

Riverine and Coastal Wetlands for Biodiversity and Climate – Linking Science, Policy and Practice

A Compilation of Abstracts for the 5th European Conference 26-28 September 2023 in Bonn, Germany

Carla Klusmann, Ute Susanne Kaden, Katrina Marsden, Mathias Scholz, Aletta Bonn and Simone Wulf (Eds.) BfN-Schriften 672 2023





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Editors: Carla Klusmann Ute Susanne Kaden Katrina Marsden Mathias Scholz Aletta Bonn Simone Wulf

Imprint

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Floodplains of the Vjosa River in Albania, one of the last wild rivers in Europe (© Christian Hecht)

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About the European Conference "Riverine and Coastal Wetlands for Biodiversity and Climate – Linking Science, Policy and Practice"

Since 2011, the German Federal Agency for Nature Conservation (BfN) and the European Network of Heads of Nature Conservation Agencies (ENCA) have been jointly organising a series of "European Conferences on Biodiversity and Climate Change". The aim of the conference series is to strengthen the interface between science, policy and practice and to promote exchange and networking between respective experts from all over Europe working on the links between biodiversity and climate change.

Riverine and coastal wetlands have been chosen as a focal topic of the 5th conference in this series, due to their high importance for biodiversity conservation as well as climate change mitigation and adaptation. The conference will bring together scientists, policy makers and practitioners to discuss how to jointly advance the conservation and restoration of these vital ecosystems in Europe. Participants will exchange knowledge and experience on how to boost resilience of wetland biodiversity in the face of climate change, how to maximize their climate services and further co-benefits, how to scale up wetland restoration in practice and how to move forward in European wetland policy and governance.

This publication serves as a practical guidance document for the BioClim-Wetlands Conference, compiling detailed information on all sessions, speakers and poster presentations.

The BioClim-Wetlands Conference is held in Bonn on 26th-28th September 2023. It is hosted by BfN and the ENCA network, in close cooperation with the Helmholtz Centre for Environmental Research (UFZ) / German Centre for Integrative Biodiversity Research (iDiv) and adelphi. The conference contributes to the implementation of the Ramsar Convention on Wetlands.

In May 2023, an additional background document was published as a more technical knowledge base for the BioClim-Wetlands Conference, presenting key findings of a preparatory European expert workshop implemented in November 2022.

The background paper's key messages are:

- Riverine and coastal wetlands are vital ecosystems for nature and people, while playing a crucial role in mitigating and adapting to climate change. They are considered hotspots for biodiversity and provide important ecosystem services to people, such as climate and water regulation, carbon sequestration and retention, flood prevention and water filtration, as well as food provision and opportunities for recreation.
- Inland and coastal wetlands have, however, drastically declined by about 35% between 1970 and 2015 (Ramsar Convention on Wetlands, 2018). This has serious consequences for both people and nature, accelerating climate change by releasing greenhouse gases (IPCC, 2022) while limiting opportunities to buffer climate change impacts.
- Climate change has significant impacts on riverine and coastal wetland ecosystems and their biodiversity. Among these are long-term effects on the landscape, the water balance and groundwater levels through rising sea levels, changing precipitation and resulting discharge patterns, increased temperatures, and shifts in species compositions. These inevitable changes threaten their unique biodiversity and related ecosystems services.
- In many wetlands, irreversible changes in river morphology or soil physicochemical properties due to land use and long-term drainage make it unlikely that a natural state can be

achieved from rewetting within a few decades. Thus, a focus must be on protecting remaining wetlands, as well as on adaptive management to improve restoration outcomes.

