BOOK OF ABSTRACT

I. SESSION DESCRIPTION

ID: B2b

Assessing Ecosystem Services and their Trade-offs towards an Integrated River and Floodplain Management – The RESI (River Ecosystem Service Index)

Hosts:

	Title	Name	Organisation
Host:	Dr.	Simone A. Beichler	Leibniz Institute of Freshwater Ecology and Inland Fisheries (IGB), Berlin
Co-host(s):		Martin Pusch, Mauro Carolli	

Abstract:

Rivers and floodplains represent relatively scarce elements in the landscape and are therefore often overlooked in ecosystem service (ES) assessments. At the same time, they are among the most complex and dynamic ecosystems in Europe that in some places still represent hotspots for biodiversity and are subject to multiple human uses such as recreational activities, hydropower, drinking water and flood regulation. That is why many riverine landscapes have been profoundly modified leading to a decrease in the ecological status and thus ES. In many places, conflicts arise from the management goals of different sectors e.g. among agriculture, tourism and nature conservation, whereby at the same time stakeholders have to deal with multiple legal frameworks such as the European Water Framework Directive, the Natura2000 and the Floods directive.

In such complex decision making processes, the ES concept can enable inter- and transdisciplinary communication. On the one hand, the assessment of multiple ES across ecosystems (aquatic, semi-aquatic, semi-terrestrial and terrestrial) brings together methods from different scientific disciplines as well as data from various sources. On the other hand,

visualisation and analysis of ES bundles and trade-offs can provide a basis for decision making by enabling a comparison of management options across sectors. In this session, with the aim of synthesizing ecosystem service knowledge towards integrated solutions, we seek to explore approaches for the assessment of ES across ecosystems and sectors.
The opening talk will give insights into the project RESI – River Ecosystem Service Index – wherein an integrated approach was developed to quantify various ES provided by rivers and floodplains as well as their synergies and trade-offs for different case studies in Germany. An integrated approach including provisioning, regulating and cultural ES requires assessment protocols that avoid double-counting, standardize aggregation procedures and ensure a unified valuation system. For the assessment of the individual ES, several indicators (from catchment to specific local data) need to be combined as river-corridors are complex systems that depend on lateral and longitudinal connections and include aquatic, semiaquatic and terrestrial ecosystems.
In this session we will discuss methodological developments reflecting challenges encountered and decisions taken. We invite studies that deal with the ES assessments across ecosystems or explicitly address water related ecosystems, studies that deal with the analysis of ES bundles, synergies, and trade-offs as well as studies that develop an index or look into integrative management approaches based on ES assessment (e.g. nature-based-solutions, blue infrastructure).

Goals and objectives of the session:

The session aims at synthesizing knowledge on the assessment of ecosystem services (ES) and their trade-offs across ecosystems and sectors towards an integrated river and floodplain management. We explore how the ES concept can serve as a common language for inter- and transdisciplinary communication through:
- the integration of methods of different scientific disciplines (conceptual basis, assessment methods, combination of qualitative and quantitative methods, differences among disciplines)
- science-practice knowledge exchange (stakeholder involvement, data sources, visualisation of results)
- cross-sectoral approach for the management of riverine landscapes (analysis of bundles, synergies, and trade-offs; scenarios; implementation of the ES concept in practice)

Planned output / Deliverables:

Collaborative opinion paper

Related to ESP Working Group/National Network:

