boring dung beetles.

135. Erosion in a landscape evolution context: LISEM and LAPSUS: variation in temporal and spatial scales

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In many erosion studies only contemporary erosion is assessed, assuming this to be the direct or indirect effect of human influence. In geomorphological studies, erosion is viewed as a naturally

occurring process in the context of landscape evolution. This study aims to bridge the gap between these two contrasting views. In the study area (Guadalentín Basin; SE Spain) two models are applied: the short-term, event-based model LISEM (Limburg Soil Erosion Model) and the long-term landscape evolution model LAPSUS (Landscape Process Modelling at Multi-Dimensions and Scales). LISEM is a physically based erosion model that spatially simulates erosion and sedimentation after a rainfall event. It needs relatively many and detailed input parameters and rainfall data. LAPSUS is a landscape evolution model (LEM) which optionally includes the processes: water erosion and deposition, biological and frost weathering, soil creep, solifluction, landsliding, dust deposition and erosion due to tillage. The model uses relatively simple process descriptions, input maps and average annual rainfall. Theoretically LISEM is expected to perform better than LAPSUS due to more detailed processes and input variables. However, spatial variability of the required characteristics is high in the study area, giving rise to high uncertainty in input and output. Therefore, LAPSUS may give better results despite the simpler process descriptions and input maps. Currently, the two models are being calibrated and validated for the study area individually. Eventually, we aim to combine the two models, to get insight in erosion processes in the context of longer-term landscape evolution. Apart from uncertainty and performance issues, questions that include i) Does one major rainfall event cause geomorphic changes or is the sum of many events of lower magnitude more important? Particularly in the semi-arid environment of SE Spain, this would enhance insight in process dynamics. And ii) can we simulate the observed erosion and sedimentation without including processes related to human influence, e.g. erosion due to tillage? This latter question can not be answered without involving the longer-term, natural erosion processes and gives insight in the possible drivers of erosion and sedimentation processes.

Session 1.2, Land use dynamics I: Thursday 15.15-16.15

48. Multi-scale integrated analysis of the Brazilian biodiesel production

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Brazil engaged in biodiesel production after having replaced more than 50% of gasoline with ethanol. In only five years from the beginning of the Biodiesel Programme, biodiesel production reached the policy targets and substituted 5% of diesel consumption. The fast growth of the biodiesel production has giving rise to an intensive debate about the possible expansion of the programme. However, an integrated assessment of the constraints affecting a large-scale biodiesel expansion is still lacking. A comprehensive method to assess the feasibility of biofuel powered scenarios is proposed and applied to the biodiesel Brazilian case. Brazilian biodiesel is nearly all produced from soybeans. Thus, the proposed analysis considers biodiesel obtained from soybean feedstock. The paper builds on the multi-scale integrated assessment of the societal metabolism (MuSIASEM) framework developed by Giampietro and on the fund-flow approach of Georgescu-Roegen. Land and human time are used as funds while added value and energy are proposed as flows.

In order to identify the biophysical and socio-economic constraints imposed by biodiesel, an energetic assessment is presented along with an economic one. The economic implications of the biodiesel expansion are assessed through an analysis of the changes in the flows of added value caused by biodiesel at three different scales: the soybean production, the agricultural sector and the whole economy. The input-output Leontief matrixes are used for this

analysis. In this way, the changes in the total economic labour productivity at the three scales are quantified.

The energetic analysis requires a more sophisticated system of accounting than that commonly encountered in the reductionist linear representations. If biofuels are intended to be renewable energy carriers, the consumption of gross energy required to deliver net energy to society must be included in the analysis. This gives rise to an internal loop that amplifies the energy consumption. After having calculated the energy balance of the Brazilian soybean biodiesel, the paper quantifies the gross energy required to deliver net energy to the society. This value is so high, that substituting only 3% of the Brazilian energy consumption with biodiesel (which is equivalent to only 20% of diesel consumption) becomes unfeasible, even in a country characterized by large extensions of pasture and agricultural land that could theoretically be used for soybean cultivation.

Rather than predicting the future scenarios powered by biofuels, the proposed method shows the feasibility space for the substitution of fossil fuels with biofuels. This is given by the constraints that the funds defining the different scales impose on each other through the flows of energy and added value.

82. Biofuel, Dairy Production and Beef in Brazil: Competing Claims on Land Use in São Paulo State

Andre Novo^{1,2}, Kees Jansen¹, Maja Slingerland¹, Ken Giller¹

(1) Plant Production Systems Group, Technology and Agrarian Development Group, Wageningen UR, Netherlands; (2) Embrapa, Brazil

This paper addresses the issue whether the decrease in dairy farming and pastures in São Paulo state has been a direct result of the recent expansion of sugarcane production resulting from a global demand for biofuel. In order to identify the different factors that might impact upon the competing claims between sugarcane/ethanol production and dairy and beef production we use an historical perspective on both technological and land use changes as well as economic and political changes. The relationship between bioethanol and beef/dairy is not simply a result of recent global market demand but strongly mediated by high levels of long term government support for the bioethanol chain and lack of support for small-scale dairy farming. While historically the bioethanol sector has been supported with a range of government policies (regarding supporting R&D, tax benefits, import controls, regulations of blending ethanol with gasoline and more recently the flex fuel technology in cars engines) government policies for the dairy sector were much less developmental but basically served other interests (inflation control). Furthermore, we argue that the decrease of dairy production in São Paulo state can only be understood if we look beyond the strength of the bioethanol economy and look into the internal dynamics of dairy production and its technological configuration which shifted the milk frontier to new areas and supported the expansion of mix herds. The option of an ever expanding milk frontier together with technological innovations such as UHT milk and political and economic developments such as price drops after deregulation and the concentration in the dairy industry and the retail sector provide a context in which dairy farming in São Paulo state became less and less competitive. It was in this context that many farmers decided to stop specialized dairy farming and rent out their land to the sugarcane sector. Increased land prices and the high rents offered by the sugarcane/ethanol industry pulled farmers into this new situation. The recent global demand for biofuel is for the Brazilian case, the major sugarcane-based bioethanol producer in the world, just one extra impetus (the high oil prices in the 2000s

have probably been more important global market factor). The dynamics of the recent growth in bioethanol production in Brazil should not be explained by referring only to the global discussion about biofuel but by understanding the historical development of the specific social-technical configuration around sugarcane/ethanol production and use in Brazil, and in São Paulo state in particular.

106. Assessment and management of scale crossing environmental impacts from local bioenergy crop production

Wiebke Saathoff, Christina v. Haaren, Institute of Environmental Planning, Leibniz University Hannover, Germany

Rising bio-energy crop production contributes significantly to an increasing competition for land in Germany. Resulting unexpected rapid changes in land-use patterns can have serious impacts on landscape functions, both at the level of interference as well as on broader scales.

Objective of a research project carried out on three different spatial scales in cooperation of the universities of Göttingen and Hannover is to analyse (i) to what extent ecological impacts of local bio-energy crop production can be solved by integrated farm management on farm scale, and which framework conditions should be in place for such a bottom-up approach; (ii) which impacts reach beyond farm scale and are not manageable on farm scale; and (iii) which instruments and planning framework should be used for a possible top-down approach, which is not thwarted by deficient acceptability on the farmers side.

The methodological approach to these research questions combines an assessment of the environmental impact of energy crop cultivation with sociological and economic studies on farm scale as well as on landscape or supra landscape scales. The environmental assessment covers biodiversity, soil erosion and green house gas emissions. In cooperation with three test farmers the cropping system is optimised on farm level with regard to landscape functions and economic criteria. Another scenario will optimise exclusively the environmental performance. The costs of the reference state as well as the two alternatives can thus be compared in order to calculate potential compensation payments. Also the willingness to comply with different environmental obligations is discussed with the test farmers but also surveyed by questioning a bigger sample of farmers. Moreover, producers of regenerative electricity are questioned about their interest in “green electricity” certificates or assessment systems (University of Göttingen). Such systems would integrate a wider range of landscape functions into contracts for biomass provision by the farmers. An open source GIS based system for the assessment of environmental services on farm scale (MANUELA) is tested and advanced for these purposes.

As a further framework condition legal instruments of environmental protection and farm targeted incentives for providing ecosystem services will be discussed with farmers and explored by a survey. Modelling response options on regional and state scale will be the next step, accompanied by interviews with competent authorities about framework conditions and implementation options.

The paper presents the methodological approach and results from the empirical survey focussing on the discussion to what extent bottom-up approaches are able to solve land management induced scale sensitive environmental problems.

Session 1.2, Land use dynamics II: Thursday 16.30-17.30

97. Evaluation of agricultural ecosystem services in fallowing land based on farmers' participation and model simulation

Yen-Lan Liu, Jetse Stoorvogel, Kang-tsung Chang, Land Use Dynamics Group, Wageningen UR, Netherlands

Planting green fertilizer during fallow periods improves the supply of ecosystem services (ES) like soil quality, habitats and weed control. Nevertheless, farmers in Taiwan do not implement fallow practices and plant green fertilizer commonly. This is due to the current subsidy (46000 NT\$ per ha) to manage fallowing of being too low. In this paper, the objective of government agriculture policy or farmer's objective is defined as maximization of farm productivity, approximated to the value of social welfare and agricultural ecosystem services as well. Farms, which do not follow proper fallowing practices, often have poorly maintained fallow land or leave land abandoned. This results in negative environmental consequences such as cutworm infestations in abandoned land, which can affect crops in adjacent farmlands. The objectives of this study are to: 1) determine proper the fallowing subsidy based on payment for ecosystem services (PES) to entice more farmers to participate in fallowing; and 2) simulate the benefit of planting green manure in fallow land to the supply of agricultural ecosystem services, represented by the rate of farmer participation in fallow land practices and essential variables that affect soil fertility change. The approach involves a series of interviews and a developed empirical model.

114. Scenarios of farm structural change for assessing adaptation strategies to climate change: a case study in Flevoland, the Netherlands

Maryia Mandryk, Pytrik Reidsma, Martin van Ittersum, Plant Production Systems Group, Wageningen UR, Netherlands

In order to cope with the impacts of climate change, farmers have to develop adaptation strategies. Adaptation strategies to climate change can be implemented at different levels. At the farm level these strategies include adjustments in agro-management within the current farming system, adoption of alternative functions that the agricultural sector can provide to the society, and in the longer term, a shift to another farm type due to structural changes (strategic decisions to change objective, size, intensity and/or specialization). Aggregated changes at farm level may lead to a different farming landscape at regional level.

Climate change is expected to have significant impacts in the longer time run; in 2050 a 1-2° increase in temperature is projected for the Netherlands. Towards 2050, climate change is one of the drivers that will change the farming landscape, but market developments, policy and technological development will be equally important. As a consequence, adaptation to climate change must be considered in the context of these other driving forces that will cause farms of the future to look differently from today's farms. This paper describes an approach to study farm structural changes for assessing adaptation strategies at farm and regional level to climate change in the context of market and policy changes. The aim of the study is to derive images of future farms in a region that can stay viable under different plausible futures. The province of

Flevoland in the North of the Netherlands with intensive arable farming as the main type of agricultural activity, has been chosen as a case study.

To account for the heterogeneity of farms and their responses and to indicate possible directions of farm structural change, a farm typology was developed. Trends in past developments in arable farm types were analyzed with data from the Dutch agricultural census. The historical analysis allowed to detect driving forces that contributed to farm structural changes and to evaluate their relative importance. Simultaneously, scenario assumptions about changes in these driving forces elaborated at global and European level, were downscaled for Flevoland, to regional and farm type level in order to project impacts of drivers on farm structural change towards 2050. Scenario assumptions and historical trends were verified and discussed with stakeholders. Together, this resulted in images of future farms in Flevoland, which are likely to stay viable under changing climatic and socio-economic conditions, and for which alternative climate change adaptation strategies can be developed.

138. Analyzing Social-ecological Interactions in High Mountains, System Perspectives for Landscape Research in Northwest Yunnan, China

Till Rockenbauch, Department of Geography, University of Bonn, Germany

Traditional cultures have been forming the high mountain landscapes of Northwest Yunnan over thousands of years, creating highly adapted land use systems rich in agrobiodiversity. However, socioeconomic development of the last decades as well as national resource use politics have heavily impacted ecosystems and local livelihoods. Dramatic biodiversity loss and ecosystems degradation have outlined the urgent need to elaborate integrative research agendas towards sustainable landscape management under changing conditions.

In order to identify relevant research objectives an explanatory model of land use is needed, which incorporates local and expert knowledge and allows qualitative as well as quantitative interpretation. Therefore the promising sensitivity analysis toolkit developed by F. VESTER (1988, 2003) was adapted and tested for its applicability in the context of the high mountains landscapes of Northwest Yunnan, China. Semi-quantitative data derived from expert interviews and participatory fieldwork in a Tibetan village was applied to derive i) a conceptual model and ii) a partial model of land use. Applied working steps included system description, key variable identification, role allocation and pattern analysis. As a result the applied methodology made it possible to gain understanding of system controls and dynamics from various perspectives. Consecutively the linking of conceptual and partial model variables made possible an adjustment of expert and local knowledge. Expert interviews revealed the highly critical character of land use under the driving influence of market and infrastructure development as well as national resource use regulations. Contrastingly the case study pictured local land use locked in transition due to limited labor and income. This shows, that the comparison of both, expert and local knowledge, helps to adjust general assumptions and enables to draw a more realistic picture of local land use in transition.

Despite methodological difficulties regarding the identification of variables and their causal interrelations, the sensitivity analysis toolkit has proved to be viable for structuring and interpreting land use systems in NW-Yunnan. Moreover the overall approach can be seen as an insightful contribution to the question of bridging scales respectively the gap between expert and local perspectives. By contrasting and adjusting different system perspectives the methodology draws attention on relevant questions rather than giving concrete answers. Hence it can be recommended as an instructive tool for the elaboration of research agendas on complex social-ecological interactions.

Theme 2: Socio-economic scaling and scaling politics in relation to governance

Session 2.1, Policy and institutional analysis I: Thursday 10.30-11.30

5. Scaling and Governance

Renate Werkman, Gerard Breeman, Public Administration and Policy Group, Wageningen UR, Netherlands

The national policy agenda on EU related issues is usually dominated by implementation problems of EU directives. Central questions are: how should an EU-directive be interpreted legally and what are the requirements to conform national legislation to the EU directive? Recent EU studies however focus more on political responses and feedback processes and not only on the technical matters of EU policies. This calls for additional agenda-setting analysis that includes issues of scaling. The political venues that are available to change EU policies and the (re)framing of EU policy images differ substantially from those on national level. In this paper we show that EU policy agendas do not always match with national agendas. We describe how the shifting beliefs about the Common Agriculture Policy (CAP) on EU level triggered resistance on domestic level; in our case, The Netherlands.

The CAP has been subject to continuous change. The most recent initiative to reform is the 'Health Check' (2008). It entails among others that the link between direct payments to farmers will be limited and reduced. The money that is saved will be used to induce more fundamental changes of the CAP's traditional values towards other societal values: such as climate change, biofuels, and biodiversity. But in the Netherlands, these new values are resisted, even though the Ministry of Agriculture seems to have embraced them. Traditional values prevail. The central argument in this paper is that domestic policy images hinder the implementation of new EU policies because these are dominated by fixed groups of insiders who hold 'older', norms. These 'traditional' actors know how the domestic agricultural venue works and how to influence them. By lobbying to the right representatives, they manage to sustain their own policy image time and again, making it impossible to move towards a new norm-set.

31. Multi-scale biofuel governance; an expanding universe for sustainability initiatives

Sarah Stattman, Aarti Gupta, Environmental Policy Group, Wageningen UR, Netherlands

The global demand for alternative fuels for transportation has not only put biofuels on the agenda, but has also created a debate on the sustainability of production and use of these alternative fuels. The 'green' label that biofuels initially received, because of their renewable character, has quickly been blemished by possible negative consequences. Increased deforestation, problems with landownership, expansion of agricultural areas at a cost of nature conservation areas or an undermining of food security through prioritization of fuel over food are some noted consequences of the increased demand for biofuels. As a reaction many different sustainability initiatives are being developed at different scales and networks varying from governmental to non-governmental and from national to international and regional initiatives. Currently, over thirty-five different labeling and certification initiatives aim to influence biofuel policies and practices at multiple governance levels. Some of these initiatives

focus on biofuel production requirements, while others also consider strategies for future policy development.

Brazil, with a long history and experience with biofuels production is at the centre of many of these discussions. As a member of the G8+5 it is involved with international bodies such as the Global Bioenergy Partnership. Simultaneously various Brazilian actors participate in development of sustainability criteria in multi-stakeholder non-state fora such as the Better Sugarcane Initiative and the Roundtable on Responsible Soy. At the same time, Brazil also has bilateral agreements with several European countries that are developing their own and European biofuels standards. Our aim in this paper is, first, to map these diverse international state-led and non-state biofuel sustainability initiatives that operate at different levels and scales, and to analyse the ways in which sustainability of biofuel production and use is being framed within an illustrative subset of these initiatives. Secondly, we want to analyse the influence of (potentially competing) international biofuel sustainability discourses, criteria and practices on the evolution of domestic policy choices in key countries at the forefront of biofuel development, such as Brazil. In doing so, this paper highlights how Brazil strategically uses framing strategies to meander through this complex field of political scales.

37. Analysis of institutional and technical adaptation: biodiversity conservation capabilities of forestry organisations responding to local social-ecological challenges

Emma Terama^{1,2*}, Eeva Primmer¹, Steven Wolf³

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Assuming that local organizations develop competencies as a response to social demand, and further, organizational adaptation is shaped by the social-ecological context, we hypothesize regions to differ in terms of their organizational competencies to deal with biodiversity conservation (Wolf and Primmer 2006). Our paper investigates how forest indicators of sector activity, sociodemographic as well as economic indicators, and previous commitment and/or constraints to conservation predict local investment in conservation competencies, and whether they contribute to the success of forest conservation endeavors in thirteen regions, or Forestry Centres, in Finland. The question is set in the global stage of demand for democracy in governance and the management of ecosystems as part of (local) decision making (Steel and Weber 2001).

Each forestry centre is defined by the prevailing sociodemographic conditions, the economic significance of the forest sector and previous commitments to conservation and/or constraints on forestry. The sociodemographic conditions for demand on conservation are outlined for each forestry centre as follows: the age structure of the population, level of education, level of urbanization, population density and population growth. The project uses population data on the municipal level from Statistics Finland, aggregated to fit the forestry centre boundaries, published forestry statistics from the Finnish Forest Research Institute and survey data on biodiversity conservation competencies of forestry organizations (Primmer and Wolf 2009). The applied methodology is the statistical analysis of bivariate correlation between numerous variables; explanatory, control and dependent variables with respect to success in conservation.

According to our initial findings, traditionally forestry dependent regions that are high in forest sector economic activity and forest sector employment also have high old age

dependency and low urbanization. Despite the earlier understanding of urban, young and educated population demanding conservation (Steel and Weber 2001), it is the forestry dependent areas that have thus far committed to conserving natural resources. The nature of investments in conservation competencies depends on population characteristics. In urban and educated areas, forestry organizations invest more in networking through formal channels whereas actors rural, relatively forestry dependent areas, rely on operational information sources, and particularly forestry dependent areas had invested in organizational support mechanisms towards biodiversity conservation. Future analysis of conservation should consider the paradox that conservation pressure expressed by highly educated and urban population is channeled to regions with highest dependence on the economic utilization of forests. Actors in these areas are those whose conservation competencies are crucial for minimizing the damage to biodiversity in managed areas.

Session 2.1, Policy and institutional analysis II: Thursday 11.45-12.45

28. Urban sustainability pilot projects: misfit between challenge and solution or potential for replication and scaling?

Sofie Bouteligier, Global Environmental Governance and Sustainable Development Research Group, Faculty of Social Sciences, KU Leuven, Belgium

Urban areas around the world face tremendous environmental challenges linked to air, water, waste, energy and transport. Dealing with these issues asks for large-scale investments and holistic policies. Old, well-established cities ought to transform existing infrastructures to realize more sustainable ways of living. Expanding cities in emerging economies have to serve a rapidly growing population, which puts stress on the creation and provision of basic infrastructure. In both cases, city governments tend to put great effort in high-profile pilot projects that deal with a limited amount of environmental challenges on a small-scale, without necessarily embedding these projects in long-term, holistic policies that will increase the city's environmental livability. Nevertheless, it is indeed the retrofitting of a municipal building, the creation of a zero emissions neighborhood or the redevelopment of the waterfront in the historic centre that put a city on the map as the next 'sustainability hub'. Hence, a misfit between the complexity, size and scale of urban environmental challenges and the scope of such initiatives seems to exist.

To what extent do these high-profile pilot projects have a potential for broader societal change? A common answer is that these laboratories or testing grounds are necessary to advance innovative policies on a larger scale. This can happen in three ways. First, experiments with new solutions can generate citizen-support for broader environmental policies and create local markets for sustainability. Second, literature on city network formation stresses how successful projects are replicated in other cities. Third, national governments might find inspiration in what happens at the local level.

Based on empirical evidence from cities around the world, this paper examines the conditions under which high-profile projects are replicated within and across cities or generate a scaling-up effect. In other words, it assesses whether and how small-scale initiatives can go beyond local, short-term benefits and as a consequence have significance for environmental governance at a larger scale. This exploratory study stimulates reflection on the interaction between the space of places – the high-profile project in a particular locale – and the space of flows – the potential for replication and scaling through flows of information.

118. Improving accountability in NRM sectors: An exploration

Arend Jan van Bodegom, Centre for Development Innovation, Wageningen UR, Netherlands

In this article the concept of accountability is explored in relation to its possible application in natural resource management sectors. Firstly different aspects of the concept of accountability are highlighted and the fact that improving accountability is also a political project. At the base of accountability are moral beliefs which justify the act of demanding accountability, both towards the government and the private sector. Accountability mechanisms in the NRM sectors have been developed in different so-called spheres. A sphere is the space where one group of actors is the main actor in demanding accountability. Accountability can be exercised by individual citizens, by parliament, by special agencies within the government towards other ones (horizontal accountability), by Civil Society Organisations (social accountability) and by different stakeholder groups together (mutual accountability). For each of these spheres examples of accountability mechanisms are given from NRM sectors like forestry, fisheries and water management. These examples serve as inspiration, not as a blue-print. As a conclusion a way forward is presented to improve accountability in concrete situations. Elements include identification of the moral base for accountability, identification of the possibilities and spheres for improving accountability, definition of strategies and management of conflicts when improving accountability.

129. Area development, scaling, boundaries and governance

Marcel Pleijte, Alterra, Wageningen UR, Netherlands

In the introduction (section 1) is shown that changes in spatial planning since the mid-eighties can be characterized as 1) plan targets that are not unilaterally determined only by the national government, but should be discussed with the fragmented society 2) the value and basis of a comprehensive social program was questioned. Aestheticism gets the upper hand and 3) Project planning would reflect our fragmented society rather than large nationwide plans. Criticism covers three elements: 1) there is a substantive vision of national government missed, 2) the aesthetic issues are dominant in spatial planning and 3) project management frustrated system solutions. Then area development (section 2) is introduced as an illustration of scaling and governance. Area development takes the problems of the area on different scales as starting point of joint policy making by governments, markets, social organizations and citizens. The main task of area development is sustainable development, which is often identified by the 3 P's, Profit, People and Planet, but also has a time dimension and spatial dimension. After that this paper showed which problems are met in area development with the three P's, spatial and temporal scales (section 3). Mismatches between scales of area development are illustrated by an example of the larger area 'Green Heart' of the Netherlands and small areas within the Green Hart like the Old Rhine area, the Bloemdaelerpolder and Rijnenburg.

The most renewal and original approach in this paper is the link (in section 4) from the dimensions of sustainable area development with new concepts to deal with the problems or challenges, explained for the three P's (red-for-green approach and compensation); spatial scales (regional swap and project envelopes) and time scales (first let go out the cost for the benefit). For the problems that still exist, an approach which linked scaling and governance to each other (section 5) can offer new insights and can analyze the spatial-temporal patterning of human and environmental interactions and can be applied to area development. The theory of

the Network Society of Manuel Castells offers such an approach. Area development is often concentrated to development into an area, without using the theory of the Network society. This paper showed that so attention is lacked for developments in a society which a) operates at different scales (vertical), b) which goes beyond boundaries and c) which happens in different time schedules. This means that a more fluid approach of scales, boundaries and interactions is needed. Suggestions for a better connection between scales, boundaries and governance are given.

Session 2.2, Scale framing I: Thursday 15.15-16.15

59. Local Agency in using scale to realize water rights in South Africa

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The purpose of this paper is to explore the actions that local people have initiated to ensure their environmental and social rights in South Africa and how these initiatives are manifested in the scaling of water issues. The paper examines local agency and action or the lack thereof against social and environmental injustice and the use of scale in shaping water discourse in the country. South Africa is recognized internationally for its progressive legislation and policy which could be enabling structures for citizen participation in water governance. South Africa also has a legacy of successful community mobilization in the struggle against apartheid. The fight against apartheid was pervasive through all sectors of society and drew people together to fight against injustice. The paper examines what has happened to this strong social capital since democracy. South Africans became part of the international community with a big bang in 1994 and many are playing leading roles in global social and environmental networks but this does not seem to translate effectively at a local level to ensure fair and equitable water governance. The paper explores how water issues have been scaled by government in pursuit of development goals and the nature of community responses in contesting this through re-scaling or jumping scales in pursuit of social and environmental justice. An examination of the politics of scale will be underlain by a consideration of how different forms of power are exerted by different agents in water governance. Case studies from South Africa will be used to understand how the forms and characteristics of power relate to the construction and contestation of scale in water governance. Through understanding the dynamics of power and scale and the opportunities of local agency and re-scaling, we can move towards new forms of water governance that empower local agents.

