

# Ecosystem Services at NINA

This note gives an overview of ongoing and upcoming activities at NINA on ecosystem services in order to inform potential project partners, funders of our research and management authorities of the scope of our activities in this field. But also to inform others that might find our results and methods relevant. The overview focuses on projects with case studies within Norway.

## ONGOING RESEARCH PROJECTS

### **BESAFE - Biodiversity and Ecosystem Services: Arguments for our future Environment (2011-2014)**

In order to protect biodiversity, policy makers increasingly require demonstration of its value. BESAFE uses case studies to investigate how much importance people attribute to alternative arguments for the protection of biodiversity and in particular how this relates to ecosystem services. It focuses on the arguments used by policy makers at different governance levels and in different ecological, socio-economic, spatial and temporal contexts. BESAFE examines the interactions of environmental protection policies between governance scales. This will lead to an assessment of the transferability of arguments across scales. The project will consider the contribution that valuing ecosystem services can make in demonstrating the value of biodiversity. The results will be used to produce a framework that will give guidance on the effectiveness of alternative arguments and protection strategies in various contexts. The framework will be made accessible through a web-based public access database with associated toolkit. To ensure practical usability, the toolkit and database interface will be developed in cooperation with stakeholders.

**Area in focus in Norway:** Case study on large mammal conservation and management and the arguments used. Interviews with people in Hedmark and Dovre

**Involved persons from NINA:** Henrik Lindhjem, John Linnell, Jiska van Dijk

**Financed by:** European Commission, FP7-ENV-2011

### **Values of ecosystem services in forests in Norway (2012)**

A review of Norwegian, and to some extent, international literature documenting the extent and significance (value) of ecosystem service flows from Norwegian forests. The report also discusses synergies and trade-offs between ecosystem services and significant knowledge gaps.

**Area in focus in Norway:** Forests in the whole country.

**Involved persons from NINA:** Henrik Lindhjem, Erik Framstad, Vegard Gundersen

**Other involved institutions in Norway:** Vista, Norwegian University of Life Sciences

**Financed by:** Ecosystem Services Committee Secretariat, Ministry of Environment

**POLICYMIX - Assessing the role of economic instruments in policy mixes for biodiversity conservation and ecosystem services provision (2010-2014)**

POLICYMIX is evaluating the role of economic instruments in the mix of instruments that make up Norwegian forest conservation policy. In Norway and 6 other case studies in Europe and Latin America, national level studies of conservation policy mixes have been carried out, identifying the role played by voluntary conservation instruments such as payments for ecosystem services, and instruments such as ecological fiscal transfers. In detailed case studies at the subnational and local levels a number of studies are being carried out on the economic value of ecosystem services from forests, the costs of different instruments for protecting forests, cost-effective targeting of new public and voluntary conservation areas, legitimacy of economic instruments as perceived by different stakeholders, and institutional possibilities and constraints on extending the scope of economic instruments.

**Area in focus in Norway:** Telemark, Buskerud, Vestfold.

**Involved persons from NINA:** David N. Barton (coordinator), Henrik Lindhjem (case study coordinator), Graciela M. Rusch (WP coordinator), Margrethe Tingstad, Hanne Svarstad, Stefan Blumentrath, Anne Sverdrup-Thygeson Vegard Gundersen and Roald Vang.

**Other involved institutions in Norway:** Institute for Forest and Landscape Research, Department of Ecology and Natural Resource Management, University of Life Sciences (UMB).

POLICYMIX also collaborates with the EU funded project ECOSPACE, coordinated by the University of Wageningen, which is currently carrying out ecosystem service mapping in Telemark (Matthias Schröter).

**Financed by:** the EU Theme FP7 ENV.2012.6.2-1: Exploration of the operational potential of the concepts of ecosystem services and natural capital to systematically inform sustainable land, water and urban management". Support from Norwegian Research Council for proposal preparation.

<http://policymix.nina.no>

<http://policymix.nina.no/Casestudies/Norway.aspx>

**FUNCITREE - Functional Diversity: An ecological framework for sustainable and adaptable agro-forestry systems in landscapes of semi-arid and arid ecoregions (2009-2013).**

The research in FUNCITREE is based on the principles of functional ecology to address the provision of multiple services of silvopastoral systems (SPS) in semi-arid regions in Africa and Central America.