Biome Working Groups: 2B – Rivers & Lakes

II. SESSION PROGRAM

Date of session: Wednesday, 17 October 2018
Time of session: 8:45 – 12:30

Timetable speakers

Time	First name	Surname	Organization	Title of presentation
8:45-9:00	Martin	Pusch	Leibniz Institute of Freshwater Ecology and Inland Fisheries (IGB Berlin)	The River Ecosystem Service Index (RESI) – a new tool for integrated river and floodplain Management
9:00-9:15	Volkmar	Hartje	TechnischeUniversitaet Berlin	Hydropower and inland shipping transport as abiotic ecosystem services – classification, quantification and economic valuation
9:15-9:30	Christine	Fischer	UFZ – Helmholtz Centre for Environmental Research	River Ecosystem Service Index (RESI) – Analysis and evaluation of regulating ecosystem services "habitat provision"
9:30-9:45	Julia	Thiele	Leibniz Universität Hannover	Operationalization of Cultural Ecosystem Services in River Landscapes
9:45-10:00	Kati	Haefner	TU Berlin	Economic Valuation of river landscapes in Germany for recreational

Time	First name	Surname	Organization	Title of presentation
				use
10:00–10:15	Simone	Podschun	Leibniz Institute of Freshwater Ecology and Inland Fisheries (IGB)	Joint Discussion
BREAK				
10:45–11:00	Lars.	Symmank	Germany Federal Institute of Hydrology	Floodplain ecosystem services of riparian zones– A case study
11:00–11:15	Marin	Rayanov.	TU Berlin	The value of agriculture in floodplains compared to ecosystem services provided by alternative land use patterns
11:15–11:30	Simone	Podschun	Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB).	Facilitating inter- and transdisciplinary cooperation via analysis of ecosystem service interactions.
11:30–11:45	Diptimayee	Nayak	Indian Institute of Technology Roorkee	Creating baseline information for the assessment of ecosystem services and their trade-offs towards an integrated Ramganga River Biome, India
11:45–12:00	Gerardo	Anzaldua	Ecologic Institute	Enabling practical implementation of the ecosystem services approach from the

Time	First name	Surname	Organization	Title of presentation
				bottom-up: the DESSIN ESS Evaluation Framework
12:00-12:15	Niels	Riegels	DHI	A new software tool supporting the cascade approach to ecosystem services assessment
12:15-12:30	Sirje	Vilbaste	Estonian University of Life Sciences	Methods for assessment of ecosystem services (ES) in fresh waters on the basis of the ecological status of a water body
12:30-12:45	Simone	Podschun	IGB Berlin	Final Discussion the integration of methods of different scientific disciplines; methodological challenges encountered and decisions taken; cross-sectoral approach for the management of riverine landscapes
12:45-13:00	Simone	Podschun	IGB Berlin	Final Discussion (see above)

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:* ***Invited speaker abstract***

B. Biome Working Group sessions: B2b Assessing Ecosystem Services and their Trade-offs towards an Integrated River and Floodplain Management – The RESI (River Ecosystem Service Index)

Facilitating inter- and transdisciplinary cooperation via analysis of ecosystem service interactions.

First author: Simone Podschun

Affiliation: Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB), Germany

The River Ecosystem Service Index (RESI) has been developed as an integrated approach quantifying multiple ecosystem services across the aquatic-terrestrial ecosystem gradient. In an interdisciplinary research process, the ecosystem service concept was adapted for the application in river and floodplain systems and data from various sources were analyzed integrating methods from several scientific disciplines. The methods developed were documented in standardized indicator factsheets, which are embedded in the RESI-Handbook for all individual ecosystem services. The RESI has already been applied in several case studies, as in the framework of a large-scale planning process aiming to improve flood retention in the Bavarian section of the Danube River, to a wide-ranging floodplain development scenario (Nahe River) and to a before/after comparison of a river restoration program (Nebel River). The comprehensive assessment of provisioning, regulating and cultural ecosystem services enabled to identify hotspots and coldspots in terms of the ecosystem service sum as well as for the different index variants including the RESI multifunctionality index. Several ecosystem service bundles along the riverine landscape could be revealed, and specific interactions demonstrated. Thus, trade-offs and synergies associated with management measures can be identified. Therewith, the RESI has already been proven to represent a suitable basis facilitating the dialogue and cooperation between stakeholders from various sectors in projects aiming at an integrated management of rivers and floodplains.