84. Scale frame interaction patterns in the Dutch debate on the future of intensive cattle breeding

Maartje van Lieshout, Art Dewulf, Public Administration and Policy Group, Wageningen UR, Netherlands

A starting point of this study is the fact that complex decision making processes often exceed (administrative) scales and levels, whereas actors and organizations are usually bound to a certain scale and level. This raises difficulties and indistinctness for example regarding responsibilities and accountability. Since clear responsibilities and accountability are essential to

bring complex, scale-transcending processes to a good closure, we study: which interaction patterns actors use to negotiate the responsible scale and level.

In this paper we study scales as social constructions. Scales are not just out there as fixed entities with an unequivocal meaning. Through the process of framing, actors highlight different aspects of a situation as relevant, problematic or urgent, and by doing so situate issues on different levels and scales. Framing refers to the interpretation process through which people construct and express how they make sense of the world around them. We use the term 'scale framing', with which we mean the process of framing a phenomenon on a certain scale and/or level.

Presently in the Netherlands a debate about the future of the intensive agriculture is going on. We take this debate as an example of a complex decision making process in which responsibilities are undefined. The process is complex, since many interests and interdependencies on different scales and levels are involved. Taking this debate as casus, the data for our analysis consist of recordings of several discussions about the future of Dutch intensive cattle breeding in different settings. We use a discursive approach to framing to analyze the different scale frames and related interaction patterns, actors in discussion bring to the fore. These interaction patterns provide insights in the negotiation of taking and shifting responsibilities and as such can contribute to the settlement of deadlocked decision making processes.

Session 2.2, Scale framing II: Thursday 16.30-17.30

105. Water management issues in lakeside communities: perspectives from New York

Sharon Moran, Michael Dimpfl, Department of Environmental Studies and Graduate Program in Environmental Sciences State University of New York, Syracuse, USA

Water management problems have similar biophysical causes worldwide, yet the ways they get identified and solved varies across contexts. The water governance literature helps explain how political, economic, and social factors shape the practices adopted by water managers. One of its main contributions has been to identify several misconceptions about the role of scale in water governance, replacing them with less deterministic understandings of the roles of the national, state, and local levels.

This paper presents a single case study and explores it using theories advanced in the water governance literature. In New York, dozens of ecologically fragile lakes have been celebrated as drinking water sources and as sites for recreation; recently, people have found themselves literally 'swimming in their own waste,' as poorly managed household wastewater has been identified as one of the main sources of water contamination. This paper describes how the problem got framed and reframed over the past century, and the various management strategies used to address it. Drawing on interviews with environmental managers and dozens of lakefront residents, we show how this case manifests classic patterns in water governance. In addition, we identify two areas in which these theories might be expanded, specifically (1) the role of technologies and also (2) the scale of the household; for additional explanatory power, we suggest drawing on theories associated with science, technology, and society, and political ecology.

109. Scale framing in the climate change controversy

Art Dewulf, Katrien Termeer, Public Administration and Policy Group, Wageningen UR, Netherlands

The appropriate scales for science, policy and decision-making about climate change issues cannot be unambiguously derived their physical characteristics, and often involve a struggle about the appropriate scales at which to frame climate issues. In general framing refers to the way actors make sense of issues by making particular aspects of an issue more salient in a communicative context. Scale is a powerful resource for framing issues, especially in the case of climate change where a multitude of scales and levels are potentially relevant. The framing of an issue as a local, regional or global problem, or as a short term or long term problem, is not without consequences. Framing an issue at a certain level on a certain scale carries implications for who is to blame, who is responsible and what should be done. Framing involves a normative leap from 'what is' to 'what ought to be' and thus directs the search for solutions towards certain alternatives and not others (e.g. framing climate adaptation as a local issue directs the search for solutions towards local rather than national or global solutions). In the controversy about climate science that became known worldwide as 'climategate', scale framing has played an important role too. Already by its naming, the issue of the hacked e-mails from the Climate Research Unit (CRU) at the University of East Anglia was scaled up to the proportions of a big scandal. The issue was also scaled up from a CRU issue to a global issue of international climate science and the IPCC. Interestingly, this upscaling allowed afterwards for the downscaling of 'climategate' towards a national level issue in other countries – thus the parliamentary hearing about 'climategate' in the UK was mirrored by a parliamentary hearing in the Netherlands about national climate policy. Given that climate issues are very susceptible to scale framing, it is crucial to account for this process in any attempt at scale-sensitive governance.

134. Fluid scales, fluid laws and fluid decisions: the complexity of sustainability governance, with a case study of the Round Table on Sustainable Palm Oil

Otto Hospes, Law and Governance Group, Wageningen UR, Netherlands

This paper uses insights from political ecology (Brown and Purcell, Bryant, Poulson), legal anthropology (Santos, Benda-Beckmann) and political sciences (Teisman, Termeer) to develop a theoretical perspective on sustainability governance and the politics of scale. For this purpose, first 'scale' is conceptualized as a social construct, as fixed and fluid, and as a resource and outcome of discursive and materialist struggles. Second, the concept of 'interlegality' will be used to emphasize how legalities clash, mingle, hybridize, and interact with one another and to explain fluidity of laws during scaling of sustainability governance. Finally, a 'stream-model of decision-making' and 'configuration' theory are used to conceptualize the complexity and network ordering of decision-making on rules and regulations for sustainability

The case study is about one of the frontrunners in the field of private sustainability governance of global agricultural commodities: the Round Table on Sustainable Palm Oil (RSPO). Emerging from an initiative of WWF and Unilever to establish a business partnership model for sustainable palm oil in 2001, the RSPO has evolved into a global, member-based and network organisation. More than 300 organisations from the South and the North (representatives of palm oil producers, traders, manufacturers, bankers, social and environmental NGOs) together have developed principles and criteria for sustainable palm oil production. Now that sustainability principles and criteria have been established, the RSPO wants to 'upscale' its

membership and operations in many different ways and directions. The paper critically reviews the notion of ‘upscaling’ as currently promoted by the RSPO on the basis of the theoretical perspective developed in the paper. This is not only to provide a suggestion on how to alternatively conceptualize scaling as a form of governance but also to offer ways for the RSPO to actually realize its ambitions.

Session 2.3, Linking scales: scale jumping and rescaling I: Thursday 16.30-17.30

22. Nature’s scales: exploring the drivers and implications of watersheds as governance scales

Alice Cohen, Department of Resource Management and Environmental Studies, University of British Columbia, Vancouver, Canada

Water is the ultimate multiscalar resource. It flows within, along, and across domestic and international boundaries, through plants, animals, and humans, and is used in a range of industrial, domestic, and biophysical processes. Water also carries with it signs of its past users: changes in flow, quality, and temperature act as reminders of previous activities. It is perhaps unsurprising, then, that water governance continues to be beset by challenges associated with the diverse spatial and temporal scales across which water extends. In the last two decades, watersheds (also known as ‘basins’ or ‘catchments’) have emerged as a putative solution to these challenges – as a natural governance scale that integrates land with water, humans with nature, and the local with the regional, national, and international. Indeed, since the mid-1990s, watersheds have been adopted as the basic scale for water governance in the European Union, New Zealand, and parts of Australia, Canada and the United States; they are also part of policies at the United Nations, the World Bank, and the Global Water Partnership.

Drawing on concepts from resource management, political science, and geography (particularly the literature on the social construction of scale and political ecology), my inquiry examines the drivers and impacts of the recent re-scaling to the watershed. Specifically, my paper draws on three provincial case studies within Canada to explore the way(s) in which – and perhaps more importantly, the reason(s) why – governments have shifted from conventional political scales to watershed scales for the purposes of water governance. This interdisciplinary, multi-scalar research touches upon a number of critical questions: what happens when we re-scale environmental governance? Is there such a thing as a ‘natural’ governance scale? How – or should – we reconcile ‘natural’ scales with human scales, and what might this reconciliation imply for our understandings of political representation and democracy? I show that rationales for and critiques of watershed-scale governance reflect broader academic and policy discussions, and, more fundamentally, argue that environmental scaling and governance decisions are one and the same.

25. Tracing Drivers of Global Environmental Change Across Levels

Sylvia I. Karlsson-Vinkhuyzen, Turku University, Finland and Visiting Fellow, Department of Public International Law, Leiden University, Netherlands

Analysis of drivers of global environmental change has to consider their increasingly multilevel (multi-scale) character and complexity. Global environmental change is not only manifested at multiple scales from the local to the global and increasingly addressed at multiple levels of governance, the drivers emerge from a system where individuals and communities find

themselves in a constitutive hierarchy; individuals are contained in families, which are contained in neighbourhoods, followed by cities, regions, nations, and finally international organizations. The driving forces for any global environmental change issue can seldom be confined to one part of this hierarchy or one level of governance, more often they derive from a combination of institutions and actions originating at local, national, regional and global levels. Institutional drivers from these different levels in combination influence individual and collective decisions and behaviour which leads to environmental change. This raises the need to explicitly include the multilevel aspect in analysis which aims to identify and trace drivers of global environmental change. In addition to advancing the understanding of global environmental change, it would also support the objective of assisting policy-makers with better information.

This paper identifies four methodological challenges in efforts to trace and analyse drivers across levels: to develop a *study design* which can trace drivers at several or all governance levels as well as the interaction among them; the mere *scope* of the endeavour; to devise *data collection* approaches appropriate for the task; and to manage the *large diversity* in the character and contexts of the unit of analysis. The paper then goes on to present a methodological approach that seeks to address these challenges, an approach which was applied on the case of analysing the drivers of the problems with pesticide use in developing countries across multiple levels. In this case nested hierarchies of drivers are identified and it is demonstrated how differently they can be perceived and experienced by stakeholders at various levels. This case is explored in order to strengthen the argument that despite the few examples of making multilevel analysis of drivers through empirical data collection at several levels, and the many methodological challenges that comes with it, the approach is necessary if we are to develop further the understanding of the multilevel aspects of drivers.

90. Scaling up transition lab experiments towards sustainability

Erik Mathijs, Department of Earth and Environmental Sciences, KU Leuven, Belgium

In recent years, a set of initiatives have been taken that complement mainstream innovation and policy networks. These initiatives are rooted in complexity based thinking and adaptive learning and are using multi-actor, multi-level and multi-sector approaches. Broadly spoken, these initiatives can be categorized in two schools: (1) the transitions approach that originated in the Netherlands (Grin et al., 2009), and (2) the change lab approach that originated in the USA (Scharmer, 2007; Senge et al., 2008; Kahane, 2010). It must be noted, however, that for instance the transitions school itself consists of various approaches and schools. I call the blend of the two approaches transition labs, as they broadly share the same characteristics and phases. More specifically, such labs consists of three phases: (1) the antecedent phase, in which preparatory work is carried out to start up the process; (2) the generative phase, in which transition experiments are invented, prototyped and learned from; and (3) the institutionalization phase, in which some experiments are up-scaled and more experiments are created and up-scaled in several new cycles.

The purpose of this paper is to explore how various transition labs are dealing with the institutionalization or up-scaling phase, as this is the most under-researched phase given that most of these initiatives have only started at most 10-15 years ago and transitions typically take several decades to materialize. This exploration is based on a review of available literature, interviews with participants and personal participant observations of several transition labs in Flanders, Belgium (Plan C, Duwobo) following the transitions approach and a global change lab (the Sustainable Food Lab) following the change lab approach.

Session 2.3, Linking scales: scale jumping and rescaling II: Friday 10.15-11.15

51. Institutionalizing IWRM in Transition Countries – The Case of Mongolia

Lena Horlemann, Ines Dombrowsky, Christoph Görg, Helmholtz Centre for Environmental Research (UFZ), Leipzig, Germany

Integrated Water Resources Management (IWRM) focuses on the coordinated management of water on a watershed level and can be understood as an approach to solve problems of spatial fit and institutional interplay of different sectors and governance levels. It is assumed that the implementation of IWRM forms a particular challenge for transition countries which face complex political dynamics, since IWRM often requires a fundamental realignment of water sector institutions. This process is shaped by conflictive interests of actors operating on different socio-spatial scales, resulting in a rescaling of political institutions. Thus, strategic aims and interactions of different political actors have to be analyzed to identify their influence on IWRM institution-building within and between scales. In order to analyze the political challenges regarding the institutionalization of IWRM in transition countries, a case study on Mongolia was carried out. Mongolia suffers from water scarcity, intensified by climate change and increasing depletion. As a transition country it is undergoing a rapid institutional change which is accompanied by a process of decentralization. While an attempt to introduce IWRM exists on paper, it is unclear how it will be made politically and institutionally operational.

Results of 25 interviews and a review of policy and legal documents show that in Mongolia the transition and the process of decentralization involved have themselves lead to problems of fit and interplay. While endeavours have been made to overcome these problems, like the establishment of River Basin Councils (RBCs), these yet face problems regarding their room for manoeuvre. We argue that these problems are not only a matter of deficient resources, but particularly of the difficult process of institutionalization which accordingly requires particular attention. The institutionalization of IWRM offers options for political actors to exercise influence and transcend scales, and it uncloses political spaces which are occupied and contested. For instance, the definition of river basins itself can be considered as a political process of rescaling decision making, and the establishment of RBCs implies the introduction of an additional scale to the conventional governance levels. Moreover, modern formal and old informal institutions from the soviet era coexist, and it is assumed that political actors gain profit from the resulting ineffectiveness of formal institutions, extending their control over resources. Thus, there is a risk that vested interests prevail over collective interests, thwarting the implementation of IWRM.

52. Integrated water governance as cross-scale coordination: Comparison of experiences on appropriate institutional architectures from different countries

Andreas Klinke¹, Eckhard Störmer¹, Jörg Balsiger²

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Water provides diverse functions that influence interactions between natural and social systems. Existing and new pressures have raised issues at the intersection of societal demands, ecological integrity and resource security. As a consequence, there have been calls for more integrated water governance through the integration of water use, water protection and protection from water. In many countries there is a need for enhancing coordination and

integration across water-related scales including sectors such as water supply, wastewater treatment and hydropower generation where key water policies and programs are institutionally separated and management units are highly fragmented.

This paper focuses on 'scale' as an interdisciplinary analytical concept. Scale plays a key role within and across natural and social systems, particularly with respect to water, where scales of space, jurisdiction, political authority, policy instruments, organization, and management are crucial dimensions for analyzing water governance dynamics. Cross-scale coordination is important for integrated water governance, as well as the development of adaptive capacity through organizational learning. Whereas previous studies have mainly built on scale as concept to describe the nesting of government jurisdictions from local to global, we expand the notion of scale to six other variables: space, economic sectors, political authority, management, organization, and policy instruments. Such an understanding of scale, we argue, generates a more powerful theoretical tool that can produce more refined insights into the widely popular but rarely specified concept of integration. Using the lens of within- and cross-scale integration, the paper presents the result of a comparative study of integrated water governance approaches in five countries (Germany, Austria, UK, Netherlands, US). The analysis aims at exploring the trade-offs between the benefits and (transaction-)costs of integration. This helps to identify appropriate forms, structures, processes, and instruments of integrated water governance with adaptive capacity.

This research is one of several work packages of a policy-oriented project on integrated water governance in Switzerland. In a transdisciplinary way the results of international and Swiss cases will be discussed in different fora of interdisciplinary researchers, policy makers and NGOs to elaborate working governance schemes for regional integrated water governance in Switzerland. Funding for this project is provided by the Swiss National Science Foundation under the National Research Programme "Sustainable Water Management."

102. Economic governance to expand commercial ecosystems: within- and cross-scale challenges

Arianne de Blaeij, Nico Polman, Stijn Reinhard, LEI, Wageningen UR, Netherlands

Commercial ecosystems are specific types of socio-ecological systems (SES) which are (partly) managed by private parties to generate income. Commercial ecosystems generate value for society as a whole. The ecosystem processes have mainly public good aspects. Therefore, markets are unable to generate incentives resulting in social optimal provision of ecosystem processes. The desired level of the processes are often determined by the public sector. In order to do so, the public sector needs to take into account that investing in ecosystems will contribute to the solution of different social issues like insufficient water quality, flood risk, desiccation problems, and climate change. From a social perspective, commercial ecosystems are an interesting option to maintain and to expand the provision of ecosystem services. Furthermore, commercial ecosystems give the entrepreneur (for example a farmer) an extra option to earn an income. This will contribute to a more vital regional economy, improved rural vitality and improved quality of life in rural areas.

To exploit a commercial ecosystem, financial incentives for the voluntary provision of ecosystem services are needed. In this paper, we focus on the economic governance necessary to create financial incentives reflecting the value of commercial ecosystem services. Economic governance is defined as the creation of tangible and intangible property and exchanges of goods and services to create or add value (Dixit 2004). Within economic literature, the voluntary

transaction between an ecosystem provider and an ecosystem buyer is known under the umbrella Payments for Environmental Services (PES) (Engel et al. 2008). To determine the adequate economic governance structure, economic, ecological and institutional perspectives have to be combined.

An Economic Ecosystem Governance framework (summarized as Eco² governance framework) framework is developed and used to analyze the role that ecosystems services can play in private decisions to invest in commercial wetlands. We make use of scaling to incorporate the value of commercial ecosystem services into the private decision on land-use. A mismatch between the financial incentive for private exploiters, the benefits received by beneficiaries and the current jurisdictional levels exists. Therefore, we argue for policies to stimulate commercial ecosystems which take into account economic governance barriers at multiple levels to develop economic incentives that are beneficial to Dutch society as a whole.

Session 2.3, Linking scales: scale jumping and rescaling III: Friday 11.30-12.30

26. Subsidiarity and the Global Politics of Scale: as Negotiated in Johannesburg

Sylvia I. Karlsson-Vinkhuyzen, Turku University, Finland and Visiting Fellow, Department of Public International Law, Leiden University, Netherlands

The patterns of governance in the world are becoming increasingly complex, partly as a consequence of processes of global environmental change and its manifestations in closer linkages between people, processes and their environment across time and space. One aspect of this complexity can be found along the vertical 'scale' of governance, from the local, national, regional to the global where governance — including policy, rules and action — for particular issues engages multiple levels of governance. In such a multi-level governance context the question of allocating governance to specific levels gains prominence. While this issue has received a lot of attention within federal nation-states, it is only in the last decade that it has been more explicitly addressed in the international context, particularly in the EU discussions on subsidiarity. However, subsidiarity, or other concepts which can be used to discuss the criteria for the allocation of governance among levels (and actors), has received comparatively limited attention in the analysis, both theoretically and empirically, of multilevel governance which includes the global level.

This paper addresses this gap by exploring the use of subsidiarity as a conceptual lens in the analysis of governance of sustainable development at the global level and applying this approach to the analysis of one specific global policy process, the negotiations for the World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa in 2002. The paper first briefly discusses the philosophical and political foundations of the principle of subsidiarity, its implementation in the EU context and how this has been interpreted by the academic community. It then looks at some of the efforts to expand the application of the principle beyond the EU, upscaling it to the global level. The empirical part of the paper describes the politics of scale as they emerged in the negotiations in Johannesburg, outlining what type of governance was asked for at what level in the Plan of Implementation of the WSSD, which issues proved to be contentious and for which it was easy to reach consensus regarding their allocation to specific levels or combinations of levels. Lastly some final reflections are made on the usefulness of discussing the principle of subsidiarity in global policy processes and theory development.

92. Upscaling local environmental problems to create governance solutions

Derk Jan Stobbelaar, Gilbert Leistra, University of Applied Sciences Van Hall-Larenstein, Wageningen UR, Netherlands

In this paper we describe three case studies, which give evidence that upscaling local (environmental) problems can lead to a shift from government to governance, from stakeholders standing against each other to stakeholders working together. These three case studies are done by the science shop of the Wageningen University and Research Centre, using transdisciplinary techniques, which means that the results were a co-creation between students, researchers and lay-people (clients of the science shop). The latter group bringing a regional network, doing time consuming surveys and organising meetings with other stakeholders.

In the first case, the municipality of Utrecht wanted to build houses on the garden park of Ons Buiten. The board of the garden park asked the Science Shop to find ways to save the garden park. The Science Shop rephrased this question into: what is the value of the garden park for the city of Utrecht. An overview of ecological, social, environmental and historical values was given, and a pathway to involve neighbouring institutions (schools, elderly houses etc.) in using and developing the garden park. Now a coalition of stakeholders around the garden park is advocating that the many qualities that the garden park brings for the city may not get lost. Nowadays the garden park is not threatened anymore.

In the second case, a possible ring road around Erp, a little village in the municipality of Veghel (North-Brabant, The Netherlands) divided the community already for a very long time. Half of the village wanted the ring road, the other half absolutely not. A local pressure group 'Erp Alert' asked the science shop to prove that the ring road was a bad solution for the traffic problems in Erp. The science shop rephrased their question into: what is the best solution to the traffic problem taking into account the wishes of all stakeholders in the area. A stakeholder analysis showed that everybody wanted: safety, fast transport, no disturbance, no decline of landscape and nature qualities. The researchers used these criteria to test 11 traffic options – which they collected from the stakeholders themselves – and found out that one of the solutions – which was not the ring road - was by far the best. The best option was a combination of guiding the traffic to the main roads, away from the village, in combination with a dead-end road to the industrial area. This solution was taken over by the municipality in their policy. This solution could only be found by looking at a higher spatial level and a higher social level, the latter meaning not discussing the different solutions per se, but first the criteria on which a solution should be based.

In the third case, sand pits in Spaubeek (province of Limburg, The Netherlands), a local environmental group asked the Science shop to prove that an ecological lay out of the empty sand pits would be better than just the standard lay out that is required legally. The science shop rephrased this question into: which lay-out would fit best the needs of the region. This meant that – based on a survey among the stakeholders - the solution should take into account – landscape-ecological, environmental (floodings), economical, recreational, liveability and cultural historical elements. The scale of the solution should then not only be the sand pits, but also the surrounding areas. By presenting an integral plan, the environmental group could change its status of 'always being against solutions', into taking the lead in finding solutions. This made that they became an interesting partner in regional discussions, which – as it seems now – are also more integral than before.

From these cases can be concluded that the science shop interventions led to a physical and social upscaling of the problem setting, which made it possible to find new solutions that

were acceptable for all stakeholders. Also, before the intervention policy was made by the government, whilst the new policy is made in a network of stakeholders.

122. Governance on distance: distance decay functions for use and non-use values in the Netherlands

Nico Polman, Arianne de Blaeij, Martijn van der Heide, Vincent Linderhof, LEI, Wageningen UR, Netherlands

When conducting an analysis of governance of nature area management, a recurring key question concerns the beneficiaries that should be taken in to account. Governance can be public or private on different governance levels ranging from local governance to international governance. In this study, governance levels are linked to the willingness to pay (WTP) of beneficiaries. As such, it gives insight in the preferences of beneficiaries for designing policies and the aggregation of individuals' benefits. The aggregate benefits depend on both the estimated benefits per individual – quantified through individual WTP amounts – and the population of beneficiaries. Environmental economic research has mainly focused on the accuracy of the estimates of the individual WTP. However, little attention has been paid to the aggregation of benefits, and in particular to the question of whose benefits should be counted. Whether the relevant geographic level (where the beneficiaries of the environmental improvement are expected to reside) is confined to the immediate vicinity of the environmental good under consideration, or extends across the region, country or even further away has. Here, the issue of scale plays an important role. A scale is defined as the spatial, temporal, quantitative, or analytical dimensions used to measure and study any phenomenon. We will focus on the spatial dimension of WTP estimates and explicitly combine this scale with levels of governance.

This paper builds on earlier studies in the literature that estimated distance-decay functions for landscape improvements. The phenomenon distance decay means that the mean value placed on an environmental improvement of a particular area declines with the distance between the location of individuals' residences and the particular area. This will result in changing incentives for individuals to pay for environmental improvement. We have conducted a discrete choice experiment among the Dutch population to ask for their WTP for ecological improvements in three different areas in the Netherlands. The three areas are mainly forest areas and differ in ecological and societal importance (because of, *inter alia*, their size, their specific location in the country, and the type of nature that is found in the areas). We estimate distance decay effects both for users and non-users with respect for the three areas. The goal of this approach, which is modest and fairly narrow in scope, is to identify the relevant population of beneficiaries for the areas by including distance as an explanatory variable in the individual bid curves and to discuss consequences for governance.

Session 2.4, Politics of scale in the governance of natural resources [organized session]

This session is sponsored by the European COST Action IS0802 "Transformation of Global Environmental Governance", and more particularly its Working Group 2 "Multilevel environmental governance". It is a follow-up activity to brain-storming workshop on the meaning of scale and scaling for environmental governance that was held in Geneva on 16 June 2010 back to back with the Regional Governance international conference at the University of Geneva.

The Action ISO802 addresses the current transformation of global environmental governance that can be described as (i) increasing trans-nationalisation, that is, the growing relevance of public and private actors beyond national governments; (ii) increasing supra- and trans-governmentalisation, that is, growing relevance of transnational and supranational institutions; and (iii) increasing fragmentation, that is, increasing segmentation of the policy process through additional layers of decision-making and parallel regulatory systems.

