



Programme and Abstract Book

Climate Adaptation in the Nordic Countries

– Science, Practice, Policy

**Stockholm, Sweden
8–10 November 2010**



Dear Conference Participants,

Climate change is rapidly becoming a reality to which society has to adapt. Reducing greenhouse gas emissions is critically important, but it cannot prevent many impacts of climate change in the near to medium term. Scientists, planners and policymakers have therefore begun to address the challenge of adapting to climate change: planning and preparing for the unavoidable impacts. This conference sets out to meet a growing demand for sharing knowledge and experience on climate adaptation in the Nordic countries.

The purpose of the conference is to explore the links between adaptation science, practice and policy. Taking an interdisciplinary perspective and involving stakeholders, it will deliver insights that advance the emerging science of adaptation and meet the needs of practitioners and policymakers. In addition, we expect the conference to stimulate the preparation of peer-reviewed articles for consideration by the Intergovernmental Panel on Climate Change. The conference addresses key issues such as uncertainty about local impacts of climate change, the social and institutional processes of adaptation, and the role of policy at national and international levels.

The conference is an initiative of the Nordic Climate Change Adaptation Research Network (NORDCLAD-Net), funded by the Nordic Top-level Research Initiative 'Effect studies and adaptation to climate change.' The conference has been coordinated and co-funded by the Stockholm Environment Institute and the Swedish research programme Mistra-SWECIA. Co-funding has also been provided by the Swedish Research Council Formas and the Norwegian PLAN project at the University of Oslo. We also thank the City of Stockholm for their generosity in hosting the conference reception in Stockholm City Hall.

We would like to thank everybody who has helped to make this conference possible, including the funders, the members of the planning committee and the scientific committee, and you. Without the enthusiasm of the many participants who have submitted abstracts and agreed to give presentations, this conference would not have been possible.

We hope this conference will be the starting point for many of the dialogues that are essential to ensure the successful adaptation to climate change. Welcome to Stockholm, welcome to this conference!

Richard J T Klein
Chair, Scientific Committee

Annika E Nilsson
Coordinator, NORDCLAD-Net

Johanna Ulmanen
Head, Conference Logistics

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Organisers

Nordic Climate Change Adaptation Research Network (NORDCLAD-Net)

NORDCLAD-Net is a concerted effort to bring out the best from Nordic research on adaptation to climate change. It is funded by the Nordic Top-level Research Initiative 'Effect studies and adaptation to climate change'. In addition to the conference 'Climate Adaptation in the Nordic Countries: Science, Practice, Policy', the activities of the network include a PhD school, creating a forum for young professionals, and a scientific conference in Finland 2012.

The partners in NORDCLAD-Net are:

Stockholm Environment Institute
 MILEN (Miljøendringer og bærekraftig energi), Oslo University
 National Environmental Research Institute (NERI) and the Coordination Unit for Research in Climate Change Adaptation (KFT) (Denmark)
 Western Norway Research Institute
 Finnish Environment Institute (SYKE)

For more information and contact details, please visit www.sei-international.org/nordclad

Stockholm Environment Institute (SEI)

SEI is an independent international research institute with its headquarters in Stockholm, Sweden. It employs some 160 scientists and professionals worldwide and has permanent offices in six different countries. SEI's mission is to support decision-making and to induce change towards sustainable development around the world by bridging science and policy in the field of environment and development. SEI's work covers a range of topics under four research themes: Reducing climate risk, Managing environmental systems, Transforming governance, and Rethinking development. SEI coordinates the Nordic Climate Change Adaptation Research Network and leads the Mistra-SWECIA project The Process of Adaptation to Climate Change, which investigates factors that influence people's decisions to prepare or not to prepare for future climate risks. Read more about SEI at www.sei-international.org

Mistra-SWECIA

Mistra-SWECIA is a strategic research programme on climate, economy, impacts and adaptation, encompassing different scientific disciplines. The most important gathering points are advanced modelling and case studies. The programme started with a multidisciplinary character, aiming over time to add more interdisciplinary approaches. The programme aims to include development of new integrated decision-support, new scientific modelling tools and overall new knowledge both for use in climate adaptation and of climate adaptation itself. Communication with users is an important part of the programme activities. Read more at www.mistra-swecia.se

Sponsors

The Top-level Research Initiative

The Top-level Research Initiative is the largest joint Nordic research and innovation venture ever, initiated by the Nordic prime ministers in 2008. It is a joint venture between business and science, with six sub-programmes ranging from basic research to innovation and development. The ambition is to produce results through co-ordination and dialogue between Nordic researchers across different climate, energy, and environment themes, involvement of national agencies across the five countries, and through involvement of

industry and other knowledge producers and users in the field. The sub-programme 'Effect studies and adaptation to climate change' aims to improve knowledge about the effects of climate change, the adaptation capacities of society, and the risks and opportunities that the effects of climate change may bring to the Nordic region. The initiative extends over a five-year period, from 2009 to 2014.

The Swedish Research Council Formas

The Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas), is a governmental research-funding agency. The research should be of the highest scientific quality and relevance to the areas of responsibility of the Council. Formas may also fund development projects to a limited extent. The objective of Formas' research communication is to disseminate information on research results within the research areas of Formas. Research communication activities are for example exhibitions, conferences, seminars and publications. The pocket-book series "Formas Fokuserar" is a debate forum in which researchers write their own articles on important environmental issues.

PLAN (The Potentials of and Limits to Adaptation in Norway)

PLAN is an interdisciplinary social science-based research project funded by the Research Council of Norway's NORKLIMA programme. The aim of the project is to investigate how individuals and communities in Norway adapt to climate change. PLAN uses an integral framework and considers not only how social, economic, political and institutional factors affect adaptation decisions, but also how cultural factors, values and world-views influence prioritised responses to both observed and projected climatic changes. PLAN is based at the University of Oslo's Department of Sociology and Human Geography in Norway and the project includes geographers, political scientists, urban planners, and anthropologists from several leading Norwegian research institutions. For more information visit our homepage www.iss.uio.no/forskning/prosjekter/plan/. Or contact us by email: siri.mittet@sosgeo.uio.no

Other acknowledgements

Funding for PhD students to participate in the conference has in part been made possible with support from the Nordic Climate Mitigation, Adaptation and Economic Policies (N-CMAEP) Network, which is part of the Nordic TFI programme 'Effect studies and adaptation to climate change.'

Conference organisation

Scientific committee

Richard JT Klein, Stockholm Environment Institute, Sweden
 Carlo Aall, Western Norway Research Institute, Norway
 Timothy R Carter, Finnish Environment Institute, Finland
 Michael Goodsite, Aarhus University, Denmark
 Annika E Nilsson, Stockholm Environment Institute, Sweden
 Karen O'Brien, University of Oslo, Norway
 Markku Rummukainen, Swedish Meteorological and Hydrological Institute, Sweden

Planning committee

Johanna Ulmanen, Stockholm Environment Institute
 Annika E Nilsson, Stockholm Environment Institute
 Oskar Wallgren, Stockholm Environment Institute
 Peter Rudberg, Stockholm Environment Institute
 Katarina Eckerberg, Stockholm Environment Institute

Conference programme

MONDAY 8 NOVEMBER: SCIENCE FOCUS

11.00 –	ENTRANCE	Registration opens – coffee and tea provided
13.00 – 13.20	AULA	Opening of conference
13.20 – 13.30	AULA	Welcome speech <i>Maria Ågren, Director-General, Swedish Environmental Protection Agency</i>
13.30 – 14.00	AULA	Keynote presentation <i>Kristie L. Ebi, Intergovernmental Panel on Climate Change (IPCC): Climate adaptation assessment by the IPCC</i>
14.00 – 14.15	GALLERY	Break
14.15 – 15.45		Parallel sessions 1
	AULA	1.1 Assessing vulnerability 1.1.1. Identifying vulnerable places most in need of adaptation strategies. <i>Jan Ketil Rød</i> 1.1.2. Susceptibility to harm in Norway: adapting social vulnerability index to a new context. <i>Ivar Holand</i> 1.1.3. CARAVAN: interactive mapping of vulnerability to climate change in the Nordic region. <i>Timothy R. Carter</i>
	SPELBOMSKAN	1.2 Adaptation and public health I 1.2.1. Vulnerability, impact and adaption assessment of health threats from infectious diseases. <i>Jan Semenza</i> 1.2.2. Indicators to support health-oriented climate change adaptation. <i>Celie Manuel</i> 1.2.3. Climate change health impact and adaptation assessment in the North of the Russian Federation: a pilot project in the Arkhangelsk region. <i>Galina Degteva</i>
	MIMER	1.3 Climate information and climate services 1.3.1. Improved climate scenarios for impact studies in the Arctic: the ADSIMNOR project. <i>Ralf Döscher</i> 1.3.2. Model development for risk assessments of climate change impact on forestry. <i>Anna Maria Jönsson</i> 1.3.3. Bridging the gap between science and practice – the case of Finnish national climate change portal www.ilmasto-opas.fi . <i>Simo Haanpää</i> 1.3.4. Problematizing climate change through integral GIS. <i>Lynn Rosentrater</i>
	BERGSMANNEN	1.4 Adaptation at the regional level 1.4.1. Regional challenges of climate change adaptation: grounding of national climate strategies in Finland. <i>Sirkku Juhola</i> 1.4.2. Climate change adaptation at the regional level in Norway: status quo and challenges. <i>Eli Anine Heiberg</i> 1.4.3. How is climate change addressed in municipal planning and why – observations from three recent comprehensive planning processes in the Stockholm region. <i>Oskar Wallgren</i> 1.4.4. Baltic sea region climate change adaptation strategy – BALTADAPT. <i>Erik Buch</i>
15.45 – 16.15	GALLERY	Coffee and tea break
16.15 – 17.45		Parallel sessions 2
	AULA	2.1 The role of adaptive capacity 2.1.1. The ability of Nordic countries to adapt to climate change: measuring adaptive capacity at the regional level. <i>Lasse Peltonen</i> 2.1.2. Moving beyond generic adaptive capacity: exploring the actual adaptation space of the water supply and wastewater sector of the Stockholm region, Sweden. <i>Peter M. Rudberg</i> 2.1.3. Local adaptive capacity to climate change: the electricity sector in Norway and Sweden. <i>Liv Arntzen Loechen</i> 2.1.4. Five metaphors for making adaptive water management happen – lessons learned from seven NeWater case studies. <i>Hans Jørgen Henriksen</i>
	SPELBOMSKAN	2.2 Adaptation and public health II 2.2.1. Heatwave in Stockholm 2030: analysing impacts on heat-related mortality. <i>Henrik Carlsen</i> 2.2.2. Effects of climate change on infectious diseases of importance for humans and animals. <i>Ann Albihn</i> 2.2.3. The gender perspective in climate change and health. <i>Maria Nilsson</i>
	MIMER	2.3 Infrastructure and technology 2.3.1. Adapting the Danish building stock and urban environment to climate change. <i>Torben Valdbjørn Rasmussen</i> 2.3.2. Decision tools for sustainable adaptation planning in the drinking water sector: a case study from Botkyrka municipality. <i>Karin Edvardsson Björnberg</i> 2.3.3. Adaptive capacity of the Swedish electricity sector: influence from organisational structure and culture. <i>Tor Haakon Inderberg</i>
	BERGSMANNEN	2.4 Social issues in adaptation 2.4.1. The politics of local adaptation. <i>Elin Selboe</i> 2.4.2. Perceptions of climate change among reindeer herding Sami in Sweden. <i>Maria Furberg</i> 2.4.3. Social impacts of climate change and climate adaptation in Finnish rural areas. <i>Rauno Sairinen</i> 2.4.4. Framing and scaling of environmental perspectives in the negotiation over petroleum development in the Lofoten and Vesterålen region. <i>Berit Kristoffersen</i>

TUESDAY 9 NOVEMBER: PRACTICE FOCUS

08.00 –	ENTRANCE	Registration opens
09.00 – 09.20	AULA	Summary of conclusions from day 1
09.20 – 10.00	AULA	Keynote presentations <i>Ian Burton, University of Toronto: Science, policy and practice: How can the gaps be reduced?</i> <i>Gustaf Landahl, City of Stockholm: Climate adaptation in Stockholm. From theory to practice</i>
10.00 – 11.00	GALLERY	Coffee and tea break Posters, exhibits and tool demonstrations (see list below)
11.00 – 12.30		Parallel sessions 3
	SPELBOMSKAN	3.1 Flood risk management 3.1.1. Flood hazard and climate change: reactive and proactive approaches. <i>Kyrre Groven</i> 3.1.2. Climate adaptation where rivers meet the sea – the Stockholm and Gothenburg examples. <i>Johan Andréasson</i> 3.1.3. Three Points Approach (3PA) for urban flood risk management: climate change adaptation through transdisciplinarity and multifunctionality. <i>Chiara Fratini</i> 3.1.4. Civil protection and climate change impacts in the Netherlands: local risk perceptions and actions. <i>Maya van den Berg</i>
	AULA	3.2 Decision tools and frameworks 3.2.1. The question of when to adapt: developing a framework for optimal timing of climate change adaptation. <i>Henrik Carlsen</i> 3.2.2. Decision making framework for climate change adaptation in Denmark. <i>Kirsten Halsnæs</i> 3.2.3. Adaptation tools in practice at the local level – experiences from applying a LCLIP (local climate impacts profile) on three Swedish municipalities. <i>Annika Carlsson-Kanyama</i> 3.2.4. Designing and applying a toolbox for adaptation to climate change. <i>Reinhard Mechler</i>
	BERGSMANNEN	3.3 Adaptation at the municipal level 3.3.1. Approaching climate change adaptation in Swedish spatial planning practice. <i>Sofie Storbjörk</i> 3.3.2. Climate adaptation in the Danish municipalities. <i>Dorthe Lund</i> 3.3.3. Setting adaptation to climate change on the municipal agenda in Norway. <i>Grete K. Hovelsrud</i> 3.3.4. Helsinki metropolitan area adaptation to climate change strategy – how to build a relevant and usable strategy? <i>Susanna Kankaanpää</i>
	MIMER	3.4 Participatory adaptation research 3.4.1. Institutional aspects of adaptation – participatory approaches in Nordic cities and sectors. <i>Anna C. Jonsson</i> 3.4.2. The role of scientific knowledge in stakeholder deliberations on local climate adaptation: two case studies in Sweden. <i>Åsa Gerger Swartling</i> 3.4.3. Testing the combination of natural science and economic information for adaptation purposes within a deliberative framework. <i>Adriaan Perrels</i> 3.4.4. How to provide and disseminate scientific knowledge for decision making – the Danish experience. <i>Martin Drews</i>
12.30 – 13.45	GALLERY	Lunch
13.45 – 14.45	AULA	Plenary presentations on supporting adaptation decisions <i>Roger Street, UK Climate Impacts Programme: Informed support to decision making in the context of adaptation to a changing climate: UKCIP as an example</i> <i>Annika Carlsson-Kanyama, Swedish Defence Research Agency: Adaptation to climate change at the local level: lessons learned and ideas for further research</i> <i>Andrea Prutsch, Environment Agency Austria: Guiding principles for adaptation to climate change in Europe</i>
14.45 – 15.15	GALLERY	Coffee and tea break
15.15 – 16.45	AULA	Plenary panel discussion on the science–practice dialogue Panellists: <i>Anna Bratt, The County Administrative Board of Östergötland; Povl Frich, Danish Energy Agency; Gunn-Britt Retter, Saami Council; Esko Kivisaari, Federation of Finnish Financial Services; Cathrine Andersen, Directorate for Civil Protection and Emergency Planning, Norway.</i> Moderator: <i>Johan Kuylenstierna, Stockholm Environment Institute</i>
18.30 – 21.00	STOCKHOLM CITY HALL	Conference reception at Stockholm City Hall, hosted by the City of Stockholm <i>Johan Rockström, Stockholm Environment Institute, will speak.</i>

WEDNESDAY 10 NOVEMBER: POLICY FOCUS

08.00 –	ENTRANCE	Registration opens
09.00 – 09.20	AULA	Summary of conclusions from day 2
09.20 – 10.00	AULA	Keynote presentations <i>Hans-Martin Füssel, European Environment Agency: Developing European knowledge and policy for adaptation</i> <i>Svend Binnerup, National Environmental Research Institute, Denmark: The value of science, policy, and private sector integration for implementation of adaptation strategies</i>
10.00 – 11.00	GALLERY	Coffee and tea break Posters, exhibits and tool demonstrations (see list below)
11.00 – 12.30		Parallel sessions 4
	SPELBOMSKAN	4.1 The institutional context of local adaptation 4.1.1. Planning for climate change in urban areas. <i>Jan Erling Klausen</i> 4.1.2. Knowledge networks for local adaptation in the Stockholm region: challenges of multilevel governance. <i>Annika E Nilsson</i> 4.1.3. Equal, equitable and climate change responsive? The (in)visibility of power/privilege in institutional climate change discourse. <i>Tanja Stähle</i> 4.1.4. Building a bridge from aspirations to implementation: Ireland as a case study. <i>Jackie S. McGloughlin</i>
	AULA	4.2 National policy initiatives 4.2.1. Extreme weather lessons and climate change adaptation in the Norwegian civil protection system. <i>Idun A. Husabø</i> 4.2.2. Adaptation to climate change in Denmark – science-policy interaction in practice. <i>Povl Frich</i> 4.2.3. The German adaptation strategy: promoting the implementation on regional and local levels. <i>Andreas Vetter</i> 4.2.4. The governance of adaptation to climate change: taking stock and providing guidance. <i>Andrea Prutsch</i>
	BERGSMANNEN	4.3 Integrating adaptation into policy 4.3.1. Integrating climate adaptation policy in Swedish forestry: an analysis of the policy process from 2000 to 2010. <i>Johanna Ulmanen</i> 4.3.2. Regional lessons for adaptation: comparative insights from adaptation processes of Helsinki, Finland, and the Gold Coast, Australia. <i>Susanna Kankaanpää</i> 4.3.3. An integral analysis of climate change adaptation in Norway: results from the PLAN project. <i>Karen O'Brien</i>
12.30 – 13.45	GALLERY	Lunch
13.45 – 15.15	AULA	Plenary panel discussion on adaptation policy Panellists: <i>Annett Möhner, UN Climate Change Secretariat; Marianne Karlsen, Ministry of Environment, Norway; Pirkko Heikinheimo, Ministry of Environment, Finland; Klas Eklund, SEB; Lena Sommestad, former Swedish Environment Minister. Moderator: Johan Kuylentstierna, Stockholm Environment Institute</i>
15.15 – 15.30	AULA	Closing of conference

Posters, exhibits and tool demonstrations (Gallery)

P1. Adaptation and mitigation to climate change in freshwaters – the EU REFRESH project. *Leonard Sandin*

P4. European Centre for Disease Prevention and Control (ECDC). *Jan C Semenza*

P5. Bridging the gap between basic climate science and adaptation research: the centre for regional change in the earth system (cres). *Martin Drews*

P6. Nordic Strategic Adaptation Research (NORD-STAR). *Michael Goodsite*

P7. CLISP – Climate Change Adaption by Spatial Planning in the Alpine Space. *Wolfgang Lexer*

P8. Incorporating climate change aspects in strategic planning in Belarus: learning experience from pilot SEA projects. *Iryna Usava*

P9. Synthesis from the 1st NONAM workshop on risk assessment and stakeholder involvement: commonalities and differences across infrastructure type. *Adriaan Perrels*

P10. A framework for convergence. *Sigrún María Kristinsdóttir*

P 11. The governance of urban climate change adaptation. *Jan Erling Klausen*

P12. Chilling Nordic cities in hot summers: Low-cost low-tech large-scale cold sinks. *Robin Grayson*

P13. Geothermal energy and adaptation in Kenya. *Pacifica F. Achieng Ogola*

P14. Transition dynamics towards electric cars fleet. *René Biasone*

P15. Adapting the Danish building stock and urban environment to climate change. *Torben Valdbjørn Rasmussen*

P16. Adaptation and mitigation from the perspective of the insurance sector. *Lára Jóhannsdóttir*

P17. Climate change, impact and adaptation in the sub arctic – a case study from the Torneträsk region. *Karin Brink*

E1. The Swedish portal for adaptation to climate change. *Pelle Boberg*

E2. Climate Impact Research and Response Coordination for a Larger Europe: CIRCLE-2 ERA-Net. *Markus Leitner*

E3. The Norwegian portal for adaptation to climate change. *Guro Andersen*

E4. CARAVAN/MEDIATION interactive vulnerability mapping tool – Demonstration. *Stefan Fronzek, Hanna Mela, Lynn Rosentrater*

E5. Organisers and sponsors

Reception at Stockholm City Hall

The City of Stockholm invites the conference participants to a reception in the Stockholm City Hall on Tuesday 9 November 2010. The doors open at 18.30. Please arrive no later than 18.45. The conference participants will be welcomed by a representative of the City of Stockholm. The reception includes a buffet dinner and a guided tour of the Stockholm City Hall.