Keywords: ecosystem service bundles, trade-offs, floodplain, management, index

2. *Type of submission:* ***Invited speaker abstract***

B. Biome Working Group sessions: B2b Assessing Ecosystem Services and their Trade-offs towards an Integrated River and Floodplain Management – The RESI (River Ecosystem Service Index)

Enabling practical implementation of the ecosystem services approach from the bottom-up: the DESSIN ESS Evaluation Framework

First author: Gerardo Anzaldua, Sebastian Birk

Other author(s): Nadine V. Gerner, Manuel Lago, Katrina Abhold, Mandy Hinzmann, Sarah Beyer, Caroline Winking, Niels Riegels, Jørgen Krogsgaard Jensen, Montserrat Termes, Jaume Amorós, Kristina Wencki, Clemens Strehl, Rita Ugarelli, Marius Hasenheit, Issa Nafo, Marta Hernandez, Ester Vilanova, Sigrid Damman, Stijn Brouwer, Josselin Rouillard, David Schwesig, Sebastian Birk

Affiliation: Ecologic Institute gGmbH, University of Duisburg-Essen, Centre for Water and Environmental Research, Germany

Europe is facing increasingly adverse water quality and water scarcity challenges. Driven by the need to address these challenges, innovation in the water sector is outpacing science. The methods and tools that are currently used to measure the impact of new implementations remain highly theoretical, making them difficult to apply and limiting their usefulness for water practitioners. This often means new technologies and innovative management practices are not taken up, ultimately resulting in foregone social, environmental and economic benefits. The DESSIN project has developed a framework that aims to contribute in solving this issue by helping its users evaluate changes in ecosystem services (ESS) that take place when new technical or management solutions are implemented. The evaluations are conducted at the water body, sub-catchment or catchment level. The development, testing and validation of the framework was carried out by conducting ESS evaluations in three different urban case study settings. The development work entailed a detailed exploration of the issues that commonly hinder the practical implementation of similar assessment methods. The subsequent testing and validation activities were done iteratively in order to incorporate new knowledge and experiences emerging from the case studies. The framework builds upon existing classification systems for ESS (CICES and FEGS-CS) and incorporates the DPSIR adaptive management scheme as its main structural element. This enables compatibility with other international initiatives on ESS assessments and establishes a direct link to the EU Water Framework Directive, respectively.

Keywords: Ecosystem services, Assessment framework, Practical implementation, Economic valuation, Water management

3. *Type of submission:* ***Abstract***

B. Biome Working Group sessions: B2b Assessing Ecosystem Services and their Trade-offs towards an Integrated River and Floodplain Management – The RESI (River Ecosystem Service Index)

River Ecosystem Service Index (RESI) – Analysis and evaluation of regulating ecosystem services "habitat provision"

First author: Christine Fischer, Mathias Scholz
Other author(s): Hans Kasperidus, Barbara Stammel, Marion Gelhaus, Andrea Rumm, Francis Foeckler, Christian Damm, Peter Horchler, Lars Gerstner, Simone Beichler, Martin Pusch
Affiliation: Helmholtz Zentrum für Umweltforschung (UFZ), Department Naturschutzforschung, Leipzig, Germany