The WG2 is particularly interested in the forms and problems of governance across the spatial and social scales. The interactions between levels of public authority and between layers of social scale from the local to the global are subjected to scaling effects. At the same time scaling up and down policy models remains problematic. Social actors also play on these dissonances to promote their claims, evade responsibilities, reduce costs and shunt policy constraints. Moreover political authority is not necessarily situated at the adequate level to address the environmental challenges ; the politics of scale is part and parcel of the emergence of globalized environmental governance.

The session will explore various aspects of the impact of scale and scaling on sustainable forest management, wildlife and biodiversity conservation, climate change governance as illustrations of multilevel governance complexes where scale matters.

Participants are invited to join the panel discussion after the presentations!

Session 2.4, Politics of scale in the governance of natural resources I, Thursday 15.15-16.15

130. Rescaling and the state in the South: impediment or broker

Daniel Compagnon, SPRIT-Sciences Po, University of Bordeaux, France

There are three main meanings of the word 'scale'. As a graduated range of values implying some kind of hierarchy, scale multiplies in an economic scale (revenue), a social scale (status), a political scale (institutions) and spatial scale (territorialities) not to mention others. This is close to the second sense of scale as ladder, with levels of the scale equating bars on that ladder. The second sense of scale is the dimension of things, of social organisation. In scale as a hierarchical organisation, scaling or re-scaling means shifting from one scale to another. However, the most common understanding of scaling is related to scale as dimension: changing the scope or size of a phenomenon. Then scaling up is to step up the size, numbers or extent of something, while scaling down is doing the opposite. In this acceptation scale implies a notion of proportionality like the scale of a map. This points at the origin of the concept in political geography with its different levels of territorial organisation where the local is encapsulated in wider units up to the global. The realisation by political scientists that many governance problems, in particular in the environment, cut across the scale and that political authority deemed to address them is not necessarily situated at the level where it matters has increased interest for this concept in the later years. Thus as pointed out by Andonova and Mitchell, rescaling is a widespread strategy in global environmental governance, both for researchers trying to address the complexities of the earth system, and for policy makers looking for a new success formula. However the implementation of these strategies is problematic as there are institutional, cultural and other social differences between let's say a local community and higher levels of social interaction. In social and political organisation the difference in scale is sometimes a more ontological one.

This paper will try to assess the potentialities and difficulties in scaling up and down policy models and recommendations in the South in two issue areas: forest management and

wildlife conservation, building up mainly on experiences in Sub-Saharan Africa. It will put the emphasis the impact of the hierarchical political scale by stressing the role of the national state and its capacity to hinder or facilitate these rescaling processes – especially decentralisation and regionalisation.

131. Scaling REDD

Marc Hufty, IHEID, University of Geneva, Switzerland

REDD is emerging as a major new international mechanism that will deeply impact the financial, social and institutional dynamics of deforestation and conservation. Its basic idea is ‘to generate a significant level of compensation or economic incentive to outweigh the income generated through deforestation’ (FoEI 2008: 9). Portrayed as a ‘win-win’ for developing and developed countries alike, the mechanism has gained momentum and support. There is a quite a breadth of literature covering REDD, however, this literature is fairly slanted towards technical issues and the prospective design of the scheme. There is clearly a gap on two issues: governance and social impacts. Governance is understood as the design of the normssetting procedures at all levels. To be an effective instrument to curb deforestation rates and biodiversity loss in the Tropics in a socially acceptable way (including rights, development and equity), the mechanism’s design is crucial. Tropical forests governance is marked by the proliferation of coordination mechanisms at different political levels and the multiplicity of actors, including non-state. There is no clear international leadership and no international binding agreement. Although it can be said that the domain is integrated in a global regime, rules, norms and procedures are not fixed or stabilized. Moreover the regime lies at the intersection of several other regimes, such as trade, biodiversity or development.

The challenge is to develop an operational (usable in concrete empirical research) framework to integrate at the same time the vertical and horizontal interplays within and between actors at different levels (assuming that levels are positions on a range or scale). It is not an option, but a necessary step. Based on the work of COST ISO0802 network on global environmental governance, on political ecology’s chains of explanation (Blaikie & Brookfield) and commodity chains (Ribot), and the Governance Analytical Frameworks’ model for the transmission of social norms (Hufty), such a framework can be elaborated for the analysis of the REDD mechanism. This framework is a contribution to the project ‘REDD-Obs: A social observatory of the Reduced Emissions from Deforestation and Degradation Mechanism’, to start in September 2010.

Session 2.4, Politics of scale in the governance of natural resources II, Thursday 16.30-17.30

132. Understanding multi-level governance of a nascent policy subsystem: Applying the ACF to Swiss biodiversity policy

Tobias Schulz, Swiss Federal Research Institute for Forest, Snow and Landscape, Switzerland

In Switzerland, biodiversity has become an issue of its own at the national level mainly because of international pressure that triggered certain national actors and finally resulted in a parliamentary mandate for the national government to develop a national strategy for biodiversity conservation. However, since the political competences are delegated mainly to the sub-national level and quite a few traditional policies are affected by the biodiversity-issue,

designing and implementing a national programme requires complex multi-level coordination and inter-policy cooperation. Among the many policies that are affected by the biodiversity issue, three are particularly relevant: agriculture, forest policy and spatial planning. All of these have very different policy designs for mostly historical reasons but also due to different "scales" of the problems they (originally) have to address. Integration of nature conservations has been an issue in all three cases also, however to very different degrees.

In order to be able to describe and to better understand the complex changes that took place over the last decade that all contribute to this "nascent" policy-subsystem "biodiversity protection", the analytical tools of the Advocacy Coalition Framework (Sabatier and Jenkins-Smith, 1999) will be applied. However, applying the ACF to such a situation requires to take into account recent expansions of the framework that are not yet fully implemented. First, it has to capture the rather complex multi-level setting, involving at least three levels (cantonal, national and international), by providing predictions about how actor-coalitions at one level might influence decisions at a lower or higher level or what can be expected from cross-level actor-coalitions (Sewell, 2005; Weible and Sabatier, 2005). In addition, horizontal coordination processes can be analysed using the concept of "overlapping and nested subsystems" (Sewell, 2005).

The ACF shall this be applied to a policy, which is evolving out of established policy subsystems. The expected policy change is the integration of policy subfields, which is accomplished by certain outputs, such as formulating "strategies", the establishment of new institutions and the choice for certain policy instruments. Hence, the paper will explore to what extent the application of this framework will give us some tools to better understand multi-level interactions to better integrate policies that originally have been designed for problems at different "scales".

133 (Re-)Scaling Environmental Governance: The Politics of Climate Change Adaptation in Switzerland

Marco Pütz, Swiss Federal Research Institute for Forest, Snow and Landscape, Switzerland

The paper takes the emerging politics of climate change adaptation in Switzerland as a case study to explore the relationship between scale and governance. The paper focuses on national and sub-national climate change adaptation within the context of multi-level environmental governance. Regional adaptation strategies allow a problem-oriented and stakeholder-specific perspective and may include a broader portfolio of potential adaptation measures than the local scale. The regional level of decision-making is less institutionalised which makes it well suited for the realisation of the necessary reflexive, flexible and adaptive governance approach. Political decisions for climate change adaptation depend on a) the identification of local/regional climate change impacts, b) the assessment of local/regional vulnerabilities (in order to define issues and priorities of adaptation), c) the coordination of federal and cantonal measures, d) foresight and concernment of private industries (strategic management, planning of investments), e) political willingness to take action and to fund adaptation measures.

Adaptation is a new policy area for climate change policies – not only in Switzerland – and faces two main challenges. The first one is to improve the resilience of sectors, countries, regions and cities to climate change impacts, which are spatially varying. A set of direct and indirect impacts is expected, depending on the region. These climate changes cause a range of impacts on societies, human life and ecosystems. The second challenge for climate change policies is to encourage the integration of adaptation issues with other policies. The task of

ensuring sufficient consideration of climate change (climate proofing) in global/international, national and regional policies, legislation and regulations is just in its beginnings. Constraints on adaptation strategies are issue specific, state specific and influenced by the relevant governance system.

Conceptually, the paper refers to scale-sensitive conceptual frameworks of spatial relationships such as “scalar structuration” (Brenner 2001) and “embeddedness” (Hess 2004). Building on this framework allows to identify the interplay of actors and institutions across levels, to investigate the driving factors of policy change and to better understand the emergence of new policy fields such as climate change adaptation. Finally, the multi-level nature of climate change adaptation policies in Switzerland is critically assessed.

Theme 3: Theory and method building in scaling and governance

Session 3.1, Social-ecological systems I: Thursday 10.30-11.30

8. Adaptation of water governance regimes: The problem of fit, interplay and scale

Elke Herrfahrdt-Pähle, German Development Institute (DIE), Bonn, Germany

Recently adaptation to climate change has gained ground in environmental change research. Adaptation or probably even transformation is required at different scales of the social system in order to keep pace with current and future changes in the ecological system. The analytical concept of scale refers to the different dimensions or perspectives on a problem. This paper focuses on institutional and jurisdictional scales. Distinguishing among scales and levels makes possible the identification of mismatches between scales and levels, which may result in mismanagement of natural resources and a subsequent loss of adaptive capacity and resilience in the social-ecological system. Climate change opens up new mismatches and aggravates existing ones, thus underlining the urgency of learning and building resilience. Catchment management represents an effort to align the spatial fit between the boundaries of the water body and the social institutions and organisations administering it. The paper examines institutional arrangements and governance structures and processes at various scales and levels. Institutions function as an interface between social and ecological systems and thus play a crucial role in adapting to climate change impacts. The water sector and its institutions will especially come under pressure through climate change, e.g. through changes in the availability of water and increased occurrence of extreme events such as droughts and floods.

The paper firstly develops a framework which allows integrating different scales and levels of analysis both from the ecological and the social system. This framework is geared towards analysing the fit, interplay and scale of institutional arrangements within social-ecological systems and allows identifying mismatches within and between scales. In a second step the framework is applied to water governance reforms in South Africa which have been internationally praised for integrating social equity, economic efficiency and environmental sustainability. The example of the introduction of Catchment Management Agencies (CMA) illustrates the advantages of introducing hydrological boundaries with regard to adapting governance structures to ecological conditions. But it also highlights some institutional mismatches and trade-offs occurring in the process as well as its outcome. A trade-off exists between (1) the improved fit between the social and the ecological system and (2) the misfit between scales within the social system (termed diagonal interplay). Secondly a trade-off exists between (1) a correct classification along hydrological boundaries (holistic approach) and (2) a feasible size for effective management, meaningful stakeholder participation and financial viability. The paper concludes that the perspective of scales and levels is a helpful tool for analysing complex adaptive systems. It particularly offers insights for the sustainable management and governance of natural resources such as water in the face of climate change.

67. Social-Ecological System perspective within multiple level governance: models and metaphors to understand the sustainability and dynamics of alpine grassland

Beatrice Marelli¹, Rocco Scolozzi², Alessandro Gretter², Cristina Orsatti², Ian Soane³

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The European Landscape Convention (Council of Europe 2000) recognises the contribution of landscape to societal wellbeing and its important ecological, cultural and economic roles. In particular, cultural landscapes may reflect a historical functional relationship (as recognised in UNESCO definitions of cultural landscapes) that may no longer be present. The EU Habitats and Species Directive (also named as Natura 2000) sets EU wide objectives for the maintenance of habitats and species wherever they occur. Conservationists are increasingly recognising that sustainable resource management requires resilient systems and to evaluate habitats in respect of much more than their biophysical measures.

We adopted the Resilience Theory (Folke 2006) and Social-Ecological System (SES) concept (Holling and Gunderson 2002) and applied these perspectives in the construction of panarchy metaphors that examine Natura 2000 interests associated with “Malghe” (alpine-mountain) grassland at Val di Ledro (Trentino region, northern Italy). This cultural landscape has shown considerable stability for hundreds of years, due to a long history of “communal management”, but now is changing because of economic circumstances. SES as a paradigm for the understanding of natural resources dynamics fosters to take into account the local community called to manage local environmental resources. Latest contributions (Ostrom 2009) on such concept (based on common-pool resources approach) introduces a general framework to identify SES sub-systems and variables that affect the likelihood of self-organization in efforts to achieve a sustainable SES, stressing the necessity to appreciate social understanding of natural resources management. Our starting point in this study of Malghe grassland was to consider that both ecologically and socially there are a number of sub-systems operating at a range of scales. We decided to explore the relationship of these systems to identify whether ecological and social dynamics can be interpreted in an adaptive cycle, within a panarchy metaphor (Holling and Gunderson 2002).

The results suggest including into the analysis of social-ecological systems also variables such as altruistic behaviours and cooperative values, substantially affecting sustainable practices among communities of users. Furthermore, the identification of the system dynamics needs to cover the range from management systems, user systems and biophysical parameters that affect ecological composition of the SES.

119. Socio-ecological networks to couple spatial scales in collaborative landscape design

Eveliëne Steingröver, Paul Opdam, Land Use Planning Group, Wageningen UR, Netherlands

The concept of socio-ecological systems (SES) is proposed for a systems approach in sustainable landscape change at different spatial scales. We explore how knowledge about socio-ecological networks can help in collaborative landscape design processes which require solutions on multiple spatial scales. The physical structure of peri-urban landscapes often takes the shape of a mosaic of patches for food and housing or commercial functions, intertwined by a network of green and blue landscape elements. This network supports a large part of the biodiversity and related ecosystem services and water regulation functions, and is a key factor in the perception

of beauty and heritage value, etc. Characteristically, these functions require structural cohesion at a large scale. So the appropriate physical conditions for required landscape changes can only be managed collectively by a variety of actors on different spatial scales.

The social component of the SES contains land owners, farmers, citizens, visitors, pressure groups and authorities responsible for common goods. These actors constitute a complex of partly overlapping subnetworks, extending across the boundaries of the region.

In general sustainable landscape change demands a collaborative planning and design process. But regional processes require the involvement of regional actors and aim at specific tailor-made regional solutions. These collaborative processes usually don't take the larger spatial scale into account that is required, nor aim for solutions that may be part of required changes on larger spatial scales. Adaptation to climate change is an example in which the required landscape change plays on multiple scales involving multiple actors. Regional policy requires solutions that are generated in a collaborative process with stakeholders, while national policy requires the total sum of the regional solutions to equal solutions to national set goals for climate change. We propose that the use of socio-ecological networks in regional planning results in solutions that take multiple spatial scale issues into account and contribute to solutions that can only be realized on larger scales.

Session 3.1, Social-ecological systems II: Thursday 11.45-12.45

41. Resilience of Coastal Social-Ecological Systems in the Caribbean: Ecosystem Dynamics, Natural Hazard Risks and Environmental Knowledge Systems

Beate Ratter, Arnd Holdschlag, Institute of Geography, University of Hamburg, Germany

Coastal areas are particularly sensitive to external shocks and internal impacts of the socio-ecological interplay. In the Caribbean, coastal ecosystems provide both direct and indirect uses values. Indirect environmental services of coral reefs, sea grass beds and coastal mangroves include the protection of coastlines against wave action and erosion as well as the preservation of animal habitats. The regenerative capacity of these inshore marine ecosystems is endangered by numerous threats. In particular human activities, such as chronic overfishing, coastal building developments and increased nutrient run off from the land show destructive impacts on the ecosystem. Furthermore, with the impact of external shocks like hurricanes, many degraded reefs have undergone regime shifts, showing an erosion of the ecosystem's resilience.

Ecological as well as the coupled social vulnerability to such disturbances and disasters are influenced by buildup or by erosion of resilience. The scientific concept of resilience generally focuses on the capacity of social-ecological systems to absorb shocks and still remain function as well as on the capacity of renewal and development when coping with change and crisis. The resilience perspective is embedded in theories of complex adaptive systems based on multi-agent systems. Complex interactions of elements – agents in social systems – develop large-scale system effects that are different from its single elements' behavior ("emergence"). Such a concept emphasizes non-linear dynamics, thresholds, regime shifts, uncertainty and surprise. The questions arise, how periods of gradual change interplay with periods of rapid change and how such dynamics interact across temporal and spatial scales?

In this paper, concepts of complexity and resilience are reviewed, and it is argued that these approaches can enrich research on coastal communities and scale sensitive governance. The focus is put on the social dimension of social-ecological system dynamics. Understanding agents' behavior and agents' interaction means as well an analysis of the underlying

environmental knowledge systems of different agent groups that shape the natural resource utilization and hazard management. The Bahamas archipelago e.g. is characterized by diversity, fragmentation and informality of the social and political sphere. Based on preliminary results from first exploratory fieldwork, we address the question how different institutional contexts and scales frame the social environmental memory and the present mental models of nature and risk. Finding answers has significance for a flexible and adaptive policy based on monitoring, evaluation and institutional learning.

108. Governing spatial-temporal dynamics of biodiversity conservation networks using a tradable permit market scheme

Astrid van Teeffelen¹, Paul Opdam^{1,2}, Martin Drechsler³, Florian Hartig³, Karin Johst³, Claire Vos², Frank Wätzold⁴, Silvia Wissel⁵

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Networks of protected areas are widely accepted as an appropriate strategy for biodiversity conservation, particularly in intensively used landscapes. In such regions, (semi)natural habitat mainly occurs in small, spatially scattered areas, embedded in land used for food and fiber production, housing, infrastructure and working facilities. Conserving biodiversity successfully in such fragmented landscapes requires sufficient levels of spatial cohesion, allowing species to utilize the individual areas as a large network. Current conservation networks are conceptualized as static structures, with the individual sites (areas) protected by law. Recent arguments in literature suggest that a certain degree of spatial dynamics might be beneficial for several reasons. With spatial dynamics we mean that parts of the network are being used for other land use functions, while elsewhere the network is strengthened via habitat restoration. Such a flexible approach allows improving the ecological effectiveness of networks in a wider landscape context, as well as improving robustness to climate change. Furthermore, it enables the incorporation of conservation networks and habitat provisioning into sustainable spatial development. However, it is largely unknown at what rate the spatial change of the networks is compatible with retaining biodiversity goals. Another unanswered question is how this change can be governed in a way that is more compatible with sustainable development than the current strict regulations.

For a case study in the west of the Netherlands (Green Heart) we simulated loss and gain of wet grassland habitat sites using the policy instrument of tradable permits. We explored how such instruments should be governed to generate robust and resilient ecosystem networks. We compared various combinations of market incentives and spatial planning rules with respect to their ability to realize cost-effective patterns of ecosystem sites in the case study area. The patterns of habitat turnover produced by different governance settings were assessed for ecological effectiveness using population-dynamic models for a few species with different ecological strategies. The results suggest that with a strong bonus for maintenance and enhancement of spatial network cohesion, market based policy instruments could improve the ecological effectiveness and the adaptive capacity of ecosystem networks.

125. Scale-sensitive policies towards natural gas extraction in Pennsylvania, USA

Jason Weigle¹, A.E. Luloff¹, Frans Padt²

(1) Pennsylvania State University, USA; (2) Alterra, Wageningen UR, Netherlands

Development of natural gas bearing shales represents a growing source of energy for local, regional, national, and world markets. The development of the Marcellus Shale in the Pennsylvania (northeastern United States) is very attractive to natural gas developers for several reasons. First, there is a tremendous supply of gas that is relatively easy to access with new technology. It has been estimated \$1.2 trillion in recoverable gas exists in Pennsylvania. For a state with a \$355 billion economy, the economic potential is obvious and immense. Additionally, economic and political policies in this and surrounding states make development in Pennsylvania very efficient and profitable. Finally, this resource is in close proximity to some of the largest markets in the country (New York City, Philadelphia, Boston, and other large east--- coast cities) and close to several major transmission pipelines and storage fields. This significantly reduces the costs associated with transporting the gas to markets.

Economies based primarily on the extraction of non---renewable resources tend to follow a cycle of explosive growth followed by a period of decline. These boom---bust cycles have been widely studied in the US and around the world. The towns and cities where this type of development occurs are known as boomtowns. Such areas generally experience a rapid increase in population followed and supported by an increase in services, infrastructure, housing, and newfound prosperity. Several studies also indicated issues emerging over land and water use and pollution in communities as well a rise in social disruptions. In many instances, the boom is followed by a bust – the collapse of the community when the project is over or the resource is exhausted. The Marcellus Shale region is likely to be in an early stage of a boom---bust cycle. The scale and speed of natural gas development in the area has already surpassed early estimates and its growth is likely to continue at a faster rate in the future.

Generally, disturbances and issues can be sorted into three categories: (1) those directly associated with drilling; (2) those associated with governance and scaling; and (3) those associated with both. In this paper we demonstrate, using concepts from resilience theory, how disturbances and issues associated with natural gas development at one level have significant impacts at other levels. These impacts, as we illustrate, tend to be the result of a lack of planning or foresight caused by depressed economic activity and a long history of natural resource extraction. We argue that a scale---sensitive policy related to building adaptive capacity for resilient community development in a new age of gas development is required. Such a policy includes knowledge building, conflict resolution, creativity and learning, self organization, and economic diversity.

Session 3.2, Integrating networks and hierarchies I: Friday 10.15-11.15

50. How to integrate the multi-level perspective on socio-technical change with a spatial analysis and multi-level governance? The district of Murau and the global energy transition

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Which role do spatial dimensions play in the transformation of socio-technical regimes, in particular the energy system, towards more sustainable configurations? Concepts such as the

multi-level perspective on socio-technical change have not given sufficient attention to space and place so far. We develop our considerations around the case of 'Energy Regions' in Germany and Austria which try to bring about a substantive shift in their local energy supply structure and have the ambition to contribute to a general transition towards sustainable energy systems. However, if this ambition is to stand the test of reality, what are the mechanisms and processes through which regional governance can have a broader impact on the transition of the energy system? What are the resources it can draw upon? What are the linkages with other governance levels?

We investigate in detail how one regional showcase for the feasibility of a non-fossil, sustainable energy system was set up in Murau, a remote, alpine district of Austria. Starting from the multilevel framework for the modelling of niche-regime interaction we put particular emphasis on the formation of discourse coalitions and dynamics of multi-level governance. Our findings support the view to pay considerably more attention to the interplay of local and non-local discourses and the dynamic relations between local initiatives and non-local networks which can provide specific opportunities for the legitimization and entrenchment of alternative socio-technical configurations.

68. Scalar considerations in climate adaptation for natural resource management

Jennifer West, Center for International Climate and Environmental Research, Oslo, Norway

Drivers and impacts of, and prioritised responses to, environmental change vary across scale. For example, local perceptions, national priorities, and international policy discourses relating to climate change may differ greatly, leading to questions of whose interests win out, and whose may be marginalised, in prioritised actions, programmes and policies for climate adaptation. In this paper I explore scalar considerations in relation to climate adaptation and natural resource management. I do so by comparing findings from research conducted in Northern Norway (coastal fisheries), Inner Mongolia, China (desertification and ecological migration), and Tanzania (REDD and agriculture). The latter work forms part of my current PhD project, in which I aim to explore the potential tradeoffs and synergies between local perceptions and experiences of dealing with livelihood vulnerability on the one hand, and policy and practitioner discourses on vulnerability and adaptation priorities connected to REDD, and climate adaptation and mitigation more generally. Although the cases differ markedly in terms of their geography, culture, predominant resource use patterns, and governance traditions, they are all concerned with natural resource management in relation to climate change, and the focus in each of them has been to try to broaden understanding of the potential synergies and disjunctures between local perceptions, experiences and priorities relating to the impacts of climate variability and change on resource use and management, and the wider policy and decision-making contexts in which climate adaptation and resource management goals are being articulated. My aims in drawing them together here are to provide a basis for comparison from which to develop a theoretical frameworks that i) recognises the cross-scale adaptation challenges facing rural communities, ii) acknowledges and accommodates the plurality of perceptions of and prescriptions for dealing with climate change across decision-making scales and iii) critiques and provides alternatives to hegemonic definitions of the climate "problem", including envisioned solutions to it.

98. Governance at different scales and levels; investment programs for rural areas (ILG) in the Netherlands

Roel Jongeneel, Nico Polman, Louis Slangen, LEI, Wageningen UR, Netherlands

In 2007, responsibility for rural areas policy in the Netherlands shifted from the national government to the provincial authorities. For the period 2007-2013, the total budget involved is about 4 billion euros (about one third of provincial tax income). This budget originates from the national government, provincial governments and third parties, such as local stakeholders and the EU. Two third of the budget is intended for nature conservation, followed by recreation (18%) and agriculture (7%). This paper focuses on scaling and governance issues associated with this rural policy shift in the Netherlands. Contracts are concluded between the government and individual provinces to govern the relation among these two levels of the government. These contracts are rather detailed and are intended to delegate and decentralize decision power. To analyze this shift in governance two questionnaires have been carried out. The first – carried out in 2007 - among experts of provinces focused on the relation between provinces and the national government. The second questionnaire addresses the way provinces deal with different scales within their responsibility to manage rural areas. For this latter questionnaire, we interviewed in 2009 experts of provinces and committees to which the provinces delegate responsibilities.

Some results of the surveys are that the provincial authorities regard it as feasible to integrate the contracts into their own policies. Further the provincial authorities were found to have relatively low trust in the national government or in private parties at local and municipal level. This raises concerns, because the provincial authorities will need these parties to successfully implement their programs. Opportunities for co-financing the rural policy program were estimated to be limited. For their regional policy, Dutch provinces mostly use regional advisory committees and hardly delegate decision power. The tasks the advisory committees take on in practice are, however, often going beyond their formal discretion of these committees. Regional advisory committees have a high regional coverage and claim to have a better knowledge about local circumstances than the provinces themselves. The committees cover simultaneously multiple themes, such as nature, landscape, agriculture, recreation and water. The multiple theme-approach leads to additional transaction costs but nevertheless turns out to be an effective way to come to an integral balancing of interests. The advices made by the regional advisory committees are usually adopted by the provinces.

