

Session: D5a-28 & D5b-29

Title of session: Approaches to modelling ES, where are we now and new approaches & Uncertainty analysis and validation of mapping and modelling ES

Session host / primary contact person:

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Short description of the session:

Session 28: Understanding the flows between ecosystems and society is a central topic in ecosystem service research. For understanding future changes in ecosystem service flows and the effects of management decisions on these flows, ecosystem service models are essential. Ecosystem service models can help to support policies and ecosystem management, for example through the development of scenarios for decision making. Ecosystem service modelling also helps understanding how physical conditions,

management, policies and societal demand affect flows of services, and vice versa. To support this understanding of feedbacks between ecosystem service flows, society and decision making, an important task for models is to incorporate interactions between ecosystem services, to give insights into trade-offs and synergies. Also, models are necessary to improve the understanding of the temporal and spatial dynamics involved.

Existing ecosystem service models range from those based on data, developed for the purpose of assessment (regression models; bayesian models), to models based on causal relationships (system dynamic models). While assessment models help support policies to know their inventory of service assets, system dynamic models facilitate the “what if” questions through the development of scenarios. Ecosystem service models based on system dynamics are knowledge bases to formulate causal coupling among the physical conditions, management, policies and societal demands, also called “thinking spaces”. Ecosystem service research is to gain from pursuing this causal knowledge towards improvement of systems dynamics models.

The purpose of this workshop is twofold. First, it looks into the current approaches for ecosystem service modelling. Second, it addresses the needs for further developing dynamic and integrated ecosystem service models. Getting an overview of the state-of-the-art in ecosystem service modelling is necessary to align modelling efforts, assess potential links between existing models and address potential research gaps. The workshop aims at providing an overview of the different types of models that are currently available and the purposes for which they can be applied. The need for an integrated approach for ecosystem service modelling will be discussed, either through the coupling of existing models or the development of an integrated ecosystem service modelling framework. Future needs in ecosystem services will be addressed, focussing on user orientation, potential applications, model integration, dynamic approaches and the inclusion of feedback loops.

Session 29: A large number of ecosystem service mapping and modelling approaches has been developed over the past years. Approaches range from process-based models, often utilized to map patterns and changes of one or a limited number of specific ecosystem services, to expert-based methods that aim at providing an approach that is easy to implement for whole bundles of ecosystem services and in multiple situations. Such maps are increasingly used to support policies that target at safeguarding the benefits that ecosystems provide to society, like the Convention on Biological Diversity, the European Biodiversity strategy and in many local scale conservation plans.

Implementing policies based on the quantity and spatial distribution of ecosystem services requires that estimates of ecosystem service provision are accurate. Despite the availability of ecosystem service maps and models at multiple spatial and temporal scales, assessing the quality and inherent uncertainties of ecosystem service quantifications and maps remains a major challenge. Very few maps and models have been validated, and although studies on ecosystem service mapping increasingly provide an uncertainty analysis, methods for quantifying uncertainties in ecosystem service maps are not crystallized.

Additional information:

This session forms part of the conference workshop sequence organized by the ESP thematic working groups on Mapping (TWG 4) and Modelling (TWG 5).

Planned Output:

Session 28: In the general discussion we will explore the possibilities for a common paper on the need for an integrated approach for ecosystem service modelling, either through the coupling of existing models or the development of an integrated ecosystem service modelling framework.

Session 29: In the general discussion we will explore the possibilities for a common paper on coping with uncertainty and validation in ES mapping.

Format & Speakers:

Topic	ID	Name	Organisation	Title of presentation	Time
10.30 – 12.30: Model development	35	Maud Mouchet	French National Museum of Natural History	Spatially explicit assessment of ecosystem service supply in Europe: where are we now and what should we expect from the future?	10:30–10:45
	122	John Robert Dymond	Landcare Research	Downscaling national models of ecosystem services to the Ruamahanga catchment, New Zealand	10:45–11:00
	206	Alistair McVittie	Scotland's Rural College	Operationalizing an ecosystem services approach using Bayesian Belief Networks: Integrating economic valuation	11:00–11:15
	251	Mark Rounsevell	University of Edinburgh	Representing ecosystem service supply and demand and human decision-making within an agent-based modelling framework	11:15–11:30
	286	Paula Harrison	University of Oxford	A regional integrated assessment model for building the capacity of decision-makers to adapt to cross-sectoral climate change impacts on ecosystem services	11:30–11:45
	439	Douglas A. Shoemaker	North Carolina State University	Anticipating the combinatorial effects of urbanization on water quality: an integrative modeling approach.	11:45–12:00

