PROGRAMME AND EXTENDED ABSTRACTS

Understanding Change in the North

EDITED BY RIITTA KAMULA, ARJA RAUTIO AND KARI STRAND

UNIVERSITY of OULU
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Thule Research Seminar and Workshop 2013 is part of the activities of the Thule Institute’s research and doctoral programmes. It is an open discussion forum for doctoral and advanced master’s level students as well as their supervisors with the focus on topical northern and environmental issues. The workshop will also provide essential knowledge about the best practices in managing scientific publishing and improving the quality of your research plan.

This annually arranged Thule Research Seminar and Workshop serves as the obligatory part of the course ‘Research Plan & Seminar’ of the University of Oulu Graduate School ‘UniOGS’. During the seminar, the students will introduce their research plans and participate in a scientific workshop. The presentations will be followed by comments from one fellow student and discussion with other participants. The goals are also to provide tools for active participation in scientific conferences, and to introduce multidisciplinary approach to research. The seminar also provides possibilities for networking.

This year, the seminar will cover four themes of the Thule Doctoral Programme (ThuleDP): (1) Climate change dynamics, impacts and adaptation, (2) Sustainable resources managements, (3) Human health and community wellbeing, and (4) Dialogue and conflict resolution. The underlining drive in ThuleDP is change in the North and the need to study its impact on ecosystems and societies. ThuleDP will provide technological and management solutions to mitigate climate change impacts, to safeguard sustainable use of natural resources, and to ensure human health and community wellbeing. Adaptation, mitigation, management, and trans-disciplinary dialogue are pervasive throughout the research themes and studies in the Thule DP.

We hope that the stimulating environment of the Oulanka Research Station at Kuusamo will encourage the seminar participants to lively discussions and increase our understanding of change in the North and its consequences. The seminar is financially supported by the Thule Institute. In the following pages you will find the seminar programme and the abstracts of all the presentations.

Special thanks to Riitta Kamula for editing this abstract book and for practical and educational arrangements related to the seminar and workshop. Thanks also for Hannele Heikkilä-Tuomaala for the graphic design of the abstract book. We are also grateful for the staff of the Oulanka Research Station for their contribution to the seminar in the inspiring station.

We warmly welcome you to the seminar and workshop and wish you stimulating discussions during the seminar days!

Kari Strand, Eva Pongrácz, Riitta Kamula, Arja Rautio and Timo P. Karjalainen
Wednesday 25 October

8:15  Departure by bus in the front of the Thule Institute, the University of Oulu (address Paavo Havaksentie 3, Oulu)
Arrival in the Oulanka Research Station, Kuusamo at 12
12:00  Lunch

Opening of the seminar
13:00  Welcoming address by Director Riku Paavola, Oulanka Research Station

Science Session: Climate Change Dynamics, Impacts and Adaptation
13.20  Research Prof. Kari Strand: Introduction to theme: Climate change dynamics, impacts and adaptation
Student presentations
13:40  Climate change and boreal rivers: predicting present-day patterns and future changes in natural flow regime and its effects on river communities
Kaisa Mustonen (discussant Lauri Rantala)
14:00  Vegetation responses to restoration in pine-dominated boreal forests
Anne-Maarit Hekkala (discussant Riku Eskelinen)
14:20  Combining population genetics and population ecology in management of endangered species
Hilde Hens (discussant Henni Ylänne)
14:40  Eurasian arctic ice sheets in transitions - consequences for climate, sea-level and oceans
Ekaterina Kaparulina (discussant Terhi Järvinen)
15:00  Coffee break

Keynote lecture
15.30  Modelling and assessing impacts of global change processes on ecosystem services
Prof., Division Manager Martin Forsius, Finnish Environment Institute (SYKE)

Student presentations
16:00  Geographical variation of ecosystem services, biodiversity and geodiversity in Finland: GIS-based approach
Terhi Järvinen (discussant Miisa Pietilä)
16:20  Stable isotope study during snowmelt period in peatland drainage areas: effect of soil frost
Riku Eskelinen (discussant Ekaterina Kaparulina)
16:40  Combined effect of reindeer grazing and global warming on subarctic carbon stocks
Henni Ylänne (discussant Anniina Holma-Suutari)
17:00  Dinner
18.00  Evening program with sauna etc
Thursday 26 September

8:00 Breakfast

Science Session: Sustainable Resources Management
9:00 Docent Eva Pongráz: Introduction to theme: Natural resources and their sustainable use
9:20 Possibilities of future bioeconomics: novel engineered biomaterials and biochemicals
Prof. Jouko Niinimäki
Student presentations
9:40 Structuring the Smart Energy Network - Shaping a sustainable future
Jean-Nicolas Louis (discussant Miikka Visanko)
10:00 Electronic waste: potential secondary source of critical metals
Jenni Ylä-Mella (discussant Jean-Nicolas Louis)

10:20 Student poster session
Coffee
- Factors contributing to the urban plant species richness
- Jenni Moilanen (discussant Kaisa Mustonen)
- Total oxidation of dichloromethane over platinum based catalysts
- Zouhair El Assal (discussant Jenni Ylä-Mella)
- Chemical modification of cellulose to produce nanofibrils for new membrane structures
- Miikka Visanko (discussant Zouhair El Assal)

11.00 Lunch

Science Session: Human Health and Community Wellbeing
12:00 Prof. Arja Rautio: Introduction to theme: Human and community wellbeing
Student presentations
12:20 Differentiation of self, family patterns and the intergenerational transmission of violence
Anu Kangas (discussant Anna Reetta Rönkä)
12:40 PCDD/FS, PCBS and PBDES in Finnish moose (Alces alces) liver
Anniina Holma-Suutari (discussant Hilde Hens)
13:00 Adolescent´s experiences of loneliness in Northern Finland
Anna Reetta Rönkä (discussant Anastasia Emelyanova)
13:20 Break to prepare for outdoor activities
13:30 Guided tour of the Oulanka Visitor Center’s Nature Exhibition and hiking to the Kiutaköngäs waterfall
15.00 Coffee