The project integrates theories and concepts from agro-forestry and ecological science and provides a scientifically based model that combines biodiversity functional traits related to species water use efficiency, litter decomposition rates, nitrogen fixing ability and capacity to provide forage with culturally defined species traits such as Central American cattle farmers' distinction between "good" and "bad" canopy types for livestock and pasture productivity, linking in this way, tree traits with the provision of one or more services by agro-forestry in dry and marginal areas. FUNCITREE develops models to link tree traits, ecological functions and farmers' perceived benefits (ecosystem services) and choices that are suitable to utilize information from different sources, handle missing data and uncertainty, and that facilitate iterative model development.

**Area in focus:** Central America and West Africa.

**Involved persons from NINA:** Graciela M. Rusch (coordinator), David N. Barton (WP coordinator), Christina Skarpe and database developers.

**Other involved institutions:** CATIE Costa Rica, CSIC Spain, WUR The Netherlands, CIRAD France, ISRA Senegal and IER Mali.

**Financed by:** the EU Theme FP7 Theme 2, Food, Agriculture and Fisheries, and Biotechnology. Research in Nicaragua is supported also by the project "Multi-functional Landscapes: Bio-engineering multi-functional silvopastoral landscapes: A case study in Nicaragua". Research Council of Norway (2009-2013).

<http://funcitree.nina.no>

### **SIS -Pollination. Structural and functional complexity as determinants of provision of ecosystem services (2011-2015)**

SIS-Pollination addresses the roles of structural and functional composition of the landscape at different levels of organization and their relations to the flow and value of pollination services. The project aims to i) study how the amount of pollination depends on the interaction between landscape properties in terms of the landscape mosaic, the quality of its habitat patches, and the functional attributes of the pollinators and ii) conduct an economic valuation of different 'pollination landscapes' for different Norwegian crops. The project uses models to link functional traits of pollinators, plant communities and landscapes; ecological functions and the delivery of ecosystem services that are suitable to use information from different sources, handle missing data and uncertainty, and that facilitate iterative model development. SIS-pollination draws from other ongoing projects at NINA studying the distribution of pollinators related to land-uses and predictions of pollinator distributions as a response to climate change.

**Area in focus in Norway SIS-pollination:** South-East and South-West Norway

**Involved persons from NINA:** Graciela M. Rusch (coordinator), Frode Ødegaard, Jan-Ove Gjershaug, Sandra Öberg, Jens Åström, Kristine Westergaard, David N. Barton and Henrik Lindhjem.

**Financed by:** Research Council of Norway, NINA - Strategic Institute Support.

### **EUTROPIA - Watershed EUTROphication management through system oriented process modeling of Pressures, Impacts and Abatement actions. (2010-2013)**

The aim of Eutropia is to produce a holistic decision analysis tool for management of eutrophication problem. The project involves detailed modeling of the provision of watershed services from management of catchment vegetation and landuse management practices, and its effects on lake eutrophication. The project combines hydro-geo-chemical processes and uncertainty of mobilization, transformation, flux and effect of nutrients by use of integrated simulation models in a Bayesian network, with a systematic societal response analysis WP1: Describe catchment processes governing mobilization, transport and nutrient flux WP2: Develop sampling and analytical methods of P fractionation in water WP3: Integrate the developed system and process understanding of the terrestrial and aquatic environments in the models WP4: Use Bayesian network to integrate the simulation models in the driver-pressure-state-impact-response (DPSIR) model chain with stakeholder (e)valuations of changes in water quality; develop a better measure of uncertainty in prediction power for future changed pressures. WP5: Develop systematic societal response analysis based on identified nutrient sources with focus on behavioural modelling the likelihood of implementation of different abatement strategies.