Please remember the invitation card, which you will find in your conference bag. You will need to show it at the reception entrance.

Travel directions to the reception at the Stockholm City Hall

From the conference venue, Aula Magna

Walk to metro station Universitetet. Take the Red line number 14 direction T-Centralen/Fruängen. Get off at the Central Station (T-Centralen). Walk 900 meters to the Stockholm City Hall.

The metro departs every 5 minutes and takes approximately 10 minutes. The walk from Central Station to Stockholm City Hall will take about 10 minutes.

From Clarion Collection Hotel Tapto

Walk to the metro station Stadion. Take the Red line number 14 direction T-Centralen/Fruängen. Get off at the Central Station (T-Centralen). Walk 900 meters to the Stockholm City Hall.

The metro departs every 5 minutes and takes approximately 5 minutes. The walk from Central Station to Stockholm City Hall will take about 10 minutes.

From Hotel Oden

Walk to the metro station Odenplan. Take the Green line number 18 direction T-Centralen. Get off at the Central Station (T-Centralen). Walk 900 meters to the Stockholm City Hall.

The metro departs every 5 minutes and takes approximately 5 minutes. The walk from Central Station to Stockholm City Hall will take about 10 minutes.

Plenary speakers and panellists

Welcome speech

Maria Ågren is Director General at the Swedish Environmental Protection Agency since 2009. She is graduate engineer with a Master of Science in Engineering focused towards social planning and the environment. Maria Ågren has a great interest in management issues and she is well experienced in managing change in large organizations. Maria Ågren has eighteen years experience with SMHI – the Swedish Meteorological and Hydrological Institute – first as a specialist in air pollution and then as Director General. She has also been Director General at the Swedish Geotechnical Institute.

Keynote speaker, Monday 8 November

Kristie L. Ebi is Executive Director of the Technical Support Unit for Working Group II (Impacts, Adaptation, and Vulnerability) of the Intergovernmental Panel on Climate Change (IPCC). Prior to this position, she was an independent consultant. She has been conducting research on the impacts of and adaptation to climate change for more than a dozen years, including on extreme events, thermal stress, foodborne safety and security, and vectorborne diseases. She has worked with the World Health Organization, the United Nations Development Programme, USAID, and others on implementing adaptation measures in low-income countries. She facilitated adaptation assessments for the health sector for the states of Maryland and Alaska. She was a lead author on the "Human Health" chapter of the IPCC Fourth Assessment Report, and the "Human Health" chapter for the U.S. Synthesis and Assessment Product "Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems." She has edited four books on aspects of climate change and has more than 80 publications. Kristie Ebi's scientific training includes an MS in toxicology and a PhD and a Masters of Public Health in epidemiology, and two years of postgraduate research at the London School of Hygiene and Tropical Medicine.

Keynote and plenary speakers, Tuesday 9 November

Ian Burton likes to work in the spaces between science, policy and practice. He says that there is lots of room for others. He has served in three IPCC Assessments and is a consultant to UN agencies, international financial institutions, the UNFCCC Secretariat, and the private sector. Ian Burton also works at the national, provincial and municipal level, and is co-chair of Ontario Ministerial Advisory Panel on Climate Change Adaptation. Ian is concerned about the growing gap between science and policy and is hopeful that changes in practice can help to lead the way. He is a Fellow of the Royal Society of Canada and was a Vice-Chairman of the International Federation of Institutes for Advanced Study (IFIAS) when it was based here in Stockholm at Ulriksdals Slott.

Gustaf Landahl is Head of Department Planning & Environment at the Environment and Health administration, City of Stockholm. He has a Masters degree in civil engineering from the Royal Institute of Technology in Stockholm, Sweden. Gustaf Landahl heads the environmental control in Stockholm with inspectors responsible for everything from sewerage works, district heating facilities to polluted land and small workshops. Special focus is also put on hazardous waste and chemical substances in goods. He is also responsible for Stockholm's work on climate protection with emphasis on the city's work to reduce greenhouse gases. Gustaf Landahl was also on the Steering group that the city had to organize the climate adaptation work.

Roger B. Street is the Technical Director within the UK Climate Impacts Programme (UKCIP) where he leads the Programme's technical and scientific work aimed at guiding impacts and adaptation assessments, and at developing and delivering new supportive

resources and tools, including those related to supporting the use of the recently launched set of climate projections for the UK. He came to the UKCIP in January 2006 after working for over 32 years on climate impacts and adaptation while with the Canadian federal government. This included working related to understanding impacts and adaptation to a changing climate, working within the Intergovernmental Panel on Climate Change beginning with its first assessment report and leadership of Canada's first national assessment on climate change impacts (Canada Country Study).

Annika Carlsson-Kanyama works as a Research Director at the Swedish Defence Research Agency (FOI), Division of Defence Analysis. Her projects deal with mitigation and adaptation to climate change, energy and food security as well as environmental impacts from consumption and production patterns. Currently she leads the research programme *Climatools*, where tools for adaptation are developed together with stakeholders in Swedish municipalities. Her background is in short as follows: After graduating from Agricultural College she worked for several years as a farmer in tropical South America. After returning to Sweden she pursued studies at Stockholm University resulting in a BSc where the main subject was physical geography. She added training in Development Studies before working in Tanzania as a Soil-Conservation Officer. Back in Sweden she worked as an Environmental Inspector for several years before enrolling as a PhD student at Lund University where, in 1997 she presented a licentiate thesis on the subject of food consumption patterns and their implications for the environment. She presented a PhD thesis in Natural Resource Management at the Department of Systems Ecology in 1999. Since then she has been employed at FOI and from 2004 to 2008 also at the Department of Industrial Ecology at KTH after a docentship there in 2005.

Andrea Prutsch holds a Master in Landscape Ecology and Landscape Planning from the University of Natural Resources and Applied Life Sciences Vienna (BOKU). After two years as a Junior Researcher at BOKU University, she joined the Department of Environmental Impact Assessment & Climate Change at Umweltbundesamt Vienna in April 2008. Her main field of expertise ranges from adaptation methodology and planning to policy relevant aspects of climate change adaptation, stakeholder involvement and adaptation communication. Andrea Prutsch supports the Austrian Ministry of Environment in the process of establishing a national adaptation strategy (e.g. vulnerability assessments, identification of adaptation measures, preparation of a policy paper). She is also managing a participation process accompanying the national adaptation strategy. Furthermore, she was responsible for setting up an information platform on climate change and adaptation in Austria (www.klimawandelanpassung.at) and is involved in the conception of an adaptation newsletter for Austria. Under the 'European Topic Centre for Air and Climate Change' she has accomplished various tasks for the European Environment Agency and at present is responsible for the preparation of guiding principles for good adaptation. Besides her work in the agency, Andrea Prutsch is a PhD student at the BOKU University with the research focus on adaptation methodology and the contribution of stakeholder process to reach good adaptation.

Panellists, Tuesday 9 November

Anna Bratt has since last year worked as Coordinator of climate change issues at Östergötland County Administrative Board, with the task to spur, coordinate and promote adaptation of society to a changing climate at local and regional levels together with affected municipalities, organisations and sector authorities. The work includes to identify specific climate adaptation issues pertinent to the region based on current climate change prognoses, to identify needs and demands of knowledge, measures and network/process support in prioritised target groups (especially the municipalities), and to identify current work with climate adaptation being carried out by various external target groups such as municipalities, sector authorities, universities etc. Previously, Anna Bratt worked as senior lecturer and director of studies in Environmental Science at Linköping university, where she holds a PhD based on research on management of nutrient leaching from agricultural production within the EU Water Framework

Directive. The research for her MSc degree in International Forest Resource Management from Colorado State University, USA, was a study on nutrient cycling in a tropical forest in Costa Rica. She has several years of experience working with rural development and soil conservation projects in Bolivia and Lesotho, and also several years of working in Sweden with horticultural production.

Povl Frich is Chief Advisor with the Danish Energy Agency, which is part of the Ministry of Climate and Energy. In addition to his main role as IPCC National Focal Point, he is responsible co-author of the Danish Strategy for Adaptation to a Changing Climate. He currently works as a climate expert with the Danish Information Centre for Climate Change Adaptation and serves as a co-editor of the Danish Portal for Adaptation to Climate Change. He holds a MSc in Physical Geography from the University of Copenhagen and has held a range of positions related to his expertise in climate science, including at the Danish Environmental Protection Agency, the Hadley Centre for Climate Prediction and Research and the Danish Meteorological Institute. During his career, he has published 15 scientific papers, 60 popular reports and given more than 140 presentations. He has served on a number of committees and was also co-founder of the Partnership for European Environmental Research (PEER), and chair of the WMO CCL/CLIVAR Task Group on Indices of Climatic Extremes.

Gunn-Britt Retter is head of the Saami Council's Arctic and Environmental Unit, where she has been since 2005. She has previously worked as an advisor to the Arctic Council's Indigenous Peoples Secretariat in Copenhagen and is an active spokesperson on indigenous rights in the Arctic. In 2005, Gunn-Britt Retter was elected to the Saami Parliament in Norway and is now in her second term representing the Norwegian Saami Association. Her interests include the role of traditional knowledge in adapting to climate change.

Esko Kivisaari has been Deputy Managing Director of the Federation of Finnish Financial Services since 2007. Esko Kivisaari was born on 8 September, 1957 in Turku, Finland. He received a Master of Science degree in Mathematics from the University of Turku in 1985. He has also been a Fellow of the Actuarial Society of Finland since 1993. Prior to his present post, Esko Kivisaari was Managing Director of the Federation of Finnish Insurance Companies between 2001 and 2006 and acted as managing director of the Federation of Finnish Financial Services from 1 July to 31 December 2008.

Cathrine Andersen holds a PhD in Marine Geology and has previously worked at the Norwegian Polar Institute with surface ocean climate development and heat flux variability in the Nordic Seas and the subpolar North Atlantic during the last 10 000 years. The reason for studying past climate variability is to be able to identify human induced climate changes happening today. She left the science world to become a climate bureaucrat instead, and is now working as a senior advisor at the Directorate for Civil Protection and Emergency Planning. The directorate holds, from 2007-2012, the secretariat for the Norwegian Climate Adaptation Programme. The secretariat provides knowledge through www.klimatilpasning.no and through courses in climate change adaptation. It gives out climate change maps and guidelines in adaptation, and is coordinating the project *Cities of the Future*.

Keynote speakers, Wednesday 10 November

Hans-Martin Füssel holds master degrees in Computer Science from the Johann Wolfgang Goethe-University in Frankfurt am Main and in Applied Systems Science from the University of Osnabrück as well as a PhD in Physics from the University of Potsdam. He has almost 15 years of experience in climate change research and policy advice. Hans-Martin Füssel worked at the Potsdam Institute for Climate Impact Research from 1996 to 2003 and again from 2006 to 2010. As a recipient of a Marie Curie Outgoing International Fellowship, he worked from 2004 to 2006 at the Center for Environmental Science and Policy of Stanford University. From 2007 to 2009, he was a Professor by Special Invitation at the Ritsumeikan Research Center for Sustainability Science of Ritsumeikan University in Kyoto. In June 2010, Hans-Martin Füssel joined the European Environment Agency as a Project

Manager for Climate Impacts, Vulnerability, and Adaptation. He has contributed to many interdisciplinary research projects concerned with the integrated assessment of climate change and the development of response strategies. His research interests include climate impacts modelling, climate change vulnerability and adaptation assessment, probabilistic integrated assessment of climate change, international adaptation funding, and the relationships between climate change and global justice. Hans-Martin Füssel served as author, review editor, and expert reviewer for the IPCC Fourth Assessment Report. He has consulted UNDP, UNFCCC, WHO, IPCC, the World Bank, the European Commission, and national governments on climate change.

Svend Binnerup, PhD, Senior science officer, Coordination unit for Research in Climate Change Adaptation (Koordineringsenhed for Forskning i KlimaTilpasning, KFT) established under the Government's Strategy for Adaptation to Climate Change in Denmark. The secretariat is located at Aarhus University, National Environmental Research Institute, (AU-NERI). Svend Binnerup has a scientific background as Environmental scientist with 15 years of research experience (10 years as senior scientist) within the area of microbial turnover of N and C-compounds. He has had a leading role in the design of KFT and during the last three years been part of the KFT-secretariat with focus on the transfer of knowledge and experiences between the research community and society. He has authored or co-authored recent publications analysing The climate adaptation development process in Europe; The climate research competencies in Denmark: Current knowledge gaps and research needs regarding climate adaptation in Denmark. He represents the Danish research policy interests in a number of well established European networks – e.g. CIRC2LE-ERA-net; and the Joint Programming Initiative Clik-EU and currently participates in other networks and projects having a focus on bridging the gaps between science, policy and society.

Panelists, Wednesday 10 November

Annett Möhner has worked for the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) since 2004 in the area of adaptation to the adverse effects of climate change. Her expertise includes climate policy, in particular in the area of adaptation and finance; information, capacity and financial needs of developing countries to adapt to climate change and multilateral and bilateral support for adaptation, development and disaster risk reduction. Currently she focuses on supporting the negotiations on enhanced action on adaptation as part of a post-2012 climate change regime and the Nairobi work programme on impacts, vulnerability and adaptation to climate change. Prior to joining the UNFCCC, she worked for the Environment Directorate of the OECD and the German Agency for Technical Cooperation (GTZ) in India. She holds an MSc in Environmental Sciences from Louisiana State University, USA and a BA in Political Science and Ecology from the University of Greifswald, Germany.

Marianne Karlsen is senior adviser in the Ministry of Environment in Norway. In 2010 she is heading the Norwegian climate change vulnerability and adaptation assessment due in November 2010. Since 2007 she has been working with climate change adaptation, first with the Norwegian Climate Adaptation Program in the Directorate for Civil Protection and Emergency Planning and later with the Ministry of Environment, where she was part of the Norwegian negotiating team to the climate negotiations responsible for adaptation to climate change. Marianne Karlsen has a broad background from development cooperation in the Norwegian Agency for Development cooperation and from South and South East Asia. She is educated as human geographer from the University of Oslo.

Pirkko Heikinheimo has been working as a climate expert for the Finnish Government since 1996. Currently she is a project manager of the Government's Foresight Report on Climate and Energy Policy. Before this she worked as a coordinator of the start-up phase of ISTO, the national research programme on adaptation to climate change. She has a long background in the international climate negotiations and in the IPCC process as a Finnish government's delegate. She has been actively involved in science-policy dialogue

both in national, Nordic and European programs and studies. Before her career in different ministries Pirkko Heikinheimo was working in the Academy of Finland in the administration of the first national climate change programme SILMU.