Doctoral Studies Workshop
15:20 Objectives of Thule Doctoral Programme (ThuleDP)
Research Prof. Arja Rautio
15:30 Introduction to workshop, Coordinator, Dr. Riitta Kamula
Round table discussions with short introductions
- How to improve your research plan, Docent Eva Pongráz
- Efficient scientific writing process - from ideas to acceptance, Research Prof. Kari Strand
- How to publish internationally, Research Prof. Arja Rautio
- Administrative practices in doctoral training, Dr. Riitta Kamula
Discussion on expectations and wishes
17:00 Dinner
18.00 Evening program with sauna
Friday 28 September

8:00  Breakfast

Science Session: Dialogue and conflict resolution

9:00  Docent Timo Pauli Karjalainen: Introduction to theme: Dialogue and conflict resolution  
      Student presentations

9:20  Developing place-based visitor monitoring in Oulanka National Park  
      Miisa Pietilä (discussant Jenni Moilanen)

9:40  Science "speaking truth to power" in Rokua groundwater conflict  
      Lauri Rantala (discussant Anne-Maarit Hekkala)

10:00  Circumpolar dimension of population aging: cross-regional analysis towards optimal policy  
       adjustments  
       Anastasia Emelyanova (discussant Anu Kangas)

10:20  Coffee

Summary Session

10:40  Concluding remarks of seminar and workshop  
       General discussion  
       Future plans

Lunch and departure

11:00  Lunch and packing

12:00  Departure for Oulu

16:00  Arrival in Oulu
Keynote abstracts
MODELLING AND ASSESSING GLOBAL CHANGE IMPACTS ON ECOSYSTEM SERVICES

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Ecosystems generate a range of goods and services important for human well-being, collectively called ecosystem services. Over the past decades, progress has been made in understanding how ecosystems provide services and how service provision translates into economic value. Nonetheless, the losses of ecosystem services continue more rapidly than ever [1, 2, 3, 4]. Efforts have been made to define "planetary boundaries" for the major impacts and changes [5]. Research in this field is also of great national science and strategic need regarding topics such as ecological restoration, ecological compensation and sustaining ecological security. It has still proven difficult to move from general pronouncements about the tremendous benefits nature provides to people to credible, quantitative estimates of ecosystem service values [6, 7]. Large efforts are currently devoted to develop methodologies for deriving spatially explicit values of ecosystem services across landscapes [8, 9, 10, 11, 12, 13, 14, 15]

This talk will present the background on the ecosystem service concepts and give examples on how global change processes affect ecosystem processes and key services.

References


www.syke.fi/projects/climes
www.openness-project.eu
POSSIBILITIES OF FUTURE BIOECONOMICS: NOVEL ENGINEERED BIOMATERIALS AND BIOCHEMICALS

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Environmental, societal and economic trends drive chemical and materials engineering towards bioeconomy both globally and locally. The questions regarding climate change, food and non-food materials, genetically modified plants, clean water scarcity and material efficiency will affect in particular the use of natural resources. The depletion of fossil raw materials is another significant global problem that is advancing bioeconomy everywhere, calling for a shift towards a new, post-petroleum society. This is a timely issue also as Europe is struggling to create jobs and to promote much needed economic growth from alternative natural resources and sources of energy. Although bioeconomy serves a greater purpose to increase sustainability, efficient business and attractive consumer products are still the foundation upon which all bioeconomy activity is built.

Increasing environmental consciousness means that more and more of us are willing to pay for sustainable products, and it has become clear that European Union and its member states are driving the development towards eco-friendly production and cleantech process solutions with higher taxation to products and services with pronounced consumption of non-renewables. However, sustainable processes which can convert biomass to a multitude of reusable, biodegradable or at the very least easily recyclable products are the heart of the bioeconomy. At the current rate of emerging technologies and new product families, it can be foreseen to make major socioeconomic contributions on a global scale. The bioeconomy on EU level already has a turnover of nearly €2 trillion and employs more than 22 million people, accounting for 9% of total employment in the EU. The success is not, however, guaranteed: harnessing the potential bioeconomy has will require coordinated policy action by governments and transnational collaboration in R&D activities.

Several industrial sectors will clearly benefit from bioeconomy and it is expected to have considerable impact on society. The initial beneficiaries of the future bioeconomy are the companies controlling the biomass supply. In Finland large companies in the forest sector are the major contributors but private land owners and the state also have their role in the utilization of the green growth. In the coming years, industries that are in an especially promising position to prosper from bioeconomy include pulp and paper, packaging, food, energy and chemical producers.

Bio-based production is today used in primary production, health and industry. Platform technologies such as genetic modification and DNA sequencing have commercial uses in several application fields. Human health applications include bioactive compounds, functional foods and medical devices. Industrial applications include the development and use of technological processes to produce novel composite materials with functionality such as in biosensors or water purification media. Chemical products yield from the production of biofuels to substitution of inorganic materials in concrete manufacture or devising of organic systems such as solar cells. Several applications are comparatively “mature” technologies while many others lack viability or are still in the experimental stage. These, and many other bio-based solutions are also vigorously investigated in the Bioeconomy research community Oulu (BRC-OULU) that was established in early 2013 within the University of Oulu as an attempt to consolidate the research in biomass conversion and valorisation value chain.
Abstracts of Doctoral students
TOTAL OXIDATION OF DICHLOROMETHANE OVER PLATINUM BASED CATALYSTS

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Sol-gel method was used to prepare Al2O3, TiO2, MgO, CeO2, (Al2O3)0.95(SiO2)0.05 (AlSi5), (Al2O3)0.90(SiO2)0.10 (AlSi10), (Al2O3)0.85(SiO2)0.15 (AlSi15), (TiO2)0.95(SiO2)0.05 (TiSi5), (TiO2)0.90(SiO2)0.10 (TiSi10) and (TiO2)0.85(SiO2)0.15 (TiSi15) supports. After calcination, catalysts were prepared by wet-impregnation of H2PtCl6.6H2O to add 1% of Pt on the support. The prepared samples were characterised by TGA-DTA, XRD, TEM, ICP and physisorption of N2. Acidity of the catalyst surface was measured by the adsorption of pyridine that was followed by FTIR. The performance of the prepared catalysts was evaluated by catalytic oxidation of dichloromethane (DCM) in the presence of water under atmospheric pressure in an air flow.