The joint research project RESI aims to improve the current basis for decision-making by developing the so-called "River Ecosystem Services Index" (RESI). RESI represents an innovative and cross-sectoral platform that enables an interdisciplinary ecological-economic assessment of scenarios. For the first time, ecosystem services of river corridors are quantified and evaluated and visualized synoptically, which enables the objective comparison of management strategies. One of this ecosystem services "habitat provision" focuses on the functional and structural quality of characteristic riverine and alluvial habitats and their species communities as a basis for multiple human uses of the landscape. These habitats provide a diversity of animal and plant biocoenoses typical for rivers and floodplains of natural and cultural landscapes under characteristic site conditions. Depending on the considered scale (nationwide or local) different methodological approaches are used due to the different resolution/accuracy of spatial data and the availability on information about species and communities. Regardless of the scale the individual evaluation criteria are transferred into a five step range (1-5). The resulting habitat index describes the importance of a floodplain area for typical species and habitats in 5 classes from "very high" (= 5) to "very low" (= 1).The methodical approach and first application-results using the habitat index on local scale are presented. The evaluation was applied in three steps: First, an evaluation of the biotope-type using a RESI-biotope values-system was performed followed by a biotope related assessment based on specific characteristics of the biotope or biotope complex (e.g. backwater). Finally, these results were weighted by their spatial expansion and aggregated within 1 km floodplain stretches. The aim of this "habitat index" is to provide a

tool for planners and decision makers to compare and analyze the effects of already implemented measures as well as possible consequences of management options.

Keywords: habitat provision, ecosystem services, species and habitat, rivers, floodplain, management

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

B. Biome Working Group sessions: B2b Assessing Ecosystem Services and their Trade-offs towards an Integrated River and Floodplain Management – The RESI (River Ecosystem Service Index)

Hydropower and inland shipping transport as abiotic ecosystem services – classification, quantification and economic valuation

First author: Volkmar Hartje

Affiliation: Technische Universitaet Berlin, Germany

The classification of hydropower and water transport as ecosystem services (ESS) has been subject to an intensive debate as ESS were thought to be dependent primarily on biotic processes. However, there seems a consensus emerging to classify the human use of the flow processes of water ecosystems as abiotic ecosystem services and include them in the list of ESS. Here, the focus will be on freshwater ecosystems with inland shipping transport and hydropower as important services.The potential consensus of classifying both as abiotic provisioning ESS is only useful if they can be measured, and their quantification and their economic valuation are possible. The presentation will give a survey of the existing literature which can be used in answering these questions. The first point is the definition of a metric which can serve as a basis for quantifi-cation of the ESS. The second point relates to the practice of quantification and the existing systems of indicators for hydropower and transport potential of water bodies and whether they can help to identify the corresponding ESS. As provisioning ESS, economic valuation is presumed to be an easy undertaking as market prices exist for products further down the value chain, but the empirical literature is rather scarce and deals mostly with human invest-ments.A major problem is that these services, as they are currently understood, depend to large extent on human modification of watercourses, which has and still is the major reason for concern from an ecological point of view by reducing a number of regulatory ESS, but at the same time these modifications influence these ESS to a large extent, but in a different man-ner for hydropower and water transport.

Keywords: Abiotic ecosystem services, hydropower, water transport, indicators, economic valuation

5. *Type of submission:* ***Abstract***

B. Biome Working Group sessions: B2b Assessing Ecosystem Services and their Trade-offs towards an Integrated River and Floodplain Management – The RESI (River Ecosystem Service Index)

Creating baseline information for the assessment of ecosystem services and their trade-offs towards an integrated Ramganga River Biome, India

First author: Diptimayee Nayak, Shukh Pal Singh

Other author(s): S. P. Singh, Falguni Pattanaik

Affiliation: Indian institute of Technology Roorkee, ndia, Indian Institute of Technology Roorkee, India