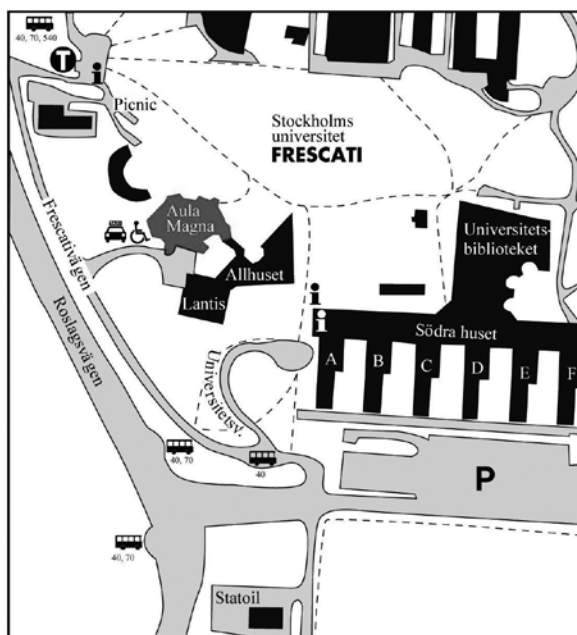
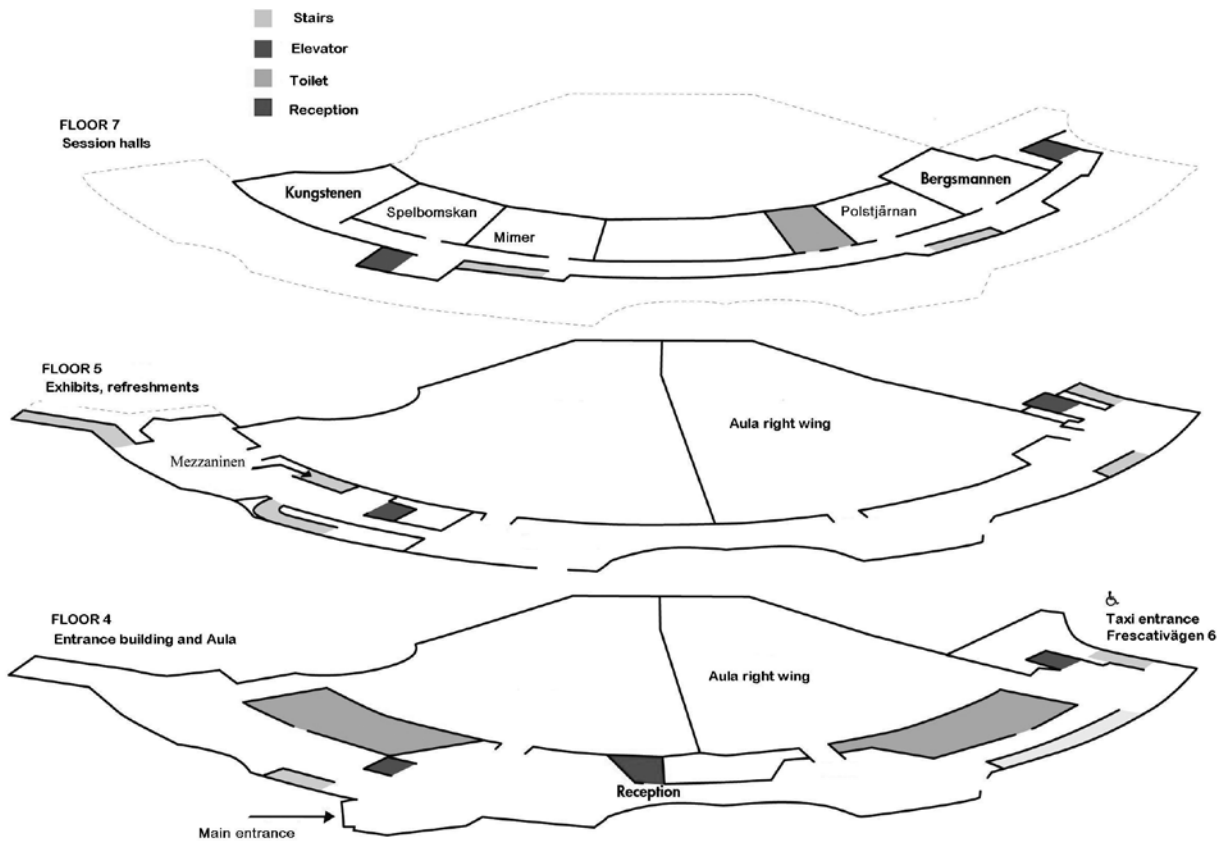
Klas Eklund in the 1980s worked at the Ministry of Finance (as Deputy Under-Secretary of State) and in the Cabinet office (as economic adviser to the Prime Minister). In 1990-91 he chaired the government's Productivity Commission, analysing the poor Swedish growth performance in the 1970s and 80s. Klas Eklund has published some 800 articles and columns and a number of books, including the best-selling Swedish economics textbook, and books on the budget deficit, the Swedish tax system, economic growth and financial markets. He has also written a financial thriller about insider trade and murder in the Ministry of Finance. Recently, his work has focused on the economics of climate change. He has published a book on this topic, in Swedish: 'Vårt klimat' ('Our Climate'). Klas Eklund is an adviser to the green and liberal think-tank Fores, he is a board member of Mistra-SWECIA, as well as a member of the board of the International Institute for Industrial Environmental Economics, University of Lund.

Lena Sommestad is professor of economic history and former Swedish Minister for the Environment (2002-2006). She is member of the Board of Mistra SWECIA. Lena Sommestad is currently associated professor at the Swedish Institute for Futures Studies, where she is working on a project on social investment and climate change. Lena Sommestad has devoted most of her research to comparative studies on gender regimes, social policy, and demography. She has been professor at Uppsala University. In 1998, she was designated to be Director at the Swedish Institute for Futures Studies. In early 2002 she took office as Minister for the Environment and served in this capacity until 2006, when there was a change of government. From 2007 to 2010, Lena Sommestad served as CEO of the Swedish District Heating Association. Her other assignments include membership of the Board of Mistra 2000-2002, membership of the Board of the Swedish International Development Agency (Sida) 2000-2002, and membership of the Board of the Swedish Central Bank (2006-2010).

Panel moderator

Johan Kuylentierna is Centre Director for SEI Stockholm and Deputy Director Operations. He holds an adjunct professorship in international water resources issues at the Department of Physical Geography and Quaternary Sciences at the Stockholm University. Johan Kuylentierna has previously worked as the Chief Technical Advisor to the Chair of UN-Water, based at FAO in Rome. Before joining the United Nations, he served as Project Director at the Stockholm International Water Institute with the overall responsibility for the World Water Week in Stockholm. He also established the Swedish Water House initiative and served as its first manager. Johan Kuylentierna has worked as a consultant for many years with a focus on environmental management, corporate social responsibility (CSR), communication, core-value development, stakeholder participation processes and capacity development. Among other things, he developed and ran negotiation training games, both in Sweden and through international training programmes. He has experience from international policy work through professional positions at the World Meteorological Organization in Geneva and the Division on Sustainable Development (CSD) at the United Nations Headquarters in New York. He focused primarily on water and climate change issues from policy and management perspectives. He worked in close co-operation with governments, international organisations, NGOs, and the academic and business communities.

Aula Magna: floor plan and map



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Parallel 1:1 – Assessing vulnerability

1:1:1

Identifying vulnerable places most in need of adaptation strategies

Jan Ketil Rød¹; Ivar Berthling¹; Haakon Lein¹; Päivi Lujala²; Geir Vatne¹

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The future climate of Norway is expected to become “warmer, wetter and wilder” and it is anticipated that this will cause an increased vulnerability towards floods, landslides and strong winds. Any evaluation of future vulnerability towards natural hazards must use today’s situation as a base line. In this paper, we analyse current vulnerabilities for Central Norway at the ward level (1488 basic statistical units). Our vulnerability assessment combines physical vulnerability indices (exposure to flood, mass wasting and strong winds) with a social vulnerability index (capacity to respond to hazards, as well as capability to recover from a disaster), thus incorporating both physical and social dimensions of vulnerability. In Norway it is the municipalities that have the juridical responsibility to perform a safe land use planning as regards to natural disasters. Our integrated vulnerability assessment could therefore serve as a tool to screen places in order to identify localities most susceptible to natural hazards. In addition, an integrated multihazard assessment could provide a basis for a more precise and proactive intervention in the form of land use planning, prioritization of protective investments, emergency planning etc. However, maps expressing expert views on vulnerability may not necessarily be useful for the municipality planners if they perceive vulnerability very differently, for instance due to their local knowledge. Alongside with a local integrated vulnerability assessment, we will therefore use a GIS based interactive web platform where expert’s opinions on vulnerability can be negotiated with stakeholders’ perceived vulnerability.

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1:1:2

Susceptibility to harm in Norway: adapting social vulnerability index to a new context

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This paper examines the process of adapting the Social Vulnerability Index (SoVI) – developed by Susan Cutter and colleagues – to a new setting. SoVI uses factor analysis to reduce information from a large number of variables that each measures a facet of a place’s susceptibility to a potential hazard. Applied on Norwegian municipalities, we first replicate the original index using variables and interpretation applied in the article by Cutter, Boruff and Shirley, published in *Social Science Quarterly* in 2003. Next, we conduct an adaptation to make the index more compliant with Norwegian context. We do this by investigating validity of concepts and indicators, adjusting content owing to differences in organizational and geographic context, and accommodating for scale and technical issues. Preliminary results suggest that issues elaborated during the adaptation process are relevant, because differences between the replicated and the adapted index are considerable. This suggests that researchers, although agreeing with the main tenets of vulnerability research, need to accommodate vulnerability concepts, indicators, and interpretation of analysis results to the new setting. In the paper we discuss each of these issues in turn.

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1:1:3

CARAVAN: interactive mapping of vulnerability to climate change in the Nordic region*Timothy R. Carter*¹; *Karen O'Brien*²; *Louise Simonsson*³; *Stefan Fronzek*¹; *Aino Inkinen*¹; *Ismo Lahtinen*¹; *Hanna Mela*¹; *Lynn Rosentrater*²; *Cathrine Ruud*²; *Ida Skivenes*²¹*Finnish Environment Institute (SYKE), Climate Change Programme, Helsinki, Finland;* ²*University of Oslo, Department of Sociology and Human Geography, Oslo, Norway;* ³*Linköping University, Centre for Climate Science and Policy Research, Norrköping, Sweden*

Background: The affluent Nordic countries are often perceived to be relatively well insulated from the potential detrimental effects of climate change. However, such a positive outlook can mask vulnerabilities and potential barriers and constraints to adaptation at local scales. CARAVAN (Climate change: a regional assessment of vulnerability and adaptive capacity for the Nordic countries) is a two-year collaborative project (2008–2010) funded from national sources in the Nordic-Call of the EU CIRCLE (Climate Impact Research Coordination for a Larger Europe) project. CARAVAN aims to explore alternative approaches for estimating and mapping vulnerability to climate change at the municipal scale across the Nordic region.

Approach: The project has developed a tool for visualizing vulnerability to climate change in social and environmental contexts. Vulnerability of a system or population is described as a function of its exposure to climate change, its sensitivity to the impacts of that climate change, and its adaptive capacity to cope with the impacts. Each of these elements is represented spatially in a web-based system and combined to visualize climate vulnerability at the present and for 2050. Two cases studies were selected concerning vulnerability of agricultural livelihoods and of the elderly.

Results: While the interactive web tool can depict maps of individual indicators of exposure, sensitivity and adaptive capacity, it can also combine these indicators (weighted if desired) into vulnerability indices. Rather than the research team making academic choices about these combinations, the user-interface allows end-users to make informed choices themselves. To illustrate, the proportion of elderly (≥ 65 years) in the Nordic region is expected to increase from 16% in 2008 to 23% in 2030. When combined with indicators of extreme weather conditions derived from climate observations and models (defining exposure) and statistics representing socio-economic risk factors (adaptive capacity), an emerging pattern of regional vulnerability to climate change becomes apparent for certain extremes that are projected to increase (e.g. summer heatwaves).

Conclusion: The CARAVAN project has developed a prototype interactive web tool for users wishing to examine regional vulnerability to climate change in the Nordic countries. The tool now requires refinement, based on stakeholder feedback, if it is to provide useful aid for regional adaptation planning.

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Parallel 1:2 – Adaptation and public health I

1:2:1

Vulnerability, impact and adaption assessment of health threats from infectious diseases*Jan Semenza*¹; *Elisabet Lindgren*²; *Kristie Ebi*³; *Jonathan E Suk*¹¹*European Centre for Disease Prevention and Control (ECDC), Future Threats and Determinants Section, Scientific Advice Unit, Stockholm, Sweden;* ²*Karolinska Institutet, Environ Medicine, Stockholm, Sweden;* ³*ISSC, Stanford, CA, United States*

Climate change has far-reaching implications for public health such as the emergence and re-emergence of communicable diseases including Lyme disease, hantavirus pulmonary syndrome, tick-borne encephalitis (TBE), or cryptosporidiosis. While climate change is expected to shift their distribution and transmission patterns, health impacts will vary across European countries depending on climatic regions as well as differences in the capacity of the public health infrastructure to adapt and respond to

these changes. The European Centers for Disease Prevention and Control (ECDC) has developed a decision-making tool to help EU Member States assess their potential vulnerabilities to climate change, evaluate the impact and consider adaptation options.

A set of decision-making algorithms based upon clear criteria and principles were developed. These included assessment not only of anticipated climatic changes and the links with communicable disease transmission, but also multi-disciplinary assessment of the relevant infrastructures in the country, such as water supplies, animal husbandry, vector abatement, and disease surveillance. It also involves thorough assessment of specific options for each climate-sensitive disease and criteria for evaluating of health and economic variables, and options for monitoring and evaluation. This assessment will have to be done for different parts of the respective country, with an identification of needed adaptive and preventive policies and measures to address these risks. Trans-disciplinary approaches and cross-sectoral collaboration are needed when assessing the impacts of climate change on infectious disease risk in an area. Sectors other than the health sector, and existing collaborations between the sectors, often need to be included in the assessment as well. They include water management, food industry, veterinary medicine, nature conservation and management, housing and urban planning, transport, energy sectors, etc. A set of climate change monitoring indicators will be established to track the impacts of climate change on communicable disease transmission, and to guide prioritisation of adaptation strategies.

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1:2:2

Indicators to support health-oriented climate change adaptation*Celie Manuel**University of Copenhagen, Department of Social Medicine, Copenhagen, Denmark*

Background: The paper presents a decision support tool: a conceptual indicator framework to enable climate change adaptation planners to effectively reduce population vulnerability to adverse consequences of climate change. The framework is tested on water scarcity and diarrhoeal disease as a case climate-sensitive health issue.

Method/approach: Two scientific disciplines inform the construction of the framework, namely the theory and practice of environmental health indicators and climate change adaptation. The former is used to develop the structure of the indicator framework presented, while climate change adaptation theory makes up the content, i.e. which information components are required within the structure. Moreover, lessons from public health harm reduction are used to ensure the framework is action-oriented by identifying where and which adaptive interventions could be instated. The resultant framework is tested on a climate-sensitive health issue: water scarcity and diarrhoeal disease to determine the degree to which it provides the information relevant to planning adaptation measures to reduce this burden of disease.

Results: Information needs for adaptation planners relate to the nature of the climate-sensitive hazard, the determinants of sensitivity, existing coping measures and adaptive capacity. These components were organised into an action-oriented framework emphasizing the causal pathway through which the components are related to a given health burden. The framework has both strengths and limitations in regard to providing adequate information to water-related adaptation planning. Main limitations relate to the practical applicability of the framework and its inability to take into account the policy context. Furthermore, the use of indicators is not in line with the prevailing perception that climate change policy should be scenario-based in order to take account of uncertainties in impact estimation.

Conclusion: Despite not presenting an all-encompassing information solution for adaptation planners, the proposed indicator framework constitutes an important step in the right direction for creating health-relevant decision support tools through its emphasis on causality and action-orientation.

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1:2:3

Climate change health impact and adaptation assessment in the North of the Russian Federation: a pilot project in the Arkhangelsk region

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Background: The project is a part of the "Protecting health from climate change: a seven country initiative in the Eastern part of the WHO European region" project. Main objectives include health vulnerability assessment and development of adaptation strategies for the Russian Arctic areas. The project also aims at building institutional capacity on climate change in relation to extreme weather events preparedness and response, infectious diseases surveillance and control as well as water and food safety. Criteria for selection of the pilot area and priorities for assessment: Size of population at risk, burden of disease, climate sensitivity of health problems, data availability and quality, human resources, availability of preventive measures and feasibility within existing services. According to predictions, the most pronounced temperature increase is expected in Northern Russia, particularly in winter months. Cardiovascular mortality in the North of the country is among the highest in the world. Respiratory diseases top the morbidity statistics. Several studies have reported associations between ambient air temperature and the number of cases of salmonellosis and tick-borne encephalitis; however no studies have been performed in high latitudes.

Pilot region: Arkhangelsk region covers a territory of 587400 km² with a population of 1.26 million. The regional centre (Arkhangelsk) with neighbouring towns forms the largest in the world urban agglomeration in high latitudes with a population of >600000 allowing quantitative assessments. The region also includes Nenets Area with high proportion of indigenous people whose traditional lifestyle is intertwined with the nature. While the average temperature in the region was increasing by 0.0064°C/year in 1881–2007, the increase for 1975–2007 was 0.0538°C/year.

Assessment areas: Associations between climatic factors and 1) all-cause mortality in Arkhangelsk; 2) cardiovascular and respiratory morbidity; 3) tick-borne encephalitis and salmonellosis; 4) health of the indigenous population in the Nenets Area and 5) natural climate-related emergencies.

Results: Data collection for the period 1992–2008 was initiated in 2010. Details on study design and preliminary results of the quantitative assessment will be presented.

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Parallel 1:3 – Climate information and climate services

1:3:1

Improved climate scenarios for impact studies in the Arctic: the ADSIMNOR project

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Development of suitable adaptation strategies for a changing climate are based on scenario simulations with coupled climate models. However, many of the processes involved are not completely understood. Improved understanding of the physical climate system and its impact on the land surface is needed such that better founded guidelines on trends, variability, uncertainties and probabilities of change become possible.

The newly started ADSIMNOR project (Advanced Simulation of Arctic Climate Change and Impact on Northern Regions, <http://www.smhi.se/en/Research/Research-departments/climate-research-rossby-centre2-552/rossby-centre-in-arctic-climate-change-research-programme-1.10701>)

aims at increasing our understanding of key Arctic processes, improving our ability to simulate such processes and their interaction with the rest of the global and northern climate system and providing improved scenarios of future climate conditions over high northern latitude ocean and land areas. One focus will be on creating high resolution scenarios for northern Sweden.

These scenarios will be used by ADSIMNOR partners in climate change impact studies covering e.g. permafrost, vegetation, tourism and reindeer herding in northern Sweden. The wider impact and adaptation community is planned to be integrated via links to existing projects and networks.

The presentation covers the state of the art in Arctic climate modelling including the Nordic area, and the improvements planned by ADSIMNOR. Possibilities to interact with adaptation research will be discussed.

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1:3:2

Model development for risk assessments of climate change impact on forestry

Anna Maria Jönsson; Fredrik Lagergren; Ben Smith
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Climate change is likely to alter the temperature and precipitation regimes in Northern Europe, including the frequency and severity of extreme events. Increased warmth and growing season length can lead to increased wood production, as well as increase the risk for attacks by forest pests and pathogens. Extreme weather events such as heavy precipitation, drought, storm and frost can cause damage to forest stands. Probabilistic knowledge of climate change impact on disturbance regimes, species-specific responses and outcome of altered interactions between species are of crucial importance for development of adaptation strategies.

Within the Forestry case study of Mistra-Swecia, our main objective is to develop and refine climate impact assessments of relevance to the Swedish forestry sector, by exploring functional relationships using the process-based ecosystem model LPJ-GUESS. We simulate the impact of climate change on forest predisposition to storm damage, and related this to windload assessments and climate dependent risk for subsequent attacks of the spruce bark beetle. Close contact with key stakeholders assures that relevant management options and goals (production, economy, biodiversity, and carbon sequestration) are included. A multitude of forest management aspects are considered, including species selection, continuous-cover versus clear-cut forestry systems, thinning program and rotation length, and which fractions of the trees that are harvested. Our results suggest that climate change may increase the sensitivity of Norway spruce forest to storm damage and subsequent spruce bark beetle outbreaks, via shorter periods of ground frost and an additional generation of bark beetles per year. The risk may however be counteracted

by management adaptations such as shorter rotation periods, implemented in response to faster tree growth, and an increased fraction of broadleaved trees in the landscape. Representation of uncertainties associated with climate model data and ecosystem modelling is an important part of the project, linking to economic evaluations of forest management strategies.

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1:3:3

Bridging the gap between science and practice – The case of Finnish national climate change portal www.ilmasto-opas.fi

Simo Haanpää

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Background: Finland has been a forerunner in climate change adaptation with a national adaptation strategy released in 2005 (Ministry of Agriculture and Forestry, 2005). In designing and developing adaptation responses however, the role local and regional levels are crucial. So far few regional or local adaptation strategies have emerged, for various reasons – one of them being that practical, research based information on adaptation options for Finnish regions has been lacking. This paper explores the challenges of building communication on climate change issues between researchers and practitioners. Especially in the internet, various national institutions, consultancies, non-profit organizations and the mass media are offering climate change related information. Information relevant to the different users' needs is at times hard to find, at times questionable in terms of reliability and sometimes confusing with conflicting views presented.