TGA-DTA results showed that the desired supports were achieved at 500°C, and this temperature was chosen for catalysts’ calcination. These results were confirmed by XRD analysis. The XRD analysis showed also the existence of amorphous phase in addition to the crystalline phases (γ-Al2O3, anatase (TiO2), cerianite (CeO2) and periclase (MgO)). In the case of (AlSiSix and TiSiSix (x = 0, 5, 10 and 15)) supports calcined at 500C the SiO2 phase did not appear, only γ-Al2O3 and anatase were observed in these type of samples. Additionally, the crystallite size of TiSix was influenced by the amount of SiO2 added, but not in the case of AlSix catalysts that kept the same crystallite size. However, the surface area of both types of catalysts was increased with increasing the SiO2 loading. The surface area of catalysts (except AlSix) was in agreement with the crystallite size determined by XRD (surface area increased with decreasing of the crystallite size). Pt was obtained as small nano-particles (less than 5 nm except for TiO2 where it was more than 5 nm). This result was obtained by TEM analysis. The supports and catalysts contained Lewis acid sites. Their quantities were independent on the sample’s surface area.

The DCM conversion (over unmodified supports) was more than 90% except over Pt/MgO and MgO. The T90 order of the catalysts starting with the lowest was as follows: PtAl2O3 < Al2O3 < PtTiO2 < TiO2 < CeO2 < PtCeO2. The highest influence of impregnation of Pt was observed in the formation of HCl as a desired end-product and also in decreasing and/or disappearing of the CHCl3, CO and CH2O that were observed over the corresponding supports. The modified catalyst that contained 10 % of SiO2 was the most active in the oxidation of DCM, but the HCl yield was highest over Pt/AlSi10 and Pt/TiSi15. In conclusion, the activity of the samples followed the strength of their acidity. This acidity was independent on the surface area of supports. Moreover, the addition of Pt influenced the selectivity of the catalyst.
Circumpolar dimension of population aging: cross-regional analysis towards optimal policy adjustments

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Global warming, climate change and huge resources waiting to be exploited will increase the geopolitical importance of the Arctic in the coming decades. Any strategies how to develop the region and how to provide human security need a thorough understanding of its public health and demographic drivers such as fertility, mortality, life expectancy, migration patterns and population aging (Emelyanova and Rautio, 2013). The last demographic phenomenon is fairly under researched within the science and not given enough policy attention in the circumpolar localities. A close research attention is required to learn which policy responses make population better adapted for a new demographic face of the region. This research is aimed to structure scientific and governmental literature in the field and to make a separate research constructing an aging profile of the Arctic with identifying similarities and variations in the process distribution, intensity and policy responses among each of 28 circumpolar municipalities out of 8 countries (Emelyanova and Rautio, 2012).

To answer stated research questions, both quantitative and qualitative methodologies are chosen to be applied. A specific to population aging quantitative methodology supposes two approaches: so-called ‘conventional’ and ‘prospective’ ones. The global analysis generally applies conventional aging indicators developed by United Nation Population Bureau and based on the concept of chronological age, while since recently International Institute for Applied Systems Analysis and Vienna Institute of Demography have defended a new ‘prospective’ methodology in demography on aging, elaborated within the concept of ‘prospective’ age or remaining life expectancy (Sanderson and Scherbov, 2008). A qualitative part supposes a development and application of a questionnaire for policy/decision makers among the countries under analysis and particularly the arctic municipalities which will provide data regarding local capacities on aging, mainstreaming aging into various social systems as well as aging specific activities in the northern communities.

The results produced at the arctic cross-regional level can be generally used to develop more positive, aging agendas and lead to a broader understanding and adjustments to an aging arctic society.

References
Stable isotope study during snowmelt period in peatland drainage areas: effect of soil frost

Riku Eskelinen, Anna-Kaisa Ronkanen, Hannu Marttila and Bjørn Kløve

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Abstract
In this study, we analysed stable isotopes and water quality of water and snow collected from two different peatland drainage areas from March 2012 to October 2012, located in Northern Finland. Our primary aim is to find out how different land use types, i) peat mining area and ii) peatland forestry, are affecting the flow paths and runoff water quality during the snow melt periods.

Results show that there is a clear difference in δD signal between these systems. The peatland forestry area is located at groundwater dominated area which can be seen as a flat line when δD values of all samples are plotted; this is different from samples taken at the peat extraction area which show a clear response to the snowmelt event. Most likely this is caused by different soil frost conditions. Quantity of the groundwater at the forestry area is able to prevent the soil from freezing during the winter, therefore the melting snow is able to infiltrate to the peat soil and push pre-event water into the drainage system. This observation can also be seen as a peak values in water colour measurements from runoff water. Contrary, the peat extraction area behaves in opposite way. Melting water from snow is not able to infiltrate to ditches but instead will rapidly move on the frozen soil surface as overland flow. Because the soil is frozen, moving water is not able to leach humic substances from soil layers or erode particulate matter from the soil surface.

These observations can be used to development water quality protection policies for drained peatland areas. In Northern areas, where freezing of soil during winter is common it is not crucial to emphasize water protection during spring snowmelt, as frozen soil helps to maintain the runoff water quality at reasonable levels. In South-West part of Finland, ground soil frost is rarer; therefore impact of purifying runoff water in spring thaw will be more beneficial for the receiving water bodies than in the areas with regular soil freezing.
VEGETATION RESPONSES TO RESTORATION IN PINE-DOMINATED BOREAL FORESTS

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Forest restoration is widely used in Finland to bring back essential components typical to natural forests, which have been reduced by efficient forest management. The structural variety of forest stands is increased by adding dead wood by felling trees and re-introducing fire-disturbance, which has been almost eliminated from the forests. Vegetation responses to restoration have been rarely studied, as the research has focused on dead-wood dependent taxa, eg. beetles and polypores. Vegetation succession is expected to be initiated after forest restoration, although the type and level of restoration influence how the succession proceeds. We compared the effects of two forest restoration methods and two dead wood addition levels on the vegetation succession and tree sapling and seedling establishment.

