



BOOK OF ABSTRACT

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I. SESSION DESCRIPTION

ID: T14b

Assessing effects of landscape structure on ecosystem services for landscape planning and management: Striking a balance between level of detail and feasibility

	Title	Name	Organisation	E-mail
Host:		Johannes Hermes	Leibniz University Hannover, Institute of Environmental Planning	hermes@umwelt.uni-hannover.de
		Anna Cord	Helmholtz Centre for Environmental Research – UFZ, Department Computational Landscape Ecology	anna.cord@ufz.de
Co-host(s):		Jonathan Rhodes	University of Queensland, School of Earth and Environmental Sciences	j.rhodes@uq.edu.au
		Felix Neuendorf	Leibniz University Hannover, Institute of Environmental Planning	neuendorf@umwelt.uni-hannover.de
		Laura Graham	University of Southampton, Geography and Environmental Science	l.graham@soton.ac.uk
		Christian Albert	Leibniz University Hannover, Institute of Environmental Planning	



Abstract:

Land use change has profound impacts on the structure of landscapes (i.e., landscape composition and spatial configuration) and on the functioning of socio-ecological systems embedded within them. We know that these changes in landscape structure affect ecosystem services supply and benefits, yet actual mainstreaming and implementation of these effects in practical planning and decision-making is still in its infancy. Research and practical knowledge are therefore needed concerning (i) how to assess and predict the impacts of changes in land use and landscape structure on ecosystem services supply and benefits and (ii) how to structurally include this knowledge in planning and management tools as well as legal instruments of nature conservation, taking into account applicability in practice. A recurring challenge is to develop ecosystem services assessment methods that are applicable with limited resources available for planners, but still robust enough to be used in decision-support.

We welcome conceptual contributions, simulation studies as well as applied case studies based on empirical data that address this challenge. However, we particularly encourage applications from landscape planning and management practice across a range of land use systems worldwide. Contributions should either (1) present analyses, procedures or tools that disentangle and/or quantify the links between landscape structure and ecosystem services while adhering to limitations of practical planning and management, or (2) report applications of ecosystem services assessments in formal or informal planning instruments or land management strategies. We welcome submissions that report successes and address perceived advantages and benefits, as well as remaining difficulties and concerns, but we are likewise interested in cases that shed light on failures in order to foster joint learning.

Goals and objectives of the session:

- 1) Connecting researchers with different disciplinary backgrounds that develop tools, theory, or approaches to assess and model effects of landscape structure on ecosystem services for planning and management
- 2) Providing an overview of the current knowledge and best-practice examples and highlighting research gaps and the road ahead
- 3) Identifying commonalities in the effects of land use structure on ecosystem services across land use systems worldwide
- 4) Discussing benefits, concerns, and challenges of integrating the ecosystem services concept in practical landscape planning and management at the community and county level.



Planned output / Deliverables:

Potentially a joint paper discussing the commonalities found and a reflection of the main research gaps and the results of the discussion.

Related to ESP Working Group/National Network:

[Thematic working group: TWG 14 – Application of ES in Planning & Management](#)

II. SESSION PROGRAM

Date of session: Thursday, 24 October 2019

Time of session: 10:30 – 18:00

Timetable speakers

Time	First name	Surname	Organization	Title of presentation
10:30–10:45	Johannes	Hermes	Leibniz University Hannover	Session introduction
10:45–11:00	Jonathan	Rhodes	University of Queensland	Social–ecological networks explain the effect of landscape structure on ecosystem services
11:00–11:15	Julia Camara	Assis	State University of São Paulo – UNESP	Landscapes as the spatial agent connecting ecosystem service components
11:15–11:30	Katja	Schmidt	University of Potsdam	Key landscape features in the provision of ecosystem services: Insights for management
11:30–11:45	Matteo	Giacomelli	University of Camerino	Mapping individual perceptions in rural environments: a participatory approach for the integration of Cultural Ecosystem Services in territorial planning
11:45–12:00	Camila	Hohlenwerger	University of São Paulo	Determining the effects of landscape structure on coffee pollination using social–ecological networks