**Area in focus in Norway:** Morsa Catchment, Østfold & Akershus, Norway

**Involved persons from NINA:** David N. Barton (coordinator WP4 – Bayesian network modeling of watershed services)

**Other involved institutions in Norway:** University of Oslo(coordinator), NIVA, Bioforsk, Handelshøyskolen UMB

**Financed by:** TVERS, MILJØ 2015, Norwegian Research Council

## **EcoManage - Improved development and management of energy and water resource (2012-2015)**

EcoManage aims to combine methods of habitat equivalency analysis, ecosystem services valuation (mainly using rehabilitation cost approaches), life-cycle analysis (LCA) and multi-criteria decision analysis (MCDA) of offsetting alternatives and stakeholder participatory methods to address the questions of whether biodiversity offsetting is ecologically and economically feasible in hydropower. We would aim to conduct an evaluation of habitat equivalency and restoration costs of sites that would offset impacts within watersheds that are candidates for peak power regulation and land affected by newly constructed transmission lines. An evaluation of offsets would be carried out for hypothetical alternatives within the same catchment, and hypothetical alternatives in a different catchment in South-western Norway.

NINA coordinates the workpackage on application of MCDA methodology and evaluation of ecosystem services in habitat equivalency analysis of biodiversity offset measures.

**Area in focus in Norway:** case study to be decided in South-western Norway.

**Involved persons from NINA:** David N. Barton (coordinator WP4 – Multi-criteria analysis and ecosystem services), Dagmar Hagen, Anders Finstad, Henrik Lindhjem.

**Other involved institutions in Norway:** SINTEF, NTNU, CEDREN

**Financed by:** CEDREN, Norwegian Research Council

<http://www.cedren.no/Projects/EcoManage.aspx>

## **UPCOMING RESEARCH PROJECTS**

### **OpenNESS - Operationalisation of Natural Capital and EcoSystem Services: From Concepts to Real-world Applications” (2013-2017)**

OpenNESS has been designed to deliver innovative and practical ways of applying the concepts of Natural Capital (NC) and Ecosystem Services (ES) in land, water and urban management in Europe and to examine how they link to, and support, wider EU economic, social and environmental policy initiatives. It will build on the experience of global and national Ecosystem Service and Natural Capital assessments (MA, 2005; TEEB, 2010, 2011; UK National Ecosystem Assessment (UK NEA, 2011)); Spanish Millennium Ecosystem Assessment (EME, Montes and Lomas, 2010) and the models and datasets developed in numerous other research projects (e.g. RUBICODE, BESAFE, SEAMLESS, GREENVEINS, CLIMSAVE, MOTIVE), which lack integration and are underexploited. OpenNESS brings together 35 European centres of excellence with the interdisciplinary expertise and understanding to expand on previous work in four important ways:

- 1) Work with public and private decision-makers and stakeholders to better understand the range of policy and management problems faced in operationalising the ES concept in different case study contexts (different locales, sectors, scales and time). In Norway NINA leads a case study on the valuation of urban and peri-urban green infrastructure and its integration in urban planning in the Oslo area.
- 2) Consolidate, refine and develop a range of spatially-explicit methods for identifying, quantifying and valuing ES. NINA coordinates “WP4 Valuation of the demand for ecosystem services”
- 3) Explore the effectiveness of financial and governance mechanisms, such as tradable permits (e.g. habitat banking), ‘reverse auctions’ (e.g. payment for ecosystem services, PES), regulatory price signals (e.g. agro-environment schemes), direct markets (e.g. ecotourism) and voluntary price signals.
- 4) Examine those environmental, social and economic policy arenas and processes where the concepts of ES and NC are most relevant, where the most urgent action is needed, and where the most effective

implementation can be achieved. In particular, it will assess how current regulatory frameworks and other institutional factors at EU and national levels enable or constrain consideration of ES and NC, and affect decision-making on ES and NC 'on the ground'.

**Area in focus in Norway:** Oslo urban and peri-urban 'green infrastructure'

**Involved persons from NINA:** David N. Barton (WP leader), Henrik Lindhjem (task & case leader), Jiska van Dijk (WP deputy), Graciela M. Rusch, Erik Stange

**Other involved institutions in Norway:** VISTA Analyse

**Financed by:** the EU Theme FP7 ENV.2012.6.2-1: Exploration of the operational potential of the concepts of ecosystem services and natural capital to systematically inform sustainable land, water and urban management". Support from Norwegian Research Council for proposal preparation, project management and networking.