The seven-year study (2005-2011) was conducted in four Natura 2000 -areas in eastern Finland (Oulanka, Pahamaalima, Elimyssalo and Lentua). The restoration treatments were carried out in 2006, including tree felling with two levels (20 % and 40 % of initial stand volume) of added dead wood, with and without subsequent fire, and intact controls. We surveyed the vegetation cover, species richness and species composition from six vegetation sampling squares (1 x 1 m) per each experimental plot (n=58) prior to the restoration, one year after and five years after restoration in 2005, 2007 and 2011, respectively.

The results show that tree felling with subsequent burning affects the succession of the forest vegetation by increasing the cover of pioneer species such as graminoids and forb and moss species, and by decreasing the cover of forest species such as evergreen shrubs and lichens. Five years after restoration, the cover of pioneer species still exceeded their initial cover, while forest species had not yet recovered to their initial level. Tree felling without fire did not have any significant effects on the cover, species richness or species composition. Pine seedling establishment was especially enhanced by tree uprooting and burning enhanced the establishment of deciduous trees, especially aspen. Felling the trees without breaking the ground did not affect seedling establishment.
COMBINING POPULATION GENETICS AND POPULATION ECOLOGY IN MANAGEMENT OF ENDANGERED SPECIES

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Long term viability of species is related to the size, structure and dynamics of populations. Small and isolated populations often have a reduced genetic variation and suffer from inbreeding. Genetic variation is important for the short and long term viability of populations, since it enables populations to adapt to environmental changes. Inbreeding results in a decreased heterozygosity of individuals often leading to the accumulation of deleterious alleles and consequently to a lower fitness of individuals. The genetic diversity and structuring is also influenced by the ecology of a species. Life history traits, including the life form, breeding system, mode of reproduction, dispersal capacity, generation length and survival, may determine the vulnerability of populations to the loss of genetic variation when their range is reduced. Revealing which trait is important for both the genetic diversity and the viability of populations is important in order to assess the extinction risk and in order to generate appropriate conservation strategies and prioritize conservation efforts. In this study, population genetic and population ecology data will be gained and combined in order to assess the viability of species. This is up to date seldom applied in conservation genetics and knowledge about this topic will have applications for conservation both on species-specific level as for other common endangered northern species.

The current distribution and genetic structure can, besides current processes, also be the result of historical processes. Species in northern regions have experienced repeated glaciation throughout the Pleistocene, resulting in repeated distribution shifts of these species. During glaciations their distribution shifted to ice-free refugia (e.g. Northern or Southern located), often resulting in small and isolated populations. Populations expanded their range again and increased in size again during inter-glacials. These changes contribute to the present genetic structure. Populations and lineages will go extinct, alleles will be lost during bottlenecks and founder events and mutations will occur through time and be spread by selection or chance during population expansions. The use of DNA markers enables us to study and identify historical colonization histories. In this study, the location of refugia during the last glaciation and colonization routes after the last glaciation will be studied based on genetic markers. Knowledge of the cause of the current discrete distributions of populations enables us to better assess the extinction risk and predict the impact to future climate changes on populations.
PCDD/FS, PCBs and PBDES in Finnish Moose (Alces alces) Liver

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Moose (Alces alces) is an important game animal in Finland. About 2.5 kg moose meat is consumed per person each year. Marketing of liver of moose over one year is, however, not allowed because of accumulation of toxic heavy metals.

In this study PCDD/F, PCB and PBDE concentrations were analyzed in Finnish wild moose liver. The results are presented here and compared with the results of earlier Finnish food monitoring studies with moose meat and reindeer meat and liver.

Liver samples from adult moose and moose calves were sampled from Northern and Southern Finland. The samples were pooled by sampling area, sex and age of moose.

Adult moose from Northern Finland had lower PCDD/F and PCB concentrations than moose calves from Northern and young adult from Southern Finland. However, one female calf from the northern area had also quite low PCDD/F level compared to other calves from the northern area.

A young adult moose from Southern Finland had the highest WHO-PCDD-TEQ of the all samples studied. Low concentrations of WHO-PCB-TEQs of the calves and adult moose correlated with WHO-PCDD/F-TEQs: One moose calf and one moose adult had lower WHO-PCB-TEQ concentrations than the other samples studied from the Northern Finland. Lower WHO-PCB-TEQs of these samples may indicate different exposure conditions to PCBs. It has been found in earlier studies that Finnish reindeer calves’ livers contained more PCDD/Fs and PCBs than adult reindeer livers (Ruokojärvi et al., 2011).

In this study PBDE concentrations were on average higher in the livers of moose calves than in the liver of adult moose. In addition, PBDE concentrations were very low in general: below 0.5 ng/g fat in all moose liver samples. Very similar PBDE concentrations have been found also from Finnish semidomesticated reindeer liver samples, although occasional higher concentrations have been found also.

References
GEOGRAPHICAL VARIATION OF ECOSYSTEM SERVICES, BIODIVERSITY AND GEODIVERSITY IN FINLAND: GIS-BASED APPROACH

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Biodiversity generates the foundation for the life of the globe. Unfortunately, many direct drivers such as climate change, habitat destruction and spreading of invasive species have reduced it. The methods used so far to control the loss of biodiversity have not been effective. The concept of ecosystem services - benefits that human derives from ecosystems - offer a new tool to maintain biodiversity. Biodiversity and ecosystem services have intrinsic link to each other, the former has a key role at all the levels of ecosystem services (Mace et al. 2012). The changes in ecosystem services are associated with the changes in biodiversity which impacts people’s well-being. The ecosystem services, in which the societal and ecological aspects integrate, offer a promising approach to determine the conflicts between conservation and the use of natural resources (Nelson et al. 2009).