Session 3.2, Integrating networks and hierarchies II: Friday 11.30-12.30

79. Environmental cooperation between subnational governments from developed and developing countries: an example of (trans)regional environmental governance

Joana Setzer, London School of Economics and Political Science, UK

While the literature on regional environmental governance generally focuses on 'Northern' cases, this paper explores the emergence of (trans)regional cooperation between developed and developing countries. The subject is a Memorandum of Understanding (MOU) signed in November 2008 by four Brazilian states of the Amazonia Region (Amazonas, Amapá, Mato Grosso and Pará), two Indonesian states (Aceh and Papua), and three American states (California, Illinois and Wisconsin), that aims to be the first state-to-state sub-national

agreement focused on Reducing Emissions from Deforestation and Degradation (REDD) programs.

The paper first analyses whether an environmental cooperation initiative between subnational governments can be understood as an example of (trans)regional environmental governance. Such cases cannot be understood through traditional regionalist approaches. The new concept of 'transnational regions', as constructed by scientific assessment and policy practices, is needed to explain how and why subnational governments representing regions from different nations and continents cooperate to protect the global environment. The paper further illustrates how the MOU case study represents also a 'new wave' of cooperation; an iterated, nonlinear, decentralized and open-ended process, capable of a transformative impact both on actors and on the operation of the international system.

Based on a multilevel governance approach - chosen because (trans)regional cooperation vertically and horizontally links different levels of governance -, the paper explores the rationale, potential benefits and limitations of (trans)regional environmental governance. This is particularly interesting in the case of this MOU: where the cooperation emerges in the spaces between the international regime and national regulations on climate change; where the sub-national governments involved are from nations that have no legally binding commitments under the international framework; and where the object of the collaboration is a mechanism that is not yet part of the international climate regime. The paper also considers whether and how such initiatives might respond to the increasing fragmentation of global environmental governance. Countering key premises in international relations literature, it argues that regional environmental governance can help in enhancing cooperation and creating new levels of integration. It concludes by pointing to lacunas in the present literature and suggesting that environmental cooperation at the regional and subnational levels might help overcome some of the limitations faced by international environmental cooperation.

94. Potential and limitations of a polycentric governance approach for water infrastructure management in Ukraine

Nina Hagemann, Department of Economics, Helmholtz Centre for Environmental Research, Leipzig, Germany

After independence in 1991 Ukraine entered into a period of transition to a market economy by restructuring of the economic and political system including for example the rearrangement of property rights. This led to implications for the management of water infrastructure providing water supply and sanitation. The responsibility and ownership of enterprises that provide drinking water and sanitation in Ukraine has been handed over from the central government to the municipalities. This transfer was connected with the assignment of the responsibility to set tariffs and provide for the maintenance of the infrastructure. However, despite this decentralization approach the Ukrainian state remains highly centralized - for example budget competencies do not lie with the municipalities and major requirements for tariff setting rest with the central government. This system of unclear distribution of competencies provides few incentives for all actors to foster economic development and secure sustainable resource use. This results in an ever increasing deteriorated infrastructure and increasing environmental implications such as highly polluted wastewater discharges into rivers and wastewater infiltration into groundwater. The current Ukrainian system of water infrastructure governance will be analyzed from the perspective of polycentric governance which consists of the idea that "many centers of decision making which are formally independent from each other" exist

(Ostrom et al. 1961: 831). The theoretical approach allows for the analysis of actors' relationships, the distribution of power between these actors and incentives for action provided by the institutional setting.

The main questions which are asked are what potential does polycentric governance provide in the case of water infrastructure management in a transition country like Ukraine? What are limitations provided by the current regulatory system? Based on a literature review, analysis of legal documents and stakeholder interviews the paper argues that there is scope for polycentric governance as an instrument to provide more efficient and sustainable water provision, despite the fact that the institutional setting in Ukraine is still quite unstable.

111. Tackling transdisciplinary complexity in climate change adaptation of urban regions – a research approach sensitive to multi-scalar spatial and temporal dynamics

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Due to a complex, hybrid social-ecological nature of climate change and the underlying uncertainties arising from it, decision-makers experience particular difficulties when it comes to develop and implement adaptation strategies to climate change impacts. This is even more evident at the regional and local level, implying rather high levels of uncertainty with regard to future climate change and its local impacts. Therefore, at the centre of the presented research project stands the question of how to formulate and implement integrative strategies and processes of urban and regional development, when faced with uncertainties and knowledge limitations as regards future impacts of climate change. Against this background, our paper aims to report on a developed inter- and transdisciplinary scalesensitive research approach. We strive to give due consideration to the transdisciplinary complexity which is inherent in our object of research at several levels: First, at a more general level of the complex social-ecological system linkages, second with regard to the hybrid social-ecological nature of climate change, and third, regarding the transdisciplinary integration of science and practice in the field of climate change adaptation, acknowledging cross-sectional and multi-scalar dynamics. The utilization of social-ecological resilience as a bridging concept lies at the core of our inter- and transdisciplinary endeavor.

Our approach takes specific spatial and temporal scales and their interplays into account. The global scale is often the scale of interest when mitigation options are examined. Climate change is often described by IPCC-Scenarios with time frames until 2100 and local measurements are often achieved by downscaling with regional climate models. In the case of urban regions understood as socialecological systems, local changes (canopies, land-use, economy, infrastructure, mobility) over time can influence or overlay with the global effect of climate change and have diverse effects influencing local vulnerability to climate change. Studying impacts of climate change on local scales is impossible without taking these finer spatial scale changes into account (Shackley, Deanwood 2003). As climatechange impacts differ substantially from one region to another, strategies and measures have to be developed on the local and regional level (Blanco et al. 2009; Hall 2009). As these scales are interlinked within urban regions due to their complex and manifold social-ecological interplays, especially as far as land-use is concerned, both are to be put in the focus of adaptation strategies at the same time. Taking the local and regional level into account in urban regions understood as interlinked social-ecological systems, allows to coordinate different demands on an adequate scale as well as to develop sufficiently concrete strategies and measures (Overbeck et al. 2008). For concrete

adaptation measures it seems that the natural and social multi-scalar interdependencies seem more appropriate to be considered than the political-administrative structures and boundaries (Frommer 2009). However, the latter are the governance arena for common decision-making on future land-use and cannot be neglected if the developed adaptation strategies are to be implemented in practice. Concerning the temporal scales, also there, different scales have to be considered, as decision-makers in planning administration as well as in the political and economic realm are oriented towards short periods, within which climate changes as temperature rise, changes in precipitation patterns and sea-level-rise are moving slowly.

Session 3.3, Scaling and governance methodologies I: Thursday 15.15-16.15

17. Bridging Human and Environment Scales: Methodology and Case Study of Karst Regions in China

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There are three different scales involved in applied geographical research, observations scale, model scale and policy scale; For specific geography processes or phenomena, there are also involved different social organization levels and environment hierarchies, the scales relationship between human and environment systems are key issues in understanding and managing the world. The paper attempts to analyze the different approaches in bridging human and environment scales, find the connectivity in scaling different problems and phenomena based upon our land change study in Karst Mountains of Guizhou province, southwest of China. Karst regions are the vulnerable regions in the worlds, Karst rocky desertification and poverty alleviation are two challenges which confusing the local and regional government and so on, almost twenty years of integrated rehabilitation of Karst rocky desertification which focused on small watershed restoration and human-environment interact can shed light on bridging human and environment scale. By integrating spatial scales of patterns, processes, drivers and impacts of land change at multi-scales of Guizhou province, Wujiang River Basin, Miaotiao River Basin and several other small catchments, the complexity and connectivity between various scales were identified. Then, a framework was constructed to interpret the relationship between scales and governance where stakeholder and multi-sector were participated. It is found that the general approach of Scale study is scale selection - scale analysis - scale integration; When performing the scale selection, we should consider the questions which would be solved and the data which could be collected, then choosing the appropriate scale; When doing the scale analysis, it is required that analysis should be carried out from a larger scale and a smaller-scale at the same time, to find a significant change in dynamics, to prevent the omission or exaggerated of information; Scaling(or scale integration) is the bond to recognize the relationship between global and local, which should combine top-down and bottom-up approaches to identify direct and indirect links and the emergent character between scales. When performing the scaling, method is the key problem, whose objective is to find the "connectivity" between scales.

58. Relating archetypical patterns of vulnerability to policy making at different levels

Paul Lucas, Marcel Kok, Peter Janssen, Netherlands Environmental Assessment Agency, Netherlands

Vulnerability analysis is often of a local and case study nature, while global assessments of vulnerability are necessarily based on aggregated data and rather crude assumptions of the underlying mechanisms. Overcoming the scale difference between both methodologies is a major challenge for vulnerability analysis. On the one hand, to be able to use case studies in global assessments, the result should be generalized, while their relevance in similar situations should be assessed. On the other hand, global vulnerability assessments, even when dealing with a fine spatial resolution, face the question whether and how local specifics are adequately represented and understood in the global context. Recognising the need and the potential to look at the similarities between related situations around the globe, a methodology was developed that aimed at generalising the outcomes of local vulnerability studies, building on the insights and tools of global assessments, thereby looking at an intermediate scale. This methodology looks for common vulnerability creating mechanisms amongst a multitude of situations, delineating and describing 'archetypical' combinations of vulnerability creating mechanisms which work at different places in a similar way. These so-called 'archetypical patterns of vulnerability' were defined as 'specific, representative patterns of the interactions between environmental change and human well-being'.

The methodology was first developed and applied as part of the fourth Global Environmental Outlook of UNEP, where it proved itself useful for the qualitative analyses of a number of archetypical patterns, including directions for policy making. It was further elaborated and formalized towards a more quantitative methodology. This methodology quantifies the vulnerability creating mechanism with indicators from global Integrated Assessment Models and uses statistical analysis to assess the different manifestations and their geographic location of the archetypical pattern under analysis. The next step is to explore the potential of this approach for policy analysis. Insights gained from the analysis may provide input for policy making with respect to guidance to adaptation and mitigation policies in specific situations and possibly as a reference for identifying the consequences of international policies for vulnerable groups. This paper elaborates the possibilities and constraints of using this approach for the identification and analysis of policy both at the sub-national level and international level.

61. Scaling and governance in EU Rural Development

Stijn Reinhard, Peter Nowicki, Tom Kuhlman, LEI, Wageningen UR, Netherlands

Rural Development is a policy domain in which scaling and governance issues play an important role. Member States prepare Rural Development Plans (RDPs), which must take into account the overarching European goals. These goals are environmental (e.g. reversal of decline in biodiversity) and socioeconomic (e.g. labour productivity) all with different spatial and temporal scale. The objective of this paper is to contribute to a modelling methodology that enables the evaluation of RDMs (Rural Development Measures) as part of a RDP. In this paper a methodology is elaborated for an *ex post* analysis, validated by empirical data and user response. This methodology benefits from the current widespread availability of spatial data that can be interpreted through GIS techniques; such a spatial approach is the key to assessing whether the delivery of rural development outcomes are correctly targeted and provide value for money.

Differences in the impact of rural development measures may be related to either environmental or governance (economic, institutional) factors. Regional policies, too, are a differentiating factor, as they are determined locally (although within the EU framework). These lead to differences not only in levels of RDP payments, but also to zoning and targeting. Data of different variables used in the same RDM model are often not available at the same spatial level. They may have to be either aggregated or disaggregated. Both present problems, although aggregation is of course easier. Downscaling is often required for environmental indicators, which typically can differ sharply over small distances. The boundaries for the environmental processes, relevant for the measures, differ from the administrative boundaries that determine many socio-economic indicators and governance. The major challenge is moving between phenomena that are causally related but distributed in entirely different spatial and temporal patterns. This paper presents the relevant research agenda and the first results from this work in progress.

Session 3.3, Scaling and governance methodologies II: Thursday 16.30-17.30

40. Backcasting as multi-scale governance tool; on the development of local robust actions and their implications for higher scales

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Within SCENES (Water Scenarios for Europe and Neighbouring States) ten river basin scale participatory workshops used backcasting to develop robust actions. This paper evaluates the methodology used, the results and the implications of them for the European scale. The backcasting workshop was the last workshop in a series of three. In the first two workshops detailed storylines were developed for four distinctly different scenarios. They have been used to set the context for the backcasting exercise. Goal of the backcasting was to define a number of robust (policy) actions, by working backwards from a desired objective in 2050. Workshops lasted one to two days, and included a diverse group of about 15-20 stakeholders. Participants and organisers were enthusiastic about the backcasting method, although there were also some process related difficulties. Each small group of participants studied the possible actions within one scenario. Actions developed within the different scenarios were compared to look for those that are effective in all scenarios. These are robust actions; the fact that they are effective in all scenarios shows they are likely to be effective in the actual future.

The analysis showed that several robust actions could be identified in multiple case studies. Actions like 'integration of legislation and policies', 'monitoring', 'financial incentives', 'education' and 'increasing awareness' were not only robust across scenarios within a case study, but also across case studies. It is those actions that have implications for higher scales. A number of the robust actions on the river basin scale also addressed the EU directly, for instance with the development of more specific targets for the 'good water status' of the WFD and an increase of agro-environmental schemes under the CAP. We can conclude that backcasting exercises can be used in participatory workshops to develop (policy) actions. By involving stakeholders directly in defining (policy) actions, the backcasting tool can be said to facilitate governance. Results from multiple case studies show the robustness of actions across a larger area, and the implications for higher scales. With such a set-up, governance is linked to a multi-scale frame.

103. Doing scaling and governance analysis

Frans Padt, Alterra, Wageningen UR, Netherlands

One of the basis premises in scaling and governance is that there is a mismatch between the scales of ecological and social processes and the scales of government and governance. Detailed and empirical scale analysis is needed to reconstruct these scale mismatches. In recent research we applied a scale analysis for the greenbelts in The Hague Region in the Netherlands. These greenbelts have been formalized during the 1950s. The research question was why these greenbelts were still open despite persistent urbanization pressure. Following a political-ecological approach we hypothesized that this can be explained from a match between 'operational scale' (i.e. the scale of social activities and biophysical processes); 'observational scale' (the scale of policy making and administrative control and management); and 'interpretative scale' (the scale at which institutions, groups and individuals perceive the process of change and outcomes). Such a match can occur at different levels. Data for this analysis were derived from the PLUREL project (Peri-urban Land Use Relationships - Strategies and Sustainability Assessment Tools for Urban-Rural Linkages). PLUREL is a research project within the European Commissions' Sixth Framework that started in 2007 and is expected to end in 2010.

Findings show there is a match of the three aforementioned scales at two levels: the global level and the city region level. This double match explains why the greenbelts are still open today. At the global level, the greenbelts provide The Hague Region with a comparative advantage in global capital, labor and agricultural markets. At the city region level the region has used its formal authority to develop powerful greenbelt policies and investments (thereby further strengthening its own position). Much less scale matching was done at the European, national and Randstad level. However, major trends like urbanization, counter-urbanization, demographic change and climate change threaten the greenbelts. These developments are on a wider scale than the scale at which greenbelt policies are currently made, i.e. the city region level. We argue that a complete rethinking of greenbelt policies are required at the higher metropolitan level (taking into account its position in global networks)

New matches between operational, observational and interpretative scales have to be found at this level. In this paper and presentation we present a general methodology to do this job.

137. Evaluation of the variation in semantic contents of class sets on modelling dynamics

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To define and explain the interaction of human-environment systems, understanding the scale of interaction and the scale of different environmental and social processes is of paramount importance. There are three dimensions of scale: space, time and the organisational hierarchy as constructed by the observer. The latter dimension of scale has received little attention. The variation in semantic contents of data expressed as differences in categorisation is synonymous with organisational hierarchy. In this paper the relationship between semantic contents of data with modelling dynamics is explored using two land-cover data sets for Romania, one based

upon the Land-Cover Classification System (LCCS) and the other as used in the EURURALIS study. Three levels of semantic contents of the LCCS data and the single semantic level present in the EURURALIS data are used to establish empirical relations between the land-cover class and its driving factors. The methodology of the CLUE model is used as the spatial and temporal dimensions of land change have been explored with this model and the examination of the variation in semantic contents of data is complementary to the earlier research. The results show that variation in semantic contents of data within one data set and between two data sets lead to different sets of spatial determinants. There is no pattern recognizable when establishing the organizational hierarchy. Future policy and decision making depend to a great extent on which organisation hierarchy is present in the data used to formulate a policy or to make an informed decision. This would mean that if the same results would be found in other data sets using different models not only multi-scale but also multi-semantic analysis are needed in order to make meaningful predictions of spatially explicit land change.

Theme 4: Case studies: learning science from practice

Session 4.1, Regional environmental governance I: Thursday 10.30-11.30

49. Environmental decision-making through hierarchical interaction among multiple actors in a spatially heterogeneous region of rural China

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Regional governance is becoming important in environmental decision-making because of the decline in the functions of state. Although multiple actors and their interactions are essential factors in regional decision-making, information about the heterogeneity of relevant conditions within a region is also crucial because one-size-fits-all policies cannot provide adequate solutions. This study examined three hierarchical actor levels, i.e., a town government, villages (self-governing bodies), and households, in a desertified region of rural China to understand the process of regional environmental decision-making. In addition, natural and socio-economic conditions in every village within the town were examined to consider their spatial heterogeneity. As people's perceptions of environment are the basis for their actual action, we specifically addressed the following: (1) differences in perceptions of desertification among the three levels, (2) spatial heterogeneity of perceptions of desertification as well as of natural and socio-economic conditions within the town, and (3) process of regional decision-making on desertification, considering the hierarchical and spatial diversities derived from (1) and (2). We interviewed senior officials of the town government, village leaders, and households. The spatial heterogeneity of the abovementioned villages' attributes was analyzed by Moran's I spatial autocorrelation statistics by using the interview data and satellite images. We showed clear differences in the perceptions of desertification among the three levels with reference to their different political roles and households' poverty. Significant spatial autocorrelation was found in all observed villages' attributes, and some of the spatial patterns were found to be correlated. We then clarified that the process of decision-making was progressed through a hierarchical interaction among the three distinct levels. Moreover, through the interaction, the spatial heterogeneity of perceptions of desertification as well as of natural and socio-economic conditions was reflected in the process. Although the resultant process could effectively stimulate the implementation of current environmental policies, the nature of both, process and policies, was reactive. We concluded that the current process of environmental decision-making overlooks the potential risk of desertification, and proactive measures need to be executed considering the hierarchical and spatial diversities of the region.

86. Navigating scales for place-based policy: Lessons from the Canadian experience

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Like many countries, Canada is facing increasingly complex, “wicked” policy challenges in many areas such as natural resource management, public health, community development, etc. These problems are wicked due to their socially, politically, economically and geographically multi-scalar nature and their tendency to defy simple solutions (Caron and Serrell, 2009; Freeman, 2000). The nature of these challenges has fundamental implications for governance, and forces public administration to look more closely at how concepts of collaboration, coordination, consultation, etc. are implemented.

Place-based approaches, defined as a “...collaborative means to address complex socio-economic issues through interventions defined at a specific geographical scale”, are suggested as one of the ways to tackle these wicked policy challenges (Cantin, 2010). Issues of scale are central to the discussion on place-based approaches: not only are new forms of collaboration and coordination needed across policy areas, but variability in how traditionally separate policy areas define scale increases an already complex process of integration in any given “place”. Place-based initiatives all face general challenges related to scale, such as the difficulty of setting boundaries when scales do not overlap, different measurement systems, conflicting stakeholder perspectives, etc. From a federal perspective, the Canadian government faces an additional set of challenges in implementing place-based approaches, including: a bureaucratic system where departments self-identify along different scales; jurisdictional complexity with three or more levels of governance involved in place-based initiatives; national equity considerations; etc.

This paper investigates three Canadian examples of place-based initiatives to analyze how the federal government can effectively navigate issues of scale for place-based policy. The case studies are drawn from three distinct policy areas: oceans management; agri-environmental policy; and public health. Because of the policy linkages between these areas, and because of the different ways in which existing policies define scales, these experiences provide insight on how to move forward with place-based approaches and highlight areas for further policy research.

115. Farmer’s LUC decision-making in a conflictive multi-level network; the case of the buffer-zone community Tierra y Libertad, Chiapas, Mexico

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Farmers and the agro-ecosystems they manage are part of an increasingly tighter knitted web of markets, government and governance institutions. Population growth, migration, increasing (international) trading, and cheap consumerism have pushed farmers to produce more intensively. At the same time, an greater awareness of nature conservation of the general public has resulted in more claims on land to protect the environment. Markets, governments and societal groups have responded by developing instruments to stimulate both processes.

Examples where these contradicting interests meet are the buffer zones of Man and Biosphere (MAB) reserves. Here, farming is allowed under a set of restrictions to protect the environment. In this paper, we attempt to improve our understanding of the effects of this increasingly complex social-ecological system with contradicting stimuli on farmer's land use change (LUC) decision-making. For this purpose, we interviewed 50% (n=75) of the household heads of the *ejido* Tierra y Libertad. This 50-year old community borders the most important core zone of the Sepultura MAB reserve, established in 1995. The interviews focused on land use changes and the reasons for changes on a field basis. We identified the major changes in land use and the main reasons as stated by the farmers for their changes. We identified influences from six levels of the social-ecological system; 1) field e.g. soil, micro climate, 2) household e.g. needs for family well being, 3) community e.g. social network, 4) local e.g. NGO supported participatory projects, 5) national e.g. reserve rules, price support and subsidy programs, 6) international e.g. prices. Farmer's decision-making differed depending on: 1) historical baggage, 2) assets, 3) sensitivity to social influences, 4) price sensitivity. The largest land use changes were the spread of intensive commercial maize production followed by widespread livestock ranching, were the unintended effects of the national policy to support the maize price followed by a crisis induced by the international North American free trade agreement. Governmental prohibitions and subsidy programs were the least effective in influencing land use decisions. In addition, the local social network proved very important for the farmer's decision making. Recent participatory projects seem to be successful in terms of striking a balance between production and conservation interests by internalisation of conservation goals and the development of sustainable land uses. These results show that participatory projects that are sensitive to the local social network can be effective in balancing contradicting interests and meeting multi-stakeholder interests.

Session 4.1, Regional environmental governance II: Thursday 11.45-12.45

87. Examining Local Governance and its Impact on Project Outcomes: Evidence from participatory forestry projects of Bangladesh

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The key challenge of forest management nowadays is how decisions are made and how stakeholders beyond the forest sector influence forest policies and practices. During the 1980s and onwards most of the developing countries experienced somewhat decentralized management of their forests with varying degrees of success and failures. Decentralization allows stakeholder participation in the co-management of forest resources, and devolution of forest management responsibilities to local communities facilitates the decision-making processes collectively in a fair, transparent, and prompt way, although many forest user committees lack such governance issues.

In this study, we examined several principles of governance including equity, accountability, transparency, information flow, responsiveness and participation in a number of participatory forestry (PF) projects, which have been implemented in different parts of Bangladesh having both success and failures, and their impact on project outcomes. Findings indicate that the project authority could not pull off adequately in reaching project objectives-sustainable management of forest resources, settlement of participants, and socio-economic

development of the participants. Low level of participation, lack of accountability and transparency in handling project money, gap in communication and information flow between project authority and participants, presence of irresponsiveness of project staff members negatively affected the outcomes. Moreover, due to dearth of equity, elite people captured most of the project benefits.

It has been observed that stakeholder's participation in project functions and their regular interactions can ensure the practice of good governance that might increase positive outcomes of the PF projects. Therefore, suggestion is made to improve governance situation through the formation of social capital which can maintain a congenial stakeholder relationship for better project's outcomes.

120. Policy Processes Connecting Scales and Governance Levels: A Case from Irrigated Agriculture in Turkey

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The functional 'fit' within and between the spatial and temporal scales of water resources and the levels of governance is acknowledged as an essential element of water sustainability. Water governance is characterised by the interference of multiple policy fields, including mainly water, agriculture, and environment, that have different, and often conflicting, objectives, actors and instruments, yet strive for integration towards water sustainability. The features of these policy fields, the interactions among them and their repercussions at different levels involve processes, the exploration of which reveals insights about the (mis)fit of scales and governance.

The specific case of irrigated agriculture is the focus of this paper since it needs attention due to four reasons. Firstly, consuming the majority of water resources in many countries, agricultural sector has a high impact on water sustainability. Secondly, in many regions, the negative impacts on water and land resources are experienced as inevitable and uncompensated externalities of irrigated agriculture. Thirdly, the spatial and temporal scales of water and land problems resulting from irrigated agriculture do not always overlap. And fourthly, the level of governance responses does not match the scale of problems about irrigated agriculture.