- Wetland conservation, restoration and sustainable management can play a key role as nature-based solutions for both climate change adaptation and mitigation, e.g., by ensuring flood risk reduction and carbon sequestration.
- Significant progress has already been made in wetland restoration in Europe, but there are still key barriers to overcome. Challenges include conflicting land use priorities, a lack of effective implementation and enforcement of legal frameworks, and a lack of funding. In addition, a lack of standardised monitoring of restoration success prevents accountability to policy goals. Accompanying research is needed to better understand the effectiveness of restoration techniques and to be able to scale up good practices.
- To effectively protect and prepare ecosystems in the face of climate change impacts, it will be necessary to consider a range of approaches, including policy reforms, the use of new land management tools, emerging technologies for planning and monitoring, as well as better stakeholder engagement with social and organisational tools.
- Involving local communities can play a critical role in the co-design of wetland restoration, conservation, and management plans, not only as stakeholders but also through the integration of local knowledge and expertise. Involving people in both decision making and planning, as well as practical restoration, can build social capital and social licence for implementation and enable collective efficacy as a driver for transformative change.



Figure 1: Cover and download link of the background paper for the BioClim-Wetlands Conference 2023

Conference Programme

Day 1: Tuesday, September 26th 2023

09:30 - 10:30	Introduction and welcome
09:30	 Welcoming Words by: Steffi Lemke, Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (video) Dr. Musonda Mumba, Ramsar Convention on Wetlands (video) Thomas Graner, Federal Agency for Nature Conservation Simon Duffield, ENCA Conference moderation: Conny Cyzmoch
10:00	Opening Keynote by Brian MacSharry, European Environment Agency
10:30 - 13:00	Session 1: Riverine and coastal wetland biodiversity and climate change – facing upcoming challenges
10:30	Keynote by Prof. Dr. Klement Tockner, Senckenberg Society for Nature Research Session moderated by Prof. Dr. Aletta Bonn
11:00 - 11:30	Coffee and tea break
11.20	Talk 1: Model chains, uncertainties, extreme events and national strate- gies: Challenges, chances and requirements to project floodplain habi- tats under climate change, Dr. Arnd Weber, German Federal Agency for Hydrology
11:30	tions for conservation planning, Dr. Sabine Fink, Swiss Federal Institute for Forest, Snow and Landscape Research WSL
	Talk 3: What does climate change mean for coastal wetland biodiversity and how to boost resilience?, Dr. Carles Ibanez, Eurecat
12:30	Moderated panel discussion with questions from the audience: How to face upcoming challenges?
13:00 - 14:00	Lunch

14:00 - 15:30	Session 2: Nature-based solutions for climate change mitigation and adaptation in riverine and coastal wetlands
	Talk 1: Introduction of the nature-based solutions standard in the con- text of riverine and coastal wetlands, Alberto Arroyo Schnell, IUCN
	Talk 2: An example of wetlands as flood defences, Dr. Barbara Stammel, Catholic University of Eichstätt-Ingolstadt
14:00	Talk 3: An example of carbon sequestration in floodplain forests, Dr. Kristin Ludewig, Universität Hamburg
	Talk 4: Example of blue carbon and coastal wetlands, Corallie Hunt, Na- tureScot
	Session moderated by Dr. Mathias Scholz
15:20	Short moderated discussion with questions from the audience
15:30 - 16:30	Poster gallery and networking with coffee and tea
16:30 - 18:00	Session 3: Maximizing ecosystem services in riverine and coastal wet- lands
16:30	Talk 1: Introduction to wetland ecosystem services and their socio-eco- nomic importance, Dr. Jan Macháč, J. E. Purkynê University in Ústí nad Labem
	Spotlight 1: Snapshots on biogeochemistry and nutrient cycling of river- ine wetlands, Dr. Dominik Zak, Aarhus University
16:55	Spotlight 2: Recreational ecosystem services of coastal wetlands, Dr. Ruth Waters, Natural England
	Spotlight 3: Cultural Ecosystem Services (of riverine and coastal wet- lands), Prof. Dr. Karl M. Wantzen, University of Tours
17:25	Interactive discussion: best practices for maximizing ecosystem services in wetland nature-based solutions projects
17:55	Closing
18:00	Break
18:15	Evening reception/ conference dinner
19:30 – 20:30	Optional evening program