However, attention should be paid to the fact that biotic nature is only part of the nature and the abiotic components of the habitat are also a fundamental component of ecosystems. The existence and importance of abiotic nature have often been underestimated. Recently, the concept of geodiversity has been put forward as a new approach to measure abiotic variation within nature. Geodiversity can be considered to be the abiotic equivalent of biodiversity. Both geodiversity and biodiversity provide the support of the key ecosystem processes, as they affect the delivery of some ecosystem services and may themselves be goods (Gray 2011, Mace et al. 2012). Still, to date few studies have evaluated the spatial concordance among biodiversity, geodiversity and ecosystem services, especially in the boreal region. Therefore, it is important to identify ecosystem services and understand how the biodiversity, geodiversity and ecosystem services vary geographically in different environments and across scales.

In this thesis, the geographical variation of biodiversity, geodiversity and ecosystem services in Finland are studied at regional and national level. Geographical information systems (GIS), remote sensing, high-quality museum data, modern spatial analytics and the survey of the literature are utilized to compile a database for ecosystem services analysis. The main questions in this study are: (1) How ecosystem services vary geographically at different scales (e.g. to identify trade-offs among the ecosystem services)? (2) How biodiversity, geodiversity and the most essential ecosystem services are connected to each other (e.g. do the biologically and geologically diverse areas produce ecosystem services which are vital to the human well-being)? Furthermore, the central objective is to improve GIS-based methods to survey and measure ecosystem services at a national level.

References
DIFFERENTATION OF SELF, FAMILY PATTERNS AND THE INTERGENERATIONAL TRANSMISSION OF VIOLENCE

Anu Kangas

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Violence in the family is a widely spread social problem. In addition, there is substantial amount of research to support the finding that people who have experienced violence in their families of origin tend to repeat patterns of violence in their own families.

To my knowledge, there is very little or no research on the intergenerational transmission of violence that focuses on family as a whole, and in particular on how lack of emotional separation from the family of origin may contribute to the intergenerational transmission of violence.

In my research I will use a system theoretical approach. The system theory that is used as a theoretical framework and a starting point is psychiatrist Murray Bowen’s (1988) family systems theory. Theory describes family emotional processes and patterns of relating, and how these processes and patterns are transmitted from generation to generation. Feminist theorists and practitioners have expanded the theory by incorporating a gender perspective. One of the key concepts of the theory is differentiation of self. It is assumed in the theory that the less people have emotionally differentiated from their family of origin, the more they are vulnerable to stress and prone to repeat the patterns of relating they learned in their family of origin. Families with low level of differentiation are also less adaptive to changes in circumstances.

The research material will consist of in-depth interviews that will be analysed using a qualitative method. The interviews will be conducted in Northern Finland during the winter 2013-2014. The participants will be recruited among the customers of the Federation of Mother and Child Homes and Shelters. My aim is to interview all family members, including children.

The purpose of the study is to contribute to the scientific understanding of the intergenerational transmission of violence, and also draw attention to the importance of emotional aspects in human functioning.

References
The present PhD research is carried out in the project “Rapid environmental changes in the Eurasian Arctic - Lessons from the past to the future” (REAL). The understanding of ice sheet transitions within past 130,000 years is one of the aims of this study. The main objective is to produce information on the rate of environmental changes and extreme events in the Eurasian Arctic.

The relevance of this study is connected with a recent global problem of the Earth’s climate warming. The understanding the changes of climate, sea-level and global ocean circulation that occurred in the past is the key to the interpretation of present global climate change and development the possible future scenario. Major past environmental changes are registered in marine and terrestrial sediments. The detailed study of sediment record via so-called proxies provides information for paleoenvironmental and paleoclimatological reconstruction.

The PhD thesis will be accomplished in the framework of our research of ice sheet collapses and transitions/terminations in the Eurasian Arctic. The lithological, mineralogical and geochemical data previously generated from cores drilled in different parts of the Eurasian Arctic [e.g. Lomonosov Ridge (IODP ACEX 302, AO-96), Yermak Plateau (ODP Leg 151), Barents Sea] make it possible to reconstruct the ice sheet development. The data will be correlated to the land sections. The terrestrial sediment records will provide the data especially for the last interglacial transition. These information and models should clarified the time and duration of relatively fast climatic and environmental transitions that caused hydrological changes including changes in sea level, glacial ice extent and volume, drainage basins and ocean currents.

The first part of the PhD project will focus on the one distinct transition in decay of Eurasian Arctic ice sheet by investigation the central Arctic Ocean sediments during Marine Isotopic Stages (MIS) 4-3 for their provenance and transport processes. The lithological, mineralogical and geochemical data previously generated from core (AO96-12p1) from the Lomonosov Ridge make it possible to evaluate the Barents-Kara Ice Sheet history and to make an assumption about those probable sediment drainage and provenance changes. The core contains the distinct sediment layer, the deposition of which is preliminary dated to take place around 50-60,000 years ago. This distinctive, 48 cm thick homogenous layer of grayish silty clay may give an evidence for suggestion about dynamic event, like a drainage of the large ice-dammed lake on the Siberian hinterland, nature of which is not yet clearly identified. The detailed study of sediments from 40 cm down to 180 cm below sea floor via heavy minerals proxy can allow implementation of the above mentioned aims. This type of study will help us to understand continental ice sheet collapses and volume changes as well as drainage basin evolution on land.
Structuring the Smart Energy Network – Shaping a sustainable future

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The emergence of the smart grid (SG) concept brought multiple visions and expectations for the future smart network. Energy utilities are continuously reinforcing the electricity grid with ICT. On the long term, smart grid can be a key to sustainable energy by reducing greenhouse gases emissions, flattening the energy profile and enhancing energy security. For data management, the Smart Grid Task Force proposes the data access point manager approach, involving an independent third party. For the electric market, Fox-Penner (2010) introduced the Smart Integrator (SI) concept. In order to handle the distributed energy system, there is a need for energy service providers on the electricity market. The Highly Distributed Energy Future initiative foresees self-sustaining “cells”, within which energy is produced locally, thus guaranteeing energy supply also on a large scale. The next step is developing a smart energy network, where SG becomes a sub-entity and integrates multiple energy carriers and energy forms throughout the network (Chai et al., 2013).