Turkey is selected as the case study area. It is among the countries that allocate most of its water resources to agricultural sector, given the arid regions that need irrigation for agricultural production. In the recent decades, huge investments are made in order to extend irrigated agriculture and increase agricultural income. However, the negative impacts of irrigated agriculture on water and land resources are experienced in various regions. Harran Plain is one of such regions, where many irrigation projects are carried out and put into operation since 1980s and problems such as water and soil pollution, soil salination and desertification are observed. This paper aims at understanding the (mis)fit within and between the scales and governance levels for the case of irrigated agriculture in Harran Plain by examining the objectives, actors and instruments of water, agricultural and environmental policies as well as their interactions and repercussions at multiple levels. The methods adopted are the review of relevant documentation and the interviews with actors from different levels. The analysis made for Harran Plain can be relevant for other cases, where similar problems are experienced.

127. Scale Challenges in Ecosystem Service Governance: A Case Study from Northwest Yunnan, China

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Ecosystem services originating from the highly diverse mountain ecosystems in northwest Yunnan provide plentiful benefits for people at different levels, including local and regional food and wood production, water regulation along the Yangtze River and habitat for many endemic species of global significance. Since single ecosystems can't supply all demanded services at one time, the governance system is supposed to balance trade-offs to sustain the landscapes' productivity for future ecosystem services.

To analyse the governance structure I, first, separated i) the spatial scale (local to global), ii) levels of governance within the Chinese administrative system (village, township, county, prefecture, province, national), iii) different forms of institutions (rules-in-use, policies) and iv) knowledge (TEK, scientific knowledge) with its capacity to manage these contested ecosystems. Second, I focused on cross-scale interactions to discover the main contradictions and gaps within the governance structure. These scale challenges include ignorance, mismatches/problems of fit, plurality and discordance. In order to assess specific linkages between different levels among the mentioned scales I used the ecosystem service approach as a relation based concept.

An in-depth village study and extensive expert and policy interviews at all relevant levels revealed significant differences of institutions and applied knowledge systems used to influence ecosystem service production. Thus partially conflicting governance is leading to losses in efficiency, i.e. ill conceived afforestation measures, repressive nature protection programmes etc. While some of these governance conflicts could be attributed to differing interests of the different spatial levels, many shortcomings of state-driven interventions could be attributed to a lack of cooperation with lower levels ("top-down approach") and missing integration of knowledge and management capacity at higher and lower levels.

To be concluded, all obstacles hindering effective cross-scale interactions for better informed governance can be described as one of the mentioned scale challenges. This shows that a scale focused governance analysis is able to deliver substantial insights in the current system of ecosystem service governance in northwest Yunnan, China. But also promising examples towards coordinated governance could be observed. It can be assumed, that the applied approach may easily be generalized to assist scientific based decision-support systems for more effective ecosystem management.

Session 4.2, Transnational governance I: Friday 10.15-11.15

24. Territorial strategies need scale sensitive governance, learning by exchange between practitioners in search for practices and policies to adapt to climate change

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FARLAND was an EU funded project on innovative approaches in land development in 6 countries, meant to formulate new policies. Exchange between project participants was based on intensive studies, excursions and thematic exchange visits. At the end of the project in many countries highly different, but positive results were experienced. In one country cooperation between different ministries was established for the first time. In another country a new policy on highly necessary land consolidation was set up. In a third country the visited project became a role model for rural development in the new policy. The results are seen as a consequence of FARLAND. However, no scientific evidence is available because that was not the goal of the project. Interregional cooperation like the EU Interreg IVC projects can be seen as an intervention. Scientific data about the exchange of experience, knowledge and good practices will be collected during a new Interreg IVC project, F:ACTS!. F:ACTS! is an acronym for 'Forms for: Adapting to Climate change through Territorial Strategies'. Scale sensitive governance is needed to adapt to climate change through territorial strategies.

F:ACTS! is a follow up project of FARLAND. It brings together a partnership of 14 organizations from eight different European countries, many of them experienced and committed to interregional learning and developing. It uses review studies, study visits, thematic workshops, identification of good practices and peer-to-peer exchange by short internships which should lead to improved governance of adaptation to climate change in all 8 countries. F:ACTS! will document the implementation of practices in 5 pilot regions. F:ACTS! is a professionals project. Within F:ACTS! the collection of scientific data does not determine the main direction and content of the project. Scientists study the project which is lead by practitioners (governmental workers including policy makers and professionals). Science follows practice. The main scientific research question of this paper is how to measure the effects of the F:ACTS! project on the project partner organizations and the practices in the pilot regions of the project.

53. Environmental goods and bads: spatial-temporal difficulties of biofuels governance in the European Union

Aaron Leopold, International Institute for Sustainable Development and Helmholtz Centre for Environmental Research (UFZ), Leipzig, Germany

Biofuels emerged on the global policy scene in the mid 2000s with a speed and fervor which has left many policy-makers with rather unwanted lessons learned. Analyzing the emerging consequences of the European Union's biofuels governance from a critical political economic perspective, this paper first illustrates an unexpected temporal issue and follows up with its spatial counterpart before moving into a discussion of biofuels governance as example of the emerging governance of new environmental goods and services.

The temporal issue at hand in this paper is the national and EU level promotion of biofuels for environmental reasons from the late 1990s onward which resulted in a state-sponsored industry for biofuels despite a lack of adequate scientific investigation to ascertain the validity of biofuels' green claims. The continuation and strengthening of these policies in the EU's Renewable Energy Directive of 2009 despite significant scientific and civil society backlash in the wake of the "food versus fuel" crisis is then explored to illustrate the powerful path dependencies created by EU-level policymaking and to delve into the question of if and how policies promoting increased use of environmental goods and services can ever be precautionary enough to avoid a repetition of the very bumpy process of regulating biofuels.

One of the consequences of this first issue has been the spatially problematic idea of indirect land-use change (ILUC). This is the recently acknowledged proposition that European biofuels policy may cause deforestation in other world regions by creating more demand than EU biofuels farmers can fill. This has led to the current major review of the EU Renewable Energy Directive's (RED) biofuels provisions which is taking place before these policies have even taken hold. This global result of the regional EU energy policy had been expected by many, but the magnitude of possibly detrimental ILUC had not been understood until very recently. In analyzing this phenomena and its repercussions for biofuels governance in Europe, the paper segues into a closing discussion of the janus faced nature of innovations leading to new environmental goods and services in need of governance processes and structures, with a focus on REDD+.

74. Border regions: From national backwaters to transnational territories and global commons

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Border regions constitute special conditions for natural resources governance. They are the most remotely located from centres of government. Especially where they are characterized by poor infrastructure, for instance in the case of tropical forest borderlands, but also in the case of border seas, they suffer from a persistent absence of the state, its agencies and related service sectors. Until today, poorly functioning rule of the law and social institutions characterize many border regions. This situation however is changing dramatically in many locations in the world, and for various reasons. National governments become increasingly concerned about territorial integrity and national sovereignty, because borderlands increasingly experience uncontrolled transborder flows. Borderland populations and economies integrate across borders, making them antagonistic to national interests and loyalties. At the same time, borderland regions are capturing non-local interests for their natural resources. National governments set their eyes on borderland natural resources when they become more easily accessible due to infrastructure improvements, or, borderlands hold biodiversity and ecosystems that make them attractive as conservation areas. Many such conservation areas are being located in single or multiple countries' borderlands. Where this happens, often supra national actors, like international conservation NGOs and with them international aid organizations join the national governments, borderland governments, and specialized agencies to govern natural resources. This trend results in a dramatic shift in natural resource governance in border regions. In many borderlands, governance reforms take place similar to governance reforms in the rest of the country, mostly in the form of decentralization, democratization and related processes. However, at the same time, non-local interests draw the national government and international conservation and development actors into the border region natural resources governance arena. The paper reviews natural resource governance changes in border regions, relying on cases of forested borderlands, border seascapes, and transborder river basins. Natural resource

governance in border regions is for an important part influenced by the characteristics of the natural resources, the diverse interest for these resources, and the prevailing governance determining factors. However, the paper identifies some common trends in natural resources governance where they are located in border regions.

Session 4.2, Trans national governance II: Friday 11.30-12.30

83. International Forest Governance and the Role of Scaling – A Comparative Case Study

Stefan Werland, Environmental Policy Research Centre, Freie Universität Berlin, Germany

This paper presents a case study which compares attempts to govern forests in different international contexts. It starts from the observation that although forests were one central topic of the Rio Conference, there exists no coherent international regime that aims at their sustainable management yet. Besides the 'genuine' UN forest process (UNFF), the UN Climate Change Framework Convention (UNFCCC) and the Convention on Biodiversity (CBD) gradually integrated forests and forest management into their portfolio. Consequently, international forest governance rather resembles a fragmented and even partly contradictory conglomerate of different conventions and negotiation forums.

The puzzle on which this paper builds is that although these institutions are very similar (i.e. comparable), they perform very differently when dealing with one and the same object. The range stretches from a 'non-regime' in the case of the UNFF over the establishment of a working programme and voluntary financial transfers under the CBD up to the development of concrete policy instruments in the case of the UNFCCC. While these institutions are similar across most explanatory variables (membership, power, scientific certainty etc.), it will be shown that they build on fundamentally different ideas about the meaning of 'forest' and about the problem to be governed. These diverging framings may be described in terms of system boundaries and spatial scales: While a framing of forests as a national or local resource is maintained in the UNFF, forest under the UNFCCC and the CBD have become globalized, i.e. connected to 'global biodiversity' and the Earth's atmosphere. Forests thus form an example for previously local goods which were introduced into a globalized context.

The study of international forest politics provides an example for the role of framing – and more specifically of scaling. In this regard, scaling is understood as a purposeful social action which is reciprocally interconnected with power of scaling agents. The hypothesis which will be tested in the paper is that the framing of forests in terms of global commons contributed to a more successful international policy. In this regard, the paper will also explore the limits to globalized problem definitions in the context of multi-level governance

121. Agricultural expansion or intensification? Disentangling the role of governance: A global study of arable agriculture

Menno Mandemaker, Land Use Dynamics Group, Wageningen UR, Netherlands

In this research we studied empirical relationships between agricultural production dynamics between 1975 and 2007 and six quantitative World Bank governance indicators for 173 nations. It is hypothesized that in countries displaying lower quality of governance, agricultural production increases are more likely to be achieved by area expansions than by increases in

yields. In the analysis, we controlled for differences in the biophysical, demographic and economic environment. We distinguished four different groups of countries: those with both area and yield increases; those with increasing yields but decreasing area; those with decreasing yields but a growing area; and those with both declines in yields and in area. We analyzed differences between these four categories, and also analyzed governance-production relationships within these four categories. On average, quality of governance is low in countries with both area and yield increases and high in countries with increasing yields but decreasing area. A more detailed analysis of governance-production relationships within the four groups of countries suggests that countries with a lower quality of governance are more inclined to achieve a production increase by expanding the agricultural area than by increasing yields. Additional explanatory value of governance indicators to agricultural production dynamics is generally small, but nevertheless significant in most cases. Our results suggest that, in order for agricultural production to increase, governance issues should be resolved in order to avoid excessive expansions of agricultural area at the expense of nature.

Session 4.3, Knowledge management I: Friday 15.00-16.00

21. Issues of scale in knowledge integration for building with nature

Stephanie Janssen, Deltares, Netherlands

This paper focuses on scaling issues in knowledge integration in the decision making process of building with nature projects. In scaling and governance literature, topics of multi level, multi scale and multi stakeholder involvement in complex decision making are gaining increased attention. Stakeholder participation has become widely accepted as a standard and problems require integration of different disciplines and social worlds. These issues have gained importance in the field of hydraulic engineering by the introduction of the innovative concept 'building with nature'. Building with nature is a design approach aimed at optimizing the potential of nature in the design of a hydraulic engineering structure, instead of minimizing the effects on nature. It aims at an integrated design by balancing different perspectives such as nature, economy, and safety. The approach is currently explored and brings along new challenges, such as how to deal with the inherent uncertainty of nature in the design and how to integrate the different knowledge disciplines?

An integrated design requires knowledge integration of different disciplines such as ecology, engineering and economy. This interdisciplinary knowledge approach needs to deal with the different time and spatial scales in these disciplines and with specific epistemic traditions. When aiming at usable knowledge for decision-making, knowledge not only depends on a sound scientific knowledge base. Knowledge depends on the context, is evaluated by multiple stakeholders and has a negotiated character. Therefore the process of knowledge development and the resulting knowledge depend on the decision making process, and consequently on the governance setting.

In this paper, we explore strategies for dealing with issues of scale in knowledge integration in building with nature projects. A literature study shows that the governance setting of hydraulic engineering projects influences which strategies are feasible. We identify distinguishing characteristics of the governance setting in hydraulic engineering projects: the client – contractor relationship and the demand for guaranteed safety in an uncertain design. A case study in which the building with nature approach is applied in practice, the so called 'sand engine', supports our idea on the need for specific strategies. The sand engine is a project along the Dutch coast and provides an example of how scales are dealt with in knowledge integration

of different disciplines. The case shows that the governance setting determines feasible strategies for dealing with issues of scale in knowledge integration.

23. Coping with complexity in regional sustainable development: exploring potentials and conditions for knowledge governance

Authors: Alwin Gerritsen¹, Marian Stuiver¹, Catherine Termeer², Renate Werkman²

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Regions in the Netherlands have to cope with the challenge of realizing sustainable development in a network society (Castells, 1996). Much is interlinked including the scales on which issues are taken up. Nobody is in control and there are no clear borders between scales. Actors have to find effective ways of cooperation between organizations and between scales. There is limited consensus on “facts” as well as limited consensus on values about what is sustainable and what not. On top of that new developments keep on emerging and change the context in which issues are taken up. Regional development issues are therefore by definition wicked (Churchman, 1967) and unstructured (Hisschemöller and Hoppe, 1998). Van Buuren and Eshuis (2010) propose *knowledge governance* as a distinct form of governance in addition to market, network and hierarchy. Knowledge governance focuses on the coordinative power of shared ideas, knowledge production and knowledge dissemination in social networks, which would often have a multi level character (Marks, 1993). Knowledge governance appears to be a promising concept for complex issues in dynamic environments.

In this paper we explore potentials and necessary conditions for knowledge governance by means of a chronology of the activities of knowledge production, coordination and dissemination in the case study National Landscape Northern Frisian Woodlands. This is a region in which 850 farmers have formed an association and propose self governance and sustainable strategies to bring landscape and nature values to profit. Around these ambitions a coalition of politicians, civil servants, non governmental organizations, scientists (partly supported by the Knowledge Base 1 program financed by the ministry of Agriculture, Nature and Food Quality) and the innovation program Transforum has been formed. The coalition consistently promotes and develops its vision and uses knowledge production and dissemination intensively. The activities focus on the province of Friesland and particularly on the region Northern Frisian Woodlands, but actors are also active on local, national and international levels and in other regions. We focus on the activities from 2007 to present, but set this in the context of an older knowledge governance arrangement in the area.

33. Policy support systems: new trends to improve their usability

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The development of policy support tools has significantly increased since the start of the XXI century as a result of two main reasons. First, the rising complexity of policy decisions with many potential conflicts or agreements between policy choices in multiple sectors and multiple scales that makes it difficult to get a comprehensive view on the impacts of the policy measure. And second, the wish of decision makers to base new policies on facts and sound evidence. The level

of tool complexity varies from advanced integrated modelling to simple knowledge rules and decision trees, e.g. Quick-scans. However, the use of these tools in policy making has proved to be rather limited in Europe. On one hand, the 'black-box' complex tools are found not transparent enough by the policy community that seeks to understand the modelling behind the impact results to be able to cope with the scientific uncertainty. On the other hand, the simple tools are found too simple to grasp all the range of interactions. Both motives suggest that the scientific community developing the tools needs to enhance the interaction with the decision makers during the design phase of the tools. Projects explicitly dealing with policy-science interaction are a new trend in the European Commission. They directly aim at increasing the understanding and usability of the results provided by the scientists, and indirectly at improving transparency of methods and tools and communication techniques. Scientists focus their efforts to engage policy makers in four main aspects, i.e. a) clarify the level of complexity needed (the complex models for long-term prospective studies and the simple tools, more transparent and flexible, for day-to-day work); b) co-design of the policy scenarios or what-ifs to be assessed; c) explanation of how these scenarios are translated and implemented into a modelling framework; and d) co-design of the user interface. Based on authors experience in last projects for the European Commission and the European Environment Agency, we conclude that there is a new trend in policy support systems by which scientists involve the decision makers in some aspects of the design of the tools. This trend implies that the traditional linear top-down approach when building the tools is changing towards an interactive circular approach where top-down and bottom-up meet.

Session 4.3, Knowledge management II: Friday 15.00-16.00

64. Effective knowledge transfer and the gap between science and collaborative design for sustainable landscape development

Willemien Geertsema, Marta Perez-Soba, Paul Opdam, Alterra, Wageningen UR, Netherlands

In this paper we address the use of scientific knowledge at different levels of scale. Sustainable landscape development is primarily a local process aiming to increase ecological, economic and social values of the local landscape. This requires scientific knowledge that is interpretable in the specific context of the local area in a collaborative design process, for example knowledge about the relation between the spatial characteristics of the landscape and the level of biodiversity and ecosystem services. We claim that there is a gap between scientific knowledge and its application in collaborative design. We suggest that this gap is (partly) caused by the fact that the knowledge is mainly developed for policy assessment. Policy assessment on the one hand is characterized as a top-down, linear process, using large scale and generic knowledge, the input of local stakeholders is minimal. Collaborative design on the other hand is characterized as a bottom-up, circular and open process, using regional and specific knowledge, this knowledge is mainly stakeholder-based. The scientific knowledge of the physical system available is often so generic that it is hard to apply in the specific situation. Also, assessment models are usually evaluating given solutions to politically defined problems, rather than they provide solutions for problems on which different local stakeholder groups have widely different opinions.

We will discuss ways to increase the effectiveness of knowledge transfer in planning process, especially in collaborative design. With cases of collaborative design of greenblue networks in the Netherlands, we illustrate how scientific knowledge can integrate with local knowledge and local benefits of stakeholder groups. The effectiveness of knowledge transfer in

the cases is evaluated with criteria of credibility, legitimacy and salience. We argue that ways to increase the effectiveness of knowledge transfer for design is related to the improvement of the usability of policy assessment tools.

We conclude that planning for sustainable landscape development will become more effective when knowledge development and application in different planning phases (design, assessment) is better balancing local stakeholder knowledge and generic scientific knowledge, thereby focusing on the relevant spatial scale. The integration of stakeholder and scientific knowledge in assessment and in design should be part of a cyclic planning approach, with options adaptive management.

99. Sustainability at different scales levels of agriculture: Does the institutional environment matter?

Stefano Pascucci, Nico Polman, Louis Slangen, LEI, Wageningen UR, Netherlands

The objectives of the paper are twofold: (i) to analyze scale effects of sustainable resource allocation in agriculture in European Union and (ii) to highlight the role of different levels within the institutional environment. The institutional environment is defined as the rules of the game in which economic activity is governed. The institutional environment differs among communities and is not fixed in time and changes in general slowly. The research has been organized in two steps. In the first step, using data provided by the Eurostat for the evaluation of rural development in the European Union, we identified suitable indicators to measure sustainable resource allocation according to all three economic, social and environmental dimensions of sustainability. In the second step of the analysis the presence/absence of sustainable outcomes (resource allocation) has been detected by the means of reference levels for each of the three dimensions. The reference levels will be investigated at different institutional environments. We then correlated this indicators of sustainability to a set of factors which have been recognized as informal rules (i.e. cultural value, trust, reciprocity, etc.) and formal rules (i.e. legal origin, type of government and constitutional setting, etc.) at different institutional environments.

We use a multivariate Probit model to measure the significance and magnitude of such factors. This model allowed us also to check cross-correlation between different dimensions of sustainability (for example if sustainable economic development affects also social and/or environmental ones) and levels of governance. By doing that this paper provides an interesting approach in relation to the role of institutions to determine sustainable development in the European Union.

136. Scaling in an integrated assessment tool for agricultural systems

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Changes in agriculture due to policies or technological innovations are likely to have a big impact on European land use and other natural resources. Integrated Assessment (IA) is a method proposed by research for ex-ante analysis of the impacts of policy changes and technological innovations on agriculture. Integrated Assessment and Modelling (IAM) is based on quantitative

analysis involving the use of different modelling tools (Harris 2002, Letcher and others 2007, Parker and others 2002), often using a string of models linked in a model chain.

In the integrated project System for Environmental and Agricultural Modelling; Linking European Science and Society (SEAMLESS) (Ewert and others 2009, Van Ittersum and others 2008) an agronomic model, an agronomic-economic model and two economic models were linked in a model chain. Ultimately these linked models provide a means to achieve up-scaling and the interdisciplinary assessment of agricultural and agri-environmental policies, technological innovations and societal and biophysical trends, that would not be possible with the individual models. Linking in a model chain requires that the data produced by one model are a meaningful input to another model, usually operating data at a different temporal and spatial scale. The models in SEAMLESS are a cropping systems model APES at field scale with a daily time step, a bio-economic farm model FSSIM at farm scale with a yearly projection, an econometric estimation model EXPAMOD at regional scale with a yearly projection, and a partial equilibrium optimization model SEAMCAP at continental scale with a yearly projection.

To link these models, different methods of scaling were made operational to operate between the models and between data and models. For the data, typologies and sampling were used design an agri-environmental zoning linked to farm types, that the models could use as a common access point for their simulations. For the models, process descriptions at different spatial and temporal scales were linked by aggregation (i.e. averaging, weighing) and extrapolation steps. These aggregation and extrapolation steps helped to convert outputs of one model into inputs of another model, and to cover the whole sample required for representativeness. Through all these different scaling methods the model chain becomes an integrated assessment tool based on a coherent conceptual framework.

Theme 5: Towards innovation in governance

Session 5.1, Governance sensitive scaling: Friday 15.00-16.00

47. Mainstreaming space saving strategies Local space saving settlement strategies as a multilevel and multidisciplinary approach

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In Austria, majors, the municipal councils and building committees are mainly responsible for the sustainable spatial development of municipalities. Settlement development is a complex task which combines inherently approaches and requirements from different disciplines e.g. spatial and landscape planning, architecture, nature conservation, landscape economy and ecology. Needs and requirements are different in each municipality. For mainstreaming strategies like space and energy saving settlement development it is therefore necessary to scale it down on different layers to deal with the complexity of these topics. This paper will outline the multilayer and multidisciplinary approaches that are necessary to mainstream complex challenges/tasks in spatial development. Hitherto technical and planning-related issues and solutions dominated the discussion about area saving spatial development. Other topics such as social consequences or political framework conditions and requirements were often neglected. Exemplified by the case study of the municipality of Lengau, a rural municipality in Upper Austria, the paper discusses the approach to downscale and mainstream space-saving targets in spatial development in Upper Austria by involving and activating local stakeholders and starting a knowledge brokerage process. Whenever new concepts and aims are to be implemented, new strategies have to be developed and knowledge and competences have to be mediated. The Federal State of Upper Austria therefore set up a new innovative funding instrument to incorporate space saving tasks in spatial development. Due to the diversity of the municipalities with their different opportunities and problems, an open funding instrument which supports studies, concepts and initiatives was set up. The aim of the funding is to develop new knowledge and competences on local level.

This paper discusses the results of a project within this new funding scheme which had two approaches: a landscape planning assessment of the local spatial structures as well as an exchange and strategy development process with the communal stakeholders. In cooperation, planners, administration employees responsible for spatial development as well as political representatives and researcher developed an overall guideline and concrete measures for the future settlement development. Experiences and methods learned from gender mainstreaming implementation processes were used to identify the requirements for a successful cooperation between different professions and disciplines as well as for the knowledge brokerage process within the project. In this paper the lessons learned from mainstreaming processes are discussed and basic principles for scaling information and competences for planning processes are pointed out.

60. Land governance in Lao PDR: analyzing scales and places of public actors' interventions on human-environmental systems

Peter Messerli, Centre for Development and Environment (CDE), University of Bern, Switzerland

Research conducted in the frame of the Global Land Project (GLP) of IHDP and the Swiss National Centre of Competence (NCCR) North-South.

Rural areas of the Lao PDR are currently undergoing rapid transformations related to global change and globalization. A key characteristic of this process is that decisions on land management are not restricted to local actors anymore but are increasingly embedded in a multi-level setting, where regional, national and even global actors are more and more important. Correspondingly, land systems and more specifically human-environmental interactions can not be adequately understood without knowing their linkages to decisions and policies made elsewhere. Conversely, the differential influence of such spheres of decision-making reshapes and fragments Lao landscapes in terms of problems and opportunities for future development. Research is needed to understand the configuration of such multi-level decision-making, and how its spatial variation forms so-called governance landscapes.

This paper presents results of a research project conducted between 2006 and 2010 in Lao PDR. Based on a relational concept of space, development interventions by public sector actors such as governmental agencies, multi- and bi-lateral development partners, and NGOs were systematically studied. The analytical categories of actors and development interventions were first analyzed in terms of their interactions paying special attention to a spatially explicit representation using Geographic Information Systems (GIS). Second, in-depth analysis was carried out to better understand the types of activities, actors' values and perception, as well as the role of knowledge in decision-making.

The analysis of 327 development interventions targeting poverty and/or natural resource management and 340 related actors shows a rapidly expanding sphere of public governance where decision-makers are increasingly connected and interdependent. Governmental agencies depend on bilateral actors for implementing policies, which in turn adapt their agendas to multi-lateral donors and implementing NGOs. In spatial terms about 60% of Lao villages are influenced by external decision-makers out of which some are confronted with more than 50 development actors from all levels claiming stakes on their future development. The description of these distinct governance landscapes allows to reflect on new center-periphery gradients in rural areas of Lao PDR. Whereas some localities confronted with multiple agendas of global development dynamics become globalised places, others remain in the vacuum of public influence. Such areas are often exposed to private sector investors and market dynamics and are hence exposed to unregulated capitalistic transformations leading to poverty and natural resource degradation. Furthermore, this analysis allows reflecting on currently applied concepts of scale as the 'global' and 'local' levels are increasingly blurred.