Method/approach: The paper draws on a project run by Finnish Meteorological Institute, Finnish Environmental Institute and Centre for Urban and Regional Studies (YTK), Aalto University in 2009–2011, aiming at developing a national climate change portal. (EU LIFE+ -funded project Climate Change Community Response Portal (CCCRP) – LIFE07 INF/ FIN/000152). The portal, named www.ilmasto-opas.fi (www.climateguide.fi) aims at gathering reliable, research-based information on climate change mitigation and adaptation under one internet address. The information is tailored to the needs of a key user group, municipal planners and decision makers. The paper is based on user surveys and workshops held during the preparation phase of the project and on the first feedback on a technical pilot released in May 2010.

Conclusion: The paper confirms the need for increased provision of targeted climate information for different user groups in order to enable regional and local adaptation, but also addresses the need for more practice-oriented information and the importance of a sense of a shared 'climate change community'.

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1:3:4

Problematizing climate change through integral GIS

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The science of climate change is often portrayed through graphs of rising greenhouse gas emissions, maps of changes in temperature and precipitation, and depictions of increasingly compromised natural resources. This imagery attempts to make understandable what is essentially abstract and difficult to render in the imagination. At the interface of science and policy, it is regularly assumed that stakeholders process such information analytically, despite research showing that most decisions are based on experiential processing; climate change is therefore likely to be understood only to the extent that it impacts one's everyday life. Given the tendency of individuals to accept imagery that reinforces their existing cognitions, new techniques are needed that problematize climate change from the objective, subjective, collective and individual contexts in which it is occurring. This presentation will demonstrate an approach for problematizing climate change through geographic information systems (GIS) and integral theory, an area of discourse that synthesizes Western and non-Western understandings of consciousness and focuses on the complex interactions of ontology, epistemology and methodology. In the past five years, we have seen the emergence of a wide array of new technologies orientated toward supporting multimedia representations of spatial

information – text, photographs, sounds, and any other media that are embedded with locational details. Using both qualitative and quantitative data, and drawing on recent advances in geographic information science which have enabled public participation, discussion, and negotiation in spatial decision-making, we will develop an example of how Integral GIS can be used to communicate about climate change in a way that is iterative and reflexive, as well as contextual and conceptual.

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Parallel 1:4 – Adaptation at the regional level

1:4:1

Regional challenges of climate change adaptation: Grounding of national climate strategies in Finland

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Climate change adaptation presents a challenge on all scales of governance with action now being taken at the European level (European Commission 2009), at the national levels within countries (Swartz et al. 2009) and at the regional level (Risbey et al. 2009). Finland's national adaptation strategy was perhaps the first in Europe in 2005 (Marttila et al. 2005), but it has not yet rooted as an integral part of local and regional activity. As impacts of climate change are most acutely felt and addressed at the regional and local level, there is a need to understand the limits and barriers of designing and implementation of adaptation measures on these levels in order to improve the societal responses to climate change.

The aim of this paper is to focus on the regional level in Finland in order to identify the limits and barriers to regional implementation of climate change adaptation in a multi-scale governance context. In order to do this, the paper draws on several empirical studies on adaptation within the regions of Uusimaa and Pirkanmaa in Finland. The paper utilises qualitative data from interviews undertaken within the projects, as well as relevant policy documents and other material.

As a result, the paper highlights the problems of a project-based approach to adaptation that currently dominates regional approaches in Finland. One of the major problems in regional co-operation is that regional strategies are non-binding in nature. The weight of a regional climate strategy depends entirely on the extent to which the strategy is capable of drawing up cooperation towards adaptation and mitigation activities. This, too, has underlined the need for regional co-operation among civil servants and extensive political commitment to adaptation projects. Furthermore, many potential threats magnified by climate change such as flood events call for a regional and cross-sectoral approach but these are slow in forming because of the short term project cycles. Finally, a significant barrier at the regional level is the exclusion of regional level from the national level strategy that underlies the resourcing problems on adaptation, but equally importantly liability and financial questions that have only recently gone under re-evaluation.

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1:4:2

Climate change adaptation at the regional level in Norway: Status quo and challenges

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Background: Climate change mitigation (CCM) has recently become a mandatory part of planning in accordance to the planning and building act at the regional and local level in Norway. Various government measures have been launched to support regional and local CCM planning. Climate change adaptation (CCA), however, is a relatively new policy area, and CCA planning is consequently a new activity for the regional authorities (counties). The County Administration of Sogn og Fjordane has produced one out of very few climate action plans that boast a balance between CCA and CCM goals and measures, and thus serves as a front-runner example.

Method/approach: The paper will a) review the recent history of national

policies on CCM and CCA planning in Norwegian counties, b) present the results from recent surveys on the CCM and CCA work at the regional level in Norway, c) describe the process of drafting a climate action plan in Sogn og Fjordane County Administration, and d) discuss the importance of making stronger links between CCM and CCA in policymaking.

Results: Although almost all the counties in Norway have an updated CCM plan, few have comprehensive plans for CCA, or included adaptation in their climate action plans. As a result, CCA is either not handled at all, or CCM strategies tend to be discussed isolated from CCA strategies and vice versa. Even in action plans that do touch on both CCA and CCM, the two subjects are poorly integrated. Regional CCA action plans focus on gathering more detailed knowledge on local and regional climate change vulnerability, and fail to go into detail on adaptation measures. On the other hand, many mitigation strategies are presented in regional climate action plans, and some are highly relevant also in an adaptation context. The possible implications of such strategies for CCA are, however, not discussed.

Conclusion: CCA is still rudimentary as an issue in public planning at the regional level of government in Norway as compared to CCM. Very few examples exist on exploring the possible interactions between CCM and CCA policies. This is also true with respect to government incentives to support such planning.

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1:4:3

How is climate change addressed in municipal planning and why – observations from three recent comprehensive planning processes in the Stockholm region

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Background: Spatial planning is one of the many processes in society that will be affected by climate change. Across legislations, the responsibility for spatial planning varies. In Sweden, the exclusive responsibility for land use planning rests with the municipalities. The study reported here focuses on how the municipal comprehensive planning process deals with the new demands posed on it due to climate change and its possible effects – what evidence of integration of adaptation concerns can be found and how can such integration be explained?

Method/approach: A multiple case study approach is used in which municipal comprehensive planning processes in three municipalities in the Stockholm region have been studied in detail. The empirical basis for the study is interviews with officials and politicians responsible for comprehensive planning locally. Additional data is gathered from of planning guidelines and policies, as well as the actual municipal plans. An organizational learning framework is combined with institutional variables at the micro, meso and macro level to analyse the data. The micro level is concerned with eg. staff resources, training, time allocations and skills development. At the meso level, organizational procedures, management structures, systems of knowledge transfers, norms and incentives structures combine to institutional behaviour. The macro level is concerned with system linkages with the external context, linkages to the larger societal value system, norms and regulations and connections with the larger policy network of stakeholders.

Results: Important differences are found between the three municipalities, with responses ranging from weak and passive to strong and proactive. Event-related and case-specific factors are found to play important roles in triggering more elaborate approaches to addressing the effects of climate change, with institutional factors forming necessary but not sufficient conditions.

Conclusion: The study shows that adaptation to climate change has yet to find its rightful place in the municipal organisation and planning process. A general barrier to more systematic integration of adaptation concerns in spatial planning at the local level is the perceived lack of guidelines and support from the national level. Conflicts between known immediate exploitation gains and unknown long-term losses (in terms of increased vulnerability) tend to weaken the integration of adaptation concerns

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1:4:4

Baltic sea region climate change adaptation strategy – BALTADAPT

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The countries surrounding the Baltic Sea are all threatened and concerned by climate change. It will influence precipitation amounts and patterns, lead to an increase in terrestrial and ocean temperatures and a rise in sea levels. The resulting changes will jeopardize the integrity of the ecosystem and increase risks caused by natural disasters.

There are good experiences of adaptation in the region but they are somehow fragmented and do not acknowledge the fact that the Baltic Sea is a specific eco region. The EU BSR Strategy recognizes this problem by calling for a BSR-wide climate change adaptation strategy, which should provide a framework to strengthen cooperation and information sharing within the region and help to create a coherent set of adaptation policies and actions from the transnational to the local level. Such an overarching framework, which is badly missing, would help to tackle what the Operating Programme of the BSR Strategy has identified as a major weakness: the “lack of transnational co-operation and joint planning in usage of Baltic Sea space and in reducing the risks caused by natural disasters”.

BALTADAPT seeks to develop such a BSR-wide climate change adaptation strategy. This truly transnational strategy will focus on the sea itself and its coastline. While it is understood that such a strategy cannot be adopted by BALTADAPT, the project can ensure its preparation and clear the ground for its adoption. Complementing this main output, the project seeks to achieve the following results:

Improved knowledge base: A knowledge brokerage process between political decision makers and researchers leading to improved institutional capacity. The “Baltic Window” in the EU Clearinghouse shall be the hub for decision makers from the Baltic Sea Region.

Action plan: Providing the operational basis for implementing the BSR-wide Climate Change Adaptation Strategy and influencing policies, programmes and regulations. Together with the action plan, recommendations on funding mechanisms for financing climate change adaptation initiatives shall be given.

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Parallel 2:1 – The role of adaptive capacity

2:1:1

The ability of Nordic countries to adapt to climate change: Measuring adaptive capacity at the regional level

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Adaptation to climate change has become an increasing priority for policy makers with all the Nordic countries currently developing their adaptation policy responses. These national strategies have their focus on the national level with varying degrees of implications to the regional and local level. Simultaneously to the developments at the national level, regions, cities and municipalities are pursuing climate strategies as voluntary initiatives that most commonly include adaptation alongside mitigation. Regional and local responses to climate change impacts are considered to be crucial since they are likely to target specific vulnerabilities with regionally and locally acceptable and feasible adaptation measures. The ability of the region to respond to climate change to a large extent is determined by its adaptive capacity that consists of economic, social and political capacity, as well as infrastructure and technological potential.

So far, there have been a limited amount of studies measuring adaptive capacity of countries or regions in the Nordic countries. This study utilises an adaptive capacity indicator developed as part of a European wide vulnerability assessment in the ESPON Climate project and applies it to the Nordic countries. This indicator focuses on and measures the generic adaptive capacity of the regions at NUTS3 level in the five Nordic countries, and further illustrates the findings through maps of all the countries. The findings show adaptive capacity varies across regions in the case study

countries, and the paper finishes with a discussion on the implications of this for the Nordic countries.

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2:1:2

Moving beyond generic adaptive capacity: exploring the actual adaptation space of the Water supply and Wastewater sector of the Stockholm region, Sweden

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The paper examines the circumstances under which generic adaptive capacity of a system is translated into actual adaptation to climate change, what form it takes and what factors facilitates or restrains such processes. This is done by an in-depth analysis of adaptation to climate change in the Water supply and Wastewater (WW) sector of the Stockholm Region. Adaptations that can be observed are categorized in terms of building adaptive capacity and implementing adaptive decisions and these actions are analyzed using a model of the adaptation process based on organizational learning theories. In particular the concept of an organization's actual adaptation space is suggested as a way to understand the adaptation options that can actually be pursued by the different WW organizations making up the sector and why. The paper finds that most adaptation occurring in the WW sector of the Stockholm region is aimed at building the adaptive capacity of the sector although there are examples of implementations of adaptive decisions. The analysis shows that the adaptation options open to the WW organizations are conditioned principally by the ability to justify the additional resources adaptation to climate change requires. There are two main avenues for this: using knowledge on climate change to argue that adaptation is necessary and refer to rules and regulations to show that it is required.

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2:1:3

Local adaptive capacity to climate change: The electricity sector in Norway and Sweden

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Although adaptation to climate change often requires facilitating from top administrative level, the local level is important for the actual implementation of adaptive measures. Combined with the fact that the electricity sector is vital for society's basic functions, its spatial exposure to climate change invites inquiries about the adaptive capacity of the sector. This paper looks into local adaptation in the electricity sector in Norway and Sweden. More specific, we evaluate the adaptive capacity of local grid-companies in the two countries.

We start by assessing the awareness of climate change vulnerability and adaptation within two local companies, a small-sized and a large-sized, in both Norway and Sweden. The analysis includes important stakeholders. Together with what options for adaptations are regarded as feasible by the companies, we also look at the perceived scope and timing of adaptive measures.

This paper compares the four grid-companies by size and by country. We expect larger companies to yield higher level of competence, as well as more experience with weather incidents to accentuate awareness to adaptation to climate change. Despite general similarities between the two countries the electricity sectors have differences. Both sectors have experienced large structural change over the last 20 years and are part of the same market. However, the two countries have differences in regulatory regimes. It's therefore natural to expect differences in adaptive capacity between Norway and Sweden.

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2:1:4

Five metaphors for making adaptive water management happen – Lessons learned from seven NeWater case studies

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The EU FP6 integrated collaborative research project NeWater – New approaches to adaptive water management under uncertainty has done action research as part of piloting Adaptive Water Management (AWM) in seven case studies: Elbe, Rhine, Guadiana, Tisza, Amudarya, Nile and Orange. NeWater defined adaptive water management (AWM), as a systematic process for improving management policies and practices by learning from the outcomes of implemented management strategies. Five selected metaphors summed up lessons learned and gave insight into policy recommendations. The overall steps in adaptive management learning processes was illustrated as a double loop learning cycle. Adaptive management provides an added value to IWRM, by paying explicit attention to the wide spectrum of uncertainties that influence water management. However, when using AWM for large scale and complex river basins a number of challenges need to be properly addressed. First, water managers are urged to start by building capacity (the Lighthouse metaphor). The Lighthouse here signifies that strong leadership and entrepreneurship is needed, with broad support from institutions at all levels, where coordination is essential. Next, the Explorer calls for in depth scenario development, based on integrated approaches considering both the technical and social aspects, in the search for most appropriate innovations. The Academician underline that uncertainties must be explicitly recognized and that system thinking requires a strong scientific support which can lead to a thorough understanding of the current water system, the adaptive capacity of its actors, the environment, and cultural and socioeconomic settings. Based on this developed conceptual understanding of the system and its uncertainties the next step in active AWM is to dare to experiment, the Researcher, where experiments due to unpredictability needs to be applied to test identified pilots. Finally, the Nurturer highlights that water managers need actively to support or initiate the creation of 'bottom up' user associations. These appear to be crucial for implementation and adoption of viable pilots and for diffusion of novel innovations to the real world. Finally, merging these five metaphors together by their capital letters result in the word LEARN, which well communicates the need in AWM for applying iterative learning process, methods of analysis, management policies and robust practices, in long term adaptation planning.

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Parallel 2:2 – Adaptation and public health II

2:2:1

Heatwave in Stockholm 2030: Analysing impacts on heat-related mortality

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Background: It has been shown that heatwaves cause excess mortality. The 2003 European heatwave caused approximately 15 000 excess deaths in France. It has also been shown that hot temperatures significantly impact mortality rates in Sweden. In recent decades, the number of heatwaves has increased and a number of studies find an increased risk of more intense and longer heatwaves as a result of climate change.

Method/approach: The aim of this paper is to analyse impacts on heat-related mortality in the greater Stockholm. We do this by constructing meteorological analogous of the European heatwave for Stockholm. Daily minimum and maximum temperatures as well as the corresponding standard deviations for 15 consecutive days in Paris were identified. The standard deviations were transferred to Stockholm in order to construct an analogous heatwave: if for example the minimum temperature in Paris on the 2nd of August was 3 standard deviations above the average, then the minimum temperature in Stockholm on the 2nd of August would be 3

standard deviations above the average for the period 1961–1990. For this heatwave we then calculate the expected excess heat-related mortality for two population projections (high and low) for greater Stockholm in the year 2030.

Results: During the modelled heatwave the daily minimum temperature peaked close to 21 °C and the daily maximum temperatures reached more than 37 °C. The number of excess heat-related deaths was calculated to approximately 150 of which two third belongs to the elderly population aged 80 years or older.

Conclusion: An excess mortality of 150 might seem relatively modest compared to what was experienced in Europe in August 2003. However, compared to other weather related deaths in the Scandinavian region this is a large number that suggests that heat-related mortality should be considered seriously. This is furthermore underlined by demographical changes leading to a larger proportion of elderly people in the population.

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2:2:2

Effects of climate change on infectious diseases of importance for humans and animals

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Climate change (CC) will alter ecosystems and thereby influence the health of wildlife as well as of humans and domestic animals. These processes are continuous, progressive and a topic of immediate concern. The distribution and ecology of several species of pests, disease-causing microorganisms and vectors as mosquitoes, fleas, ticks or mites, may change. Thus, new patterns of transmission and distribution of diseases may occur. Globalisation facilitates arrival of new pathogens from “anywhere”, and CC may enhance their establishment in regions that were previously unable to support endemic transmission. The Asian tiger mosquito, *Aedes albopictus*, a multi competent vector has recently been established in Southern Europe and caused an outbreak of an exotic disease, Crimean-Congo Haemorrhagic Fever. Recent models predict a distribution change of this vector north to Stockholm within 30 years. In Sweden the common tick, *Ixodes ricinus*, has changed its distribution and density.

Most vector-borne diseases (VBD) are zoonoses thereby having the ability to infect both humans and animals. Environmental conditions as temperature and humidity are essential for the presence of VBD. The complexity of vectors, their mammalian or avian hosts and the microorganisms life cycles make the success and dispersal of VBD difficult to predict and control. Wildlife is important as a disease reservoir and plays a major role in regulation of the natural abundance of microorganisms. Biodiversity decline increase ecosystem vulnerability. Hence, protecting biodiversity may be advantageous for human and animal health. Conclusion: Rational strategies, multidisciplinary knowledge and international cooperation are needed to understand the complex and dynamic interaction between CC, ecosystems and infectious diseases. Moreover, vector-monitoring and control routines must be further developed. Early actions are essential for successful disease control and eradication. Increased knowledge regarding effects of CC on disease-transmission may be used to forecast, and prevent future epidemic and epizootic threats.

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2:2:3

The gender perspective in climate change and health

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Background: The World Health Organization (WHO) defines health as a state of physical, social and psychological well-being. Population health is a primary goal of sustainable development. When working for a sustainable world, the gender perspective is important. The United Nations international conferences, like Beijing Platform for Action, have highlighted the key role of women in ensuring sustainable development. Educating and empowering women has shown better health outcomes

and improved health status for the entire family in all parts of the world. In the context of climate change, women are hit the hardest, but they display knowledge and skills to orient themselves towards climate adaptation activities within their societies, which is hardly comprehended in general. Due to disproportionate impact in developing countries and on less favored populations, the relationship between the three terms – climate change, health and gender, becomes even more significant for exploration, especially in relation to the achievement of Millennium Development Goals.

Method/approach: A descriptive study with a broad literature search was undertaken using databases like, Pubmed and Web of Science; hand searching of journals; and retrieving reports from WHO online library to grasp what has been published so far on climate change, health and gender.

Results: The results from this inquiry showed few articles when the three terms, are searched together. The publications from WHO treated gender as a separate issue rather than emphasizing the need for mainstreaming gender into climate policies.