This research tackles the problematic of building the future SEN using a bottom-up approach. Currently, the major stakeholders in the field of smart grid include the consumers, the authorities and the utilities. The utilities are sub-divided in groups comprising the energy conversion device manufacturers, the metering companies, the distributed system operators, the ICT companies, and the power companies. Firstly, the motivations in building the future SEN are identified for each categories and sub-categories. Secondly, a structure forming the SEN is described. This study envisions a SEN which is modular and based on a distributed energy supply. The structure presented integrates a combination of micro-grids and virtual power plant infrastructure for handling the decentralized system. It is envisioned that the energy system will integrate a tri-party connection between the consumers/prosumers, the energy services companies and an energy integrator. The tri-party repartition of the energy market fulfils the motivations of the stakeholders for a better integration of the SEN.

References
Urban areas maintain high species diversity due to heterogeneous land use patterns and a significant percentage of non-native species. The spread of non-native species increases the biodiversity at a local level, but at a large-scale level it may homogenize the species composition. Urbanization may therefore threaten the existence of natural habitats and species. For example, nationally threatened vascular plants most commonly live in natural habitats, such as forests, shores or in mires in Finland.

In this presentation, we studied the spatial distribution of vascular plants located within an urban area and determined main factors (land-use type, habitat diversity, distance to water, NDVI (Normalized Difference Vegetation Index)) contributing to the species richness. In addition, we explored effects of urbanization to red-listed species and harmful invasive species.

Study area is the city of Oulu (65°01’N, 25°28'E, ca. 400 km² in 2004) in northern Finland. The study area consists of 388 squares of 1km². Data on plant species is provided by Botanical Museum of Oulu. Species were divided into groups according to their red-list status and invasiveness. Corine Land Cover (CLC) 2000 was used to classify land-use types and to calculate habitat diversity for each square. Distance to water was calculated from the focal point of each square. Maximum NDVI was calculated for each square.

According to our results, Maximum NDVI was a good predictor of species richness. Total number of plant species and the number of harmful invasive species increased along with the proportion of built area. Habitat diversity and distance to water had positive effects on the species richness. Distance to water explained the occurrence of red-listed species.
CLIMATE CHANGE AND BOREAL RIVERS: PREDICTING PRESENT-DAY PATTERNS AND FUTURE CHANGES IN NATURAL FLOW REGIME AND ITS EFFECTS ON RIVER COMMUNITIES

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The amount and unpredictability of rainfall have been predicted to increase in northern regions due to ongoing climate change. Consequently, the flow regimes of boreal rivers and streams will be affected by the changing environmental conditions. The amount, timing, and variability of flow are among the fundamental environmental drivers structuring stream communities. Considering that freshwater ecosystems are already among the most heavily affected environments, climate change represents an additional and severe threat to freshwater ecosystems. The main objective of this research project is to combine knowledge from ecology and hydrology to assess how predicted future changes in natural flow regime will influence the taxonomic and functional composition and richness of stream communities.

This project will constitute of four different subprojects. First, we will combine ecological and hydrological expertise to define the flow regimes of boreal rivers and assess if and how these flow regimes are reflected in macroinvertebrate community structure and function. Second, we will assess whether combining hydrological and biological models improves the predictive power of models used in Finnish national assessment system for rivers and streams. Third, we will model how ecologically important aspects of the flow regime will change in response to climate change and how these changes will affect the diversity of stream assemblages at regional and local scales. Fourth, we will experimentally assess the responses of stream communities to multiple stressors emerging from climate change, such as changing discharge and sedimentation.

The interdisciplinary approach of this project will allow examination of stream assemblages and their relationships to changing environment in a great level of realism. Results from this project will provide urgently needed information about how rivers and their assemblages are likely to respond to climate change and where the effects are likely to be most pronounced. This information will allow guidance for regional managers in the protection of natural rivers as well as restoration of rivers already degraded by anthropogenic activities.
DEVELOPING PLACE-BASED VISITOR MONITORING
IN OULANKA NATIONAL PARK

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The increasing recreational use of national parks has emphasized the need to manage these areas to ensure the sustainability of physical environment as well as to provide quality experiences for visitors. As the ongoing paradigm of national park management calls for public participation and highlights the management by objectives -approach, a wide range of indicators is needed to monitor the changes in the parks and in its visitors. Nevertheless, minority of the current indicators represents the quality of visitor experience, and the ones that do, are highly general in nature.

Monitoring visitor experiences is a complex task because of several issues. The first challenge is faced when defining and operationalizing the concept. In this study, visitor experience is understood from management perspective to be constructed by visitors based on their previous expectations and on their onsite interaction with physical, social and managerial setting attributes. The second problem of monitoring visitor experiences is related to the methodological aspect, since different measurement approaches and techniques evidently lead to differing picture of the quality and nature of visitor experience. Thirdly, the monitoring tradition of visitor experiences has failed to capture the spatial dimension of visitor experience, although national park is a spatial mosaic of experiences. To reveal these issues and to promote monitoring of visitor experiences more critical methodological assessment and new monitoring techniques are needed.

Public Participatory GIS (PPGIS) is a methodological approach that has been applied in diverse ways for two decades in mapping the perceptions that the public holds for certain places to improve the decision-making across several disciplines. In environmental context, the research has concentrated in mapping landscape values. PPGIS method have found to bring many benefits to decision making, but nevertheless, there are number of issues related to this fairly new method, which needs to be resolved before either being able to scientifically argue on behalf of method’s validity or to discover best practises to apply the method in practise.