78. Climate change adaptation, development, and international financial support: lessons from EU pre-accession and solidarity funds

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Funding adaptation requires adequate governance and there are different ways to organise and channel the funds to where it is most efficient and most necessary. This paper investigates this issue and studies the practical implementation of a development under conditionality, namely adaptation-development, and its requirement in terms of financing architecture. To contribute to this research, it looks at similar problems that have been met in the past, namely the European funding programs for Eastern Europe countries that were candidate to adhesion, and European internal structural and cohesion funds. These funding examples provide a pertinent analogy for the adaptation problem, and most issues in adaptation finance have also been met in these funds (difficulty to define and measure additionality and incremental cost, concept fuzziness, need for leverage and mainstreaming, ownership and sovereignty issues). Publicly available documents from the European Commission and the European Court of Auditors are reviewed, providing interesting insights into possible implementation of adaptation finance. These insights can be summarized into seven main lessons: (1) “black-spot” programs are less flexible but more efficient than “concept-based” programs; (2) a multi-scale and multi-step approach can minimize sovereignty and ownership issue, and facilitate capacity building; (3) private funding leverage is a myth, and funding based on the “additional cost” is highly inefficient; (4) non substitutability among objectives and regions is necessary; (5) sub-national eligibility criteria are a viable solution; (6) institutional capacity matter: low-capacity countries should focus on capacity building and “black-spot” strategies; higher-capacity countries can follow a concept-based approach; and (7) the EU should use its own experience to promote its views of adaptation funds.

Session 5.2, Scale negotiations and governance I: Thursday 10.30-11.30

42. Policy instruments to improve the spatial cohesion of Natura 2000

Marie-José Smits, Hans Leneman, Nico Polman, Claire Vos, Irene Bouwma, Huib Silvis, LEI Wageningen UR, Netherlands

The EU goal to halt the loss of biodiversity by 2010 has not been reached. Therefore, the Council of the European Union has formulated a vision for 2050. Among others, it concludes that a speed up of the completion of the Natura 2000 network is needed. However, the functional connectivity within the Natura 2000 network is regarded still insufficient. To improve spatial cohesion of Natura 2000 the establishment of a Green Infrastructure is recommended. A Green Infrastructure is defined as an interconnected network of natural areas, including agricultural land, greenways, wetlands, forest reserves, native plant communities and marine areas that naturally regulate storm flows, temperatures, flood risk and water, air and ecosystem quality. The Council of the European Union calls on to further develop the concept of Green Infrastructure.

In this paper we analyse governance structures which can be used to improve the network functioning of Natura 2000, especially by developing a Green Infrastructure. Since most

of the rural areas between Natura 2000 sites are owned by farmers, we focus on instruments from the Common Agricultural Policy (CAP). The term “rural” in this paper is used in a regional sense. Regions may be defined as levels from an environmental scale perspective, i.e. using environmental (hydrological, biogeographical) boundaries. However, regions may also be defined on a social, economic or administrative scale. Land use has environmental consequences that differ markedly depending on the pattern of remaining habitat and the size and proximity of disturbances to ecologically sensitive areas. Both natural and man-made amenities have to be taken into account. However, this increases the problems to determine the spatial level for analysis.

This paper presents some recommendations for potential governance structures within the CAP, which can contribute to spatial cohesion in favour of Natura 2000 on a regional, national and international level, especially by means of developing a Green Infrastructure. The analysis is conducted using new institutional economics theory. The paper ends with some recommendations for potential instruments within the CAP, which can contribute to spatial cohesion in favour of Natura 2000 on a regional, national and international level.

57. Food security strategies and scales of governance in the Philippines

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The government of the Philippines has set out ambitious goals for achieving food security through self-sufficiency, yet simultaneously there are government activities that undermine these efforts. Lack of public funding for government programs means that agencies like the Department of Agriculture, Department of Agrarian Reform, and Department of Environment and Natural Resources seek private (often foreign) investors to reduce the agencies’ burdens of providing support services to the specific communities for which they are responsible. The lack of resources for monitoring the investment projects that get approved and the lack of substantive penalties for their non-compliance to environmental regulations sometimes result in significant ecological impacts. Investor-led development often means land is shifted from forested land or staple cropping (like rice, corn, and vegetables) towards the growing of cash crops like bananas, pineapples, and sugarcane, eroding the possibilities for local and national food self-sufficiency.

In the context of agriculture in the rural Philippines, there are different strategies that result in different scales of the reproduction of environmental conditions. While some agriculturalists orient themselves to global scales as they source inputs from multinational seed, fertilizer, and pesticide companies, others focus on the scales of the farm and the community as they use traditional open-pollinated seeds, compost crop residues, create their own fertilizer, and select seeds for future planting. Government agencies have great influence on the choices agriculturalists make regarding their methods of production, soil management, and distribution. Austerity measures within the federal government, due to international financial institutions’ structural adjustment programs, have resulted in the devolution and fragmentation of government agencies, causing discontinuities in the communication and implementation of programs across the agencies’ different scales. At the same time, on global scales, foreign production subsidies and international trade policies undermine Filipino farmers’ abilities to produce enough staples for their domestic market, with the result that the Philippines is the biggest rice importer in the world.

What is needed is a reintegration of the different functions of agencies accomplishing agricultural development, land reform, and environmental protection; and furthermore a reintegration of the ways that those agencies operate at national, regional, provincial, municipal, and community scales. The food price crisis of 2008 was presumably merely foreshadowing of the problems that food-importing countries like the Philippines will face in the future. Local scale, sustainable staple production needs to be the focus for the Philippines so it can work toward a greater degree of sovereignty.

Session 5.2, Scale negotiations and governance II: Thursday 11.45-12.45

45. Divergence of rural spatial planning policy in the Netherlands

Petra Roodbol-Mekkes, Land Use Planning Group, Wageningen UR, Netherlands

Many European countries have changed their spatial planning systems in the last decade. Tasks and responsibilities have been redivided over the different government tiers. Spatial planning has thereby become a policy field that is spread over several tiers of government, in which multi-level coordination, and scale sensitivity is becoming more important. The changes made to spatial planning systems can be attributed to the shift towards a more integrative, development oriented and participative approach in spatial planning. These approaches require a good insight into the specific needs and possibilities of a certain area. The new planning systems are designed to give the regional or local governments the possibility to adapt their policies and planning system to their specific situation. It can therefore be expected that the introduction of these new spatial planning systems will lead to a divergence in both spatial planning policy and systems on the regional and local level.

The paper will explore this assumption based on the case of the Investment Fund for Rural Areas (ILG) in the Netherlands. The ILG is a major decentralisation scheme in which the national government decentralised the implementation of national rural policies to the 12 provinces. The paper will analyse the range of different policies and systems of the provinces and the reasons that lay behind these differences. It will also explore if and how the national government facilitates the development of differences in practice.

Results show that actual differences between the provinces are limited, despite the fact that policy divergence is seen as a prerequisite for the success of the ILG. This is largely due to the fact that the national government does not 'let go'. On the other hand, the provinces are not fully using the opportunities that do exist. Practitioners at both the national and provincial levels feel that this has a negative effect on ILG results. This conclusion is in line with earlier studies that state that policy divergence, although widely recognized as important, is not accepted in the Dutch (political) culture. So far, ILG has not been able to break through this, limiting the possibility for the use of new planning approaches that were at the heart of ILG philosophy.

63. Ecological network planning and implementation as a multi-level biodiversity conservation tool: an analysis of Estonian case studies

Kadri Tillemann, Monika Suškevičs, Mart Külvik, Estonian University of Life Sciences, Tartu, Estonia

Fragmentation of natural areas as a threat to biodiversity goes beyond territorial or administrative boundaries and spans over different policy levels. Ecological networks aim to

combat the fragmentation problem scale-sensitively, by using landscape as a relevant unit for land use planning. The Estonian concept of ecological networks (The Green Network) is brought into practice through various governance levels and by including stakeholders from different sectors. Starting from the concepts of multi-level coordination and inclusion of interests in cross-level decision-making, this study addresses the role of participatory processes across levels. We evaluate ecological network planning and implementation processes in terms of their social and ecological effectiveness by assessing (1) the inclusion of relevant stakeholders from different levels as well as main sources and ways to use environmental information; and (2) mutual adjustment of ecological network delineation in the land use plans at regional and local level.

Case studies at regional (Harju County) and local level (Keila Municipality) form the empirical basis of our analysis on multi-level and multi-sector stakeholder involvement and information use. For assessing the inclusion of relevant stakeholders and information flows, a set of in-depth interviews with stakeholders were conducted. The adjustment of ecological network delineation across regional and local level (detailed planning and building decisions) was examined through a comparative study planning documents. Furthermore, all land use decisions regarding planned ecological network within local case study area during implementation period were analyzed. The main general results from planning phase evaluation showed the inefficiency and inadequacy of used participatory approaches, referring to the need for mutual understanding between stakeholders from different levels and sectors about each others' activities, goals and needs in order to enable constructive cooperation among them. We found that contradictions between different governance levels and ineffective stakeholder involvement measures have caused negative influence on land use decision-making processes. Municipalities were not enough motivated to integrate ecological network to comprehensive planning documents. In the cases when ecological network was identified at local level the adaptations made to thematic county plans in municipality's comprehensive plans were mostly an enlargement or diminution of core areas or corridors or, less often, displacement of corridors. Local land use decisions regarding ecological network showed 3 % of green network areas being superseded by given building permits and initiated detailed plans. Analysis showed that if ecological network was effectively integrated into local comprehensive planning documents, less land use decisions interfering the network were made.

117. Moving between the national and the local scale: improving the mixture of self organising and instrumental capacity of regional partnerships

Froukje Boonstra, Marian Stuiver, Wiebren Kuindersma, Alterra, Wageningen UR, Netherlands

The area based approach adopted in Dutch rural policies in the 1990s was originally established as an experiment to bridge the gap between the national scale of policy making and the local scale of communities needs and initiatives. In the course of time, multi-actor partnerships were established in several Dutch rural regions and mediated between national policy objectives and the aims of regional stakeholders. Recently, however, regional partnerships have become part of the standard rural policy repertoire nationwide. This development was accompanied with new challenges for regional partnerships. The first one involves a devolution of national instruments and resources to the provinces, in order to raise regions' contribution to policy output. The second challenge consists of the provincial wish to strengthen their control over and the efficiency of the regional partnerships through output measurement and performance contracts, reflecting the market oriented approach in public management.

By means of a case study analysis on four regional partnerships in the Netherlands, we will show that regional partnerships in order to be effective, have to respond to the needs of

both the national as well as the local scales of policymaking. For this, they need to develop sufficient self organising capacity and sufficient instrumental capacity. The concept of 'self organising capacity' refers to the partnership's ability to define and solve mutual regional problems, while the concept of 'instrumental capacity' refers to its potential for implementing national and European environmental and rural policies. There is a close relation between the two capacities and their scales: only partnerships that are sufficiently self organising are interesting partners for national or provincial authorities in policy implementation. Too much self organising capacity may reduce the partnerships instrumental value, however. And the other way around: regional partnerships were established for instrumental reasons by the state, but too much emphasis on improving this instrumental value may damage their self organising capacity.

We will show that the market oriented approach in public management has resulted in more contractual relations and less interaction between regional, provincial and national policy scales. National policy makers have, for example, retreated from regional partnerships while provincial authorities are reconsidering their position. This growing distance between scales of policy making causes new coordination deficits and reduces the chance for policy learning across the different scales. This affects both the self organising and the instrumental capacity of regional partnerships as these capacities are highly depended on the decisions made at other scales, i.e. national, provincial and local. The recent literature on meta governance (f.e. Jessop 2002) claims to have new solutions for these problems. We will explore their ideas on multi level coordination strategies and elaborate on their possibilities to improve the mixture of self organising and instrumental capacity of regional partnerships.

Session 5.2, Scale negotiations and governance III: Thursday 15.15-16.15

46. Mega farms: sustainable food production systems or bare and austere animal flats? A case study into perceptions of scale increases in Dutch intensive animal husbandry

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To relieve tensions among different functions of the rural area, i.e. agriculture, nature and landscape conservation, living and recreation, a restructuring of areas on sandy soils in the Netherlands was suggested. Such restructuring created opportunities for farmers to scale-up their intensive animal production in designated so-called agricultural development areas (ADAs). Neighbors were not happy with the ADAs and the increase in intensive animal production, and reacted by protesting. In this paper we explain the basis of the perceptions about scale increases in intensive animal production that citizens construct in interaction. We also gain insight into what happens when people feel ignored in policy development. Our empirical study shows that most respondents, irrespective of whether they are urban or rural, find scale increases in intensive animal production unacceptable. All respondents immediately associate such an increase with "mega" farms and "mega" farm buildings. Respondents who support scale increases are familiar with the agricultural sector. In addition, these respondents show cognitive dissonance by frequent efforts to defend themselves. This leads to the conclusion that the current norm is a non-acceptance of scale increases. Public support for scale increases in

agriculture can be expected to lessen even further because more people live in cities and have fewer social ties with agriculture; the number of farmers is decreasing; and even years after the construction of mega farms elsewhere, opposition has continued. A decrease in public support may give rise to an increased level of opposition and self-organization of citizens with regard to issues about rural planning, as our study shows. As evidenced by the restructuring process, which was organized as a participatory process involving different stakeholders, such participatory procedures do not guarantee a successful policy result supported by all citizens. On the basis of our results, we recommend explaining clearly the goal of citizen participation and the extent to which citizens can influence policy processes. Secondly, the government should learn how to cope with self-organizing citizens by paying special attention to what happens in informal networks.

123. The Netherlands; a fixed or a flexible Delta? Implications for scaling and governance

Marian Stuiver, Arjen Koomen, Frans Padt, Alterra, Wageningen UR, Netherlands

Climate models indicate that the Dutch Delta in the near future will be confronted with rising sea levels and changing river discharges caused by climate change. These changes will amplify the effects of the changing environmental conditions in the delta that started more than 1,000 years ago through human interaction with the environment. One important challenge for the future (and addressed in the research programme: Knowledge for Climate) is how to increase the adaptive capacity of the Dutch Delta so that future climate changes and changing environmental conditions can be sufficiently dealt with? And what governance implications does this have?

In this paper we explore two discourses in governance and planning to deal with these challenges: the first discourse frames the Delta as a 'fixed system' where safety and controllability are key themes. The second discourse frames the Delta as a 'flexible system', a social-ecological system that can adapt to future changes. Of course these two discourses are mere ideal types; in practice, planners adopt elements of both. Based on research performed for the Dutch government (LNV en VROM) and literature analysis we will explore these two ideal typical discourses and their consequences for the governance of the Netherlands. First, we provide an overview of how climate change is likely to change the geomorphological and ecological processes and scales in the Delta. Second, we compare how the two discourses have different scale implications for governing the Dutch Delta. Third, we explore how future geomorphological and ecological scales (step 1) and governance scales (step 2) can be matched to develop future economic activities (e.g., agriculture, industries, fisheries) and housing infrastructures that are climate adaptive. Here we will elaborate on recent literature on 'eco-regions', i.e. regions where economic activities (and scales) on the one hand and geomorphological and ecological conditions (and scales) on the other are matched and governed as a whole. Fourth and final, we analyze possible consequences for existing national and regional boundaries of the Netherlands and the cooperation between regions and neighboring countries Belgium and Germany.

Session 5.3, Governance of global flows: Friday 15.00-16.00

4. Governance Mismatches in the Implementation of Food Safety Standards: A Case Study Across the Nepali-Canadian Tea Value Chain

Sarah Mohan, International Development Research Centre, Ottawa, Canada

Contemporary agri-food corporations have created food safety standards which, while addressing the purported needs of western consumers, are transforming the governance of ecosystems and livelihood systems around the world. As a set of economic institutions, they are governed from the capitals, and are often set in the developed world. They are, however, contested and re-invented within value chain nodes at regional and local levels. In developing countries, industry bodies, government officials, NGOs and farmers' cooperatives govern food standards in the hope of increasing access to higher-value markets.

This study focuses on the unintended consequences of governance mismatches across these scales through a case study of a Nepali tea quality standard. The standard is a Code of Conduct that includes environmental, labour, and quality requirements. Data is drawn from in-depth interviews with actors all along the tea value chain, stretching from the fields of eastern Nepal to Canada, including industry officials, NGOs and farmers. As the field research is being conducted April to June 2010, final results are not available for submission at this time.

Preliminary findings indicate, however, that the Code's origins in western organic and fair trade standards, and its governance by NGOs and industry officials in the capital, have undermined implementation across scales. The context and constraints faced by processing firms and farmers in the Nepali tea sector have not been addressed as part of the code construction or implementation process. As a result, the code has been unable to address several of its goals – including reducing pesticide use and improving farmer livelihoods. Other standards have been explored and adopted, including the HACCP and organic certification schemes, to compensate for the inabilities of the Code of Conduct to work across scales and respond to diverse actors' interests.

The analysis is based on data about the livelihood criteria that Nepali farmers use to assess standards. These criteria include economic, gender and environmental factors. A qualitative exploration of how these criteria are defined is complemented by a quantitative analysis of the performance of standard-compliant farms and non-compliant farms on those same criteria. Do standards actually improve the livelihoods of small-scale farmers and benefit the environment? The divergence between the intent of the standard and reality is explained by an analysis of the governance of the value chain from Nepal to Canada.

43. Applying a scaling perspective to the evaluation of governance instruments: A review of current knowledge of forest certification effectiveness

Ingrid Visseren-Hamakers, Forest and Nature Conservation Policy Group, Wageningen UR, Netherlands

Certification is becoming an institutionalized governance approach to sustainable development. Certification schemes have been developed for a myriad of products, aiming to improve their social or environmental performance. Certification enables, and is perhaps even one of the drivers of, market-based governance. Forest certification can be regarded as a pioneer, since forest certification started as early as the beginning of the 1990s. One of the major standards,

the Forest Stewardship Council (FSC) addresses both social and environmental concerns, while others, like the Programme for the Endorsement of Certification (PEFC) and its associated national schemes, have less stringent demands, especially on social aspects. Despite the relatively long experience with forest certification, no systematic global assessments of these certification schemes have been performed until today. There is, however, a scattered body of knowledge available, including evaluations of certifications in specific forest management areas, and comparisons of the standards on paper. In this body of knowledge, evaluations from a broader or scaling perspective are often lacking. Some authors do discuss the consequences of the fact that certification schemes are global instruments that are implemented in a local context. However, the certification debate is hardly ever placed in a broader context, questioning the extent to which certification can address the multiple causes of deforestation, or whether certification, and market-based governance in general, represents only a partial solution.

This state of the art paper aims to present and review the current state of knowledge on the effectiveness of forest certification. Existing evaluations are analyzed in terms of the knowledge provided on the effectiveness of the schemes, the research approaches and methodologies applied, the scope of the evaluation in terms of, among others, inclusion of environmental and social issues, and the application of scaling perspectives. Based on this current state of knowledge, the paper develops a research agenda which aims to overcome the current knowledge gaps. The agenda proposes an assessment of the effectiveness, in terms of environmental, social and economic issues, of the major forest certification schemes, which includes contributions from both the natural and social sciences. The research agenda also proposes contributions to the governance debates on the risks, opportunities, and consequences of the current institutionalization of the governance mechanism of certification, while placing these debates in a scaling context.

88. Greening marine infrastructure: balancing global environmental flows and local concerns

Dorien Korbee, Environmental Policy Group, Wageningen UR, Netherlands

Due to increased maritime transport and the development of 'Post Panama' ships there is a global demand for the expansion of marine infrastructure. This development results in an increase of projects aimed at either enlarging existing, or developing new ports. Recently, a trend towards greening these practices can be discerned, by the inclusion of ecosystem dynamics in the design of these projects. The design of these projects, and the inclusion of ecosystem dynamics herein, cannot only be understood by looking at these projects as 'stand alone'. The projects are connected to each other through global flows, such as shipping, international regulations and multinational companies. To understand and analyze attributes that influence the design it is therefore necessary to include both global and local dynamics.

This paper introduces a conceptual model to understand the greening practices of marine infrastructure development. This model combines the global network theory and the policy arrangement approach. This combination allows not only for an analytical distinction between global and local dynamics that are of influence (so called 'space of place' and 'space of flows'), but it also offers analytical tools to grab the dynamics in the interaction space between these two scales. These analytical tools are the four dimensions of the policy arrangement: actors coalitions, discourses applied, rules of the game and power relations between the actors. Preliminary results of the application of this model to projects of marine infrastructure development show that multiple aspects are of influence. An important aspect for the diffusion

of ecosystem based design principles are global operating consultancy and construction firms. These organizations have the knowledge base to apply and diffuse best practices from one project to another. Global best practices are also diffused through other means, such as prescriptions induced by financing institutions and new global discourses on sustainable dredging. In addition, a greening of the design is also induced by local, place-bound dynamics, such as concerns expressed by local communities. The analysis demonstrates that differences in actor coalitions between the various projects influence rules and discourses applied, and thereby the design of these projects. This paper elaborates on the various aspects of the conceptual model, and contributes to an understanding of greening practices of marine infrastructure development.

Session 5.4, Governance authorities, leadership I: Friday 10.15-11.15

10. Dutch Environmental co-operatives as examples of boundary organizations for nature management

Jeremy Franks, School of Agriculture, Food and Rural Development (SAFRD), Newcastle University, UK

Using the framework of boundary organisation theory this paper argues that Dutch Environmental Co-operatives (ECs) conform to the organisational structure and work processes typical of boundary organisations (BOs). Organisationally, BOs bring together and build trust between people on different sides of the nature conservation boundary (land managers, conservationists, scientists and policy makers); negotiate and mediate information flows between levels; generate useful and relevant knowledge (standardized packages); help to capitalise on scaledependent comparative advantages; and increase mutual understanding of one another's capacities whilst allowing individuals to remain within their respective professional boundaries and responsible for their different constituencies. In their work processes, BOs follow the four characteristic roles: convening, translation, collaboration and mediation. Many conservationists believe BOs are essential to improving future decision making involving land management for agricultural and conservation, given that such decision-making involves (i) complex problems at different scales, (ii) must take into count changing evidence, and this requires management that can evolve to respond to the new science, (iii) poses problems that are best solved through discussion and agreement between scientists, practitioners and policy makers working at different scales, and (iv) because co-operation is needed to build trust and the exchange of ideas, interests and perspectives, all of which can improve the timeliness of policy response.

81. Sustainable innovation in intensive animal husbandry in the Netherlands: Putting your money where your mouth is

Ina Horlings¹, Jules Hinssen²

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Intensive animal husbandry in the Netherlands is up scaling and trying to meet current sustainability challenges by clustering different sectors on single locations and designing closed loops of waste, minerals, energy and waste on large agri-business sites. One of the most

innovative examples is the New Mixed Business in the Netherlands. This case shows how innovation in the large-scale intensive animal husbandry became the subject of local protests, national discussion and governmental debate, leading to a lock-in situation.

The central question in this paper is: 'What are the elements of the current lock-in situation and what would be the conditions for future sustainable agricultural innovation? We analyze the process, the views and images of the relevant actors and the perceived obstacles and relate these to discourses on sustainability. We contribute to further conceptualisation by referring to the collective and individual level, the institutional dimension and value orientations. Our conclusion is that the blockades in this innovation process can be explained from different angles. The first refers to different discourses, such as an agri-industrial, agri-ruralist, and post-productive discourse, which explain the clashing images about sustainable agriculture in this case. The second explanation refers to different stages and attitudes of sustainability which can be more or less inclusive towards aspects like animal welfare, the local environment, landscape quality or health. The third angle refers to the role of the 'human factor', leadership and psychological aspects.

The intertwinement of these angles shows that agricultural innovation requires not only financial investments but also huge societal and political investments on different scales, and is hampered by the institutional context.

Special attention is paid to the role of public and private leadership. National government facilitates this innovative initiative with knowledge, but fails to fulfil the operational consequences of large scale intensive animal husbandry in terms of social embedding and sufficient innovation acting-space. In our opinion, a 'higher' more inclusive sustainable development requires a different form of governance towards innovation and a letting go of hierarchical steering in favour of co-creation.

85. Governance for climate change and the malleability of institutional fields: An exploratory study in three industrial sectors in Flanders, Belgium

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Research literature on innovation is founded on the idea that innovators interact with one another across institutional and geographical boundaries in view to provoke cross-level technological and behavioural change. In this view, change is ultimately dependent on the creativity of and interaction between innovating minds in multi-level societal domains that are implicitly characterized as being inherently inert and recalcitrant. As a result, the bulk of the research attention goes to the actions and interactions of self-proclaimed change agents, who manage to mobilize diverse alliances of actors at multiple scales. Indeed, the emergence of such creative entrepreneurs is undoubtedly a necessary condition to set things in motion across the regional or territorial and institutional entities.