River biome ecosystem services are one of the recent ecosystems discussed in the environmental and policy dialogues. Like most of the other biomes, river biomes also provide different ecosystem services which are being discussed, identified, assessed because of fragile nature of the very ecosystems in the presence of manifold pressures and trade-offs of services. This paper highlights the case of an Indian river basin, the Ramganga, a tributary of the river Ganga, by detailing the presence of various ecosystem services across different spatial areas of the river zones. Most of the river basin ecosystem services are captured by taking a micro approach of conducting primary surveys in the select area in discussion, where the macro picture of the basin and biomes as such is not discussed much. In contrast, the present study tries to capture the baseline information of the whole Ramganga biome from the large scale data sets in India like Census of India, Socio-economic Caste Census and National Sample Survey (NSS) information for understanding and identifying a set of ecosystem services provided by river basin, and the peripheral land-use systems. Hence, for identifying and highlighting river basin ecosystems and their services, socio-economic-demographic variables of the beneficiaries living in the basin areas are analysed along with their sector-wise economic activity and dependency of the stakeholders and ultimate beneficiaries on the Ramganga river basin. The paper aims to highlight the provisioning ecosystem services of the basin by studying the status of different economic activities included in the primary sectors like Agriculture, Fishery, Forestry and basic resources like the status of water and its demand supply equations in the different locations across the basin area, i.e., within 0-5 kilometers of distance and 5-10 kilometers of distance.

Keywords: River basin, assessment of ecosystem services, sectoral activity, trade off, baseline information

6. *Type of submission:* ***Invited speaker abstract***

B. Biome Working Group sessions: B2b Assessing Ecosystem Services and their Trade-offs towards an Integrated River and Floodplain Management – The RESI (River Ecosystem Service Index)

The River Ecosystem Service Index (RESI) – a new tool for integrated river and floodplain Management

First author: Martin Pusch

Affiliation: Leibniz Institute of Freshwater Ecology and Inland Fisheries (IGB), Germany

Rivers and floodplains are the most intensely used elements of European landscapes, while in some places they still fulfill important functions of 'green infrastructure', and there represent hotspots of biodiversity of national importance. The multiple societal uses of rivers and floodplains are reflected by various sectoral legal frameworks and political objectives which apply to rivers and floodplains, as the EU Water Framework, EU Natura 2000 and EU Floods Directives, renewable energy generation, adaptation to climate change etc.. These legal objectives need to be aligned with local socio-economic interests of e.g. urbanization, tourism or agriculture. In order to establish a rationale for inter-sectoral decision making, the research project RESI – River Ecosystem Service Index – has developed an integrated approach quantifying multiple ecosystem services (ES). For the assessment, the variety of ES are all scored from 1 to 5. Scores are elaborated for the river channel and additionally for the segments of the active and the non-active parts of the floodplain. This uniform scaling of ES availability allows the elaboration of uniform maps for various ES, and an easy integration of various ES to the integrative River Ecosystem Service Index (RESI). A first practical application of the RESI has been already performed for a 80-km section of the Danube River in Bavaria (Germany), where project results are used as additional decision support for regional planning.The RESI hence allows an integrative comparison of management scenarios, as e.g. for flood retention along a river stretch by technical retention basins or alternatively by dyke relocation. Thereby the RESI may be used as a transparent inter-sectoral communication and visualization tool for inter- and transdisciplinary communication. Thus, this new cross-sectoral approach for the management of riverine landscapes enables the identification of an optimized management option for river and floodplain sections with minimized trade-offs among available ecosystem services.

Keywords: river, floodplain, inter-sectoral management, stakeholders, index

7. Type of submission: ***Abstract***

B. Biome Working Group sessions: B2b Assessing Ecosystem Services and their Trade-offs towards an Integrated River and Floodplain Management – The RESI (River Ecosystem Service Index)

Economic Valuation of river landscapes in Germany for recreational use

First author: Marin Rayanov

Other author(s): Alexandra Dehnhardt, Julian Sagebiel, Jesko Hirschfeld, Maria Lindow, Julia Thiele