Time	First name	Surname	Organization	Title of presentation
13:30–13:45	A. Paulina	Guarderas	Université de Liège	Landscape patterns and ecosystem service provisioning in a Highland Landscape of northern Ecuador
13:45–14:00	Marc	Deconchat	Dynafor	Ecosystem services related to small forests in temperate rural landscapes
14:00–14:15	Henriette	John	Leibniz Institute of Ecological Urban and Regional Development	Managing green infrastructure for the provision of multiple ecosystem services in Central Europe
14:15–14:30	José	Barquín Otiz	IHCantabria / Universidad de Cantabria	Improving the management of Atlantic Landscapes: accounting for biodiversity and ecosystem services. The ALICE project
14:30–14:45	Andrea	Staccione	Euro-Mediterranean Center on Climate Change (CMCC) and Ca' Foscari University of Venice	Green infrastructure networks for floods: spatial connectivity assessment of ecosystem services
14:45–15:00	Kelsey	McDonough	University of Bayreuth	The Spatiotemporal Influence of Urban Development Patterns on Flood Mitigation Ecosystem Services
16:30–16:45	Patrycia	Brzoska	Leibniz Institute of Ecological Urban and Regional	Mapping and assessing ecosystems and their services in urban neighborhoods with the focus on heat resilient cities

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Time	First name	Surname	Organization	Title of presentation
			Development (IOER)	
16:45–17:00	Ilkwon	Kim	National Institute of Ecology	Assessing impacts of urban forest policies on regional ecosystem services according to forestation strategies
17:00–17:15	Rebecca	Noebel	University of Potsdam	MODIS–based analysis of land surface temperature (LST) differences and relationships in dependence on city structures and geospatial characteristics
17:15–17:30	Marie	Dade	McGill University	Prioritising management increases the equitable distribution of urban ecosystem service benefits
17:30–18:00			Discussion	



III. ABSTRACTS

The abstracts appear in alphabetic order based on the last name of the first author. The first author is the presenting author unless indicated otherwise.

1. Type of submission: **Abstract**

T. Thematic Working Group sessions: T14b Assessing effects of landscape structure on ecosystem services for landscape planning and management: striking a balance between level of detail and feasibility

Landscapes as the spatial agent connecting ecosystem service components

First author: Julia Camara Assis

Other author(s): Milton Cezar Ribeiro, Jean Paul Metzger, Jonathan R Rhodes, Martine Maron, Camila Hohlenwerger, Rafaela Aparecida da Silva, Gabriela Teixeira Duarte

Affiliation: Departamento de Ecologia, Instituto de Biociências, Universidade Estadual Paulista (UNESP), Rio Claro, São Paulo, Brazil

Contact: julia.cassis@gmail.com

The provision of Ecosystem Services (ES) depends not only on the spatial arrangement of supply and demand areas but also on how landscape modulates flow between those areas (e.g., movement of people, organisms, matter). Whereas mapping ES supply and demand challenges natural and social scientists, untangling ES flows requires an integrative understanding of the ES of interest. To do so, we need to address how landscape structure influences each ES component – supply, demand and flow. Here, we propose a spatially explicit theoretical framework to integrate supply, demand and flow of ES responses to landscape composition and configuration, with particular emphasis on ES flow. First, we explore how flow is affected by ES rivalry across variation in demand and supply areas. Then we examine how the presence of neutral areas (i.e. areas that do not act as supply or demand) interfere with the supply–demand variation, modifying their quantities and spatial arrangement. We also explore situations in which supply and demand spatially overlap. Finally, we further explore variation in ES flow and how it is modulated by landscape structure, identifying which landscape attributes (e.g., fragmentation, isolation) may boost or hinder ES flow. We consider that this will depend on the ES and the spatial distribution of supply and demand areas. For ESs delivered via infrastructure, as is the case of many agricultural productions, the improvement in transportation network within a landscape may optimize ES flow through the connection of supply and demand areas. The same strategy could be used to optimize the



access of people to protected areas with natural attractions. In this sense, landscape structure can be managed and modified to optimize ES flow. Finally, we discuss key aspects regarding the ES concept and its operationalization, as well as its usefulness as an integrative tool for landscape optimization.