This paper however argues that cross-level interaction among innovators is not a sufficient condition to explain multi-level social, political or technological change. By its preoccupation with the interaction among innovators, certain strands in the literature may have become overly iconographic. While celebrating "networks of innovators and visionaries that develop long-term visions and images" (Loorbach & Rotmans, 2006: 9), comparatively little attention is paid to the nature of the institutional fields in which these innovators operate. From a methodological point of view, a problem of selection bias may exist in this respect, in that researchers are prone to select institutional fields in which innovators are rather gladly

welcomed, and in which and multi-scale interaction is more likely to thrive. The alternative hypothesis would therefore be that successful innovators are only successful in fields that are more malleable for social and technological change.

This paper develops an alternative hypothesis. We build a framework that categorizes institutional fields in terms of their malleability. We theorize three scales of interaction within an institutional field: an entrepreneurship arena, a relational arena, and a cognitively opaque arena. Depending on how these arenas relate to one another in an institutional field, more or less space is available for innovators to form adaptive networks. Our arguments are substantiated by empirical evidence from an exploratory study on initiatives for countering climate change in three industrial sectors in Flanders (energy production and distribution, transport and construction).

Session 5.4, Governance authorities, leadership II: Friday 11.30-12.30

91. Exploring the governance of carbon sequestration schemes in South Africa

Eliška Lorencová, Charles University Environment Center, Czech Republic

Climate change is recognized as one of the most pressing global environmental problems (Boyd et al., 2008). The Intergovernmental Panel on Climate Change (IPCC) states that global GHG emissions have grown by 70% between 1970 and 2004 illustrating the legitimacy of calls to take immediate action. The carbon sequestration mechanisms (a component of the Payments for Ecosystem Services) provide an alternative to offset existing GHG emissions. Two types of the carbon sequestration mechanisms, such as the small-scale Afforestation/Reforestation Clean Development Mechanism A/R CDM and Voluntary Carbon Offset Schemes exist. The governance of the two carbon sequestration schemes differ substantially and is further explored in the reality of South African institutional setting. Moreover, the concept of organisational institutional capacity, a key component regarding the human dimension of climate change, is employed to analyze South African capacity to engage with these two schemes. Based on the evidence of carbon payments in South Africa, the payments for ecosystem services involve a number of governmental, private and society actors that needs to be organized in an appropriate institutional setting. In order to achieve the environmental targets, economic goals and social benefits of these projects, it is necessary to be backed by the strong local organization structure, legitimate and representative leadership, local capacity building as well as capable and enabling policies (Perez et al., 2007). In this sense, the institutional capacity, as an indicator of country's capability to deal with carbon sequestration mechanisms is of a high importance.

In order to provide an empirical insight into the governance of carbon sequestration mechanisms and organisational institutional capacity in South Africa, a case study of the Subtropical Thicket Restoration Programme (STRP) in the Eastern Cape is examined. Based on the evidence of the institutional capacity analysis, the small-scale A/R CDM appears to fail within the global carbon arena. The investigated voluntary carbon offset schemes indicate a potential alternative direction regarding its institutional and governance flexibility, although these schemes are relatively novel and experience utilizing them is limited.

110. Sharing focus on urgent issues helps to align agendas for governance of small-scale agriculture

Frank van Schoubroeck¹, Nourredine Nasr²

(1) Independent consultant; (2) Bioversity International

Field experience: This paper proposes a method by which actors in rural societies embed technical opportunities in local or national governance mechanisms. Its origin goes back to field observations in rural areas across the globe: agronomists find that some farmers can make their plots of land productive (often loosely based on combining traditional farming methods and modern markets), while most land and farmers are becoming less productive. Less fortunate farmers face constraints such as insecure land tenure, poor land use planning, poor water management, poor marketing infrastructure, poor appreciation of multiple functions such as park or biodiversity conservation; besides many other local “hot issues”. Due to such insecurities, development options become skewed towards activity with short-time return cycles such as annual cash crops or small cattle; while long-term productivity is less likely to develop. Individuals or organisations often work hard to improve the life conditions of farmers, provide for technical solutions in pilot situations, but rarely are able to provide the combination of legal, law enforcement, technical, co-ordination, financial, infrastructural and social change needed to address constraints farmers encounter when trying to develop their farm.

Theoretical notion: Weick (2002) proposes that individuals can come to intended change if change managers provide for direction, enthusiasm, valuable partnerships, and are open for detail obstacles; besides (in multi-actor settings) co-ordination among key actors. Most interventions provide for a few of these conditions, but not for all – which entice actors to fall back on old (but possibly ineffective) strategies. Methods that provide for all five conditions are more likely to result in desired change.

Hot issues and governance mechanisms: Actors often work with enthusiasm on a subject (e.g., setting up a value chain; improved water management, integrated pest management, or any other issue) but the success at larger scale depends on conditions out of their control (policy support, policy enforcement, organisation of farmers). Similarly, actors who formulate policy have little control over the implementing agencies. In short: all actors feel powerless to change the situation towards a more productive one. The situation changes when actors agree on a shared urgency, as determined by a “hot issue” – that helps identifying actors with a common objective (the ‘direction’: ‘optimum use of water’, ‘land productivity’). The purpose of a multi-actor process is then: (1) to identify issues where different actors are ready to invest in (‘enthusiasm’), (2) to define a shared ‘direction’, (3) to define a role for each involved actor (‘valuable partnership’), (4) to take ‘practical obstacles’ into account, and (5) to establish a co-ordination mechanism so that actors have a platform to air their concerns.

Cases: The method has been applied in different intensities in situations such as action research on banana plantain selection in Cameroun; Integrated Pest Management in citrus; addressing food security in Niger, and conserving agricultural heritage systems in China and in Tunisia; while similar methods have been developed in watershed management in India. It allows actors in the agriculture governance arena to work on Governance development, even with modest initiatives.

128. A Working Group Model for REDD Implementation

Andrew Tirrell, The Fletcher School of Law and Diplomacy, Tufts University, Medford (MA), USA

There are many competing initiatives aimed at limiting the increase of the atmospheric concentration of carbon dioxide through reducing emissions from deforestation and degradation (REDD). Apart from some innovative bilateral agreements, these REDD schemes share a common approach of confronting the problem through multilateral financing agreements, often among dozens of national governments. While many of these initiatives include non-governmental observers to the process, the success of these programs relies almost entirely on the ability of government negotiators to agree on both the nature of deforestation and the best way to solve the problems presented by it.

The Working Group Model that I propose would shift the scale of this problem-solving dynamic by moving away from the multilateral treaty negotiation paradigm and towards cooperative smallgroup discussions of the problems posed by deforestation, and how best to address them. These working groups would consist of a handful of governments—both donor and recipient—as well as a variety of non-governmental stakeholders, including natural scientists, social scientists, environmental organizations, advocacy groups, and private sector partners, among others. Initiatives based on such a small group model have many advantages. First, agreements among governments are much easier to reach when the number of parties is limited. Second, such agreements will be greatly enriched by the participation of a wide range of non-governmental parties, who will have a real opportunity to contribute their expertise in such a closely collaborative setting. Finally, this model will allow greater range for creative problem-solving and make possible the scaling-up of successful programs as innovative solutions are piloted through working group partnerships.

The Working Group Model could easily fit within existing REDD initiative frameworks, creating a manageable level of engagement that could organically build up to a comprehensive multilateral agreement. It would help to bridge the gap that has currently prevented REDD initiatives from providing rich, innovative and timely results. Additionally, the experience of working in small groups of such transdisciplinary and multi-sectoral compositions has the potential to foster partnerships that could go beyond any specific REDD initiative and create positive spillover into a variety of other sustainable development issues.

Session 5.5, Governance support tools I: Friday, 10.15-11.15

15. Stakeholder perspectives on the right scales to structure land use issues: two visual formalisms.

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This presentation introduces two new visual methods that explore how stakeholders frame land use issues and processes in terms of scales and functional levels. The need for cross-scale and cross-level perspectives on governance has resulted in multi-scale participatory future visioning

processes. However, both the choices for the scales used in these processes as well as the focus levels on the chosen scales are generally framed by the designers of the participation rather than by participants. This framing often leads to a focus on geographical and temporal scales, represented by pre-set focus levels. As a result of this, system levels that are essential for adaptive governance may be overlooked. Furthermore, other scales (e.g. organizational, cultural) might be more suitable for the structuring of important issues, and more useful for the participating stakeholders.

We developed two visual participatory methods to explore these issues in a scenario development context. The first is the *Scale Perspectives Test*. This method is able to quickly elicit stakeholders' land use issues and allows them to frame their issues in a field of temporal and spatial scales. In two case studies, the Scale Perspectives Test produced useful information on the land use issues most relevant to the stakeholders, as well as their perspectives on the key spatial and temporal levels of these issues. The second visual formalism is the *Scenario Scale Repertoire*. This method explores the scales that stakeholders use to frame past and future storylines. Stakeholders develop a past storyline leading into a future scenario. Based on the drivers and events in this storyline, we elicit stakeholders' scales using Repertory Grid Technique. Stakeholders then structure their storylines using these scales. This method has been evaluated to be effective in a Dutch case: the agro-ecological innovation network TransForum. A heterogeneity of different scales was found among the stakeholders. The results from both methods advocate participatory processes in which the focus scales and levels are co-defined by stakeholders. Both methods have been evaluated as effective means for this co-framing.

38. Scaling issues in the development of a multi-level monitoring system for governing sustainable development

Aris Gaaff, Eric ten Pierick, Paul van der Wielen, LEI, Wageningen UR, Netherlands

The purpose of this paper is to contribute to an international research agenda for scale-sensitive governance approaches. More specifically, we argue that future research should lead to (a) a better recognition of the information needs of various actors to manage their activities and (b) a better understanding of the impact of their activities at different scale levels (in time and place). This will provide the basis for the development of a multi-level monitoring system that is necessary to feed the learning processes required for governing sustainable development.

Sustainable development is generally defined as a development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Since no single actor has the authority or the ability to direct mankind towards sustainable development, a governance approach is required so that a variety of actors at various levels align their activities towards the shared goal of sustainable development. Multi-level monitoring could be an important element in the governance process. It should provide the information to assess the extent to which current activities have the desired consequences (e.g. in terms of realising objectives such as the reduction of climate change) or require redirection. Unfortunately, practice shows that there are many monitoring initiatives at all levels but few of them link local activities to sustainable development at a global level. This fact decreases both the effectiveness and efficiency of sustainability policies.

In this paper, we substantiate this claim by reviewing monitoring systems at global, international, national and regional levels for both government and business. This review also demonstrates that situations are not the same for all aspects of sustainable development. We explain these differences and argue that important reasons are (a) differences in information

needs among actors at different levels, (b) inadequate understanding of the relationships between local activities and their impacts at other levels and (c) lack of total overview of effective monitoring initiatives on other levels. With regard to the former reason we advocate research that increases our understanding of the information needs of the various actors and a growing recognition of those needs in the development of monitoring systems. With regard to the latter reasons we argue for a common framework of multi-scale processes as a basis for the development of multi-level monitoring systems helpful to governing sustainable development.

66. Scaling issues in integrated land use modelling for policy support

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Today's world is increasingly more complex and changing rapidly. Numerous processes operating at different spatial and temporal scales act and react upon each other, making it difficult to understand and assess the impact of interventions on the human-environment system. Nonetheless, planners and policy makers face the challenge of making decisions in this complex system. They are not only confronted by interventions in their own sector, but must think about the impact of interventions in all sectors as well as a range of external factors not directly influenced by policy interventions, such as climate change and global socio-economic developments. Integrated models, comprising of several components representing processes operating at different scales, can support the policy practice in understanding the (unexpected and often unwanted) side effects of policies as well as the trade offs that need to be made and win-win situations that can be created. To enable this type of analysis, the integrated model should allow for feedbacks between the model components to ensure a truly dynamic integration resembling real-world interaction between these processes. Furthermore such models should incorporate both socio-economic and bio-physical components and ensure proper linkages to the policies at stake and the indicators relevant for policy making.

In this paper we will present an integrated model, which is developed with the aim to support the Puerto Rican policy practice. It has been developed in an interactive and iterative process together with the intended users, Puerto Rico's Planning Board and the local municipalities. The model links processes operating at various spatial scales, such as macro-economic behaviour, the evolution of the population on the island, the interaction between the various municipalities and the local dynamics. Moreover, the system is equipped with several policy levers that impact on the model at the relevant scale of the policies. The model subsequently provides results in the form of social, economic, transport and environmental indicators at the spatial levels asked for by the users. We will discuss the scaling issues experienced in the development of the model and the solutions chosen. Furthermore we will focus on the difficulties posed by developing and using a (scientific) integrated model in the support of policy analysis and development.

Session 5.5, Governance support tools II: Friday, 15.00-16.00

75. Science, information technology, and political convenience: The challenges in information sharing on illegal wildlife trade

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Transboundary illegal trade of wild flora and fauna is considered a billion dollar business equivalent to that of illegal drugs and arms trade. As of today, there is no mechanism to estimate the actual quantity of illegal trade taking place. To address this issue, United Nations University conceptualized a model on transboundary information sharing--the Wildlife Enforcement Monitoring System (WEMS)--and the use of spatial information for scaling the level of governance in combating illegal trade. The institutional mandate was to bring in the value disputes concealed by (and embodied in) science into the foreground of the political process so that it could turn scientific controversies into successful democratic action. This was based on the assumption that bringing scientific facts relevant to a particular controversy (here illegal trade of flora and fauna) out in the open, their implications to society can be explored better, and suitable goals can be identified to mitigate the problem and while increasing the social value of science itself. The steps taken to achieve the targeted goals were:

- a) Quantifying the level of enforcement and compliance of UNEP-CITES convention at a national level through a set of measured indices (spatial and non spatial) (Millennium Development Goal 7, Target 1)
- b) Enabling rapid data transfer and analysis through a national data compilation (connected to grass root level information gatherers) and analysis architecture (a web enabled information system).
- c) Transboundary sharing of this information by bringing the various national entities together through a formal or informal data sharing mechanism.
- d) Enabling public private partnership in information gathering, technology support and awareness raising (Millennium Development Goal 8, Target 6)

However, defining the concepts was far easier than operationalizing them. The WEMS project went through substantial criticism in the course of its 6 years trajectory. In this paper, the authors will be reasoning out the various paradigms (both theoretical and practical) that stood as challenges in developing an IT enabled decision support system for monitoring enforcement and compliance of CITES convention and how the redefined model addressed the concerns of governments.

96. Measuring Governance Quality in Forestry: from Policy to Project, or vice versa?

Secco Laura, Riccardo Da Re, Davide Pettenella, Paola Gatto, Enrico Vidale, Department of Land, Environment, Agriculture and Forestry, University of Padua, Italy

As other sectors, also forestry is stirred by the current debate on new forms of governance. Hot issues like deforestation, forest degradation, illegal logging, biodiversity conservation and

provision of other forest-related ecosystem services call for proper instruments to assess “good” governance, meant as decision-support tools able to reflect the current demands of the society (improved transparency, public participation in decision-making process, environmental and social responsibility) and measure the effects of changes on natural resources and human factors. The assessment of forest governance quality cannot abstract from the definition of its goals, dimensions and scale: in this perspective, at least two scenarios can be identified. At a large scale (international, regional or national), considerable efforts have been undertaken in developing criteria and indicators for analyzing policies and related governance issues. Systems like the MCFPE set of C&I, the UNFF List of Actions, the Tropical Forest Action Plan or the FLEGT Barometer can now be considered quite well developed. Based on official statistics and other secondary sources, they benefit from good data availability but have major shortcomings in their descriptive nature (e.g. mainly for ex-post assessment of policy effects on forest resources), while innovative dimensions of multi-level, multi-sector, multi-actor governance (e.g. organizational models for implementing public participation or assuring transparency) are marginally taken into consideration. At a local scale, the need for evaluating projects and initiatives (mainly in terms of efficacy of public expenses) has led to the development of sets of performance-based indicators, which are very site-/context-specific, more detached from secondary data and usually (forest certification being an exception) lacking considerations on governance key components like distributional effects, stakeholders inclusion, empowerment, etc. - notwithstanding emerging mechanisms like Payments for Environmental Services (PES) would strongly require information about them.

In this context, by using forestry as an illustrative significant example, the paper will present and discuss key issues in assessing “good governance”, both at policy and project scale. First, problems in identifying indicators and related quantitative variables based on reliable secondary sources of data for assessing the quality of governance mechanisms at different scales will be analyzed. Secondly, crucial methodological aspects and gaps in the development of an integrated framework able to assess this quality in a scaling-down continuum from policy to project (and vice versa) will be highlighted, compared and discussed. Finally, the potentials of these kind of governance assessments in supporting decision-makers and investors in resources allocation will be presented.

Session 5.6, SCALES and governance for innovation in biodiversity conservation [organized session]

This session under Theme 5 “Towards innovation in governance” has been organized by the EU funded project SCALES – Securing the conservation of biodiversity across administrative levels and spatial, temporal, and ecological scales. Anthropogenic and environmental pressures on biodiversity act differently at different scales and levels. Consequently, effective conservation responses to these threats must explicitly consider the scale at which effects occur. The objectives of the SCALES project range from linking ecological, socio-economic and administrative scales, to scales sensitive governance and the analysis and development of innovative policy instruments to take account of different scales and levels in biodiversity conservation. More information can be found at <http://scales-project.net>

Session 5.6, SCALES and governance for innovation in biodiversity conservation I, Friday 10.15-11.15

34. Securing the conservation of biodiversity across administrative levels and spatial, temporal, and ecological scales

Henning Steinicke, Klaus Henle, Helmholtz Centre for Environmental Research (UFZ), Leipzig, Germany

Biodiversity and its effective management are inextricably related to scale. The main pressures on Europe’s terrestrial biodiversity (i.e. habitat loss and fragmentation, disturbance, and climate change) and the socio-economic drivers behind these pressures act differently at different scales. Effective conservation measures must thus explicitly consider a) scales at which effects occur and b) any interactions among the pressures that cause non-linearities among and within the different scales. Consequently, effective policy interventions may need to be scale-sensitive, employing appropriate governmental levels for planning, decision-making, and management. The SCALES project is designed to provide the integrated, natural and social scientific research needed to guide such action.

The project seeks ways to build the issue of scale into policy and decision making and biodiversity management. The general goal of SCALES is to provide the most appropriate assessment tools and policy instruments to foster our capacity for biodiversity conservation across spatial and temporal scales and to disseminate them to a wide range of users. This general goal follows three main objectives:

Understanding and predicting trends in biodiversity at different scales and their causes.

Understanding relations between species traits, conservation needs, and ecological processes.

Improve scale related policy instruments.

In order to reach these objectives SCALES applies recent methodological advances to new and existing data and develops new methods and approaches for innovative analyses of biodiversity processes and data across scales, of how these processes interact across scales and affect biodiversity. It assesses and models the scaling properties of natural and anthropogenic processes and the resulting scale-dependencies of the impacts of these pressures on various levels of biodiversity from genes to ecosystem functions. To allow generalisations of the ecological assessments beyond the organisms studied, SCALES classifies them according to key biological characteristics. The project further evaluates the effectiveness of management and policy responses to biodiversity loss in terms of their scale-relevance by analysing policy documents and interviewing key actors. SCALES merges and tests the most promising

approaches, methods, and policy instruments in EU-wide and regional case studies to account for the ecological and societal variability and different histories of policies related to biodiversity conservation across Europe.

39. Concepts for the analysis of scale-effective multilevel governance of biodiversity conservation

Primmer Eeva¹, Similä Jukka¹, Ring Irene², Mathevet Raphaël³, Antunes Paula⁴, Cent Joanna⁵, Grodzinska-Jurczak Malgorzata⁵, Kettunen Marianne⁶, Koellner Thomas⁷, Paloniemi Riikka¹, Pantis John D.⁸, Potts Simon G.⁹, Santos Rui⁴, Tzanopoulos Joseph⁹; Apostolopoulou Evangelia⁸, Vogiatzakis Ioannis⁹

(1) Finnish Environment Institute, Finland ; (2) Helmholtz Centre for Environmental Research, (UFZ), Leipzig, Germany; (3) Centre d'Ecologie Fonctionnelle et Evolutive (CNRS), France; (4) Center for Environmental and Sustainability Research (CENSE), Department of Environmental Sciences and Engineering, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, Portugal; (5) Jagiellonian University, Institute Of Environmental Sciences, Krakow, Poland; (6) Institute For European Environmental Policy (IEEP), Brussels, Belgium; (7) University of Bayreuth, Germany; (8) Department of Ecology, School of Biology, Aristotle University of Thessaloniki, Greece; (9) Centre for Agri-Environmental Research, University of Reading, UK

The governance of social-ecological interactions necessarily involves and addresses multiple scales and levels. Governance actually is about managing scale and level interactions between and within different administrative, geographical, ecological, economic and social phenomena. Ecological processes shaping biological diversity are influenced by a range of anthropogenic activities at various spatial levels. Similarly, biodiversity conservation policies and decisions are made and implemented at multiple governance levels and in more or less nested organisations. The decisions themselves vary according to the ecological, geographical or administrative scales, and levels within these scales, that they address. The decisions can be complementary or conflicting, and they can be more or less effective in considering addressing multiple scales.

This paper surveys and develops concepts to support future empirical analysis of scale-sensitivity of biodiversity governance and scale-effectiveness of policy instruments in biodiversity conservation in Europe. Our conceptual analysis combines a review of literature on multilevel governance and scales and examples of experiences from a range of governance mechanisms in various biodiversity conservation situations in Europe. Attention to various scales as well as understanding and acknowledgement of cross-scale and cross-level linkages and dynamics, is what we call scale-sensitivity, while scale-effectiveness is the degree to which scale-and level interactions are incorporated in the design and implementation of policy instruments and to which these policies improve biodiversity conservation.

We find important implications for scale-effectiveness in conservation to stem from the level of coordination and adaptiveness. For policies to effectively enhance conservation and sustainable use of biodiversity, they must identify the relevant ecological and governance scales and levels as well as their interactions, process new knowledge relative to scales, and communicate across governance levels and management units. Coordination allows matching efforts to scales, while open (uncoordinated) efforts can generate a high level of commitment and produce new ideas. Adaptiveness can help in addressing complex and newly recognised scale and level interactions, while rigidity supports addressing interactions that are well-understood or considered important. Scale-effectiveness thus requires both scale-sensitive

governance and policy instruments that are designed to address cross-scale and cross-level interactions.

32. Fiscal transfers for reconciling local costs and national benefits of biodiversity conservation: The Portuguese communal financing law

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Local actors, both public and private, often have to bear costs for the provision of public goods and services, like nature conservation, while benefits are captured beyond their boundaries, creating spillover benefits or positive spatial externalities. In these cases, there are no incentives for local actors to engage in conservation activities promoted and justified at higher governance scales. In order to align the objectives of local public institutions and private sector actors with nature conservation goals, policies that stimulate such engagement are required.

Fiscal transfers may help matching the allocation of financial resources with the assignment of public functions to be fulfilled by public entities acting at different governance scales and contribute to the internalisation of spatial externalities. They allow compensating for expenditure incurred by local governments in conservation policies and for opportunity costs resulting from land-use restrictions imposed by protected areas.

The objective of this contribution is to better understand the potential and constraints of fiscal transfers as instruments for reconciling local costs and national benefits in biodiversity conservation, considering the ecological, economic and policy perspectives, learning from the Portuguese experience. Portugal introduced recently (2007) a system of ecological fiscal transfers integrated in the annual transfers from the national general budget to the municipalities (Portuguese Local Finances Law - LFL) in order to compensate municipalities for land-use restrictions imposed by protected areas and Natura 2000 sites. Direct fiscal transfers from central government are an important source of revenues for municipalities and until 2007 no land use or environmental criteria were considered in the allocation rules. Currently, the Local Finances Law establishes that 5 to 10% of the General Municipal Fund (FGM) shall be distributed according to the area included in Natura 2000 and protected areas network. This amount corresponds to a lump-sum payment: municipalities decide upon use of money.

A comparative analysis is developed to identify the differences in the allocated revenues for a relevant sample of municipalities, before and after the new LFL. This instrument is discussed and compared with other international experiences (e.g. Brazil).

A particular attention is directed to the discussion of the role of fiscal transfers to mitigate scale mismatch problems in policy mixes for nature conservation. The interplay with instruments acting at different governance scales is also discussed.

Session 5.6, SCALES and governance for innovation in biodiversity conservation II, Friday 11.30-12.30

139. National conservation responsibilities for species conservation

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The Convention on Biodiversity (CBD) commits its signatories to the identification and monitoring of biodiversity. The European Union has implemented this commitment into its legislation. Despite the legal requirement resources are scarce, requiring a prioritization of conservation actions, including e.g. monitoring. Red lists are currently the most prominent tool for priority setting in applied conservation, despite the fact that they were not developed for that purpose. Therefore, it is hardly surprising that they do not always reflect actual conservation needs. As a response, the concept of national responsibility as a complementary tool was developed during the last two decades. The existing methods are country specific and mainly incomparable on an international scale. Here, we present a newly developed method, which is applicable to any taxonomic group, adjustable to different geographic scales, with little data requirements and clear categorizations.

We apply the new method to over 1000 species in several countries of different size and report on the applicability of our method and discuss problems that derive from the currently available data. Our method has several major advantages compared to currently available methods. It is applicable to any geographic range, allows automatization, given database availability, and is readily adjustable to future data improvements. It further has comparably low data demands by exploiting one of the most commonly available information on biodiversity, i.e., distribution maps. We believe that our method allows the allocation of the limited resources in nature conservation in the most sensible way, e.g., the sharing of monitoring duties, effectively selecting networks of protected areas, improving knowledge on biodiversity, and closing information gaps in many species groups.