## **Mapping and Assessment of Ecosystems and their Services (MAES)**

NINA is a member of the scientific support group to EU commission DG-Environment working group MAES (Mapping and Assessment of Ecosystems and their Services). The support group will come up with experiences, advice and 'know how' with regard to the methodological approach for the assessment of ecosystems under Action 5 of the EU biodiversity strategy to 2020. Ongoing and finished case studies from the different countries will be evaluated and advice on methodological approaches will be given to the MAES working group.

The essential challenge of Action 5 (improve knowledge of Ecosystems and Ecosystem services in the EU) of Target 2 (maintain and restore Ecosystems and their services) of the 2020 biodiversity targets is to make the best use of and to operationalize the current information and scientific knowledge available on ecosystems and their services in Europe in order to help the Member states achieve this Target 2. This fact is acknowledged and taken up by the EU commission DG-ENV "working group on mapping and assessment of ecosystems and their services" (WG MAES). A discussion paper for the WG MAES was prepared by a team led by Joachim Maes of JRC,

(Maes et al., 2012b : An analytical framework for ecosystem assessments under Action 5 of the EU Biodiversity Strategy to 2020; Draft for the WG MAES, May 20, 2012). The paper states a.o. that the "*analytical framework should therefore be sufficiently flexible to accommodate the results from ongoing European, national and sub-national assessments while enabling the inclusion of future assessments*".

The supporting group will have the task to work out this analytical framework and give advice to the WG MAES. The fact that the analytical framework should be sufficiently flexible to accommodate the result from ongoing assessments while enabling the inclusion of future assessment is an important idea to take up in the methodology of the supporting group of WG MAES.

The overall approach of the supporting group of WG MAES is to develop insight in the strengths and weaknesses, opportunities and threats of current practices in mapping and assessment of ecosystems and their services by

- 1) Analysis of the relevant professional literature, focusing on Europe, but taking note of interesting practices outside Europe;
- 2) Peer review of cases across Europe (inside and outside the EU), where assessment and /or mapping were major features, based on a set of fact-sheets which include criteria regarding indicators, data sources, data quality, geographical scales, transferability of results, institutional context, and usefulness for economic valuation.
- 3) Testing of the outcomes of (1) and (2) in a 2-day intensive workshop;
- 4) Obtaining an overview of the state of the art across Europe, through relevant professional networks;
- 5) Identifying gaps in methodologies and in implementation strategies;
- 6) Developing recommendations, in the form of a guidance document to deal with the methodological and institutional challenges.

**Involved persons from NINA:** Jiska van Dijk

**Financed by:** EU DG-Environment

**Period:** 2013-2014

## FINALIZED RESEARCH PROJECTS

### **Valuation of Ecosystem Services from Nordic Watersheds (Valueshed) (2011).**

The emergence of the ecosystem services concept suggests that economic valuation studies are already fulfilling a role in raising awareness by demonstrating the loss of nature's goods and services using monetary indicators. In order to have future relevance in capturing value and giving support to policy-makers, valuation methods must specifically address resource accounting, priority setting, and instrument design.

This report provides an overview of economic valuation methods of ecosystem services from watersheds in the Nordic countries. The study indicates that economic valuation methods can be applied to watershed management in multiple ways. However, policy makers should be wary of "one size fits all" valuation estimates that appear ready to use across different watershed types and stakeholder interests.

**Area in focus in Norway:** Glomma River Basin

**Involved persons from NINA:** David N. Barton (project leader), Henrik Lindhjem

**Other involved institutions:** Norwegian Institute for Water Research (NIVA), Sweco.

**Financed by:** the Nordic Council of Ministers.

<http://www.norden.org/en/publications/publikationer/2012-506>

### **Climate and ecosystem services. The potential of Norwegian ecosystems for climate mitigation and adaptation**

The project reports some of the benefits that society receives from nature and that are linked with the challenges that society faces regarding climate change. Two areas in which nature brings benefits to society are highlighted and supported with examples which show the ecological and biological characteristics and processes that underpin the level of service supply. The first group of benefits is associated with the capacity of nature to counteract or mitigate the increase in global greenhouse gas emissions. The second group of benefits is related to the capacity of nature to buffer against hazards produced by climatic extremes. These challenges will likely be of more concern in the future according to the projected changes in the climate. The impacts of human activities on the capacity of ecosystems to provide services are emphasized as well as the potential benefits that can be obtained both by incorporating the multiple values of nature into planning and by improving the management of life systems. The project gives examples on ecosystem services from boreal forest, floodplains and riparian ecosystems, and green infrastructure. Finally, the report gives some examples of trade-offs and synergies among the multiple services associated with climate change.