Affiliation, country: TU Berlin, Netherlands

Presenting author: Kati Haefner

Rivers and their flood plains provide a whole range of cultural ecosystem services to human, for example, opportunities for recreation. In contrast to provisioning or regulating services, their value is difficult to quantify as it arises within and depends on the perception of people. Knowledge about their preferences regarding river landscapes helps to estimate their value for recreation and can be included in the planning and design of revitalization or restoration measures. The monetary value of non-market goods or services can be assessed by willingness-to-pay studies among users and non-users. Within two research projects, we conduct a choice experiment with four attributes about people's preferences regarding river landscapes in different regions of Germany. Two attributes, namely the "the naturalness of the floodplain" and the "bank enforcement" are related to environmental qualities while "infrastructure" and "accessibility" address the suitability of the river for recreation. The choice experiment is part of a questionnaire asking for people´s current use of riversides and their preferences about possible measures. In total, around 4000 people completed the survey. The sampling included regions in the state of Saxony where respondents were asked about small rivers and regions around certain sections of Danube, Nahe and Aller where larger streams were addressed. The results show that even though river landscapes are highly appreciated for recreation by most people, a majority of users do not necessarily prefer the highest possible levels of the attributes presented. Furthermore, people already show a high willingness-to-pay for moderate improvements of the current state while a maximum enhancement does not provide much additional welfare gain. The inclusion of different rivers also allows a comparison of the recreational determinants of large and small waters.

Keywords: recreation, economic valuation, choice experiment, rivers, cultural ecosystem services

8. *Type of submission:* ***Abstract***

B. Biome Working Group sessions: B2b Assessing Ecosystem Services and their Trade-offs towards an Integrated River and Floodplain Management – The RESI (River Ecosystem Service Index)

The value of agriculture in floodplains compared to ecosystem services provided by alternative land use patterns

First author: Marin Rayanov Rayanov
Other author(s): Alexandra Dehnhardt, Volkmer Hartje, Achim Sander
Affiliation, country: TU Berlin, Netherlands

Many flood plains of large rivers in Germany traditionally have been used for agriculture as they often provide high potential yields. From an ecological perspective, flood plains potentially also represent a hot spot for biodiversity and therefore deserve restoration and protection. The implementation of the European Water Framework Directive and the Directive on the Assessment and Management of Flood Risks have resulted in several ongoing flood plain revitalization programs. Despite these various drivers for restoration, the allocation of farming land to revitalization activities remains a sticking point for many projects. Within the research project RESI (River Ecosystem Service Index, see resi-project.info) we quantitatively compare the provision of different ecosystem services among current state and possible revitalization scenarios at certain sections of large streams in Germany. By assumption and simulation of different land use patterns, we illustrate the trade-off between provisioning and other ecosystem services. The value of agricultural land and pastures is calculated using a GIS-based algorithm which combines land use, site quality and flooding frequency data with standard gross margins for goods produced. The results are provided as monetary values or as indices, which are incorporated into the RESI system and compared to indices for other ecosystem services. We find that frequent inundation events can significantly reduce the average yield in the extant flood plain. This effect can even compensate advantages of high soil fertility and therefore could be taken into account in the design of compensation procedures. On the other hand, results indicate that a change to extensive agricultural use can already lead to enhanced provision of many other ecosystem services. Especially a reduction of flood risks (for example through dike re-routing), and herewith damage avoided, can already affect the outcome of conservative cost-benefit calculations in favor of restoration alternatives.

Keywords: land use changes, agriculture, river revitalization, flood plain, provisioning ecosystem services

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

B. Biome Working Group sessions: B2b Assessing Ecosystem Services and their Trade-offs towards an Integrated River and Floodplain Management – The RESI (River Ecosystem Service Index)

A new software tool supporting the cascade approach to ecosystem services assessment