Conclusion: The overall aspiration is to generate awareness that despite recognizing the differential effects of climate change on health of women and men as a consequence of complex social contexts, the gender is still an underrepresented variable in strategic planning and policy making on climate change and health. If these policies are not designed at each level (local or international) to integrate a gender perspective, they would reach only half of the world population.

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Parallel 2:3 – Infrastructure and technology

2:3:1

Adapting the Danish building stock and urban environment to climate change

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Buildings are important and play a vital economic and social role in society. They are very vulnerable to climate change and it is therefore an important issue to reduce CO₂ emissions from the building stock; another important issue is to adapt the building stock to the challenges of the future climate. It is important to preserve the value of the building stock through adjustment to future performance-based building requirements, as important buildings have been for centuries. However, in the future, adaptation is expected to be dictated by climate change in contrast to the past when the building stock was dictated by the need for protection. The adaptation needed is strongly related to the climate change expected. Many resources have been spent to define data on the impact of climate change that are relevant for the building sector and more are needed as assumptions change over time. Available emission scenarios from SRES [Nakiænoviæ, N. et al., 2000: IPCC Special Report] include A2 and B2 [PRUDENCE ,2005], and EU2C scenario [Danish Government, 2008, Danish Strategy for adaptation to a changing climate] are used for describing the climate change expected in Denmark leading up to year 2100. The impact of climate change on the built environment is unknown and also the uncertainty on the individual parameters for example for temperature, precipitation, wind speed, atmospheric humidity, solar radiation and soil moisture. In addition, the consequences of climate change on the existing built environment are not known either, as the vulnerability of the existing building stock has yet to be investigated. The presentation will discuss relevant climate parameters for Denmark including the change in mean year values, as well as the extent of maximum and minimum extremes. Cases will be presented that show climate adaptations carried out on the Danish building stock and specific design solutions will be described. Solutions related to individual buildings as well as solutions involving the built environment will be shown.

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2:3:2

Decision tools for sustainable adaptation planning in the drinking water sector: a case study from Botkyrka municipality

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Decision-making concerning adaptation to climate change often involves choosing between different options. Each option can stand in either supportive relation to other goals and policies, thus creating synergies, or a conflicting relation obstructing the realization of those goals. To avoid producing negative impacts on other goals – goal conflicts – local decision makers must have a good understanding of the long- and short-term (environmental, economic, social and ethical) consequences of their decisions. In the Climatools research programme (www.climatools.se) a decision tool – “Adaptation Sustainability Analysis” – has been developed with the aim to help decision makers identify and evaluate goal conflicts that arise in local adaptation work. The tool consists of a simple checklist and a user’s guide. The checklist has two parts. The first part consists of a questionnaire aimed at identifying (environmental, social/ethical, and economic) consequences of different adaptation options and potential goal conflicts therein. The second part consists of monetary valuations of the most important costs and benefits of the different options. A prototype of the tool was tested in a workshop concerning adaptation in the drinking water sector in the municipality of Botkyrka. In Botkyrka, a regionally valuable ground water aquifer is located – the Tullinge water source. Today, the water source supplies 15 000 people. The risk of disruption of water supply is expected to increase in the future as climate changes. Through an application of the prototype, the participants in the workshop were instructed to evaluate three types of adaptation strategies relating to Tullinge water source: “defend” (involving technical, planning and regulatory adaptation measures), “wait-and-see”, and “retreat”. Preliminary results from the workshop are presented and discussed.

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2.3.3 – see page 30

Parallel 2:4 – Social issues in adaptation

2:4:1

The politics of local adaptation

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Local social processes and practices influence responses and adaptation to climate change, along with national policies and international developments. This paper investigates the politics of local adaptation to multiple stresses, including climate change, in the municipality of Øystre Slidre in Norway. The study of this mountain farming community is based on nearly 90 key informant and household interviews. The example of an ongoing planning process in the municipality addressing a plan for responses to climate change and a long-term plan for land-use and future development is used as a case study to explore the politics of local adaptation. The material reveals a situation of competing interests both within and between groups of local actors, including local politicians, land owners, farmers and entrepreneurs involved in the local tourism industry. Many struggle to promote their interests and contribute to the future vision of their community, through confrontation and various forms of collaboration in informal networks or formal institutions. At stake are the visions for adaptation to climate change, the future of local agriculture and tourism, and ultimately the quality of life for local inhabitants. As some actors are more powerful and influential than others, some voices

are listened to and favoured over other values and interests which are not taken into account in the same manner; the tourist sector, along with short- and medium-term economic gains, are most readily favoured in the debate. It remains to be seen how the planning process evolves, but if this tendency continues the politics of local adaptation in Øystre Slidre may undermine adaptive capacity to climate change. Thus, adaptation entails a political process, where different priorities and interests are expressed and negotiated by actors of unequal power relations, affecting the potentials of and limits to adaptation in a locality.

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2:4:2

Perceptions of climate change among reindeer herding Sami in Sweden

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Background: The Arctic area is a part of the globe where the increase in global temperature is large and early noticeable, influencing the society in different ways. The indigenous peoples live closest to nature and are amongst the first ones to be affected. In northern Canada and in Alaska this is a fact. Sweden, being a part of the subarctic region, might experience early changes as well, probably influencing our indigenous people, the Sami.

Methods: A qualitative study was designed, involving interviewing Swedish reindeer herding Sami. The project was first made sure to have the support of the Sami Council. The sampling was purposive, using both so called snowballing and recommendations from the chairmen of the Sami villages. The interviewees were geographically distributed throughout all of Swedish Sápmi. In-depth interviews were conducted with 11 male and 3 female reindeer herders. The questions asked were open, concentrating upon what the reindeer herders had experienced in terms of climate change, what consequences they had seen and what they thought about it. The interviews were transcribed in verbatim and analysed using content analysis.

Results: The analysis of the interviews is being performed and will be finalized during the autumn 2010 and preliminary results will be presented at the meeting.

Discussion: By studying how indigenous people perceive and handle climate change we can understand more of what is happening and its consequences, thus being able to feed back the results to the studied target group. The study can give knowledge being useful for adaptive actions, also for other parts of the society. Preferably the study can be extended to the whole of Sápmi including Norway, Finland and Russia, to better understand how different regions of the same culture perceive and adapt to climate change.

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2:4:3

Social impacts of climate change and climate adaptation in Finnish rural areas

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The paper introduces results from just finalized project, which was part of the Finnish national research programme for climate adaptation (ISTO). In Finland, the climate change adaptation has been until now studied mainly from the perspectives of environment, economy and infrastructure. There is a clear lack of studies which concern the social and community dimensions of climate change adaptation. These questions refer to concrete impacts in the people’s everyday life, cultural and social practices and community capacities for future changes. The target of the project was to study how rural areas are affected by climate change and climate adaptation policies and what kind of social and community impacts there possibly exist. Research tasks were the following:

- 1) How we should analyse and make typologies about the social impacts of climate change and adaptation into it.
- 2) How climate impacts are understood in rural areas of the county of Varsinais-Suomi (land use practices and natural resource usage).

3) How and through which mechanisms these impacts are intertwined to people's everyday life, welfare, and future expectations (social impact mechanisms).

4) Who are relevant actors concerning the social and community impacts? The research approach was based on futures studies and social impact studies. The main method was argumentative delfoy method (with 15 experts from various areas of rural development, the focus area was countryside in the county of Varsinais-Suomi in Southern Finland). The main results concern the questions of vulnerable population groups, livelihoods and areas; relevant dimensions of social impacts; and relevant actors for coping the difficult situations (such as floods and storms) and other future problems.

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2:4:4

Framing and scaling of environmental perspectives in the negotiation over petroleum development in the Lofoten and Vesterålen region

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The intersection between environmental issues and petroleum production in Norway has been sparked by the recent blowout in the Gulf of Mexico and the scalar dynamics of the antagonism between environmental issues and petroleum development more broadly. The antagonistic dynamics ranges from the framing of climate change as a global security issue, to environmental security debates at the national policy level, which for producing countries, such as Norway, have to deal with where the 'limit' for petroleum production is being set, both geographically and politically (i.e. mitigation policies and ecological, human and societal risks). These concerns are often weighed against the short and long term economic benefits for the nation state, as well as the future security of the livelihoods and traditional industries that are directly affected from such developments. The most pressing issue in Norway is whether to open for coast near petroleum development in the fishing dependent Lofoten and Vesterålen region. Debates about the future of these island groups with regards to petroleum development, located just north of the polar circle in Norway, have caused much controversy both in the region and at the national level. This paper will discuss the scalar dimensions of knowledge and policy production and security conceptualization with a bottom up approach. The data presented is based on fieldwork in the region in the context of an ongoing national policy process.

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Parallel 3:1 – Flood risk management

3:1:1

Flood hazard and climate change: Reactive and proactive approaches

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Background: The paper is based on the Civilclim project (2007–2010), funded by the Norwegian Research Council. Vulnerability to flood damage is expected to increase due to climate change (new precipitation patterns, rising sea level, higher storm surges), as well as societal factors (location of infrastructure and accumulation of economic values in flood exposed areas). The structure of the civil protection institutions and their underlying strategic approaches that form the flood prevention work, will influence future resilience towards flood damage.

Method/approach: Comparative case studies of extreme weather management and the relationship between reactive and proactive flood

prevention strategies within the civil protection system in three Northern European harbor cities (Rotterdam, Malmö and Bergen). With 'the civil protection system' we understand bodies at local level within crisis management, water authorities and land-use planning.

Results: The study of the civil protection system's handling of flood hazard and climate change challenges, reveals a gap between the reactive and proactive lines. The first is dominated by the operational civil protection institutions, which tend to prepare for crises under today's climate conditions, whereas the other characterizes strategic-oriented units, foremost the environmental departments that deal with both mitigation and adaptation policy. In Rotterdam and Malmö the gap between the two lines remains to be bridged, while the development in Bergen shows examples of proactive adaptation policy being anchored in operational departments as well.

Conclusion: Although climate change adaptation has been high on the agenda for many years, much of what is taking place when it comes to concrete adaptive action is adaptation to today's climate. Furthermore, much of the adaptive action relating explicitly to climate change, is in most cases looking only at the vulnerabilities shaped by possible changes in climatic conditions without taking societal change into consideration. Thus, it is important to distinguish between climate adaptation and climate change adaptation. The latter requires systematic use of scenarios. In doing so, it is important to make scenarios for both climate and societal change, in order to mitigate possible vulnerabilities shaped by climatic changes, unfavourable trends in society and possible interactions between the two dimensions.

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3:1:2

Climate adaptation where rivers meet the sea – the Stockholm and Gothenburg examples

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1. Introduction

Coastal cities are normally located where rivers meet the sea. This makes them particularly vulnerable to climate change. The picture is complex, as exemplified by the planned restoration of the outlet of Lake Mälaren in Stockholm and the River Göta älv – Gothenburg system. These are the two largest metropolitan areas in Sweden.

2. The Stockholm-Lake Mälaren example

In Stockholm the safety of the fresh water reservoir for two million people is at stake, as well as flood protection for Stockholm and several inland cities. You may think that the rate of uplift of land after the last glaciation will save Stockholm, but recent research tells a different story. The very long record of sea levels from Stockholm shows that the long term trend caused by land uplift now is broken.

3. The Gothenburg-River Göta älv example

Still more complex is the situation in the River Göta älv system including the city of Gothenburg. Here we are facing new risks for rising sea levels in an area already at risk today. Along the geologically unstable River Göta älv flood risks may increase at the same time as we need better possibilities to release water from the flood prone Lake Vänern, the third largest lake in Europe. A critical situation in 2000–2001 confirmed that the situation is unacceptable all the way from the sea to the inland city of Karlstad. Most available regional climate simulations indicate aggravation of the problems with a warmer climate.

4. Ongoing adaptation work

The presentation will focus on adaptation work in the two metropolitan areas as it is carried out in close co-operation with decision makers. It includes the use of climate scenarios, estimates of future sea levels and new regulation strategies for the lakes to adapt to a changing climate and future societal conditions.

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3:1:3

Three Points Approach (3PA) for urban flood risk management: climate change adaptation through transdisciplinarity and multifunctionality

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Background: Urban flood risk is increasing as a consequence of climate change and growing impervious surfaces. Increasing complexity of the urban context, gradual loss of tacit knowledge and decreasing social awareness are at the same time leading to inadequate choices with respect to urban flood risk management. The European Flood Risk Directive sets clear requirements and emphasises the need for non-structural measures aimed at urban resilience and social preparedness.

Method/approach: The Three Points Approach (3PA) provides a structure facilitating the decision processes dealing with urban flood risk management (UFRM). It helps to accept both the relational and functional complexity of the urban context and promotes transdisciplinarity and multifunctionality. The 3PA introduces three domains wherein water professionals may act and where aspects valued by different stakeholders come into play: (1) The technical optimization domain, dealing with standards and guidelines; (2) The spatial planning and urban design domain, to make the urban area more resilient to future changing conditions; (3) The day to day values domain, to enhance support among the stakeholders and increase public awareness. Based on interview campaigns conducted in The Netherlands and Denmark we describe the complexity of decision making in practical UFRM and explain how the 3PA can be used when dealing with it. Three levels of knowledge (micro-meso-macro) are introduced to help understanding the mechanisms driving the complex adaptive systems characterizing urban areas from the perspective of each domain defined by the 3PA.

Results: The use of the 3PA in practice has proven it to be a communication tool that allows maintaining a direct connection with the complexity characterising reality. It allows water professionals to address the relational complexity characterizing UFRM in a pedagogic manner thus facilitating the organization of decision making in a transdisciplinary process. Multifunctional solutions are an expected outcome of transdisciplinary processes organized with the 3PA. Multifunctionality address the functional complexity of the urban area and thus creates higher probability for consensus in a decision making process where many stakeholders are involved.

Conclusion: The 3PA is an efficient tool to give form and context in practice to the European Flood Risk Directive when designing local strategies for urban adaptation to climate change.

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3:1:4

Civil protection and climate change impacts in the Netherlands: local risk perceptions and actions

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Background: Being a delta, half of the Netherlands territory is vulnerable to flooding risk. Next to large parts of below-sea-level-territory facing sea level rise and heavier storms, substantive parts are exposed to an increasing river flooding risk due to rising precipitation quantities – it already happened two times at the closure of the last century. Heavier rains will also affect the inner city water systems. This article discusses how the local civil protection system in the Netherlands responds to these increasing flooding risks in terms of risk perception and action. Recently, the Dutch civil protection system was transformed into 'safety regions' that combine the operational emergency services and the municipal tasks regarding safety and security.

Method/approach: This paper presents data that suggests that a minimum level of climate change risk awareness is present at the local level and that proactive action from the civil protection system is exceptional. Our research covers three Safety Regions, Rotterdam-Rijnmond ('maximum' flooding risk), IJsseland ('medium' flooding risk) and Twente (no flooding

risk). A qualitative case study in the Rotterdam area and a quantitative survey among 25 municipalities in IJsseland and Twente was applied to investigate the effect of climate change risk on the civil protection practices. **Results:** Our study of three Safety Regions revealed that so far increased flooding risk from climate change does not have changed the civil protection practices. Furthermore, the Rotterdam-Rijnmond Safety Region does not use climate-change scenarios in its preparations and appears to prepare primarily for 'regular' incidents and disasters. Risk perception plays a key role in explaining this gap, as climate change risks are considered too distant and too broad to be covered by the civil protection system.

Conclusion: Our conclusion is that the civil protection system in the Netherlands is not (yet) preparing for climate change risks due to a limited perception of these risks.

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Parallel 3:2 – Decision tools and frameworks

3:2:1

The question of when to adapt: developing a framework for optimal timing of climate change adaptation

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Background: There is an ongoing debate over how important reduction of uncertainty over future climate is for practical decision-making. While some scholars hold accurate and reliable climate predictions as an urgent need in adaptation planning, others argue either that adaptation is not significantly limited by the lack of precise climate projections or that one should rather look for alternative frameworks able to cope with deep uncertainty.

Method/approach: In this paper we develop a framework for flexible adaptation planning by applying real options theory. Real options theory is an approach for coping with decision-making when there is i) uncertainty over the future development, ii) partially or complete irreversibility and iii) a possibility of postpone actions in order to learn more over time. The key characteristic of our framework is the utilisation of real options theory for addressing the question of when there is enough information to execute an adaptation measure.

Results: The framework permits the calculation of the optimal timing of adaptation measures. This is illustrated via a simple model: The decision problem is whether to execute an adaptation measure now or wait for more information. If deferring the decision more information will be available, but on the other hand there are risks associated with not having the benefits of the adaptation measure. The reduction of uncertainty over climate impacts is modelled via simple decreasing patterns (linear, progressive).

Conclusion: When an actor makes an irreversible decision over an adaptation measure it gives up the possibility of waiting for new information that might affect the desirability of the decision. This lost option value is an opportunity cost that should be included in the valuation of the adaptation measure. The key property of the presented framework is that it takes into account 'the value of waiting to adapt'.

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3:2:2

Decision making framework for climate change adaptation in Denmark

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Climate change impacts and adaptation in Denmark have been addressed in a number of individual projects for aquatic systems, water management, urban areas, agriculture, infrastructure, and other areas, but a comprehensive decision making framework that can be used for comprehensive national and local adaptation planning has not yet been developed. The aim of the Centre for regional change in the Earth system (CRES) is therefore to develop an integrated assessment of climate change impacts and adaptation in Denmark including hydrological, biological, coastal, and urban areas through soft linked modeling and policy analysis considering uncertainties, risks, costs, and other impacts. CRES includes

a number of case studies related to sea level rise, river catchments, biosphere and agricultural impacts, and water management in urban areas. In these contexts, a risk management framework is developed and tested. The framework integrates physical information and costs, and will be used to assess scenarios involving extreme events, tipping points, and their economic impacts. Based on this, specific guidelines will be given for risk-based design of assets and for nature preservation policies. The presentation gives the general idea and content of the CRES decision making framework and discusses the approach in relation to experiences from recent flooding events in Danish urban and coastal areas leading up to recommendations about climate proofing of water management.

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3:2:3

Adaptation tools in practice at the local level – Experiences from applying a LCLIP (local climate impacts profile) on three Swedish municipalities.

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Background and method/approach: The method Local climate impact profile (LCLIP) developed for and used by foremost municipalities in the UK was modified and used in three small Swedish municipalities in Southern Sweden. The municipalities in our study face similar challenges regarding climate change and share similar status regarding strategic climate change adaptation work (just starting). An LCLIP is supposed to inform on current vulnerability to weather and climate thereby improving the preparedness to expected changes. An LCLIP involves a media trawl of local press to make a catalogue of recent weather related local impacts, interviews with local officers at different departments to deepen the understanding of these events, and efforts to communicate results within the municipality.