**Involved persons from NINA:** Graciela M. Rusch

**Financed by:** Directorate for Nature Management

<http://www.nina.no/Publikasjoner/Publikasjon.aspx?pubid=7352&Fra=P>



## NETWORKING

### **ALTER-Net: Europe's biodiversity research network**

Biological diversity plays a vital role in maintaining the health of ecosystems, as well as providing us with many valuable resources essential for our survival. For these reasons alone it is important that we understand biodiversity and the pressures it faces, so that we can develop credible responses. This requires effective scientific research.

ALTER-Net is a network of 26 partner institutes from 18 European countries. ALTER-Net integrates research capacities across Europe: assessing changes in biodiversity, analysing the effect of those changes on ecosystem services and informing policymakers and the public about this at a European scale. Originally funded by the European Union's Framework VI program to stimulate a collaborative approach, ALTER-Net is now operating independently. On [www.alter-net.info](http://www.alter-net.info) you can find information about key issues of concern and ALTER-Net projects contributing to the lasting integration of Europe's research capacity on biodiversity. ALTER-Net is well known for its successful yearly summer school and for strong consortium building for new research projects. In addition we have good collaboration with the EU commission and are building a strong science-policy interface

**Involved persons from NINA:** All researchers are ALTER-Net colleagues. Furthermore is Jiska van Dijk strategic advisor for ALTER-Net and represents Tor Heggberget NINA in ALTER-Net council

**Financed by:** Cash and in-kind contributions from the partner institutes

**Period:** 2004-still ongoing

<http://www.alter-net.info>

### **BiodiversityKnowledge: Creating a Network of Knowledge on biodiversity and ecosystem services in Europe**

There is plenty of knowledge on biodiversity and ecosystem services in Europe, but it is still scattered across many different types of institutions. As a result being "well-informed" is not an easy task for policy makers. A one-stop entry point into the knowledge community as well as a process for integrating knowledge and fitting it to the need of a decision maker are currently lacking.

Decision makers across the globe have agreed that there is a need for a better link between science and policy and have set up the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES). This should become operational in 2013. Europe, as one of the main knowledge holders in the field, will need to ensure that this knowledge is properly communicated into IPBES. Also, Europe needs similar support itself to implement its 2020 Biodiversity Strategy.

BiodiversityKnowledge will support the discussion on how knowledge should be gathered together. It provides baseline information on IPBES and its regional European perspective and highlights the European needs for a similar platform like IPBES. BiodiversityKnowledge is convinced that creating better links between the knowledge and the end-users will make a (significant/important) difference while tackling the short and long-term impacts of biodiversity change.

BiodiversityKnowledge is what we call a Network of Knowledge (NoK), i.e. a meta-network of institutions' knowledge, ensuring a high quality and broad scope of the knowledge available, while at the same time acknowledging the expertise of these institutions and their experts. The project is setting up a prototype of a NoK and is testing the NoK with several case studies.

**Involved persons from NINA:** Jiska van Dijk

**Financed by:** European Commission 7th framework programme

**Period:** 2011-2014

<http://www.biodiversityknowledge.eu/>

## **Norwegian expert commission on values of ecosystem services.**

The government appointed expert commission has a broad membership with twelve members. The expert commission is to describe status and development trends for Norwegian biological diversity and ecosystem services. The commission will look in particular at ecosystems that are under pressure or in decline and at possible main drivers for this, and it will pay particular attention at services that are important to meet expected effects of climate change and habitat and land use changes. Furthermore, the commission will point at needs and opportunities for better measurement and valuation of ecosystem services and at how this may be reflected in measurement of national wealth. The commission will also identify key research and knowledge needs and look at how relevant knowledge best can be made available to public and private decision makers in Norway. The commission will deliver its Norwegian Official Report ("NOU) by September 2013.

Signe Nybø from NINA is a member of the commission.

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