Day 2: Wednesday, September 27th 2023

09:30 - 09:40	Introduction
09:30	Introduction and review of Day 1
09:40 - 11:00	Session 4: Wetland restoration in practice: overcoming barriers and scaling up implementation
09:40	Keynote by Prof. Dr. Liesbeth Bakker, Wageningen University & Research
10:10	 Moderated panel discussion: Georg Frank, Danube River Network of Protected Areas Prof. Dr. Liesbeth Bakker, Wageningen University & Research Prof. Dr. Daniel Hering, MERLIN Project Anis Guelmami, Mediterranean Wetlands Observatory Discussion moderated by Simone Wulf
11:00 - 11:30	Coffee and tea break
11:30 - 13:00	Parallel workshop session slot 1
	Workshop 1: Ensuring participation: How to integrate local stakeholders and build acceptance for wetland restoration?
	Workshop 2: Finding space: How to tackle the issue of limited land availability and choose priority areas to scale up wetland restoration?
11:30	Workshop 3: Maximizing climate benefits: How to increase carbon se- questration in riverine and coastal wetlands in practice?
	Workshop 4: Monitoring success: How to evaluate success of wetland restoration for biodiversity objectives and build evidence of socio-economic benefits?
13:00 - 14:00	Lunch
14:00 - 15:30	Parallel workshop session slot 2
14:00	Workshop 5: Tackling land use conflicts: How to reconcile agriculture and other uses with wetland conservation and restoration?
	Workshop 6: Restoring coastal dynamics: How to manage coastal wet- lands in the face of climate change?

Workshop 7: Restoring river connectivity: How to achieve 25.000 km free-flowing rivers in the EU?

Workshop 8: Securing funds: How to harness private and public financing opportunities for wetland restoration?

- 15:30 16:30 Poster gallery and networking with coffee and tea
- 16:30 17:15 Summary of workshops
- 16:30 Plenum summary
- 17:15 Break
- 17:30 Evening excursion (optional, registration necessary)
- 19:30 Dinner close to the Rhine (at own cost, registration necessary)

Day 3: Thursday, September 28th 2023

09:00 - 09:10	Introduction
09:10	Introduction and review of Day 1 and 2
09:10 - 10:30	Session 5: Wetland policy: How to move forward in Europe
09:10	Keynote by Dr. Florian Claeys, Directorate General for Environment, European Commission
	Moderated panel discussion:
	 Dr. Florian Claeys, Directorate General for Environment, Euro- pean Commission
09:40	- Prof. Dr. Dietrich Borchardt, UFZ
	- Paul Brotherton, Wetlands International Europe
	- Dr. Flore Lafaye de Micheaux, Ramsar Convention on Wetlands
	Discussion moderated by Bettina Hedden-Dunkhorst
10:30	Coffee and tea break
11:00 - 12:00	Outlook and closing
11:00	 Interactive reflection with all conference participants Closing remarks by UFZ Inka Gnittke, Federal Ministry for the Environment, Nature Conservation, Nuclear Safety, Consumer Protection
12:00	End of the Conference
Afternoon	Physical meeting of the ENCA Interest Group Climate Change (at BfN)

Day 1: Tuesday, September 26th 2023

1 Introduction and Welcome: Welcoming words by BMUV, BfN, ENCA, Ramsar Convention

1.1 Steffi Lemke, Federal Minister for the Environment, Nature Conservation, Nuclear Safety, and Consumer Protection – Video

Tackling biodiversity loss and climate change together is one of the greatest challenges of our time. The global twin crises are inextricably linked and exacerbate each other. At the same time, nature is our most important ally in the fight against climate change. Protecting and restoring healthy, resilient ecosystems enables us to implement nature-based solutions that generate both biodiversity benefits and contribute to climate change mitigation and adaptation. The German government has therefore launched a Federal Action Plan on Nature-based Solutions for Climate and Biodiversity this spring. In the coming years, we will support its implementation with federal funding of at least 4 billion euros.

The conservation and restoration of riverine and coastal wetlands is of particular importance for implementing nature-based solutions that deliver biodiversity and climate synergies. Healthy and functional wetlands are biodiversity hotspots and provide a variety of ecosystem services for us humans. They sequester carbon, regulate the landscape water balance, protect us from floods and droughts, and thereby greatly contribute to mitigating climate change and helping us adapt to its impacts.