First author: Niels Riegels

Other author(s): Anders Klinting, Ole Mark, Michael Butts

Affiliation: DHI, Denmark

The EU FP7 DESSIN project has developed a new software tool to support assessment of ecosystem services and associated economic values. The tool supports application of the DESSIN ESS evaluation framework (Anzaldua et al., 2018), which was developed to support assessment of proposed projects and measures by extending assessment to include changes in ESS.The DESSIN software tool supports the DESSIN ESS framework's implementation of the 'cascade' approach (Haines-Young & Potschin, 2010), which argues that ESS emerge from underlying ecosystem processes and states, and that changes to underlying conditions result in changes in ESS. The DESSIN application of the cascade approach is aligned with the DPSIR (Drivers, Pressures, States, Impacts, Responses) framework (Smeets & Weterings, 1999) and integrates DPSIR with the 'cascade' approach following Müller and Burkhard (2012). Users of the framework are prompted to link the different elements of the DSPIR chain, and the links between States and Impacts are used to define ESS as a function of underlying ecosystem elements. The Impact step is split into two parts, one concerned with the provision of ESS, and a second with use.The software tool supports implementation of the framework by organizing links between the DPSIR elements and suggesting links between ecosystem state parameters and ESS. Furthermore, the tool provides links to indicator databases that are useful for quantifying changes at each step of the DPSIR chain. To assist with distinguishing between ESS provision and use, the tool provides guidance for identifying beneficiaries of ESS, which is also used in guidance for economic valuation.The DESSIN evaluation framework was tested on three case study locations in Europe, and feedback from the case studies was incorporated into the software tool. The tool has structured the DESSIN evaluation framework, which has developed into a mature and robust methodology that has been applied to five demonstration cases in the DESSIN project. The tool is now available for free to users outside DESSIN.

Keywords: ESS assessment software, ESS evaluation framework, ESS cascade

10. Type of submission: ***Abstract***

B. Biome Working Group sessions: B2b Assessing Ecosystem Services and their Trade-offs towards an Integrated River and Floodplain Management – The RESI (River Ecosystem Service Index)

Floodplain ecosystem services of riparian zones- A case study

First author: Lars Symmank

Affiliation: German Federal Institute of Hydrology, Germany

Today only a small amount of pristine floodplains remained in developed countries. Human land-use pressure within floodplain areas is extraordinarily high. Thus, areas suitable for floodplain restoration are rare and ecological projects are in direct competition with antagonistic human interests. In most cases near-natural ecosystem functioning is restricted to riverbanks only. Large scale floodplain restoration projects ought to be enforced whenever possible. However, additional ways to foster floodplain functions should be explored. Riverbanks are commonly used to keep streams within their stream beds only making restoration projects less problematic. Thus, the ecological improvement of riverbanks is an evident approach to increase floodplain ecosystem services. Many riparian zones in developed countries are obstructed by conventional civil engineering erosion controls such as riprap. Bioengineering techniques of riverbank protection are promising alternatives to promote near-natural conditions on rivers where erosion control is needed (e.g. waterways). The present article is a first approach of analyzing selected ecosystem services on riverbanks with bioengineering bank protection techniques in a human-dominated river system. We focus on major services mainly provided by natural floodplain: elimination of nitrogen (N), retention of phosphorous (P) and fixation of carbon (C) within biomass. Our results demonstrate that ecological restoration of riverbanks lead to a significant increase of floodplain ecosystem functions. We show that riverbank restoration can constitute to the general efforts of enhancing self-purification of rivers and the mitigation of global climate change.

Keywords: riverbanks, carbon fixation, denitrification, phosphorus retention, riprap removal

11. Type of submission: ***Invited speaker abstract***

B. Biome Working Group sessions: B2b Assessing Ecosystem Services and their Trade-offs towards an Integrated River and Floodplain Management – The RESI (River Ecosystem Service Index)

Operationalization of Cultural Ecosystem Services in River Landscapes

First author: Julia Thiele

Other author(s): Christina von Haaren, Christian Albert

Affiliation: Leibniz Universität Hannover, Institute of Environmental Planning, Germany