Keywords: supply, flow, demand, landscape structure, spatial framework

2. *Type of submission: Abstract*

T. Thematic Working Group sessions: T14b Assessing effects of landscape structure on ecosystem services for landscape planning and management: striking a balance between level of detail and feasibility

Improving the management of Atlantic Landscapes: accounting for biodiversity and ecosystem services. The ALICE project

First author: José Barquín

Other author(s): José Manuel Álvarez–Martínez, Ana Silió–Calzada, Ignacio Pérez–Silos, Edurne Estevez, Marta SainzAlexia González–Ferrer

Affiliation: IHCantabria / Universidad de Cantabria, C/ Isabel Torres nº 15, PCTCAN, 39011, Santander, Cantabria, Spain

Contact: barquinj@unican.es

All landscapes, including mountains, plateaus and coastal landscapes found within the Atlantic region provide multiple ecosystem services (ES) for the development of many coastal and rural areas (e.g., fisheries, tourism, agriculture and forestry). However, the delivery of ES in these Atlantic landscapes is seriously threaten by global change (i.e. land use and climate change), which can have deleterious effects on biodiversity and ecosystem functioning. Aquatic ecosystems (from rivers to estuaries) are especially vulnerable to such impacts, as they are the final receptors of human activities in the catchment such as urbanization in coastal areas, riparian clearance, over application of fertilisers, poor soil management or overgrazing. In this regard, the design and development of Blue–Green Infrastructure Networks (BGINs) becomes one of the most efficient landscape management strategies for global change adaptation. The implementation of BGI requires that landscape managers develop a full understanding of how to direct public and private investment. Thus, there is an urgent need for tools to identify and deliver the benefits from BGINs. The innovative and integrative technological approach



developed by ALICE identifies the ES delivered by BGI by: (a) combining a range of satellite images, GIS data and modelling frameworks to map aquatic and terrestrial vegetation formations, (b) enhancing the predictive capacity of ES delivery by using a multi-model platform and (c) developing participatory learning approaches to engage local stakeholders. Finally, ALICE also explores the economic and social barriers to the delivery of ES by BGINs. In this study, we present the ALICE methodological framework and the first results obtained by this INTERREG ATLANTIC AREA project.

Keywords: Landscape management, Ecosystem services, Sustainability, Biodiversity conservation, Integrated modelling

3. *Type of submission: Abstract*

[T. Thematic Working Group sessions: T14b Assessing effects of landscape structure on ecosystem services for landscape planning and management: striking a balance between level of detail and feasibility](#)

Mapping and assessing ecosystems and their services in urban neighborhoods with the focus on heat resilient cities

First author: Patrycja Brzoska

Other author(s): Karsten Grunewald, Oskar Wagner

Affiliation: Leibniz Institute of Ecological Urban and Regional Development (IOER), Dresden, Germany

Contact: p.brzoska@ioer.de

Urban ecosystems provide a variety of important services that play an important role in the quality of life of the world's growing urban population. As a result of rising temperatures and increasing soil sealing, these ecosystems and services are under threat. Therefore it is important to implement appropriate measures to preserve and promote urban ecosystem services (ES). Although some measures are planned in the overall context of the city, they are ultimately implemented at the neighborhood level. For this purpose, specific knowledge and data is needed at such small scale.

The presentation will outline an approach for mapping and assessing ES in urban neighborhoods and thus addresses the goal no. 2 of the session B10a. The study focuses on



two neighborhoods in Dresden and Erfurt, Germany. Both cities are representative for climatically exposed communities, which are vulnerable to urban climate effects and show differences in the topographical influence on the local climate. The talk will demonstrate the field mapping proceed for the identification of different ecosystem types and recording of the vegetation structure, which presents the basis for the following assessment of ES. In this way, ES can be spatially explicit assessed so that the results can be integrated into the planning of appropriate measures. The multi-criteria ES-assessment will be explained by the example of three selected ES (bioclimatic regulation, nature experience, recreation). The presented approach focuses on heat situations and incorporates built-up areas and green spaces. It also takes into account the residents' perspective on heat stress of their living environment in the analyzed neighborhoods.

Keywords: Urban ecosystem services, neighborhood, ecosystem service assessment, mapping, urban heat

4. *Type of submission:* **Abstract**

T. Thematic Working Group sessions: T14b Assessing effects of landscape structure on ecosystem services for landscape planning and management: striking a balance between level of detail and feasibility

Prioritising management increases the equitable distribution of urban ecosystem service benefits