I hope that this fifth European Conference on Biodiversity and Climate Change will send a strong signal that we need to address biodiversity loss and climate change in synergy, and that nature-based solutions play a crucial role for achieving this.

Steffi Lemke was born and raised in Dessau on the Elbe. She studied agricultural sciences in Berlin from 1988. In 1989, she co-founded the GREEN Party of the GDR. From 1994 to

2002 she was in the Bundestag for BÜNDNIS 90/DIE GRÜNEN, the last four years of which as parliamentary director. In 2002, her party elected her to the office of Political Director, which she held until 2013. Since the 2013 federal elections, she has been a member of the German Bundestag, where she served as Parliamentary Managing Director and Spokesperson on Nature Conservation Policy for the Green Party's parliamentary group until 2021. Since December 2021, Steffi Lemke has been the German Federal Minister for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection.



1.2 Musonda Mumba, Secretary General of the Convention on Wetlands – Video

Riverine and coastal wetlands are vital ecosystems for nature and people. They are cradles of biological diversity that provides water and productivity upon which countless species of plants and animals depend for their survival. They also are crucial to address climate change adaptation and mitigation and they directly contribute to human livelihoods and well-being. However, increased destruction, combined with the impact of the climate crisis have made wetlands among the most threatened ecosystems in the world. Loss of wetlands entails a substantial decrease in the number, extent, and quality of these ecosystems, their functions and their benefits.

There are fundamental challenges, and there is a need for urgent action to strengthen wetland resilience to climate change. The Ramsar Convention on wetlands provides an international framework for the conservation and wise use of wetlands and their resources, and a key lever to achieve global environmental objectives and commitments such as Sustainable Development Goals, the Kunming-Montreal Global Biodiversity Framework and the Paris Agreement.

Dr Musonda Mumba is a Zambian-born environmentalist with over 25 years of global experience in environmental management and sustainable development. Dr Mumba holds a

PhD in Wetland Hydrology and Conservation from the University College London (UCL). She joined the Convention on Wetlands in 2022 but has already worked at the Secretariat of the Convention as a Junior Professional between 1998 and 1999. She started her career at the Environmental Council of Zambia, and held positions with WWF at its international headquarters in Switzerland, in the United Kingdom and in East Africa.

She has further been active at the global headquarters of the UN Environment Programme (UNEP) for 12 years in different functions, including as Head of the UNEP Terrestrial Ecosystems Programme. She has founded the Network of African Women Environmentalists (NAWE) and has received numerous accolades for her work.



1.3 Thomas Graner, Vice-President of the Federal Agency for Nature Conservation

Nature conservation and climate action should go hand in hand. That is the reason why the German Federal Agency for Nature Conservation (BfN) and the ENCA network have been hosting this series of European Conferences on Biodiversity and Climate Change in Bonn since 2011. This year, the 5th conference of the series will focus on "Riverine and Coastal Wetlands for Biodiversity and Climate – Linking Science, Policy and Practice".

At BfN, we promote the implementation of biodiversity-climate synergies and nature-based solutions throughout our national and international activities. We also actively support the

conservation and restoration of wetlands in Germany, for example through the floodplain restoration programme of the Blue Belt Programme, our large-scale nature conservation projects and as the coordination centre of the recently established Federal Action Plan for Naturebased Solutions for Climate and Biodiversity.

Moreover, strengthening the science-policy-practice interface is always among our objectives. Therefore, this conference will bring together European experts from research, politics and implementation, and foster their exchange. We will discuss how to jointly advance the conservation and restoration of riverine and coastal wetlands in Europe. Together, we will exchange on the current state of science and research, identify challenges and opportunities for scaling up wetland restoration in practice, and explore how to move forward in European wetland policy and governance.