Results and conclusions: Overall and preliminary results are that the method was easy to modify and apply on the three Swedish municipalities and that the results of the LCLIP, including the process itself, were appreciated by officers in the municipalities. Possible uses of results mentioned by officers are: inputs to the planning process, as part of an adaptation plan and possibly as a prelude to a risk and vulnerability assessment. Several common aspects of the municipalities seem to warrant modification of the original LCLIP into a Swedish version where interviews focus on types of weather events and their consequences rather than on specific dates when they occurred and where emphasis is also put on making an inventory of adaptation ideas. When comparing between the three municipalities, we found similarities and differences in vulnerability with respect to intense rain, coastal erosion and heatwaves, differences that seem to be attributed to variations in infrastructure, locations and organization. Proposals for further methodological development is to focus on specific weather events such as flooding in a regional perspective, to carry out a full-scale LCLIP in several municipalities as a basis for a regional adaptation plan and to use GIS in the LCLIP process.

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3:2:4

Designing and applying a toolbox for adaptation to climate change

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Many frameworks and methods for assessing adaptation have been developed by the scientific community over the last 20 years, yet these have not generally been adopted in the context of formal adaptation policies in Europe and elsewhere. Reasons and problems have been among others (i) a fragmentation of methods and tools, (ii) a lack of linkages to actual policy needs, (iii) a lack of understanding and communication of uncertainties, (iv) the often expert-based nature and complexity of methods used versus actual user demands, and (v) a lack of consistent data, definitions and metrics.

We report on research conducted in the EU FP7 project MEDIATION, where we systematically address those critical issues by developing and applying a toolbox, defined as a set of models, methods and metrics geared towards the assessment of impacts and vulnerability and adaptation options.

Compared to integrated assessment modelling, we distinguish a toolbox as a looser and less integrated set of methods, metrics, and data helping experts and “lay” users alike address a number of key adaptation problems. The toolbox is applied to salient adaptation problems of different nature and complexity dealing with different hazards (slow and sudden onset), various types of adaptation (planned and autonomous, private and public sector) as well as a range of uncertainties (epistemic, aleatoric, model and data uncertainties). We report on the progress made and problems encountered during the first iteration of work leading to a toolbox prototype, which is applied to 5 regional case studies of MEDIATION.

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Parallel 3:3 – Adaptation at the municipal level

3:3:1

Approaching climate change adaptation in Swedish spatial planning practice

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In December 2009, the Swedish Association of Local Authorities and Regions (SALAR) presented results from a national survey on to what extent Swedish municipalities are approaching climate change adaptation in their spatial planning. Compared to most previous studies a more optimistic picture was drawn on municipality responses to our changing climate. The survey showed that nine out of ten of the responding municipalities (the response rate was 200 out of a total of 290 municipalities) claimed to be working with climate change adaptation in spatial planning and every fourth municipality stated that they are approaching adaptation to a high degree. At the same time the results give little indication of what the high degree stand for and how these municipalities concretely approach adaptation in spatial planning practice.

In the presentation I will report some initial findings from a study on planning for climate adaptation in the ten Swedish municipalities who in the SALAR-survey state that they approach climate change to a high degree in 1. master plans, 2. detail plans and 3. recommendations for planning and building. The study is conducted between September and October 2010 and is based on document analysis (master plans, detail plans and recommendations for planning and building) and interviews with local planners. The presentation will focus on what concrete steps towards a more proactive climate change adaptation is taken in spatial planning practice in the ten Swedish municipalities and how climate change is accounted for or not, e.g. in terms of determining robust safety-margins for waterfront planning.

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3:3:2

Climate adaptation in the Danish municipalities

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The national strategy for climate adaptation in Denmark has left it up to the municipalities to take action autonomously, which means that the Danish municipalities have approached the task in widely different ways. While some municipalities have not yet considered climate adaptation, others have already implemented a number of measures. Based on a review of literature and practices, a workshop with climate researchers and a workshop with representatives from Danish municipalities we have produced a thematic catalogue of the most important topics to address in order to adapt to climatic changes. These topics are divided into four themes: Mapping and analysis of effects of climate change, strategies and plans, implementation, and cross cutting topics such as e.g. collaboration and knowledge management. This thematic catalogue has been the basis for a qualitative analysis of the efforts of the Danish municipalities to adapt to climate change. The analysis has involved a screening of a quantitative survey by the Danish Energy Agency, a qualitative analysis of ten municipal climate adaptation strategies, and interviews with planners and utility

companies from five municipalities who are at the forefront regarding climate adaptation in Denmark.

Generally, management of water is by far the most important issue when adaptation is addressed. The municipalities which have made the most efforts to adapt to climate change have been motivated by concrete flooding events in the recent past, obvious threats to municipal values and/or political focus. However, the municipalities inquire for the State to address climate adaptation more specifically at a national level: The interviewed representatives of municipalities ask for better legal instruments in order to improve the possibilities to regulate and encourage private climate adaptation efforts and the necessary collaboration between neighbouring municipalities. And they ask for mapping at local level from the State of expected climate effects in particular related to flooding threats.

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3:3:3

Setting adaptation to climate change on the municipal agenda in Norway

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The difficulties associated with implementing local-level adaptation to climate change are well-documented. Preconditions for achieving implementation have not been explored to the same extent. This paper examines the preconditions for setting planning for climate change adaptation on the municipal agenda.

The absence of clear top-down signals from the state provides an opportunity to investigate the factors which have led some municipalities to address adaptation to climate change. Based on in-depth interviews and interaction with eight Norwegian municipalities that have put climate adaptation on the agenda, we ask why some have managed to start working with climate adaptation in the two-year period of our study. We examine how the issue was put on the municipal agenda and draw connections between the agenda-setting process and what the municipalities have achieved in terms of implementation and mainstreaming of adaptation planning.

Two key preconditions for implementing adaptation measures are the existence of engaged officials acting as issue proponents, and a capacity to handle non-mandatory tasks. Adaptation is not likely to progress in Norwegian municipalities lacking these features unless external conditions such as national adaptation policy, resource allocation or legislation undergo change.

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3:3:4

Helsinki metropolitan area adaptation to climate change strategy – how to build a relevant and usable strategy?

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The Helsinki Metropolitan Area has a climate change mitigation strategy in place but it is also widely acknowledged that the cities of the area need to prepare for the consequences of climate change as well. Therefore, the four cities and HSY Helsinki Region Environmental Services Authority started in 2009 a joint effort to prepare an adaptation to climate change strategy for the area. The strategy is to be completed by the end of 2011. The preparation work is coordinated by HSY and supported by two projects: Julia 2030 (www.julia2030.fi) and BaltCICA (www.baltcica.org). The focus of the strategy is on urban and built environment and it mainly concentrates on impacts and measures that require cooperation between the different sectors and/or cities, or cross sectoral, administrative or geographical borders. In order to achieve real changes on the ground, however, the measures and policies need to be implemented. An essential requirement for implementation is that the strategy is useful and relevant to the cities and deals with concrete impacts and risks of climate change in the area. It is therefore important to involve the city planners and experts that deal with practical adaptation issues in their everyday work in the planning

process. In addition to the workshops for planners, we also interviewed experts representing several sectors at the city and regional levels about their experiences with weather-related events and the existing plans and measures in the cities to cope with impacts of climate and weather applying the LCLIP-method (Local Climate Impacts Profile) by the UK Climate Impacts Programme. In addition to the more bottom-up approach of involving planners and experts, also a top-down approach is necessary to ensure successful mainstreaming of the strategy in the cities. For this aim, the adaptation strategy has a steering group consisting of higher level civil servants representing different sectors and cities of the Helsinki Metropolitan Area. An important task of the steering group is to ensure that the strategy will be adopted in their organisations. The decision makers also play an important role in mainstreaming the strategy. Hence gaining political approval is a prerequisite for the effective and successful implementation of any strategy in the cities.

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Parallel 3:4 – Participatory adaptation research

3:4:1

Institutional aspects of adaptation – participatory approaches in Nordic cities and sectors

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To successfully implement adaptation measures to reduce vulnerability to climate changes, and/or to exploit possible advantages and positive impacts, several factors need to be present and certain levels of individual and institutional features are required. Several studies have shown that top-down approaches and knowledge provision are not sufficient but need to be complemented with bottom-up processes in order for climate adaptation to become prioritized. Also, the many interacting driving forces that contribute to both the problem and solution need to be recognized and understood. Many research projects are now occupied with furthering the understanding of these factors and their critical levels. However, since climate adaptation is often local and context-bound there is still a great need for determining what factors are generic, what situations and regions are comparable and what results are general, specific or anomalies. In this paper we will present findings from several studies performed with the same basic methodology and specific techniques that justifies a comparison and some general lessons learnt on the institutional aspects of climate adaptation.

In this study we have used participatory methods and tools in focus group settings with stakeholders responsible for the implementation of adaptation measures at various levels in regions, cities and sectors in the Nordic and Baltic region. The purpose has been twofold: (i) to test participatory tools for climate adaptation; and (ii) to investigate the institutional aspects that create obstacles and/or opportunities for effective sustainable adaptation measures.

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3:4:2

The role of scientific knowledge in stakeholder deliberations on local climate adaptation: Two case studies in Sweden

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Over the past decade, the global climate change debate has increasingly been transformed into mitigation and adaptation action by policymakers and public and private actors. Sweden has often been considered a pioneering country in terms of mitigation efforts, while the country's adaptation policy agenda is still in its infancy. Considerable progress has however been made, which is evidenced by the recent appointment of climate officials in Swedish County Administrative Boards with dual responsibility for mitigation and adaptation policy issues, a growing number of web pages on climate adaptation issues, and adaptation

responses in municipalities notably in southern Sweden. However, for stakeholders engaged in adaptation efforts there is still much uncertainty regarding what climate change impacts are to be expected in their localities, how various sectors will be affected and what are the most effective and cost efficient adaptation responses in their sectors. While scientific information is widely recognized as one key source of knowledge for decision support, it is less understood what kind of knowledge is needed and how it should be communicated to users. This paper highlights the role of scientific knowledge in stakeholder deliberations on climate adaptation efforts in two case studies in Sweden, a horizontal study of the Stockholm region, as well as a vertical study of the forestry sector. Preliminary results from a series of focus groups are discussed, centering around two dimensions: 1) Stakeholder needs and perceptions on usefulness/user friendliness and modes of communication of scientific results; and 2) Perspectives on climate and impact model results and implications with regards to risk perceptions and adaptation needs. Apart from focusing on the stakeholder dimension, in taking a trans-disciplinary approach the paper highlights some challenges and opportunities for climate and impact scientists to meet stakeholder requirements as well as the relevance of stakeholder feedback to scientists.

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3:4:3

Testing the combination of natural science and economic information for adaptation purposes within a deliberative framework

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Background: Getting better prepared for extreme weather circumstances is more and more acknowledged by public authorities as being an indispensable part of climate change adaptation planning. If the considered class of extreme weather events is adequately delineated, the impact pathways are reasonably well known (at least qualitatively), and the consideration of countermeasures is to be part of the assessment, event tree analysis is an applicable approach. Event tree analysis lends itself well for stepwise improvement within the context of a deliberative stakeholder approach.

Approach: In an explorative Finnish study IRTORISKI ('Loose Risk'; a co-operative study of 3 institutes) event tree analysis is elaborated as to allow for different ways of cost-effectiveness analysis of adaptation alternatives. In this case cost effectiveness can include direct costs of damages, reduction of these direct costs, and investment costs of counter measures, but also overall induced economic effects of mitigated and unmitigated impacts of extreme events. Furthermore, also non-monetised effects can be included, such as effects on public health, social and environmental justice, and on local nature values. The inclusion of these non-monetised effects would either imply a transition to a multi-criteria analysis or monetization of all other effects. In both cases weight and value attribution would be part of the stakeholder involvement process.

Study steps: In the explorative study a series of interactive expert sessions is organized. In the first session the stress is on case definition and problem delineation. In the second session preliminary calculations of direct and induced economic effects of various cases (with variation in assumptions regarding insurance coverage etc.) are reviewed. In the third session new calculations, made on the basis of the feedback of session 2, are reviewed, whereas also extension towards non-monetised impacts is explored. The reviews in sessions 2 and 3 should also show how various public decision makers weigh effects against each other and what changes in results makes them to reconsider priorities.

The study requires advanced information regarding (climate change induced changes in) frequency and intensity of cloud bursts and river system flooding, direct cost estimates per event type, modeling of induced economic impacts and recovery, and case wise appreciation of the effectiveness of single and combined measures.

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3:4:4

How to provide and disseminate scientific knowledge for decision making – the Danish Experience

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Background: "Coordination Unit for research in Climate Adaptation" (KFT) was established in 2008 with reference to the Danish National Adaptation Strategy (NAS) with focus on national and international climate change adaptation research and the task to provide authoritative data, maps, and other scientific knowledge of relevance for a societal adaptation to climate change presented on a web based governmental climate adaptation portal. **Approach:** Establishing an information flow from the scientific community to the society through a national web-site raises a number of fundamental questions and dilemmas such as:

- 1) what type of information is requested by society vs. what is offered by scientists?
- 2) How do we provide the relevant scientific results?
- 3) What criteria should be used for selection of data, scenarios and knowledge to be communicated?
- 4) What criteria are needed to appoint data to be "authoritative"?
- 5) How to address new findings inconsistent with information appointed to be authoritative?
- 6) How to communicate limits and uncertainties linked to the scientific information?
- 7) How to use scenarios and data in developing new tools and guidelines for decision making? These are all complex issues that demand a thorough dialogue among scientists and stakeholders, experts, decision makers, and citizens.

Here we present how KFT interacts in this dialogue and based on examples from our current activities we will address the above mentioned questions.

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Parallel 4:1 – The institutional context of local adaptation

4:1:1

Planning for climate change in urban areas

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This paper will focus on the complex process of climate change adaptation in cities. Urban planning and development is characterised by a maze of public and private actors with various and often crossing interests and goals. As people in cities live close and use the same infrastructure, neither individuals nor organizations can adapt unilaterally. In order to ensure good adaptation these actors need to be coordinated, and this makes urban adaptation a complex task. We have studied how the actions of all these actors are coordinated by different coordination mechanisms; through hierarchical regulations, through the price mechanism of the market and through discussion and bargaining in voluntary networks. Based on empirical research in five Norwegian cities, we will focus on how these different coordination mechanisms facilitate or hinder adaptation to climate change. Specifically, we will focus on how these coordination mechanisms

affect the way differing interests and goals are communicated, negotiated and eventually articulated in urban planning. National government has been slow in integrating adaptation measures in national policies, and we find that local interest, often based on particularly interested individuals, are important for integration of adaptation measures in local urban planning. The market is also slow since developers get few incentives from house buyers to change their practice. Networking between cities seems to be important for facilitating learning and has resulted in growing awareness and search for new solutions in local governance. We also find that that professional standards and learning among architects and engineers are important, and particularly interested individuals take the lead in this. Thus values and norms are important for the social process of adaptation in urban planning.

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4:1:2

Knowledge networks for local adaptation in the Stockholm region: Challenges of multilevel governance

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Adaptation to climate change is often perceived as a local concern, yet local stakeholders are influenced by both knowledge and politics that have their origins in larger contexts. Based on interviews conducted in the Stockholm region, Sweden, this presentation highlights the knowledge networks of local civil servants and how they are linked to activities at other levels of governance. While climate information often aims to increase the general level of awareness, these results illustrate the central role of formal political and administrative processes that can translate international scientific findings in ways that are scientifically and politically credible and salient also at the local levels. In Sweden nationally, the Commission on Climate and Vulnerability served such a role and thereby made adaptation to climate change a legitimate concern. However, in order to raise awareness among the local politicians who ultimately determine the extent to which civil servants are able to make adaptation a priority, the interviews highlight the need to make climate change knowledge local, e.g. showing how water levels may affect a particular municipality. Another result is the key role of mainstreaming adaptation into sectoral policies and professional practices. Typically established regulations and technical norms determine day-to-day decisions-making in municipalities, e.g. building codes or regulations of pipe dimensions. International climate science and policy arenas generally play a limited role for these local actors, while climate concerns that had been mainstreamed into EU directives have some influence. Other knowledge providers that were deemed relevant included SMHI as a central knowledge broker, consultants, professional organizations and municipalities that provide examples of successful activities. However, local political priorities were still considered a major bottleneck. The presentation will discuss the interview results in the context of social learning about climate adaptation in Sweden and internationally.

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4:1:3

Equal, equitable and climate change responsive? The (in) visibility of power/privilege in institutional climate change discourse

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This paper examines local institutional approaches to climate change, emphasizing connections to overarching goals of an equal and equitable society. In Sweden, sustainable development has had an important impact on local environmental policy development, in particular through the municipalities' responsibility for the implementation of Agenda 21. It can be argued that this, in combination with the strong position of municipalities in the Swedish territorial political organization, has enabled a front position for local activity in national climate change responses. In these local contexts, goals of equality and equity are explicit. Nevertheless the visibility of these goals in actual climate change responses is narrow. The same is valid for fundamental aspects such as power and privilege throughout the discourse.

The paper presents a discursive analysis in which local policies for physical planning and climate change response are considered. Guided by a theoretical framework with insights from intersectionality theory, the argument is built on a number of interviews with environmental strategists and planners in the Environmental Strategic Office in the Swedish city of Malmö. The position of the public officer is crucial as a human catalytic filter in the policy process. Their translation of politics and policies into action also has an impact on future policy contents.

The main argument developed in the paper is that in spite of, and because of, explicit goals of mainstreaming gender, equality and equity into public policies such as responses to climate change; power and privilege are made invisible or deliberately left as a question applicable to a undefined group of "others".

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4:1:4

Building a bridge from aspirations to implementation: Ireland as a case study

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The challenge of mitigating climate change adapting to the unavoidable impacts is a rising policy agenda in most nations. Central government has an imperative to drive the policy agenda and facilitate the transition from aspirations to implemented policies. That being said, the top-down approach has failed to produce wide-spread, significant responses by local governments.

Local governments also have a role in addressing climate change. They are responsible for relevant policy areas; however, the links between these discrete policy areas and climate change have not been fully acknowledged by local governments. In the Irish example, most local authorities address their statutory requirements without many notable further measures. The question of how to advance local climate measures requires addressing both political will and institutional frameworks.

A case study of Irish local government preparation for climate change highlights the importance of local context and local actors. Barriers to effective implementation have been identified; and ways forward have been identified through stakeholder engagement. Results will be presented from a nationwide survey of city and county planning authorities as well as from interviews with several local and regional authorities. The local perspectives are supplemented by insights drawn from a review of all city and county development plans and local climate change strategies. This case study assesses the contributing factors of jurisdictional affiliations, changes over time of development plan adoption, population density, and local staffing levels. The information from each of these sources supports the need for strong central government drivers.

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Parallel 4:2 – National policy initiatives

4:2:1

Extreme weather lessons and climate change adaptation in the Norwegian civil protection system*Idun A. Husabø; Kyrre Groven; Carlo Aall
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Background: Management of extreme weather threats provides valuable insights into the conditions for climate change adaptation. In a study of the civil protection system of Norway at different levels of governance, we have investigated to which extent extreme weather events have resulted in learning and institutional change with implications for adaptive capacity. The paper is based on the Civilclim project (2007–2010), funded by the Norwegian Research Council.