First author: Marie Dade

Other author(s): Jeffrey Hanson, Matthew Mitchell, Jonathan Rhodes

Affiliation: McGill University, Canada

Contact: marie.dade@mcgill.ca

To promote wellbeing, urban parks are often managed to increase a single ecosystem service. This can potentially lead to decreases in other ecosystems services and unequal distribution of ecosystem service benefits across urban landscapes, reducing social equity. Using the urban park network of Brisbane, Australia, we use spatial prioritisation software to determine the optimal spatial allocation of management actions to each park to achieve targeted increases in two ecosystem service benefits: recreation and carbon storage. To determine whether this spatial prioritisation approach can ensure a more socially equitable distribution of ecosystem



service benefits across the urban landscape, we used this approach to identify and compare the optimal spatial allocation of management actions under two different scenarios: a socially equitable scenario, where management actions were implemented to parks to ensure equal increases in ecosystem service benefits within different regions of Brisbane, and a non-socially equitable scenario, where no spatial restrictions were placed on where management actions were implemented to parks to achieve target increases in ecosystem service benefits. We found that carbon storage benefits could be increased by 13% and recreation by 88% under the non-socially equitable scenario, but only 13% and 27%, respectively, under the socially equitable scenario. To increase carbon storage benefits, the spatial prioritisation approach allocated more parks to management actions that increased tree cover, but to increase recreation benefits more parks were allocated management actions that increased the park facilities. Furthermore, our results found that the socially equitable scenario ensured more equal distribution of ecosystem services benefits across Brisbane, but was the more costly scenario to implement. This study demonstrates that spatial prioritisation allows urban park managers to make informed choices on how to increase multiple ecosystem service benefits in a socially just way to create more sustainable urban areas.

Keywords: Ecosystem services; urban parks; spatial optimisation; social equity; landscape planning and design

5. *Type of submission: Abstract*

T. Thematic Working Group sessions: T14b Assessing effects of landscape structure on ecosystem services for landscape planning and management: striking a balance between level of detail and feasibility

Ecosystem services related to small forests in temperate rural landscapes

First author: Marc Deconchat

Other author(s): Cécile, Barnaud, Antoine, Brin, Floriane, Clément-Kumar, Laurent, Larrieu, Annie, Ouin, Clélia, Sirami Aude, Vialatte

Affiliation: Dynafor-INRA, France

Contact: marc.deconchat@inra.fr

Many temperate rural landscapes are composed of cropland, pastures and a diversity of tree-based landcovers including small patches of forests. As these small forests are relatively persistent in time, they can be considered as ecological infrastructures that influence



ecological processes, including those who contribute to the provision of ecosystem services (ES). In this presentation, we review ES provided by small forests. Based on several long-term studies in French rural landscapes, we analyse the main factors influencing the production of these ES, the role of remote sensing data in ES mapping, and the role of ES in management decisions made by diverse stakeholders. Our analysis shows that small forests provide many ES to farmers, but also to other stakeholders, such as hunters or tourists. ES production is primarily influenced by the internal structure and composition of forests, as well as by the spatial configuration of forests and adjacent land covers, factors which do not only depend on local practices but also on other factors that are more difficult to influence. Remotely sensed data can be used to map ES that are related to the structure and composition of forests over large spatial scale. This may help to identify hotspots of ES production and to propose specific management actions to consolidate the provision of ES at the landscape or regional levels.

Keywords: Forest, rural landscape, agriculture, ecosystem services

6. *Type of submission: Abstract*

T. Thematic Working Group sessions: T14b Assessing effects of landscape structure on ecosystem services for landscape planning and management: striking a balance between level of detail and feasibility

Mapping individual perceptions in rural environments: a participatory approach for the integration of Cultural Ecosystem Services in territorial planning.

First author: Matteo Giacomelli

Other author(s): Fulvia Calcagni, Giulia Tagliente, Alessandro Musetta

Affiliation: School of Architecture and Design "E. Vittoria", University of Camerino, Camerino 62032, Italy

Contact: matteo.giacomelli@unicam.it

Rural areas hold most of the cultural natural heritage of our societies. However, the economic and social changes of the last century (e.g. industrialization and urbanization) have resulted in a progressive decline in the attractiveness and values ascribed to rural areas. The promotion of rural natural capital and the deriving cultural ecosystem services (CES), such as landscape aesthetics, outdoor recreation, or cultural heritage, is currently a challenge of environmental



science and planning. However, the assessment of community or individual landscape perceptions lacks well-grounded methods and planners face limitations in integrating this perspective in management practices. In particular, a clear issue in rural regions normally not interested by tourist flows is the difficulty in performing participatory and fine scale assessments. In order to address this gap, we involved people in a mapping walk across the rural landscape connecting the towns of Ripe San Ginesio and Colmurano (MC), Italy, through the collaboration with a local festival. We adopted a bottom up approach encompassing the whole procedure, from the selection of the CES to be analyzed to the actual process of valuation. Along the walk, the use of an open source app, OpenDataKit Collect, allowed the participants to map their perceptions of CES offered by the surrounding landscapes, resulting in fine scale geolocalized data. This exercise proved useful in assessing the plurality and diversity of individual interactions and perceptions that can be experienced in a rural environment. Moreover, it represented a first attempt to include CES perceived in rural areas in the planning agenda of rural municipalities.