Thomas Graner worked as a lawyer and officer at the German Federal Ministry for the Environment from 1995 to 2008, covering four departments with the following topics and responsibilities: Fundamental and international affairs of waste management, personnel department, Packaging Ordinance and CITES. Since 2008, he heads the Central Division and Section I at the German Federal Agency for Nature Conservation (BfN), acting as the President's Deputy. From 2014 to 2022, he was the BfN's Budget Officer. His areas of responsibility include BfN administration, central information services, legal counsel, enforcement tasks, fundamental issues of nature conservation including international nature conservation, and funding coordination.



1.4 Simon Duffield, European Network of Heads of Nature Conservation Agencies

Climate change knows no boundaries. To ensure the level of action required to both limit future climate change and to adapt to what is inevitably ahead, requires an approach that also works across boundaries. To support this goal, the European Network of Heads of Nature Conservation Agencies (ENCA) established a Climate Change Interest Group.

The aim of the group is to foster best practice across Europe and has actively supported the scoping and preparation of the series of joint BfN-ENCA European Conferences on Biodiversity and Climate Change since 2009. We at ENCA are therefore delighted to welcome you to this fifth climate change conference.

As before, BfN has drawn together key scientists, policy makers and practitioners in one place to enable real progress to be made on key climate issues. Every attendee to the conference will have something to contribute, so we encourage all participants to listen, learn and share your knowledge and expertise. This is especially important in the interactive workshops on day two which will focus on addressing common challenges. Each workshop will result in concrete recommendations for action that will inform a synthesized ENCA report to ensure real reach, influence and impact. **Dr Simon Duffield** is a Principal climate change specialist at Natural England. He works with academics and practitioners to develop our understanding of the direct and indirect impacts of climate change and the effectiveness of adaptation and mitigation interventions. He works with government bodies, NGOs, land owners and advisors to ensure that climate change adaptation and mitigation is delivered through appropriate policy, designations, incentives and advice. He has chaired the ENCA climate change interest group since 2014 and is a member of the Bern Convention Group of Experts on Climate Change and Protected Areas.



1.5 Opening Keynote: Brian MacSharry, Head of Group Nature and Biodiversity, European Environment Agency

Riverine and coastal wetlands are invaluable ecosystems that serve many purposes including the preservation of biodiversity and the mitigation of climate change. These ecosystems encompass a diverse array of habitats, ranging from floodplains and estuaries to marshes and deltas. They serve as essential habitats for a large variety of species, many of which are unique to these wetlands. They act as critical breeding grounds, shelter, and sustenance for numerous species. The ecological significance of these wetlands extends far beyond their borders, as they interconnect with adjacent ecosystems, bolstering overall landscape resilience. Furthermore, riverine and coastal wetlands make substantial contributions to climate change mitigation. They operate as carbon sinks, sequestering significant volumes of CO₂ from the atmosphere. The organic matter within these wetlands accumulates over time, storing carbon that would otherwise contribute to greenhouse gas emissions. Nonetheless, these vital ecosystems are subject to a number of threats, including habitat degradation, pollution, and habitat loss resulting from human activities. To ensure their continued roles in preserving biodiversity and mitigating climate change, it is essential to ensure they are adequately protected and restored.

Dr. Brian MacSharry is the Head of the Biodiversity and Nature Group at the European En-

vironment Agency in Copenhagen. With over two decades of experience, Brian has dedicated his career to conservation efforts, working at various levels from the Irish Government to international platforms. After an initial five-year stint with the Irish government, Brian transitioned to roles focused on gathering and evaluating data related to habitat and species conservation within the EU, as well as the management of protected areas across Europe. Following this, Brian assumed leadership of a team at UNEP-WCMC, overseeing global progress toward Biodiversity Targets, specifically in relation to protected areas. Since 2018, Brian has been at the European Environment Agency, initially serving as an expert in biodiversity information and



protected areas. As of early 2021, he has taken on the role of Head of Group, where his responsibilities encompass the EU Biodiversity Strategy and Global Biodiversity Framework.

2 Session 1: Riverine and coastal wetland biodiversity and climate change – facing upcoming challenges

Aim of the session

The aim of this session is to assess current and projected impacts of climate change on coastal and riverine wetlands and their biodiversity in Europe. We will explore key vulner-abilities and discuss how to boost resilience, how to deal with future changes and uncer-tainties adaptively, and what these new dynamics imply for decision-making in the context of wetland conservation, restoration and sustainable management.