River landscapes can provide diverse cultural ecosystem services (CES, also termed non-material benefits) to people: they are sources of inspiration, places for the enjoyment of landscape aesthetics, and sites of heritage. The capacity of river landscapes to actually provide cultural ecosystem services has however decreased as rivers and their floodplains were transformed to allow and increase navigability, agricultural production, and settlements. Various policy and planning initiatives have been initialized to safeguard remaining 'natural' river landscapes, and to enhance or restore more transformed river stretches. Providing more information on the quantity and values that river landscapes provide in terms of cultural ecosystem services could contribute to and facilitate the implementation of these river landscape conservation and restoration activities.The aim of this contribution is to present an assessment of cultural ecosystem services of river landscapes in Germany as support of plan- and decision-making at national and sub-national levels.The contribution focuses the CES classes 'landscape aesthetics', 'heritage', 'unspecific interactions' (e.g. nature observation) and 'water-based activities' (e.g. angling). The development of indicators was based on the Practice-Oriented Ecosystem Service Evaluation Model (Haaren et al., 2014) according to which a distinction was made between indicators referring to the offered CES, the human input of relevance for utilizing the CES, as well as the actual use of CES. A geographic information system (GIS) is employed to quantify the indicators for offered CES and human input, while the quantification of the actual usage is based on survey results. The research results shall provide valuable information to policy-, plan- and decision-makers in support of efforts for navigating towards more sustainable developments of river landscapes. The operationalization of CES of river landscapes is part of the project "River Ecosystem Service Index", which is sponsored by the German Federal Ministry of Education and Research.

Keywords: cultural ecosystem services, river landscapes, spatial modelling, recreational use

ESP EUROPE
2018 REGIONAL CONFERENCE
Ecosystem services in a changing world: moving from theory to practice
SAN SEBASTIÁN, SPAIN
15-19 OCTOBER 2018

12. Type of submission: ***Abstract***

B. Biome Working Group sessions: B2b Assessing Ecosystem Services and their Trade-offs towards an Integrated River and Floodplain Management – The RESI (River Ecosystem Service Index)

Methods for assessment of ecosystem services (ES) in fresh waters on the basis of the ecological status of a water body

First author: Sirje Vilbaste

*Other author(s):*Aija Kosk, Peeter Nõges, Ingmar Ott, Kai Piirsoo, Tiina Nõges

Affiliation: Estonian University of Life Sciences, Estonia

Using the ES approach, we developed a matrix with consistent linkages between the ecological status and ES for the Estonian rivers and lakes. We listed the ES provided by the freshwater ecosystems and described a methodology for evaluation of the capacity or potential supply of ES. The main idea is that the amount and value of ES depend on the characteristics depending on the hydro-morphological or morphological features as well as by the ecological and chemical status of a water body. In the rivers, the hydro-morphological status was evaluated according to a three-point scale of the human impact on the riverine ecosystem (strong, moderate, and nearly natural). In the lakes, the amount and the ES value depend largely on their morphometric characteristics. Morphometric index was calculated on the basis of the surface area and maximum depth of a lake. The lakes are divided into three classes: large, average, and small. For assessment, the ecological status of water bodies a five-point scale (bad, poor, moderate, good or high) and for chemical status, a two-point scale (poor or good) was used. The following services were identified according the Common International Classification of Ecosystem Services (CICES): (1) provisioning; (2) regulating and maintenance; (3) cultural. Besides the CICES, we identified (4) abiotic services. On the left side of the matrix, all possible hydro-morphological, morphological, ecological, and chemical statuses were listed. On the right side, all relevant ES were listed. A five-point scale (1-no supply, 2-insignificant, 3-moderate, 4-significant, 5-very significant) was applied for each ES. The matrix enables to compare the ability of different water bodies to supply the ES correspondingly to their ecological status and to monitor variation in the ES capacity over time in relation to changes in the ecological status of a water body.

Keywords: Capacity of Ecosystem Services, Estonia, Lakes, Matrix, River


ESP
EUROPE
2018 REGIONAL CONFERENCE
Ecosystem services in a changing world:
moving from theory to practice
SAN SEBASTIÁN, SPAIN
15-19 OCTOBER 2018