44. Shift of environmental governance in Poland – Natura 2000 public consultation program

Joanna Cent^{1,2}, Agata Pietrzyk¹, Malgorzata Grodzinska-Jurczak¹

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Current ecological challenges in different scales require changes in government and governance approaches. More flexible, scale-sensitive and participatory approaches are considered to be more effective than the top-down ones. In Poland, shift towards multi-level approach has started in 2004 while the accession to the EU. The main change considers transition from the centralized to the multi-level share of responsibilities and participatory approach in the governing of the nature. The pilot program of such approaches was initialized and adopted in Malopolska (one of the Polish province) in the period of 2008-09 while Natura 2000 designation phase. It comprises consultation meetings with stakeholders of various levels - from regional to local - aimed at both designation and identification of further management needs of Natura 2000 sites. Meetings were highly evaluated, and currently they are conducted in the whole country.

In the presented study, the level of different stakeholders engagement and effectiveness of the process regarding the time scale were estimated. Further needs for improvement were indentified. In-depth interviews with stakeholders and participant observation of the consultations were used.

The following poster describes effects of public consultation in Malopolska in terms of: (1) communication and information transfer between stakeholders of various administrative levels, (2) presence and quality of dialog, seen as an open exchange of views and mutual learning, (3) trust building, (4) participation of actors of various levels in decision-making and (5) participants'

satisfaction from taking part in the process. The results show that much was achieved in communication and dialog building, despite a difficult background of current conflicts and historical unfairness. Further meetings in the region and national-wide program are highly recommended by both local stakeholders and experts. Public institutions easily learn how and why they should effectively use information gathered from other stakeholders, however real trust in their actions and shared responsibilities for decision making require more time to be developed.

18. Scale mismatches in networks of protected areas

Evangelia Apostolopoulou, Evangelia G. Drakou, John D. Pantis, Department of Ecology, School of Biology, Aristotle University of Thessaloniki, Greece

The designation and implementation of adaptive conservation strategies able to respond to changing socio-ecological conditions, requires understanding networks of protected areas as complex, interconnected socio-ecological systems able to reconcile human needs with biodiversity conservation. This consideration leads to perceiving ecosystems involved in biodiversity conservation and the social, political and economic processes and structures behind their management, as interrelated. Therefore, matching ecological and human scales becomes a prerequisite in order to avoid deterioration and degradation of both ecosystems and local livelihoods. Greece is a typical case of a chronic policy failure in successfully establishing protected areas in meeting both social and ecological goals, especially over the last decade after the implementation of Habitats Directive and the subsequent increase in the number of protected areas.

By investigating the complex matrix of ecological, institutional, legislative and socio-political factors involved in conservation initiatives, we determined the mismatches between the scale on which current conservation policy focuses and the scale of biodiversity to be protected and investigated the reasons underlying their emergence. We focused on both the networks of protected areas and the relevant social networks involved in biodiversity conservation. We then estimated the degree of connectivity and fragmentation in a) governance level and b) spatial arrangement of protected areas within the management agencies.

In the governance level, we observed a reduced connectivity, mainly due to the unclear role division between governance units and an increased fragmentation of responsibilities within the established institutions. We then observed a greater degree of spatial fragmentation in the area of responsibility in multiple-site management agencies, as opposed to single-site ones. These could be attributed to the founding of only 29 management agencies for 84 conservation areas towards the establishment of a national network of protected areas. However, in some cases this strategy has proven to be more effective, as a multiple-site agency might prove more cost-efficient, than a single-site. Moreover, the diffusion of responsibilities, the ambiguous conservation goals and the persistence of power imbalances led to unequal gain from cross-scale interactions for different social groups involved in biodiversity conservation.

Overall, this policy is characterized by ignorance towards cross-scale interactions and several temporal, spatial, functional mismatches between ecosystems and institutions. We support that the coordination of authorities at various scales, the increase of multi-actor participation, the adoption of integrated policies and adaptive management approaches could enhance connectivity within ecological and governance units and promote socio-ecological resilience.

Side event

Students and staff of Wageningen UR/ Van Hall Larenstein together with regional authorities of the City Region Arnhem-Nijmegen and the municipality of Tiel organize a special session Scaling and Governance and Landscape Design. The session is the start of the major Landscape Architecture. The question is how can we design climate proof cities and a climate proof city region? For 5 different areas sub questions have been formulated on each city's riverfront and a climate park along the river Rhine.

In a nearby youth hostel fifty students will work for many hours a day in their design atelier. They will be inspired by visiting regional and local politicians, developers and farmers explaining to the students their perception of problems and solutions. Also scientists from the conference are invited to give lectures to the students from a scientific scaling and governance conference related perspective.

In the special session on Friday the awarded best designs will be presented by the students and discussed by interested scientists and some of the regional actors and decision makers offering an interesting possibility of discussion between science and practice.

List of presenters

Name	Country	E-mail address	Abstract nr.	Theme	Topic	Title
Evangelia Apostolopoulou	Greece	evaposto@bio.auth.gr	18	5.6.2	SCALES and governance for innovation in biodiversity	Scale mismatches in networks of protected areas (<i>poster</i>)
Jantiene E.M. Baartman	Netherlands	jantiene.baartman@wur.nl	135	1.1.2	Ecosystem management	Erosion in a landscape evolution context: LISEM and LAPSUS: variation in temporal and spatial scales
Jörg Balsiger	Switzerland	joerg.balsiger@env.ethz.ch	52	2.3.2	Linking scales: scale jumping and rescaling	Integrated water governance as cross-scale coordination: Comparison of experiences on appropriate institutional architectures from different countries
Arianne de Blaeij	Netherlands	arianne.deblaeij@wur.nl	102	2.3.2	Linking scales: scale jumping and rescaling	Economic governance to expand commercial ecosystems: within - and cross-scale challenges
Gemma Boag	Canada	gemma.boag@agr.gc.ca	86	4.1.1	Regional environmental governance	Navigating scales for place-based policy: Lessons from the Canadian experience
Arend J. van Bodegom	Netherlands	arendjan.vanbodegom@wur.nl	118	2.1.2	Policy / institutional analysis	Improving accountability in NRM sectors: an exploration
Froukje Boonstra	Netherlands	froukje.boonstra@wur.nl	117	5.2.2	Scale negotiations and governance	Moving between the national and the local scale: improving the mixture of self organising and instrumental capacity of regional partnerships
Matteo Borzoni	Italy	m.borzoni@sssup.it	48	1.2.1	Land use dynamics	Multi-scale integrated analysis of the Brazilian biodiesel production

Name	Country	E-mail address	Abstract nr.	Theme	Topic	Title
Sofie Bouteligier	Belgium	sofie.bouteligier@soc.kuleuven.be	28	2.1.2	Policy / institutional analysis	Urban sustainability pilot projects: misfit between challenge and solution of potential for replication and scaling?
Dr. Gerard Breeman	Netherlands	maarit.junnikkala@wur.nl	5	2.1.1	Policy / institutional analysis	Scaling & Governance
Remi Chandran	China	remi@iist.unu.edu	75	5.5.2	Governance support tools	Science, information technology, and political convenience: The challenges in information sharing on illegal wildlife trade
Ruishan Chen	China	chenrsh04@gmail.com	17	3.3.1	Scaling and governance methodologies	Bridging Human and Environment Scales: Methodology and Case Study of Karst Regions in China
Alice Cohen	Canada	cohen@interchange.ubc.ca	22	2.3.1	Linking scales: scale jumping and rescaling	Nature's Scales': Exploring the drivers and implications of watersheds as governance scales
Pr. Compagnon	France	compagnondan@wanadoo.fr	130	2.4.1	Politics of scale in the governance of natural resources	Rescaling and the state in the South: impediment or broker
Doris Damyanovic	Austria	doris.damyanovic@boku.ac.at	47	5.1	Governance sensitive scaling	Mainstreaming space saving strategies: Local space saving settlement strategies as a multilevel and multidisciplinary approach
Wil de Jong	Japan	wdejong@cias.kyoto-u.ac.jp	74	4.2.1	Transnational governance	Border regions: From national backwaters to transnational territories and global commons
Hedwig van Delden	Netherlands	hvdelden@riks.nl	66	5.5.1	Governance support tools	Scaling issues in integrated land use modeling for policy support
Dr. Art Dewulf	Netherlands	art.dewulf@wur.nl	109	2.2.2	Scale framing	Scale framing in the climate change controversy

Name	Country	E-mail address	Abstract nr.	Theme	Topic	Title
Fabio Homero Diniz	Netherlands	fabio.homerodiniz@wur.nl	20	1.1.1	Ecosystem management	Deforestation in settlement-projects: exploring an integrated approach of livelihood and land-use dynamics in the Brazilian Amazon frontier
Ryan Ehrhart	USA	rehrhart@gc.cuny.edu	57	5.2.1	Scale negotiations and governance	Food security strategies and scales of governance in the Philippines
Karen Eilers	Netherlands	karen.eilers@wur.nl	46	5.2.3	Scale negotiations and governance	Mega farms: sustainable production systems or bare and austere animal flats? A case study into perceptions of scale increases in Dutch intensive animal husbandry
Dr Jeremy Franks	United Kingdom	J.R.Franks@ncl.ac.uk	10	5.4.1	Governance authorities, leadership	Dutch environmental co-operatives as examples of boundary organisations for nature management
Aris Gaaff	Netherlands	aris.gaaff@wur.nl	38	5.5.1	Governance support tools	Scaling issues in the development of a multi-level monitoring system for governing sustainable development
Willemien Geertsema	Netherlands	willemien.geertsema@wur.nl	64	4.3.2	Knowledge management	Effective knowledge transfer and the gap between sciences and collaborative design for sustainable landscape development
Alwin Gerritsen	Netherlands	alwin.gerritsen@wur.nl	23	4.3.1	Knowledge management	Coping with complexity in regional sustainable development: exploring potentials and conditions for knowledge governance
Nina Hageman	Germany	nina.hagemann@ufz.de	94	3.2.2	Integrating networks and hierarchies	Potential and limitations of a polycentric governance approach for water infrastructure management in Ukraine

Name	Country	E-mail address	Abstract nr.	Theme	Topic	Title
Elke Herrfahrdt-Pähle	Germany	elke.herrfahrdt@die-gdi.de	8	3.1.1	Socio-ecological systems	Adaptation of water governance regimes: The problem of fit, interplay and scale
Arnd Holdschlag	Germany	holdschlag@geowiss.uni-hamburg.de	41	3.1.2	Socio-ecological systems	Resilience of Coastal Social-Ecological Systems in the Caribbean: Ecosystem Dynamics, Natural Hazard Risks and Environmental Knowledge systems
Lena Horlemann	Germany	lena.horlemann@ufz.de	51	2.3.2	Linking scales: scale jumping and rescaling	Institutionalizing IWRM in Transition Countries - The case of Mongolia
Ina Horlings	Netherlands	lummina.horlings@wur.nl	81	5.4.1	Governance authorities, leadership	Sustainable innovation in intensive animal husbandry in the Netherlands: Putting your money where your mouth is
Dr. O. Hospes	Netherlands	otto.hospes@wur.nl	134	2.2.2	Scale framing	Fluid scales, fluid laws and fluid decisions: the complexity of sustainability governance, with a case study of the Round Table on Sustainable Palm Oil
Marc Hufty	Switzerland	marc.hufty@graduateinstitute.ch	131	2.4.1	Politics of scale in the governance of natural resources	Scaling REDD
Louisa J.M. Jansen	Netherlands	louisa.jansen@kadaster.nl	137	3.3.2	Scaling and governance methodologies	Evaluation of the variation in semantic contents of class sets on modelling dynamics
Stephanie Janssen	Netherlands	stephanie.janssen@deltares.nl	21	4.3.1	Knowledge management	Issues of scale in knowledge integration for building with nature
Sander Janssen	Netherlands	sander.janssen@wur.nl	136	4.3.2	Knowledge management	Scaling in an integrated assessment tool for agricultural systems

Name	Country	E-mail address	Abstract nr.	Theme	Topic	Title
Judith Jobse	Netherlands	judith.jobse@wur.nl	24	4.2.1	Transnational governance	Territorial strategies need scale sensitive governance, learning by exchange between practitioners in search for practices and policies to adapt to climate change
Roel Jongeneel	Netherlands	roel.jongeneel@wur.nl	98	3.2.1	Integrating networks and hierarchies	Governance at different scales and levels; investment programs for rural areas (ILG) in the Netherlands
Sylvia Karlsson-Vinkhuyzen	Netherlands	s.i.s.e.karlsson-vinkhuyzen@law.leidenuniv.nl	25	2.3.1	Linking scales: scale jumping and rescaling	Tracing Drivers of Global Environmental Change Across Levels
Sylvia Karlsson-Vinkhuyzen	Netherlands	s.i.s.e.karlsson-vinkhuyzen@law.leidenuniv.nl	26	2.3.3	Linking scales: scale jumping and rescaling	Subsidiarity and the Global Politics of Scale: as Negotiated in Johannesburg
Mzia S. Kokhia	Georgia	mzia.kokhia@iliauni.edu.ge	124	1.1.2	Ecosystem management	High-mountainous Pastures Soil Inhabitants: Biodiversity and Trophic Structure
Dorien Korbee	Netherlands	Dorien.korbee@wur.nl	88	5.3	Governance of global flows	Greening marine infrastructure: balancing global environmental flows and local concerns
Lennart Kuemper-Schlake	Germany	kuemper@uni-bonn.de	127	4.1.2	Regional environmental governance	Scale Challenges in Ecosystem Service Governance: A case study from Northwest Yunnan, China
Aaron Leopold	Germany	aaron.leopold@ufz.de	53	4.2.1	Transnational governance	Environmental goods and bads: spatial-temporal difficulties of biofuels governance in the European Union
Maartje van Lieshout	Netherlands	maartje.vanlieshout@wur.nl	84	2.2.1	Scale framing	Scale frame interaction patterns in the Dutch debate on the future of intensive cattle breeding
YenLan Liu	Taiwan	clickvito@gmail.com	97	1.2.2	Land use dynamics	Evaluation of agricultural ecosystem services in fallowing land based on farmers' participation and model

Name	Country	E-mail address	Abstract nr.	Theme	Topic	Title
						simulation
Eliska Lorencova	Czech Republic	eliska.lorencova@czp.cuni.cz	91	5.4.2	Governance authorities, leadership	Exploring the governance of carbon sequestration schemes in South Africa
Paul Lucas	Netherlands	paul.lucas@pbl.nl	58	3.3.1	Scaling and governance methodologies	Relating archetypical patterns of vulnerability to policy making at different levels
Menno Mandemaker	Netherlands	menno.mandemaker@wur.nl	121	4.2.2	Transnational governance	Agricultural expansion or intensification? Disentangling the role of governance: a global study of arable agriculture
Maryia Mandryk	Netherlands	maryia.mandryk@wur.nl	114	1.2.2	Land use dynamics	Scenario's of farm structural change for assessing adaption strategies to climate change: a case study in Flevoland, The Netherlands
Prof. Erik Mathijs	Belgium	erik.mathijs@ees.kuleuven.be	85	5.4.1	Governance authorities, leadership	Governance for climate change and the malleability of institutional fields: An exploratory study in three industrial sectors in Flanders, Belgium
Prof. Erik Mathijs	Belgium	erik.mathijs@ees.kuleuven.be	90	2.3.1	Linking scales: scale jumping and rescaling	Scaling up transition lab experiments towards sustainability
Peter Messerli	Switzerland	peter.messerli@cde.unibe.ch	60	5.1	Governance sensitive scaling	Land governance in Lao PDR: analyzing scales and places of public actors' interventions on human-environmental systems
Takafumi Miyasaka	Japan	aa087105@mail.ecc.u-tokyo.ac.jp	49	4.1.1	Regional environmental governance	Environmental decision-making through hierarchical interaction among multiple actors in a spatially heterogeneous region of rural China

Name	Country	E-mail address	Abstract nr.	Theme	Topic	Title
Sarah Mohan	Canada	smohan@idrc.ca	4	5.3	Governance of global flows	Governance Mismatches in the Implementation of Food Safety Standards: A Case Study Across the Nepali-Canadian Tea Value Chain
Sharon Moran	USA	smoran@esf.edu	105	2.2.2	Scale framing	Water management issues in lakeside communities: perspectives from New York
Tapan Kumar Nath	Bangladesh	tapankumarn@yahoo.com	87	4.1.2	Regional environmental governance	Examining Local Governance and its Impact on Project Outcomes: Evidence from participatory forestry projects of Bangladesh
Lisa Norton	United Kingdom	lrn@ceh.ac.uk	12	1.1.1	Ecosystem management	Loweswater: a case on the importance of 'local' scale for ecosystem management
Andre Monteiro Novo	Netherlands	andre.monteironovo@wur.nl	82	1.2.1	Land use dynamics	Biofuel, Dairy Production and Beef in Brazil: Competing Claims on Land Use in São Paulo Sta
Gül Özerol	Netherlands	g.ozero@utwente.nl	120	4.1.2	Regional environmental governance	Policy Processes Connecting Scales and Governance levels: A case from Irrigated Agriculture in Turkey
Frans Padt	Netherlands	frans.padt@wur.nl	103	3.3.2	Scaling and governance methodologies	Doing scaling and governance analysis
Frans Padt	Netherlands	frans.padt@wur.nl	125	3.1.2	Socio-ecological systems	Scale-sensitive policies towards natural gas extraction in Pennsylvania
Stefano Pascucci	Netherlands	stefano.pascucci@wur.nl	99	4.3.2	Knowledge management	Sustainability at different scales levels of agriculture: Does the institutional environment matter?
Marta Pérez-Soba	Netherlands	marta.perezsoba@wur.nl	33	4.3.1	Knowledge management	Policy support systems: new trends to improve their usability

Name	Country	E-mail address	Abstract nr.	Theme	Topic	Title
Agata Pietrzyk	Poland	agata.pietrzyk@uj.edu.pl	44	5.6.2	SCALES and governance for innovation in biodiversity	Shift of environmental governance in Poland - Natura 2000 public consultation program
Marcel Pleijte	Netherlands	marcel.pleijte@wur.nl	129	2.1.2	Policy / institutional analysis	Area development, scaling, boundaries and governance
Nico Polman	Netherlands	Nico.Polman@wur.nl	122	2.3.3	Linking scales: scale jumping and rescaling	Governance on distance; distance decay functions for use and non-use values in the Netherlands
Eeva Primmer	Finland	eeva.primmer@ymparisto.fi	39	5.6.1	SCALES and governance for innovation in biodiversity	Concepts for the analysis of scale effective multilevel governance of biodiversity conservation
Valentin Przyluski	France	przyluski@centre-cired.fr	78	5.1	Governance sensitive scaling	Climate change adaptation, development, and international financial support: lessons from EU pre-accession and solidarity funds
Marco Pütz	Switzerland	marco.puetz@wsl.ch	133	2.4.2	Politics of scale in the governance of natural resources	(Re-)Scaling Environmental Governance: The Politics of Climate Change Adaptation in Switzerland
Vasna Ramasar	Sweden	vasna.ramasar@lucid.lu.se	59	2.2.1	Scale framing	Local Agency in using scale to realize water rights in South Africa
Stijn Reinhard	Netherlands	stijn.reinhard@wur.nl	61	3.3.1	Scaling and governance methodologies	Scaling and governance in EU Rural Development
Irene Ring	Germany	irene.ring@ufz.de	32	5.6.1	SCALES and governance for innovation in biodiversity	Fiscal transfers for reconciling local costs and national benefits of biodiversity conservation: The Portuguese communal financing law

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Till Rockenbauch	Germany	tirock@uni-bonn.de	138	1.2.2	Land use dynamics	Analyzing Social-ecological Interactions in High Mountains, System Perspectives for Landscape Research in Northwest Yunnan, China
Murilo R. de Arruda	Netherlands	murilo.dearruda@wur.nl	80	1.1.2	Ecosystem management	Pasture degradation in Brazilian Cerrados understood: driving forces and definitions
Petra Roodbol-Mekkes	Netherlands	petra.roodbol@wur.nl	45	5.2.2	Scale negotiations and governance	Divergence of rural spatial planning policy in the Netherlands
Dipl.-Ing. Wiebke Saathoff	Germany	saathoff@umwelt.uni-hannover.de	106	1.2.1	Land use dynamics	Assessment and management of scale crossing environmental impacts from local bioenergy crop production
Dirk Schmeller	France	dirk.schmeller@dr14.cnrs.fr	139	5.6.2	SCALES and governance for innovation in biodiversity	National conservation responsibilities for species conservation
Frank van Schoubroeck	Netherlands	frankvanschoubroeck@yahoo.com	110	5.4.2	Governance authorities, leadership	Sharing focus on urgent issues helps to align agendas for governance of small-scale agriculture
Tobias Schulz	Switzerland	tobias.schulz@wsl.ch	132	2.4.2	Politics of scale in the governance of natural resources	Understanding multi-level governance of a nascent policy subsystem: Applying the ACF to Swiss biodiversity policy
Rocco Scolozzi	Italy	rocco.scolozzi@iasma.it	67	3.1.1	Socio-ecological systems	Social-Ecological System perspective within multiple level governance: models and metaphors to understand the sustainability and dynamics of alpine grassland

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Laura Secco	Italy	laura.secco@unipd.it	96	5.5.2	Governance support tools	Measuring Governance Quality in Forestry: from Policy to Project, or vice versa?
Julika Selinger	Germany	julika.selinger@hcu-hamburg.de	111	3.2.2	Integrating networks and hierarchies	Tackling transdisciplinary complexity in climate change adaption of urban regions - a research approach sensitive to multi-scalar spatial and temporal dynamics
Joana Setzer	United Kingdom	j.setzer@lse.ac.uk	79	3.2.2	Integrating networks and hierarchies	Environmental cooperation between subnational governments from developed and developing countries: an example of (trans)regional environmental governance
Anne Short	USA	annie.short@gmail.com	62	1.1.1	Ecosystem management	Scalar challenges to the governance of sediment on transitioning rural landscapes
Marie-Jose Smits	Netherlands	marie-jose.smits@wur.nl	42	5.2.1	Scale negotiations and governance	Policy instruments to improve the spatial cohesion of Natura 2000
Philipp Späth	Germany	spaeth@ifp.uni-freiburg.de	50	3.2.1	Integrating networks and hierarchies	How to integrate the multi-level perspective on socio-technical change with a spatial analysis and multi-level governance? The district of Murau and the global energy transition
Erika Speelman	Netherlands	erika.speelman@wur.nl	115	4.1.1	Regional environmental governance	Farmer's LUC decision-making in a conflictive multi-level network; the case of the buffer-zone community Tierra y Libertad, Chiapas, Mexico
Sarah Stattman	Netherlands	Sarah.Stattman@wur.nl	31	2.1.1	Policy / institutional	Multi-scale biofuel governance; an expanding universe for sustainability

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Eveliëne Steingröver	Netherlands	eveliëne.steingrover@wur.nl	119	3.1.1	Socio-ecological systems	Socio-ecological networks to couple spatial scales in collaborative landscape design
Henning Steinicke	Germany	henning.steinicke@ufz.de	34	5.6.1	SCALES and governance for innovation in biodiversity	Securing the conservation of biodiversity across administrative levels and spatial, temporal and ecological scales
Derk Jan Stobbelaar	Netherlands	derk-jan.stobbelaar@wur.nl	92	2.3.3	Linking scales: scale jumping and rescaling	Upscaling local environmental problems to create governance solutions
Marian Stuver	Netherlands	marian.stuver@wur.nl	123	5.2.3	Scale negotiations and governance	The Netherlands; a fixed of a flexible delta? Implications for scaling and governance
Astrid van Teeffelen	Netherlands	astrid.vanteeffelen@wur.nl	108	3.1.2	Socio-ecological systems	Governing spatial-temporal dynamics of biodiversity conservation networks using a tradable permit market scheme
Emma Terämä	Netherlands	e.m.terama@uva.nl	37	2.1.1	Policy / institutional analysis	Analysis of institutional and technological adaption: biodiversity conservation capabilities of forestry organisations responding to local social-ecological challenges
Kadri Tillemann	Estonia	kadri.tillemann@keilavald.ee	63	5.2.2	Scale negotiations and governance	Ecological network planning and implementation as a multi-level biodiversity conservation tool: an analysis of Estonian case studies
Andy Tirrell	USA	andrew.tirrell@gmail.com	128	5.4.2	Governance authorities, leadership	A working group model for REDD Implementation

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Joost Vervoort	Netherlands	joost.vervoort@wur.nl	15	5.5.1	Governance support tools	Stakeholder Perspectives on the right scales to structure land use issues: two visual formalisms
Ingrid Visseren	Netherlands	ingrid.visseren@wur.nl	43	5.3	Governance of global flows	Applying a scaling perspective to the evaluation of governance instruments: A review of current knowledge of forest certification effectiveness
Mathijs van Vliet	Netherlands	mathijs.vanvliet@wur.nl	40	3.3.2	Scaling and governance methodologies	Backcasting as multi-scale governance tool; on the development of local robust actions and their implications for higher scales
Stefan Werland	Germany	werland@zedat.fu-berlin.de	83	4.2.2	Transnational governance	International Forest Governance and the Role of Scaling – A Comparative Case Study
Jennifer West	Norway	j.j.west@cicero.uio.no	68	3.2.1	Integrating networks and hierarchies	Scalar considerations in climate adaptation for natural resource management