2.1 Keynote: Bending the curve of freshwater biodiversity decline

Prof. Dr. Klement Tockner (Senckenberg Society for Nature Research)

Freshwaters host a remarkable biodiversity, including one-third of all vertebrate species. In addition, freshwaters provide a wide range of ecosystem services that are fundamental for human well-being, including clean water, recreation value, and food. However, freshwaters are under immense and increasing human pressure due to overexploitation, habitat degradation, invasion, climate change, dam construction, as well as emerging stressors such as light, noise, and synthetic chemicals. Hence, we need to carefully, and fundamentally, rethink future management strategies and support coordinated actions to reverse the decline of biodiversity. We need to advocate for hybrid approaches that manage freshwater as a crucial resource for human life support as well as highly valuable and diverse ecosystems. Furthermore, we must establish a blueprint of freshwater life to increase awareness about the enormous value of freshwaters and their rich biodiversity. Most urgent, however, is the preservation of the remaining free-flowing rivers, intact wetlands, and unspoiled lakes for the benefit of humans and nature alike.

Klement Tockner is the Director General of the Senckenberg Gesellschaft für Naturforschung and Professor of Ecosystem Sciences at Goethe University, Frankfurt am Main (since 2021). He served as President of the Austrian Science Fund FWF (2016–2020), Professor of Aquatic Ecology at the Free University of Berlin (2007–2020), and Director of

the Leibniz Institute for Freshwater Ecology and Inland Fisheries (IGB), Berlin (2007–2016). Klement Tockner is an internationally renowned freshwater scientist, particularly in the research fields of biodiversity, ecosystem science, and environmental management. He was editor-in-chief of the journal Aquatic Sciences (2005–2014) and is a technical editor of the journal Ecosystems. In 2009, he published a comprehensive book on European rivers (Rivers of Europe, Elsevier; 2nd edition in 2022). He is an elected member of the Austrian Academy of Sciences and the German Academy of Sciences Leopoldina.



2.2 Talk 1: Model chains, uncertainties, extreme events and national strategies: Challenges, chances and requirements to project floodplain habitats under climate change

Arnd Weber, German Federal Agency for Hydrology, Marieke Frassl, Enno Nilson

Floodplains and their habitats are characterized by their dynamic nature. They are created, reset and sustained by variable hydrological and morphological conditions. Especially extreme flood events shape fluvial geomorphology. Although a change of these extreme events' frequency and magnitude with climate change is expected, its impact on floodplain habitats is still not well studied and difficult to simulate.

For German Federal Waterways simulations of future prognoses are presently organized along model chains: data from different emission scenarios and global climate models are regionalized through downscaling. This is followed by basin-specific rainfall-runoff models, local hydrodynamic simulations and statistical habitat models. Each modelling step involves different sources of error and uncertainties which may propagate. Different strategies are undertaken to cope with these errors and uncertainties. Ensemble modelling covers the bandwidth of multiple emission scenarios and modelling approaches. Assumptions for and simplifications of environmental descriptors of floodplain habitats help to cope with the difficulties of model validation and projections for extreme scenarios.

PorWe will further add morphodynamic simulations to the present model chain and thereby improve our model chain. New statistics are under development and research regarding extreme flood frequencies and magnitudes is conducted as part of the German Strategy for Adaptation to Climate Change (Deutsche Anpassungsstrategie an den Klimawandel, DAS) and to support the Climate Protection Action Plan (Aktionsplan naürlicher Klimaschutz, ANK).

Arnd Weber is a freshwater and fish ecologist by training, who has moved upwards to the interface between the aquatic and the terrestrial phase and presently studies and models vegetation and animals in large river floodplains. He presently works as scientist at the Department for Vegetation Studies, Landscape Management at the Federal Institute of Hydrology in Germany and aims to improve floodplain restoration and management under climate change along German Federal Waterways.