The aim of this study is to examine the possibilities and obstacles of PPGIS in filling the methodological gap of monitoring visitor experiences as an essential part of national park management. The study answers to questions: (1) How to measure visitor experiences place-based and how to process the spatial data? (2) How to integrate place-based visitor experiences into visitor management frameworks? (3) What are the advantages and challenges in collecting and in utilizing spatially measured visitor experiences? By answering these questions, the study expands the scientific understanding of the socio-spatial dimension of a national park, strengthens the linkages between place-based visitor experiences and visitor management frameworks as well as provides practical knowledge, how to carry out the spatial monitoring of visitor experiences.

The data for the research will be collected in three phases using different mapping techniques in Oulanka National Park during the year 2014. The data analysis will be conducted using statistical methods as well as spatial statistics. The mapped visitor experiences will also be interpreted to national planning officers as a part of semi-structured expert interviews to further assess the validity and usefulness of different kinds of place-based data collection and analysis methods. These interviews will be analysed using qualitative content analysis. The study, containing tree scientific articles, will be completed in 2015.
Science “speaking truth to power” in Rokua groundwater conflict

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The intriguing case of Rokua illustrates how research-based knowledge can influence environmental decision making by reframing policy options. Knowledge plays a key role in understanding and possibly ending up the Rokua groundwater conflict, whereas participation and learning since beginning of the process have been essential for meaningful communication. The results hitherto obtained emphasize the vital role of science in decision making and invites to rethink and clarify the much criticized linear model in science-policy interface.

Rokua esker aquifer is one of the largest groundwater bodies in Finland, but the groundwater levels and groundwater dependent lakes have been observed to decline dramatically in last decades and especially during dry seasons. The reasons for the decline have not been understood, which has resulted in accusations toward forestry, agriculture, peat extraction, water pumping and even tourism industry. Since 2008, local stakeholders, officials and the University of Oulu started to collaborate in order to understand the causes of the problem and to find a sustainable policy option. At the beginning of the process it seemed obvious that the main cause for the decline was ditches made for peatland drainage. Hence, active restoration of the ditches was widely supported as it would improve the ecological state, recreation value and tourism attractiveness in the area. However, the latest groundwater model unexpectedly suggest that the main cause of the decline is the climate conditions, yet emphasized by ditches, while other believed causes (water pumping, agriculture, peat extraction etc.) are less significant. In other words, according to the model, groundwater level changes in Rokua are mainly natural, which is easy to understand at the moment as the water levels are high again due to the rainy weather. Moreover, the restoration of ditches would be expensive and might only have minor impact on lake levels, as the pre-ditch natural state of peatlands is hard or impossible to achieve. Furthermore, a climate model is showing a long-term trend of increased precipitation, which, combined with the avoidance of new drainage ditches in risky groundwater discharge areas, proposes that the problem might dissolve with time, or at least does not get worse. In conclusion, new scientific evidence is challenging the previous knowledge and policy options, and possibly making the whole environmental problem disappear.

The aim of the research is to evaluate, by interviewing stakeholders, officials and scientists, how the latest scientific evidence is understood and interpret in the light of policy options, and how the opinions are related to interests, values, perceived trust and earlier participation activity. Based on the interviews, stakeholder meetings, pronouncements, newspaper articles and other research made of Rokua, the role of science in decision making in Rokua is reconstructed.

The results so far indicate that the conflict was highly eased during the participatory and learning process as different policy options and trade-offs were constructed, stakeholders understood the problem and started to speak same language. However, after the new scientific model challenged the whole perception of the problem and changed the management options, it is still unclear if it is enough to end up the local recriminations and bring back the confidence and will to invest in Rokua.
Humans are social beings and when one’s socioemotional needs are not adequately met, the involuntary, subjective, negative feeling of loneliness may occur. Loneliness has been associated with many negative outcomes such as depression, anxiety and bullying. Therefore, left unattended, loneliness may have serious consequences on one’s mental and physical well-being and health.

In this PhD research loneliness is being examined in a large, general population-based age cohort of Northern Finland Birth Cohort 1986 (N=9,432). All mothers whose expected delivery date fell between 1 July 1985 and 30 June 1986 and who lived in two northernmost provinces of Oulu and Lapland were recruited. The study is a mixed method research; both quantitative (survey research, logistic and multinomial regression analysis) and qualitative (thematic interviews, content analysis, memory work, phenomenological-hermeneutical interviews and analysis) methods are in use. The aim is to examine how loneliness manifests itself over the life-time of young people in Northern Finland and to look what consequences it has for their well-being, health and growth.

According to the results of the first article, 3.2% of 16-year old adolescents reported feeling very lonely, 26.4% reported feeling somewhat, and 70.4% reported no feelings of loneliness. Girls reported more loneliness than boys. Multinomial logistic regression showed, that feeling somewhat or often lonely was associated with not having close friends, feeling unliked, being victim of bullying, avoiding company, feeling unhappy, sad or depressed, being dissatisfied with life and having poor self-rated health. Further, loneliness was associated with living in the countryside among girls, association not found among boys. Second article showed that 8.7% of adolescents reported deliberate self harm (DSH) often/sometimes, with girls reporting DSH almost four times more than boys. The association between DSH and loneliness was found among girls and boys. According to the preliminary results of the third article, somewhat or very lonely girls likes school less than those who are not lonely, but similar association was not found among boys. In the final, fourth article, the lived experience of loneliness is going to be examined through interviews of 20 young adults. In this presentation the research plan, the results and the challenges and the future openings of this PhD research will be discussed.
Chemical modification of cellulose to produce nanofibrils for new membrane structures

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Cellulose, which is often referred as one of the most abundant raw material in the world, has numerous applications from basic paper to high-end products depending on the processing degree. Northern region offers plenty of high quality lignocellulosic raw materials, which can be exploited for further use to develop new bioproducts. In the last decade the number of research articles related to modification of cellulose to nanosize has exploded. By chemical, enzymatical or mechanical treatment of cellulose fibres, it is possible to loosen the interfibril hydrogen bonding between nanofibrils. The most effective methods to produce nanocellulose include the combination of chemical pre-treatment and a mechanical disintegration. Mechanical disintegration is commonly done with a high pressure homogenizer, which exposes fibres to strong shear and cutting forces under high velocity and pressure. Liberated nanofibrils have average widths from 3 to 4 nm and length of several micrometers. Cellulose nanofibrils pose superior properties due to their ability to form ultra-strong network with excellent mechanical properties. Other well-known properties include good water retention capacity, low-weight and high specific surface area. The current issues in water purification require new solutions as there are more than 780 million people who lack access to clean water and more than 3.4 million die each year from a water related disease (Water 2013). Nanocellulose has been studied as a potential sustainable raw material for ultrafiltration membrane applications to replace the current petrochemical based raw materials. The strength and hydrophilic nature of the cellulose nanofibrils has led to the development of thin film barrier layers for water filtration membranes. The fabricated barrier layers can reach additional features depending on the chemical modification of cellulose fibres.