Method/approach: We have studied two levels of the Norwegian civil protection system: The municipalities, represented by a case study of the City of Bergen, and the County Governor, based on interviews with the Head of Civil Protection in each of the 18 Norwegian counties. Both studies have been carried out as interviews with key informants combined with examination of relevant documents and reports.

Results: Extreme weather events have contributed to raised awareness of local vulnerability to climate change. In the case of Bergen, flooding and landslides of 2005 prepared the ground for significant changes in policy and routines regarding prevention of extreme weather damage. The County Governors' departments of civil protection and emergency planning focus more on crisis management than preventive work, whereas flood and geohazard risk prevention seem to be best taken care of by municipal land-use planning and water authorities.

Conclusion: Extreme weather events, no matter how severe the consequences, tend to encompass important learning points that can later result in the implementation of preventive measures. The situation calls for more systematic follow-up of such events, both at regional and local level. Lack of institutional capacity is an obstacle to a desirable change towards more preventive efforts by the County Governors. Closer cooperation between County Governors and large municipalities, combining their competence on crisis management and long term land-use planning, may be one way to enhance society's climate change adaptation capacity.

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4:2:2

Adaptation to climate change in Denmark – science-policy interaction in practice*Povl Frich; Louise Grøndahl
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Adaptation to climate change in Denmark has been going on for nearly a decade. A Danish strategy was formulated and adopted, which laid the base for a science-policy dialogue. In later years this dialogue has been institutionalized. The creation of various purpose-built organizations in Denmark, has helped to identify the roles played by major actors on the adaptation scene. The benefits as well as the disadvantages of the current organizational setup will be analyzed. A few of the initiatives, which are established on the basis of the Danish climate adaptation strategy, will be discussed at a national adaptation conference in October this year. By viewing adaptation as a social learning process, main findings will be reported and a way forward will be outlined. Solutions to the following four challenges will be addressed:

- 1) Handling uncertainty
- 2) Vertical integration
- 3) Trans-sectoral collaboration and
- 4) Measures of empowerment.

This study will contribute by providing a coherent view at adaptation in Denmark with a particular focus on the science-policy interaction. More information is available at www.klimatilpasning.dk.

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4:2:3

The German adaptation strategy: promoting the implementation on regional and local level*Andreas Vetter; Clemens Haße; Petra Mahrenholz
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The further development of the German adaptation strategy (DAS), adopted in 2008, is a medium-term process. As a main next step the Federal Government is developing an Adaptation Action Plan, which is to be presented in summer 2011. This document will be a self-commitment for the Federal Government and will focus on: principles for prioritization of adaptation measures, funding opportunities, international cooperation, an evaluation concept for adaptation, measures of the Federal Government including cooperation with the Federal States, and examples for measures implemented by other actors.

It was decided to aggregate the measures provided by the Federal Government within three pillars: a) distribution of information, including the development of information infrastructure and support of stakeholder networks, aiming to improve adaptation arrangements, b) measures that are explicit in responsibility of the Federal Government (e.g. federal property such as nature conservation areas, motorways, or state forests) and c) adjusting regulation and legislation.

The national adaptation strategy sets the framework for adaptation to climate change in Germany, but actors on regional and local level, and here in particular municipalities, will play a key role in actions. Especially pillar a) has to be designed in a manner to support relevant adaptation actors in developing adaptation measures. To improve awareness KomPass – Climate Impacts and Adaptation in Germany at the Federal Environment Agency is setting up a German Clearing-House Mechanism. By the end of 2010 the site www.anpassung.net will be upgraded with more features to support municipalities, companies, and organisations. Stakeholder-dialogues and workshops accompany this platform.

Our presentation will focus on our most recent results in developing tools that enable other actors: (1) a database for adaptation measures and (2) the decision support system "Klimalotse". Both approaches are comprehensive and as such highly relevant for the adaptation discourse in Nordic countries as well.

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4:2:4

The governance of adaptation to climate change: Taking stock and providing guidance*Andrea Prutsch¹; Reinhard Steurer²; Judith Feichtinger²;
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The project GoAdapt focuses on the governance of climate change adaptation, i.e. on the ways in which adaptation policies and instruments are developed and implemented by governments in selected developed countries at different levels.

Why is this governance perspective important? By focusing on interesting practices of 'how to do it', the proposed research helps to develop and implement adaptation policies that are concerned with the 'what to do'. So far, however, "[t]he governance framework of adaptation is still largely in the making" (Paavola 2008, 652) and little is known about the governance of adaptation policies, because this issue has largely been neglected. Consequently, there is a lot to learn through governance research as proposed here. Not paying attention to the challenge of how to deliver adaptation policies through adequate governance arrangements any longer would inevitably hamper adaptation efforts.

The project analyses the ways in which adaptation policies and instruments are developed and implemented by governments in 10 OECD countries (e.g. Finland and Norway) at different levels. To keep the research focused, Go-Adapt explores how selected governments deal with four governance challenges that are paramount in the context of climate change adaptation, i.e. (i) improving the horizontal and (ii) vertical integration of policies, (iii) cope with various types of uncertainty and (iv) facilitate stakeholder involvement in line with the challenge of procedural justice. By focusing on interesting practices of 'how to do it', the proposed research helps to develop and implement adaptation policies that are concerned with the 'what to do'.

First outcomes of Go-Adapt, a survey report that gives an overview of adaptation governance approaches concerned with the challenges mentioned above, will be available by September 2010.

The Go-Adapt project is funded by the Austrian Climate and Energy Fund (ACRP programme). It is conducted by a research team at InFER – the Institute of Forest, Environmental, and Natural Resource Policy at BOKU University Vienna, in co-operation with the Environment Agency Austria and supported by a panel of experts.

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Parallel 4:3 – Integrating adaptation into policy

4:3:1

Integrating climate adaptation policy in Swedish forestry: An analysis of the policy process from 2000 to 2010

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Sweden has the largest forest areal in Europe. Safeguarding Swedish forestry through early adaptation to climate change is of both national and international interest. In 2002 a serious attempt was made to set up a climate adaptation plan for the forestry sector. Additional initiatives followed, but climate adaptation is still not included in the forestry policy. This paper explores the process of including climate adaptation on the Swedish forestry policy agenda. By studying the policy process, insights in socio-political barriers and opportunities for climate adaptation in the forestry sector are gained.

A combined quantitative and qualitative analysis is used to explore forestry related policy documents and journals. First, by means of a quantitative content analysis, the extent to which climate adaptation is part of the forestry policy process is analyzed by counting and comparing references to climate adaptation and to other relevant and potentially competing issues, such as climate change mitigation, biodiversity, and production. Second, the qualitative analysis focuses on political science concepts such as framing and learning to gain insight in the dynamics steering the policy process. In a framing analysis, communications and/or activities of relevant actors are analyzed in order to define their position and influence on the debate. In case actors change their policy position/frame, learning and potential policy change will occur. Different types of learning indicate policy change towards more or less sustainable policy outcomes.

The analysis shows that the interest in climate adaptation has increased in the forestry domain. However, barriers for further policy integration remain such as the general focus on short-term productivity coupled with uncertainty with regard to the effects of climate change. Failure to overcome these barriers are partly due to limited collaboration between lobby groups promoting climate adaptation policy, indicating a lack of shared lessons and strategic collaboration necessary for policy change.

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4:3:2

Regional lessons for adaptation: comparative insights from adaptation processes of Helsinki, Finland, and the Gold Coast, Australia

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Adaptation to climate change rarely sits within neatly defined city boundaries but is rather a regional response. As adaptation is understood to be highly context specific, regional or citywide comparisons have been largely absent from the emerging adaptation literature. Comparisons are, however, highly useful due to the robust ability to provide important lessons on the differences but also on the similarities of adaptation processes. Rather than trying to directly transfer lessons across contexts, this paper takes a comparative approach in discussing and examining institutional adaptation processes in the urban regions of Helsinki (Finland)

and the Gold Coast (Australia). Helsinki metropolitan area is in the process of formulating its specific adaptation strategy, whereas the Gold Coast has produced an award-winning strategy combining both mitigation and adaptation. The interest in comparing these two urban regions is to draw lessons on a more general scale of what drives adaptation processes and policy development in different institutional settings, and what lessons can be generated to make adaptation more efficient and practice-driven. In explaining the prevalent perceptions on climate change impacts and risks, this paper argues that understanding of practitioner relevant issues in adaptation policy development should be the first priority for adaptation research. In addition, participatory communication processes among and between stakeholder groups in institutional settings is a prerequisite for socially accepted adaptation. We also argue that specific importance must be attached to how adaptation is communicated among institutional stakeholders and decision-makers. Making adaptation research socially relevant therefore is the highest priority in order to enhance the science-policy interface.

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4:3:3

An integral analysis of climate change adaptation in Norway: Results from the PLAN project

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This paper presents preliminary findings from the PLAN project on climate change adaptation in Norway. This project explores adaptation to climate change as a social process, and includes analyses of both the subjective and objective factors that influence decisions, behaviors, and strategies. Particular attention is given to the ways that beliefs, values, cognitions, worldviews and cultural practices influence responses. Our results show that the values and interests of key actors are significant, in that they set up the norms for responses that can create the basis for either cooperation or conflict regarding adaptation. These values and interests, as well as dominant institutional cultures, can lead to multiple and sometimes conflicting objectives and goals that influence or impede adaptation. The PLAN project also shows that the nature of the challenges, as identified by scientific studies and articulated by the scientific community, is not easily grasped by many of those who are responsible for decisions and actions related to adaptation, and in some cases dismissed or denied. We conclude that leadership at all levels of society (including organizations and institutions) is key to starting the process of adaptation, and particular attention should be paid to the role of passionate agents of change, or *ildsjeler*. This suggests that the communication of scientific understandings of climate change should be targeted, values-oriented, and context-specific in order to facilitate the social process of adaptation.

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Exhibits

E1

The Swedish portal for adaptation to climate change*Pelle Boberg**SMHI, Norrköping, Sverige*

The Swedish portal for adaptation to climate change (www.klimatanpassning.se) is an internet-based climate change adaptation tool, established in 2007 by a network of Swedish state authorities. The aim of the portal is to spread information on vulnerability, impact and adaptation in the context of climate change, the target group being people working with the adaptation of society to a changed climate. So far, the main focus is on County Administrative Boards and local authorities. The portal contains texts about the consequences of climate change, risk reduction, how to put together an adaptation plan, and examples of how climate adaptation can be integrated in everyday work. There are also links to reports and other useful websites, as well as a selection of examples of practical climate adaptation at local and regional level. Presently, the authorities that constitute the network behind the portal are: the Swedish Environmental Protection Agency (SEPA), the Swedish Meteorological and Hydrological Institute (SMHI), the Swedish Civil Contingencies Agency (MSB), the Swedish Geological Institute (SGI), the Swedish Energy Agency, the National Board of Housing, Building and Planning, and Lantmäteriet (the Swedish mapping, cadastral and land registration authority).

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E2

Climate Impact Research and Response Coordination for a Larger Europe: CIRCLE-2 ERA-Net*Markus Leitner¹; Tiago Capela Lourenço²**¹Environment Agency Austria, Vienna, Austria; ²Foundation of the Faculty of Sciences, University of Lisbon, Lisbon, Portugal*

As a precursor, CIRCLE ERA-Net (Climate Impact Research Coordination for a Larger Europe) was a European Commission (EC) Framework Programme 6 (FP6) funded project under the European Research Area (ERA) Networks scheme. Its success is now being followed by CIRCLE-2 (Climate Impact Research and Response Coordination for a Larger Europe) a European Commission (EC) Framework Programme 7 (FP7) funded project. CIRCLE initiated in 2005 as a Coordination Action (CA) until 2009 and its second phase CIRCLE-2 (2010–2014) currently involves 20 partner and 15 associated partner institutions from 24 different European countries.

Key national research funding and managing institutions across Europe are represented in the CIRCLE-2 consortium either directly or through their national/regional research programmes on Climate Change Impacts, Vulnerability and Adaptation (CCIVA).

The main objective of CIRCLE-2 is to step up coordination of research activities carried out at national/regional level in the EU Member and Associated States by supporting and enhancing collaboration efforts between national research programmes on CCIVA.

By the setting up of different sub-groups based on their geo-climatic or socio-economic circumstances (e.g. Mediterranean, Nordic, Central and Eastern European States, Mountainous areas) CIRCLE establish a strong and close network that enables the alignment of national CCIVA research agendas and their funding budgets.

Through a multi-level assessment of CCIVA research needs, CIRCLE provided the framework for the programme, design and launch of joint calls for research projects. Three of such transnational joint calls were issued for the Mediterranean (2007–2010), the Nordic (2007–2009) and Mountainous areas (2009–2010). Alongside with its focus on the research management of transnational CCIVA science, CIRCLE has developed efforts to support the European adaptation and response processes by aggregating and making available national/regional information on CCIAV research programmes, projects and their results. CIRCLE-2 will move further and create a science policy interface for transnational collaboration and activities.

By matching its knowledge base with the EC and its Member and Associated States' research agendas, CIRCLE-2 will set in place an integrated structure to consider and support European CCIVA research needs and to contribute towards the development of a truly multidisciplinary ERA on Climate Change.

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E3

The Norwegian portal for adaptation to climate change*Guro Andersen**Directorate for Civil Protection and Emergency Planning, Norway*

The Norwegian Climate Adaptation Programme was established in May 2007 and is part of the Norwegian Government's initiative on climate change adaptation. The Directorate for Civil Protection and Emergency Planning acts as secretariat for an interministerial coordination group. One of the secretariat's main tasks is to gather and disseminate information and knowledge about climate change and its impacts on Norway. Extensive knowledge and experience have been acquired from climate adaptation work. However, the sources of information are scattered and not easily accessible. The portal www.klimatilpasning.no, launched in March 2009, gathers this information. It presents state of the art climate maps, good examples of municipal climate adaptation efforts, and provides practical and specially adapted information from researchers, government administration and the business sector.

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E4

CARAVAN/MEDIATION interactive vulnerability mapping tool – Demonstration*Timothy R. Carter¹, Karen O'Brien², Louise Simonsson³, Stefan Fronzek¹, Aino Inkinen¹, Ismo Lahtinen¹, Hanna Mela¹, Lynn Rosentrater^{2*}, Ida Skivenes² and Cathrine Ruud²**¹ Finnish Environment Institute (SYKE), Helsinki, Finland, ²**Department of Sociology and Human Geography University of Oslo, Oslo, Norway, ³ Centre for Climate Science and Policy Research, Linköping University, Norrköping, Sweden*** Visiting researcher at SYKE (January–April 2010)*

Background: CARAVAN (Climate change: a regional assessment of vulnerability and adaptive capacity for the Nordic countries) is a two-year collaborative project (2008–2010) funded from national sources in the Nordic-Call of the EU CIRCLE (Climate Impact Research Coordination for a Larger Europe) project. CARAVAN aims to explore alternative approaches for estimating and mapping vulnerability to climate change at the municipal scale across the Nordic region. The project is being extended from 2010 as a case study under the umbrella of the EU FP7-funded project MEDIATION (Methodology for Effective Decision-making on Impacts and Adaptation).

Methods: The project has developed a tool for visualizing vulnerability to climate change in social and environmental contexts. Vulnerability of a system or population is described as a function of its exposure to climate change, its sensitivity to the impacts of that climate change, and its adaptive capacity to cope with the impacts. Each of these elements is represented spatially in a web-based system and combined to visualize climate vulnerability at the present and for 2050. Two focal areas were selected concerning vulnerability of agricultural livelihoods and of the elderly.

Results: The online demonstration will illustrate how the interactive web tool can be used to depict maps of individual indicators of exposure, sensitivity and adaptive capacity. It will show how a user can combine these indicators into indices of vulnerability to climate change. Visitors to the demonstration will be invited to select for themselves those indicators they judge to be of importance in determining vulnerability, allocate weightings to them, if they wish, and combine them to generate maps of the Nordic region. A poster will accompany the demonstration.

Conclusions: The CARAVAN project has developed a prototype interactive web tool for users wishing to examine regional vulnerability to climate change in the Nordic countries. The tool will be further developed in the MEDIATION project, with particular attention paid to refinements suggested by key stakeholders.

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Posters

P1

Adaptation and mitigation to climate change in freshwaters – the EU REFRESH project*Leonard Sandin**Swedish University of Agricultural Sciences, Department of Aquatic Sciences and Assessment, Uppsala, Sweden*

EU – REFRESH – Adaptive strategies to Mitigate the Impacts of Climate Change on European Freshwater Ecosystems is a four year EU funded project. Understanding how aquatic ecosystems will respond to climate change in the future is a priority for freshwater science. It is also an issue of major practical relevance for the development of policies and implementation strategies needed to protect aquatic and riparian wetland ecosystems especially with respect to the implementation of the EU Water Framework Directive (WFD), the EU Habitats Directive (HD), the RAMSAR Convention, the Convention on Biological Diversity and other national and international conventions and protocols. The future status of freshwater ecosystems, however, is not simply dependent on the direct impact of climate change. Future changes in land-use, in pollution loading and in water demand also need to be considered. In addition the measures that need to be taken to restore freshwater ecosystems to good ecological health or to sustain priority species as required by EU Directives need to be designed either to adapt to future climate change or to mitigate the effects of climate. Generating the scientific understanding that enables such measures to be implemented successfully is the principal focus of the REFRESH project. The presentation will focus on the large-scale river, wetland, and lake manipulations that will take place in the project and how these manipulations can increase our practical knowledge on how to adapt and mitigate to climate change effects in freshwater ecosystems. This is especially important given the rate and magnitude of change projected in these sensitive ecosystems as we will investigate what practical adaptation and mitigation steps can be taken to minimise the adverse effects of climate change on freshwater ecosystems over the next 50 years and what measures can be taken to ensure the success of freshwater restoration projects. In the REFRESH project we focus on problems of increasing water temperature, changing hydrology (and salinity) and interactions between climate change and the behaviour of nutrients and organic matter as the principal climate-related threats to freshwater ecosystems.

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P4

European Centre for Disease Prevention and Control (ECDC)*Jan C Semenza**ECDC, Stockholm, Sweden*

Due to the high level of uncertainty on the rate and speed of climate change and its impact on infectious diseases, the European CDC (ECDC) has mounted a proactive public health response. ECDC has completed an assessment of vector-borne diseases in a changing European environment and a map that shows the precise current distribution of *Aedes albopictus*, the vector of chikungunya and Dengue with its climatic range. It has also completed a risk assessment of food and water-borne diseases from climate change. ECDC is currently in the process of building an integrated network for environmental and epidemiological data. It will be connected with the mandatory surveillance system of 49 diseases and with epidemic intelligence that monitors threats and outbreaks in Europe and beyond. The E3 Network will have the capacity to connect epidemic intelligence and infectious disease surveillance with meteorological, entomological, water quality, remote sensing, or other data, for multivariate analyses and long-term projections. ECDC has initiated and coordinated the development of a Handbook as an aid for EU Member States to assess and manage changes in risk of infectious diseases posed by climate change. The aim is not a complete review of the scientific field, but to give suggestions, tools, and hands-on approaches on how to access data, and choose organisational structure and analysis methods for a national assessment based on local conditions, competence, and aims. With this action plan, ECDC hopes to be able to mount an effective response to reduce health impacts from climate change.