Keywords: Cultural Ecosystem Services, Participatory Mapping, Landscape values, Socio-cultural Perception, Rural areas

7. *Type of submission: Abstract*

[T. Thematic Working Group sessions: T14b Assessing effects of landscape structure on ecosystem services for landscape planning and management: striking a balance between level of detail and feasibility](#)

Landscape patterns and ecosystem service provisioning in a Highland Landscape of northern Ecuador

First author: A. Paulina Guarderas

Other author(s): Franz Smith, Marc Dufrêne

Affiliation: Université de Liège, Belgium

Contact: apguarderas@uce.edu.ec

Andean landscapes represent long-term interactions between people and the natural environment, where agricultural, forestry and livestock production have been key factors shaping landscape dynamics through time. Despite the importance of these systems in the



provisioning of ecosystem services, there is a poor understanding of the impact of land use change on these ecosystems at the landscape level.

This presentation describes decadal changes in landscape patterns of highland system of Ecuador and relate them to the provision of Ecosystem Services (ES). In particular, this study focuses on native ecosystems as sentinel habitats for biodiversity conservation and ecosystem service provisioning.

Aspects of landscape structure (area and fragmentation metrics) and stability (Markov transition probability matrix) within the study area were evaluated using official Land Use Land Cover (LULC) data for five administrative boundaries (at the parish level), ranging from 41 to 91 km². These metrics were then associated with ES proxies.

Preliminary results show that native forest represent less than 10% of the territory, and there was a general trend towards a more fragmented landscape through time. Additionally, there was a general trend of decreasing stability of native forest, with the greatest changes (> 40%) associated with populated centers and occurred during the last period of analysis (2008–2014). Native forests were converted to up to six land use classes. Loss of stability of native forests (90%) was associated with conversion to few (1 to 3) land use classes, suggesting that large native ecosystem conversion was diverted into specific agricultural activities.

As our understanding of landscape ecosystem services of Ecuadorian mountain ecosystems increases, it will contribute to the broader understanding of global change processes and underpin integrated conservation and management for the maximum benefit to human society.

Keywords: Changing landscape patterns, ecosystem services, Andean ecosystems, Ecuador



8. *Type of submission: Abstract*

T. Thematic Working Group sessions: T14b Assessing effects of landscape structure on ecosystem services for landscape planning and management: striking a balance between level of detail and feasibility

Determining the effects of landscape structure on coffee pollination using social-ecological networks

First author: Camila Hohlenwerger

Other author(s): Jonathan Rhodes, Mariana Vidal, Barbara Schröter, Marie-Josée Fortin, Laura Graham, Anna Cord, Matthew Mitchell, Felix Eigenbrod, Jean Paul Metzger

Affiliation: Department of Ecology – Institute of Biosciences – University of São Paulo, Brazil

Contact: cch.camila@gmail.com

Ecosystem service provision depends on socio-ecological relationships where the provision occurs when supply is connected to demand. These supply-demand relationships (i.e., connections) depend on the movement (i.e. flow) of organisms, people or matter, and depending on the type of flow, it can or cannot be affected by landscape structure (configuration and composition). When the flow is influenced by landscape structure, this relationship affects the number and strength (i.e. intensity of flow) of the connection between supply and demand, and consequently the benefit derived from these connections. The effects of landscape structure also depend on the spatial scale at which the supply, demand and flows occur. Here, we examine how landscape structure affects the connections between the supply and demand of coffee pollination services and at what spatial scale these connections are most relevant to pollination provision. We use data on coffee yield (provision) and the spatial configuration and composition of native forest (here considered as supply areas) and coffee farms (demand areas) from the Mogiana region, one of the most important coffee producing regions in Brazil. Using a social-ecological network approach, we test how pollination provision (i.e. increases in yield) are affected by (i) supply-demand network structure; (ii) the amount of supply-supply connections; (iii) the strength of supply-demand connections, and (iv) the effects of spatial scale on these relationships. We show that the resulting network structure affects pollination provision and that this relationship is shaped by the strength of supply-demand links and the spatial scale considered. Our work shows the importance of landscape structure effects on ecosystem service provision and highlights the importance of using multi-scale analysis to evaluate supply-demand interactions. By understanding and



quantifying these relationships, it will be possible to manage the agricultural landscape in order to increase pollination provision.