The present study consists of modification of Northern birch chemical wood pulp with two new chemical pre-treatments in order to produce nanocellulose with different features. The first studied recipe is based on a sequential sodium metaperiodate and- sodium chlorite oxidation, which has been reported earlier (Liimatainen et al. 2012). The second recipe under investigation has the potential to produce hydrophobic nanocellulose with excellent viscosity properties. The produced nanocelluloses are studied as conceivable alternatives as a durable and protective membrane barrier layers where the pore size is estimated to range from 5-55 nm. So far, promising results in terms of separation efficacy have been achieved with 2,3-dicarboxylic acid cellulose (DCC) nanofibrils.

References
ELECTRONIC WASTE: POTENTIAL SECONDARY SOURCE OF CRITICAL METALS

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In the 20th century, material extraction from earth’s crust is continuously increased due to rising well-being and consumerism, and resulted in growing amounts of anthropogenic material stocks. Technological innovations, new applications information and communication technologies (ICT) and market expansion into developing countries have significantly increased also the production and use of electrical and electronic equipment (EEE) during the last three decades. Fast technical progress and EEE becoming a part of everyday life have also led burgeoned variety of substances used in EEE devices. New applications of EEE have also led to a situation where a number of materials formerly no more than scientific curiosities have nowadays an important role in electronic and other future devices, resulting in a concern about their sufficiency and vulnerability of supply. Therefore, various criticality studies and surveys have been recently conducted worldwide. According to an EU study, 14 materials are considered as critical in the EU (platinum group metals (PMG) and rare earth elements (REE) are each counted as one) from which the majority are essential in a wide range of high-tech and future applications.

Recycling is regarded as a solution to substitute primary resources and decrease environmental loading. For this reason, this study focuses on the assessment of recovery potential of critical materials from electronic waste based on criticality studies and material flow analysis of scarce metals from literature.

On the grounds of the study, recycling of critical materials from electronic waste has a high potential for future supply of those metals; however, there are currently some limitations as well. One of the main present limitations is high dissipation rates. The principal drivers for the dissipation of critical materials are explicitly dissipative applications, minor concentrations in final products and ineffective collection and recycling systems. Dissipative losses may occur at every stages of the material’s life cycle; at the end-of life stage of EEE it means incomprehensive collection, losses in dismantling and other pre-treatment stages as well as in the stages of actual recycling processes and final disposal. The destination of dissipated metals may be environmental media (air, soil or water), other material flows within the technosphere or landfills. The most potential secondary source of critical metals seems to be those intermediate or end products, which consumes a majority of the world production of certain critical materials. Optical fibers (55 % of germanium production), capacitors (60 % of tantalum) and thin films used in touch screens (80 % of indium) are good examples of such products. Also products containing high concentrations of one or more critical metals, such as printed circuit boards, are in the centre of the interest.

Ultimately, electronic waste is a potential secondary source of scarce critical metals, and their recycling serves both environmental and economic purposes. However, meeting future demands for critical materials requires efficient collection systems and improved recycling systems. An essential part of this will to minimize dissipative losses to other material flows.
COMBINED EFFECT OF REINDEER GRAZING AND GLOBAL WARMING ON SUBARCTIC CARBON STOCKS

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Global warming is feared to enhance microbial activity on arctic and subarctic areas leading to faster decomposition of soil carbon reserves and possibly to increased release of greenhouse gases (McGuire et al., 2009). The magnitude and direction of the change depend on the realized feedbacks of plant and microbial communities and their interaction with local factors, such as herbivory.

This doctoral study aims to follow how global warming and grazing by reindeer (Rangifer tarandus) act together and affect the local carbon cycle and the net flux of CO₂ between soil and atmosphere. Earlier studies have shown that reindeer grazing can counteract the warming induced spread of deciduous shrubs (Olofsson et al., 2009) and that warming releases more CO₂ from grazed areas compared to sites with reindeer exclosures (Cahoon et al., 2012). However, the impact of long-term grazing history on the carbon cycle feedbacks to climate change has remained understudied. In this doctoral study, I will follow how the past warm 10–15 years have changed the above- and below-ground carbon stocks on areas that have been managed with different reindeer grazing histories. This will be accomplished by resampling soil and vegetation samples at various sites in subarctic Fennoscandia and by modelling the growing seasonal rates of photosynthesis and soil respiration. The thesis will also use the help of two experimental settings that explore the interaction of warmer climate and herbivory with full-factorial designs.

In this research plan seminar, I will present the first part of my doctoral thesis, where I follow closely the carbon connections within an experimental setting in Kilpisjärvi, Northern Finland. In this 18-year-old experiment, the study plots have been warmed with open-top-chambers and intense herbivory has been simulated by clipping the shoots of the dominant plant Vaccinium myrtillus. I am interested how grazing and warming have affected vegetation composition, the carbon stocks in soil as well as the current flux of CO₂. In order to better explain the phenomena behind, different soil parameters are monitored throughout the growing season, including nutrient availability in soil, nutrients held within the microbial biomass, the activity of microbes and the abundance of certain enzymes. With the help of the results from this and the further subprojects, we hope to bring new insights in understanding the combined effects of reindeer grazing and global warming on terms of local carbon cycle. Ultimately, this study could provide information about the future carbon footprint of different land-use practices.

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