	347	Jahson B. Alemu I	University of the West Indies	Defining the role of coastal ecosystems in coastal zone management	12:00–12:15
15 minutes discussion (12:15–12:30)					
Lunch					
13.30 – 14.45: Applications	200	Stoyan Nedkov	National Institute of Geophysics, Geodesy and Geography – Bulgarian Academy of Sciences	Mapping and modeling of ecosystem services in protected mountain areas	13:30–13:45
	209	Kremena Boyanova Boyanova	Bulgarian Academy of Sciences	Application of the Water Footprint Concept for Quantification of Water-related Ecosystem Services	13:45–14:00
	243	Fanny Langerwisch	Potsdam Institute for Climate Impact Research	Bundling ecosystems services from forests and rice fields in Southeast Asia under climate and land-use change	14:00–14:15
	153	Mei Hua Yuan	Taiwan University	Mapping distribution and variability of ecosystem services valuation in Taiwan	14:15–14:30
	185	Kirsten L.L. Oleson	University of Hawaii Manoa	Using modeling approaches to understand and respond to land-based source pollution impacts on coral reefs	14:30–14:45
Short break or general discussion (max 15 minutes) (14:30–14:45)					
15.00 – 17.00: methodology evaluation	340	Alessandro Gimona	The James Hutton Institute	Mapping ecosystem services in data poor conditions	15:00–15:15
	393	Jan Staes	University of Antwerp	Effects of scale and methodology: can we use proxies for ES-assessments?	15:15–15:30

	444	Keigo Noda	The University of Tokyo	Prediction of Land Use Change and Future Potential of PES in the Citarum River Basin, Indonesia(2) – Assessment of Soil Erosion and Nutrient Runoff Integrating with Land Use Model	15:30–15:45
	111	Matthias Schröter	Wageningen University, Environmental Systems Analysis Group	Site prioritisation for conservation of multiple ecosystem services: hotspots vs. heuristic optimisation with Marxan with Zones	15:45–16:00
	290	Nynke Schulp	VU University Amsterdam	Uncertainties in European scale ecosystem service mapping	16:00–16:15
	252	Mark Rounsevell	University of Edinburgh	Quantifying the uncertainties within a cross-sectoral, integrated assessment of the impact of climate change on ecosystem services in Europe	16:15–16:30
	241	Sander Jacobs	Research institute for nature and forest INBO	Cross-validation of 5 ES maps: biophysical indicators versus expert-scored land use classes	16:30–16:45
Final discussion (16:45–17:00)					

Presentation abstracts:

ID: 241

Type: Voluntary contribution

29. *Uncertainty analysis and validation of mapping and modelling ES (OPEN)*

Cross-validation of 5 ES maps: biophysical indicators versus expert-scored land use classes

Presenting author: Sander Jacobs

Other authors: Toon Spanhove, Benjamin Burkhard, Toon Van Daele, Marijke Thoonen, Carine Wils, Heidi Demolder, Helen Michels, Johan Peymen, Anik Schneiders, Maarten Stevens, Peter Van Gossum, Wouter Van Reeth

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The ongoing ecosystem assessment for the Flanders region has produced a large number of spatial indicator maps for ecosystem services. The indicator maps are used to fulfill target 5 on mapping and assessment of ecosystem services of the EU biodiversity strategy. Most of these indicators are based on state-of-the-art models, measurement data or monitoring programs, recombined in GIS. Additionally, a large expert survey was conducted on ES supply capacity over different land cover units.

However, as these indicator maps are intended to inform decision on land use, uncertainty is translated into a direct risk for undesired outcomes. Therefore, scientists should be able to indicate confidence and validity of these indicator maps. Uncertainty is generated by the data behind the maps, but also by methodological choices and assumptions made during the mapping process. Time, resources and knowledge to resolve all uncertainties is lacking, while the urgency to apply the indicator maps is growing. This calls for a thorough and standardized assessment of indicator reliability.

We present a cross-validation of expert-based versus biophysically modeled indicators for the Flanders region, and discuss potential ways forward to integrate methodologies and set standards to verify reliability of indicator maps in general.