Keywords: Network structure, landscape structure, pollination, supply, demand

9. *Type of submission:* **Abstract**

T. Thematic Working Group sessions: T14b Assessing effects of landscape structure on ecosystem services for landscape planning and management: striking a balance between level of detail and feasibility

Managing green infrastructure for the provision of multiple ecosystem services in Central Europe

First author: Henriette John

Other author(s): Marco Neubert

Affiliation: Leibniz Institute of Ecological Urban and Regional Development, Germany

Contact: h.john@ioer.de

Within the framework of the Interreg Central Europe project MaGICLandscapes – “Managing Green Infrastructure in Central European Landscapes” we address the assessment of green infrastructure (GI), its functions, ecosystem services (ES) and public benefits (PB). The main objective is to operationalise the GI concept providing land-managers, policy makers and communities the tools and the knowledge that they need to ensure the persistence of GI functionality and consequent PB. This talk provides results and experiences elaborated in the case study area Tri Border Region of Czech Republic–Germany–Poland.

The first part gives insight to the GI functionality assessment. Results of Morphological Spatial Pattern Analysis (MSPA) using the free software collection GuidosToolbox are presented. MSPA describes the shape, connectivity and spatial arrangement of GI elements in the landscape. Based on transnational and regional data we identified for example cores, islets or bridges.

The second part focusses on specific ES provided by GI and the resulting PB. We developed a methodology to map GI elements in the field and to collect a set of parameters for subsequent index-based assessment of the ES provided by the respective GI elements. The ES assessment determines the value of a particular green space to provide specific ES and therefor to generate



PB. Maps, demonstrating how GI elements with low and high values are distributed, were produced. These maps proved to be very helpful in identifying localities/areas for action to increase the PB delivered by GI. The developed methodology is easy to use, enables to close gaps in existing datasets on GI very quickly and is transferable across Central Europe. The methodology itself as well as selected results and experiences from the case study area are presented. Furthermore, selected localities/areas for action plans and strategies to implement GI in the Tri Border Region or to increase the PB are demonstrated.

Keywords: green infrastructure, ecosystem services assessment, public benefits, landscape management, implementation strategies

10. Type of submission: **Abstract**

T. Thematic Working Group sessions: T14b Assessing effects of landscape structure on ecosystem services for landscape planning and management: striking a balance between level of detail and feasibility

Assessing impacts of urban forest policies on regional ecosystem services according to forestation strategies

First author: Ilkwon Kim

Other author(s): Hyuksoo Kwon, Changwan Seo

Affiliation: National Institute of Ecology, South Korea, Korea, Republic Of

Contact: ikkim@nie.re.kr, krikkim@nie.re.kr

Urbanization affects the quality of regional ecosystems and well-being of regional society. Given that adequate ecosystem services are needed to ensure the well-being of residents, urban land management plans should consider ecosystem services. While several studies have assessed impacts of land use changes on regional ecosystem services, they used limited approaches, which only consider options pertaining to urban green space management. However, selection of adequate policy options is difficult in urban areas because of complexity and emergent characteristics of land use changes and socio-economic changes in urban systems. Integrated modeling approaches, which simulate changes in urban land use and associated ecosystem services, can support urban land management decisions by comparing the effects of different land management strategies.



Ansan city, South Korea have implemented “urban forest policy” to increase forest areas. Because the policy focused conversion of barren and unused lands to forest in urbanized areas using limited budget, it is necessary to allocate optimal target areas. We developed three scenarios according to forestation strategies (current strategy, restoration of landscape structure and maximized ecosystem services) and allocated potential target areas using suitability analysis. Then, we simulated urban land use change impacts on regional ecosystem services using cellular automata and assessment tools for seven ecosystem service indicators.

The simulation results show spatial patterns of land use changes and impacts on associated ecosystem services although their impacts vary according to different service types. While land use changes affects regional ecosystem services to a lesser extent than levels of the changes, forestation program increase ecosystem services. Especially, the strategy to maximize ecosystem services can be the most effective tool that achieve both restoration of forest structure and ecosystem services with at a low cost. Our approach provides useful information to select policy implementation tools for effective land management.