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P5

Bridging the gap between basic climate science and adaptation research: the centre for regional change in the earth system (cres)*Martin Drews; Jens Hesselbjerg Christensen; Krogh Andersen Katrine; on behalf of the CRES team**Centre for Regional change in the Earth System, Danish Meteorological Institute, Copenhagen, Denmark*

Adapting to climate change requires a precise understanding and quantification of how human activities, interacting with natural processes, affect human and natural systems. The Centre for Regional change in the Earth System (CRES, www.cres-centre.dk) is a multidisciplinary platform for climate research established as a result of the Danish strategy for adaptation to a changing climate. CRES brings together leading scientists from nine major Danish research institutions and universities, key national stakeholders, as well as partners from Sweden, Norway, Spain and the United Kingdom. The overall objective of the centre is to extend knowledge of and reduce the uncertainties surrounding regional climate change and its impacts and thereby support future climate change adaptation and mitigation policies, targeting Danish and wider regional needs. This includes enhancing the knowledge base and direct advisory capacity for Danish actors, including government and the private sector, for example as realised through the Danish national web portal for Climate Change Adaptation (www.klimatilpasning.dk). The goal is to provide operational solutions for quantifying climate change and more accurate depictions of its impacts on hydrological, biological and social systems at regional and local scales, based on coupled climate-hydrological-ecosystem-risk analyses models. Direct involvement of stakeholders is crucial and ensures that societal needs are truly integrated within the centre beyond what has previously been achieved. Finally, as a multi-institutional research centre, CRES aims at enhancing the quality of Danish climate research and Denmark's contribution to international climate change research.

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P6

Nordic Strategic Adaptation Research (NORD-STAR)*Michael Goodsite**NERI-Aarhus University, Atmospheric Environment, Roskilde, Denmark*

Background: Analysis of the process of adaptation has focused on institutions and decision-making, social learning and social capital (Pelling et al. 2008; Storbjörk 2007; Tabara et al. 2009; Nilsson & Gerger Swartling 2009)2, and the link between adaptation and mitigation (Klein et al. 2007). Although adaptation and mitigation are linked, they are usually dealt with in separate policy domains. Researchers have increasingly argued for the convergence of these domains so as to avoid trade-offs between adaptation and mitigation. Research has shown the potential for creating synergies and institutional links between the two strategies, in a way that enhances overall response capacity to climate change (Swart & Raes 2007; Burch & Robinson 2007; Bizikova et al 2007, Linnér 2006, Klein et al 2007). Response capacity is the ability to manage both the causes and consequences of climate change and is dependent upon a combination of institutional, social, technological and economic factors (Tompkins & Adger 2005).

Method/approach: This talk will discuss “climate strategy” and present the NORD-STAR team and ideas that are working together to address one of the key challenges of climate action: to ensure that adaptation and mitigation action is complementary and does not impede on each other's objectives. In the Nordic context the term “adaptigation” has been coined as an integrative approach to adaptation and mitigation, suggesting that the former separation of the two is becoming increasingly obsolete (Langlais 2009).

(Contact the abstract author for complete literature references)

Results: A strategic coalition of Nordic partners has been formed to address the above in the form of a Nordic Network funded by NORDFORSK (Nordic Climate Mitigation, Adaptation and Economic Policies (N-CMAEP) see: <http://www.dmu.dk/en/climate/ncmepnetwork/> and an open Nordic Centre (NORD-STAR) we hope to fund. The 32 N-CMAEP scientists all contributed to this abstract and their names and affiliations are listed on the N-CMAEP website.

Conclusion: Better understanding of humanity's impact on the

environment as well as the impact of the changing environment on humanity is necessary for creating an optimal climate strategy for a nation or region. NORD-STAR looks forward to tackling some of the strategic challenges from a Nordic perspective.

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P7

CLISP – Climate Change Adaption by Spatial Planning in the Alpine Space

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Climate change is expected to affect spatial development, including land use, socio-economic activities and life-sustaining ecosystem services, in the Alpine Space more severely than in other European regions. As a consequence, future development options may be confined and new spatial conflicts may emerge. Doing nothing could increase vulnerability of Alpine regions and municipalities, and therewith damages and costs. Spatial planning has major steering capacity in accomplishing adaptation, containing vulnerability and increasing resilience. However, the knowledge, procedures and tools required for fulfilling the key role in adaptation attributed to spatial planning by the EU Green Paper on Adaptation and the EU Territorial Agenda are still widely lacking. CLISP is focusing on the challenges to spatial planning in the face of climate change and shall contribute to climate change adaptation by providing climate-proof spatial planning solutions. The project aims at preventing, reducing and mitigating climate-change related spatial conflicts, vulnerability of spatial development and spatial structures to adverse climate change impacts and consequential damages and costs. As climate change adaptation, including an integrated approach to adaptation and mitigation issues, is still a novel field for spatial planning policy and administration – CLISP is to be regarded as a strategic pilot project committed to the following main objectives: (i) Developing new climate-proof planning strategies for sustainable and resilient spatial development on transnational, national and regional level (ii) Developing and applying a transferable concept and methodology of regional spatial vulnerability assessment and providing knowledge of vulnerabilities in model regions (iii) Evaluating the climate change fitness' of spatial planning systems (legal and institutional framework, instruments, procedures) and identifying strengths, weaknesses and enhancement options (iv) Promoting risk governance approaches to the management of climate-related risks by conducting risk communication activities in model regions and by investigating the performance of existing risk management systems (v) Raising awareness of policy- and decision-makers, planning authorities, stakeholders and the public for climate-related risks and the need for adaptation, stimulating implementation processes and transferring results and experiences to the entire Alpine Space and to other regions

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P8

Incorporating climate change aspects in strategic planning in Belarus: learning experience from pilot SEA projects

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The attention to climate change and its potentially significant consequences for nature, human beings and economic development is increasing in impact assessment at both project and strategic level. SEA is one of the tools which fits best to exploring different policy options in the light of climate change predictions, to build scenarios for climate change itself within a given area and to assess mitigation measures and adaptation solutions in cooperation with stakeholders and decision-makers. Some practical guidelines on how to incorporate climate change aspects in to

SEA have already been developed. Currently, Belarus is making attempts to include aspects of climate change in strategic decisions, however there are some barriers such as lack of institutional capacity and uncertain sources of information.

The central objective of this research is to analyze whether aspects of climate change are incorporated in Belarusian strategic documents and to develop a framework for including climate change into the SEA in Belarus. The study presents analysis of two case study-pilot projects of UNDP programme. The research covers the following aspects: analysis of baseline data for impact assessment and quality of this information; assessment of capacity of researches and experts to make forecasts and to understand possible mitigation and adaptation measures, and investigation of the aspects of climate change already included in strategic decisions. Discussion provides arguments on whether or not the current experience and institutional capacity is sufficient to incorporate climate change issues into strategic decision-making, and what needs to be improved. This analysis is then used to draw up a framework for the inclusion of climate change in SEA for strategic decisions.

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P9

Synthesis from the 1st NONAM workshop on risk assessment and stakeholder involvement: commonalities and differences across infrastructure type

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In the first workshop of the NONAM three elements of adaptation planning were reviewed regarding their applicability for infrastructure, more in particular the water sector and road infrastructure. The three elements were: network adaptive management, stakeholder involvement, and management of uncertainty and risk. The presentation will summarize the findings of the workshop regarding these elements.

The presentation will in particular deal with the usefulness and required flexibility of the so-called double loop adaptive management model for adaptation planning in infrastructure. Obviously (spatial) scale, complexity, uncertainty, and the stage in the policy cycle (design, construction, maintenance or operation) significantly affect the way adaptive management can be sensibly applied. We will also present a preliminary comparison between the water sector and transport infrastructure regarding similarities and differences in their requirements for adaptation planning.

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P10

A Framework for Convergence

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The CONVERGE project is a transdisciplinary research project which examines the concept of global 'convergence' – how communities can move towards consuming fairer shares of Earth's limited resources and thus promote truly sustainable development. The project builds on Aubrey Meyer's Contraction and Convergence™ for CO₂ in the atmosphere, but takes a further step by framing the idea within systems dynamics and focusing on natural resources. Our aim is to holistically explore the idea of equity, while remaining within biological planetary limits, in light of various sustainability challenges the world faces. Too often, discussion of climate adaptation measures omits the idea of equity within biological planetary limits, even though such inclusion can provide insight into sustainable adaptation processes.

Our team first investigates what mechanism and tools communities use to ensure a 'fair share' of the Earth's resources. The results will be used to

make a holistic framework towards convergence and sustainability. The framework will then be tested in five different communities – Iceland, the City of Bristol (UK), the town of Lund (Sweden), the town of Gödöllő (Hungary), and villages in India.

The CONVERGE project is a collaboration between a small interdisciplinary group of academic and NGO partner organisations from the five participating countries. This presentation of the CONVERGE project will introduce the CONVERGE concept, the ideology behind the project, and the first steps of the framework towards convergence.

CONVERGE is an EU funded Framework 7 project, to be concluded in the autumn of 2013.

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P11

The governance of urban climate change adaptation

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Adaptation to climate change is at the moment an emerging item on the agenda of city governments across the world. While global negotiations on emission abatement seems to move forward very slowly if at all, there is a increasing awareness of the importance of local and regional initiatives. California governor Arnold Schwarzenegger's contention at the Copenhagen summit in 2009 to the effect that "The world's governments alone cannot make the kind of progress needed on global climate change, they need (...) the cities, the states, the provinces and the regions" seems to resonate with a broadening audience.

Considering the wide range of expected climate change impacts on cities, urban adaptation seems to represent a quite complex governance challenge. The presentation will include a generalised discussion on urban governance through hierarchies, markets and networks, to assess the potentials and limitations of these modes of governance. The discussion will be illustrated with empirical evidence from three cities in Norway who are in the process of developing their adaptation strategies. The empirical evidence is taken from the project "PLAN – Potentials of and Limits to Adaptation in Norway" which is Norway's largest social science project on adaptation to date.

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P12

Chilling Nordic cities in hot summers: Low-cost low-tech large-scale cold sinks

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Background: Many cities are heat islands in summer that are increasingly hot and energy intensive. This fate awaits Nordic high-latitude cities.

Method/approach: We reviewed the literature on city planning and city adaptation. Next we conducted fieldwork in Ulaanbaatar, the world's coldest capital city in winter, but now intolerably hot in summer.

Results: City adaptations such as irrigated planting, air conditioning and refrigeration are helpful but often expensive and unsustainable due to high consumption of energy and water. City architecture is more effective and sustainable by orientating high-rise and small buildings, use of heat-reflecting surfaces, the insertion of shade corridors, large-scale non-irrigated planting and creating of wind funnels. Results show 'cold sinks' outperform these alternatives in terms of sustainability, affordability, durability and acceptability in cooling city microclimates in hot summers. Many types of natural and accidental 'cold sinks' exist in Mongolia, particularly in the capital city of Ulaanbaatar.

Conclusion: Low-cost large-scale 'cold sinks' are advocated as being the best means of chilling cities in summer, with very little energy requirements and making a summer-time contribution to global cooling by strong albedo and a sharp reduction in energy consumption. Field trials of natural, accidental and planned 'cold sinks' are warranted in Ulaanbaatar, for transfer of know-how to Nordic cities.

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P13

Geothermal energy and adaptation in Kenya

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Geothermal energy plays a vital role in the context of climate change as a mitigation and adaptation technology. However, the full potential role of geothermal in this regard has not been realized in Kenya, especially in responding to the impacts of climate change at the micro-level where it occurs, meeting gender specific needs and ultimately the UN Millennium Development Goals (MDGs). While geothermal energy is considered the most feasible option for capacity expansion, very little has been done to assess its role in climate change beyond Clean Development Mechanism (CDM) projects. Most unexploited geothermal prospect areas in Kenya experience adverse climate impacts. The development of the resource in these areas could enhance adaptive capacity and resilience of the local people. The paper aims to discuss in general the role geothermal energy should play in mitigation and adaptation to climate change in Kenya and how its utilization can meet different gender economic requirements at the micro-level. Barriers to achieving this with possible recommendations are also discussed.

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P14

Transition dynamics towards electric cars fleet

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Background: The dependence on fossil fuels is a common concern for most countries and Iceland is not an exception. This dependence influences every economic sector including industry, households and transportation. As 86% of total greenhouse gas emissions are derived from the use of fossil fuels, transitioning away from their use is a central component of policy adaptation within the climate change regime. In Iceland the transportation sector consumes 47% of imported fossil fuels and thus adaptation transition management concentrates on the transportation sector.

Electric vehicles are rapidly becoming a viable alternative to conventional vehicles as car industries are issuing more efficient prototypes, expecting their mass production within few years. Since Iceland relies on low carbon energy resources for electricity production, transitioning to electric vehicles constitutes a real reduction in GHG emissions.

Method/approach: An effective transition management in the transportation sector requires an in-depth analysis of the complex systems that this technological transition will destabilize and transform in the next decades. This research relies on system dynamics modeling to visualize, conceptualize, and analyze such complex systems. Taking Iceland as a case-study, we set up a dynamic system of the private transport sector, and then we simulate potential transition trajectories from the conventional vehicles fleet towards electric vehicles.

Results: The results illustrate the advantages of using system dynamic modeling as a tool for identifying effective policy leverage points for local and national government intervention and to assess the optimal conditions within a society for the transition towards an environmentally and economically sustainable transport system.

Conclusion: Public interventions and private initiatives in favor of the transition towards an electric car fleet that uses cleaner and locally produced electricity involves a crucial combination of mitigation and adaptation strategies. Emissions must be reduced from the transportation sector, and at the same time the sector must adapt to increased scarcity of fossil fuels and the impacts of the climate change regime on fuel supply and distribution.

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P15

Adapting the Danish building stock and urban environment to climate change

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Buildings are important and play a vital economic and social role in society. They are very vulnerable to climate change and it is therefore an important issue to reduce CO₂ emissions from the building stock; another important issue is to adapt the building stock to the challenges of the future climate. It is important to preserve the value of the building stock through adjustment to future performance-based building requirements, as important buildings have been for centuries. However, in the future, adaptation is expected to be dictated by climate change in contrast to the past when the building stock was dictated by the need for protection. The adaptation needed is strongly related to the climate change expected. Many resources have been spent to define data on the impact of climate change that are relevant for the building sector and more are needed as assumptions change over time. Available emission scenarios from SRES [Nakićenović, N. et al., 2000: IPCC Special Report] include A2 and B2 [PRUDENCE, 2005], and EU2C scenario [Danish Government, 2008, Danish Strategy for adaptation to a changing climate] are used for describing the climate change expected in Denmark leading up to year 2100. The impact of climate change on the built environment is unknown and also the uncertainty on the individual parameters for example for temperature, precipitation, wind speed, atmospheric humidity, solar radiation and soil moisture. In addition, the consequences of climate change on the existing built environment are not known either, as the vulnerability of the existing building stock has yet to be investigated. The poster will present relevant climate parameters for Denmark including the change in mean year values, as well as the extent of maximum and minimum extremes. Cases will be presented that show climate adaptations carried out on the Danish building stock and specific design solutions will be described. Solutions related to individual buildings as well as solutions involving the built environment will be shown.

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P16

Adaptation and mitigation from the perspective of the insurance sector

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In this poster I will explain the terms adaptation and mitigation from the perspective of the insurance sector.

As one of the largest industries in the world, the insurance sector has a great connectivity in the economy. It interacts with individuals, industries, suppliers, governments, NGO's, trade associations etc. It has a great scope of persuading and supporting sustainability through mitigation and adaptation of economic risk. Furthermore, the insurance sector is vulnerable to the consequences of climate change which will negatively affect their operating results. Pressure on the insurance sector to work on sustainable issues is growing.

Majority of insurance companies are still considered to be reactive with respect to climate change consequences, but the number of insurance companies taking climate issues seriously is growing. The leading companies are focusing on their own operation, claims and loss prevention activities, investments, development of new products and benchmarking those that are best in class when it comes to adaptation and mitigation. This poster will be based on a literature review and interviews with executives and specialist from insurance companies within the Nordic region.

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P17

Climate change, impact and adaptation in the sub arctic – a case study from the Torneträsk region

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Background: Major assessments of environmental change have shown that its impact in arctic and sub arctic areas is particularly evident. Shorter and milder winters, and increasing precipitation are suggested. Kicking in of feedback mechanisms can involve loss of snow covers that damages plants and reduces permafrost. This brings negative feedbacks on reindeer grazing. In high elevated areas, increasing frequency of extreme flood events due to wetter conditions and melting permafrost will damage infrastructure more often. As people of the North contribute little to global emission of carbon, they play a minor role in global mitigation. Instead they must adapt, and adaptation is a local process. Local scale projections of future climates and their impacts are poor and need to be improved. Researchers know insufficient about what stakeholders need to know about likely local changes. Stakeholders know insufficient about what science can and cannot provide. This calls for interdisciplinary work on local adaptation strategies.

Approach: This interdisciplinary project aims to bring scientists and local stakeholders together in order to exchange knowledge and identify needs for adapting to future environmental change. Our specific project aims are to:

- ▶ Statistically downscale and interpolate past and current climate observations as well as future projections of climate at a scale of 10's of m.
- ▶ Use projections to develop high resolution understanding of dynamics in ecological and geomorphological process and land use.
- ▶ Calculate climate forcing of changes in vegetation, plant animal interactions, land-use, permafrost and hydrology.
- ▶ Project changes in land-use based on changes in ecosystem resource availability and accessibility.
- ▶ Develop adaptation strategies together with present and potential new landusers.

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2.3.3

Adaptive capacity of the Swedish electricity sector: influence from organisational structure and culture

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Adaptation to climate change has developed by a largely rational approach: If resources are available, the knowledge level is high enough, and it is cost efficient to adapt, then adaptations will be made. This paper argues that other important barriers to adaptation exist, effectively reducing systems' adaptive capacity to climate change. Furthermore, adaptation may even presuppose fundamental organisational transformation.

The paper analyses how organisational changes in the Swedish electricity sector influences the ability to adapt to the changing climate, both through formal structure and organisational culture. Climate change is expected to increase vulnerability in the sector, with the spatially extensive electrical grid as one of the most exposed areas to changes in weather patterns. This represents a timely opportunity to analyse how organisational change over the past 30 years influence adaptive capacity.

To answer the question of how organisational change influences adaptive capacity, the paper focuses on the formal structure and the organisational culture of the Swedish electricity sector. The unit of analysis is broadly understood, and includes grid companies, regulatory authorities, and the relevant political levels. The paper argues that formal organisational structure as well as organisational culture may hinder or facilitate adaptations. Formal structure consists of the explicit rules and regulations defining who can do what, across, between and within organisations. Organisational culture is a broad term that includes identities, norms and values. We expect changes in these two major dimensions to influence adaptive capacity to climate change.

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