Keywords: integrated models, land use change, urban forestation, scenario assessment

11. Type of submission: Abstract

[T. Thematic Working Group sessions: T14b Assessing effects of landscape structure on ecosystem services for landscape planning and management: striking a balance between level of detail and feasibility](#)

The Spatiotemporal Influence of Urban Development Patterns on Flood Mitigation Ecosystem Services

First author: Kelsey McDonough

Other author(s): Stacy Hutchinson, Jia Liang, Trevor Hefley, Shawn Hutchinson

Affiliation: University of Bayreuth, Germany

Contact: kelsey.mcdonough@uni-bayreuth.de

Urbanization is one of the most detrimental forms of land transformation, leading to severe negative impacts on surrounding aquatic and terrestrial ecosystems. In terms of hydrology, urbanization compromises the ability of the natural landscape to absorb, store, and slowly release water. These changes to the natural hydrologic regime increase the speed of runoff



conveyance and volume, and cause rapid changes in streamflow (e.g., stream flashiness) that are often manifested in flash flooding events in the Midwestern United States. However, watershed management strategies that strategically utilize spatial patterns of natural land cover (e.g., wetlands or forests) have shown initial promise to mitigate flood events through the enhancement of natural hydrologic mechanisms. Thus, this research investigates the potential for spatial patterns of land cover to provide flood regulation ecosystem services in a developing urban watershed in southern Kansas City (USA). The main objective of this work is to (1) identify spatial configurations of land cover that provide flood regulation ecosystem services and (2) understand the areal extent of flood regulation services throughout the watershed. We aim to understand the mechanisms that influence the biophysical supply of flood regulation services, using a measure of stream flashiness to quantify changes in flood regulation services and landscape metrics to characterize changes in spatial patterns of land cover. Results show that wetland patches that are distributed throughout a watershed in a disaggregated manner, along with a large percentage of low-density grassland patches, have the potential to increase the provision of flood regulation ecosystem services. Furthermore, improvement in flood regulation ecosystem services from the implementation of these spatial patterns of land cover are realized on second-order streams with a contributing watershed area greater than 240 km². These findings are highly beneficial for watershed managers and/or regional planners who aim to minimize flood impacts through urban development strategies.

Keywords: flood regulation, ecosystem services, land cover, urban development



12. Type of submission: **Abstract**

T. Thematic Working Group sessions: T14b Assessing effects of landscape structure on ecosystem services for landscape planning and management: striking a balance between level of detail and feasibility

MODIS–based analysis of land surface temperature (LST) differences and relationships in dependence on city structures and geospatial characteristics

First author: Rebecca Noebel

Other author(s): Ariane Walz

Affiliation: University of Potsdam, Germany

Contact: rebecca.noebel@uni-potsdam.de

Landscape structures and their spatial distribution play significant roles in the provision of ecosystem services. One important ecosystem service – or disservice – of rural and urban landscape structures is the regulation of temperature. For humans, this becomes especially evident in densely populated urban areas, where structures are highly diverse and range from natural to continuous artificial structures. This heterogeneity leads to unevenly distributed land surface temperatures (LST) that influence the surrounding area. Even as these relationships have been studied in the past, most approaches focussed on exemplary analyses of individual cities so that quantitative perspectives of regional dependencies are still lacking. Our work therefore explores this broader scope by employing MODIS data on LST as an 8–day mean between 28th of July and 4th of August 2018 (MOD11A2, 1 km resolution) and the Urban Atlas 2012 dataset from Copernicus. The analysis is carried out for 72 German cities ($\geq 100,000$ inhabitants) based on their municipal boundaries. Herein, the study 1) assesses the overall as well as city–specific distribution and composition of LST according to the different urban structures and 2) elaborates on geospatial characteristics as further influencing factors, such as fragmentation, topographic conditions and biogeographic exposition. This approach compliments research in the field of urban landscape related temperature patterns and aims to increase the understanding of different spatial factors influencing urban temperatures.

Keywords: Urban landscape structures, Urban Atlas 2012, Land Surface Temperature, Germany



13. *Type of submission: Abstract*

T. Thematic Working Group sessions: T14b Assessing effects of landscape structure on ecosystem services for landscape planning and management: striking a balance between level of detail and feasibility

Social–ecological networks explain the effect of landscape structure on ecosystem services

First author: Jonathan Rhodes

Other author(s): Laura Graham, Elena Bennett, Örjan Bodin, Roman Carrasco, Anna Cord, Lukas Egli, Felix Eigenbrod

Affiliation: The University of Queensland, Australia

Contact: j.rhodes@uq.edu.au

Land–use change has profound effects on the composition and spatial configuration of landscapes. This impacts on natural ecosystem processes, but it also affects how people interact with and benefit from natural ecosystems. Yet, our understanding of specifically how patterns of landscape structure influence ecosystem service benefits is in its infancy. Here, we conceptualise the spatial processes that lead to the realisation of ecosystem service benefits as a social–ecological network, which links areas of the biophysical supply of services to areas of demand. Then, we develop a framework for how landscape structure influences these networks and quantify how ecosystem service benefits depend on landscape and network structure using simulated landscapes, social–ecological networks, and ecosystem services. We show that ecosystem service benefits depend strongly on the fragmentation of supply, the fragmentation of demand, and the interspersion of supply and demand. However, these relationships vary with the spatial scale at which social–ecological network links form, how service supply scales with patch size and connectivity, and whether the service is substitutable/non–substitutable or rival/non–rival. Finally, we show that in real landscapes social–ecological network structures derived from patterns of landscape structure can explain ecosystem service benefits at landscape scales. This has important implications for how we best influence landscape change to achieve multiple ecosystem service benefits.

Keywords: network analysis, simulations, ecosystem service supply, ecosystem service demand, connectivity



14. Type of submission: **Abstract**

T. Thematic Working Group sessions: T14b Assessing effects of landscape structure on ecosystem services for landscape planning and management: striking a balance between level of detail and feasibility

Key landscape features in the provision of ecosystem services: Insights for management

First author: Katja Schmidt

Other author(s): Berta Martín-López, Peter Philipps, Eike Julius, Neville Makan, Ariane Walz

Affiliation: University of Potsdam, Germany

Contact: schmikat@uni-potsdam.de

Utilising ecosystem services knowledge for regional ecosystem management is an important task in ecosystem services research today. To overcome the mere generation of knowledge and actually contribute to decision-making, scientists are facing the challenge of articulating specific implications of the ecosystem service approach for practical land use management. In this contribution, we compare the results of participatory mapping of ecosystem services with the existing management plan for the Pentland Hills Regional Park (Scotland, UK) to inform its future management plan. By conducting participatory mapping in a workshop with key stakeholders ($n = 20$), we identify hotspots of ecosystem services and the landscape features underpinning such hotspots. We then analyse to what extent these landscape features are the focus of the current management plan. We found a clear mismatch between the key landscape features underpinning the provision of ecosystem services and the management strategy suggested. Our findings allow for a better understanding of the required focus of future land use management to account for ecosystem services.

Keywords: Participatory mapping, PPGIS, land use management, operationalisation



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T. Thematic Working Group sessions: T14b Assessing effects of landscape structure on ecosystem services for landscape planning and management: striking a balance between level of detail and feasibility

Green infrastructure network for floods: spatial connectivity assessment of ecosystem services

First author: Andrea Staccione

Other author(s): Jaroslav Mysiak

Affiliation: Euro-Mediterranean Center on Climate Change and Ca' Foscari University of Venice, Italy

Contact: andrea.staccione@cmcc.it

Global environmental change and landscape fragmentation are threatening the integrity of ecosystem and reducing their capacity to deliver ecosystem services. At the same time, ecosystem-based approaches gained interest for facing these global challenges, as measures for climate change adaptation strategy and disaster risk reduction. Ecosystem services depend both on living organisms and material flows across the landscape and on ecosystem functions and landscape patterns, that ensure these movements. Considering the importance of landscape and spatial configuration, build a Green Infrastructure Network would support the ecological functions and the supply of services and co-benefits. This paper aims to analyse to what extent and how the interconnections and spatial distribution of ecosystem features influence the resilience and provision of ecosystem services that contribute to reducing risks from extreme meteorological and climate related events, as floods. The study combines morphological spatial pattern analysis (MSPA) with network analysis, by applying landscape connectivity metrics, usually used for habitat and wildlife conservation purpose. The main goal is to investigate the current spatial network configuration and the hotspot for the delivery of ecosystem services. This allows the assessment of the key nodes and links that support ecosystem services provision and flows and that avoid the collapse of the system. The study investigates how the network interconnections can be improved by adding, preserving and enlarging corridors. The study carried out the analysis in the plain area of the Po River Basin (Italy), considering the green riparian zones and the protected areas as elements of the network, with the respect to flood regulations services. The work contributes to develop the understanding on linking the alteration of ecosystem services provision to the changing landscape connectivity in order to support climate change adaptation and disaster risk reduction.



Keywords: Green infrastructure; Network; Flood regulation; Spatial connectivity; Disaster risk reduction