2.3 Talk 2: The impact of changing climate on riparian species and implications for conservation planning

Dr. Sabine Fink, Swiss Federal Institute for Forest, Snow and Landscape Research WSL and Christoph Scheidegger

Riparian habitat decreased significantly over the last decade, mainly due to anthropogenic changes. Protected areas such as floodplains of national importance can be refugia for specialized riparian species. Conservation efforts targeting riparian plants must consider changing climate when choosing suitable areas for restoration.

We investigated the potential for habitat of plant species of Salicion albae and of Fraxinion along Swiss rivers. We modelled habitat suitability for target species for river restoration using environmental predictors (geology, topology, climate), and simulated species' spread along rivers based on life history and dispersal traits, while also considering barriers to dispersal.

Our study shows that the potential for future suitable habitat decreased when considering two climate change scenarios (moderate and extreme change). Predicted distributions for both plant communities do not show any future sites suitable for all species of a community. For most species, a low percentage of the area within perimeter of the protected floodplains of national importance persisted also under future scenarios. Simulations revealed a severe effect of barriers to dispersal (e.g., river dams), as current and future areas with suitable conditions could not be reached.

Our results suggest that conservation management should focus on suitable future areas for plant species, as current protected floodplains do not provide sufficient refugia for typical floodplain forest species in Switzerland.

Sabine Fink studied Ecology and Evolution at the University of Bern, Switzerland. After her

PhD in population genetics on the molecular evolution in the vole genus Microtus (2008), she joined a private company as head of bioanalytics. Since 2014, she works at WSL in the interdisciplinary applied research program "Hydraulic engineering and Ecology", which provides scientific background for the revitalization of approximately 4'000 km of Swiss rivers (for information see www.rivermanagement.ch). As a project leader at WSL, Dr. Sabine Fink focuses on ecological habitat modelling and simulations of dispersal of organisms inhabiting the riverscape (plants, fungi, lichens, cyanobacteria).



2.4 Talk 3: What does climate change mean for coastal wetland biodiversity and how to boost resilience?

Dr. Carles Ibáñez, Eurecat

Global-scale projections suggest that between 20% and 90% (for low and high sea-level rise scenarios, respectively) of the present-day coastal wetland area will be lost. This scenario can be dramatic in terms of biodiversity loss, both in terms of species and habitats, especially in deltas and estuaries. A large portion of the global coastal wetlands are already in process of degradation and even disappearance due to combined impacts of climate change and other global change drivers: sea level rise, subsidence, river sediment deficit, coastal erosion, salt stress, coastal squeezing, etc. Coastal squeeze is the main threat to the survival of coastal wetlands and beaches. This is also linked to active wetland destruction still happening in many regions of the world. Coastal wetlands can increase their resilience by improving their hydrological connectivity, increasing sediment inputs, enhancing wetland plant productivity and giving room to the coast. However, this is strongly dependent on active conservation and management policies. Thus, depending on the climatic scenario that will occur and the implemented policies the future of coastal wetland biodiversity can be very different. The good news is that we know what are the factors enhancing or weakening their resilience, so we have a good basis for management and restoration. In any case, coastal system will not survive climate change impacts unless we re-connect them with their river basins by ensuring environmental flows and restoring the river sediment flux, and give room to the coast to avoid coastal squeeze.

Carles Ibáñez is a Senior Researcher and Head of the Department of Climate Change at EURECAT, Technological Institute of Catalonia. He is further the Scientific Director of the

Climate Resilience Centre. He holds a PhD in Biology from the University of Barcelona and was a post-doc in the Laboratory of Fluvial System Ecology of CNRS (France). He has 35 years of research experience in the field of aquatic, coastal and wetland ecology, climate change impacts and adaptation, sustainable management of water resources and environmental management. He has been a member of both, the Advisory Council of Sustainable Use of Water and the Advisory Council for Sustainable Development of the Government of Catalonia. He was an expert reviewer of the Fifth IPCC Report on Climate Change 2013: Impacts, Adaptation and Vulnerability (Working Group II).



3 Session 2: Nature-based solutions for climate change mitigation and adaptation in riverine and coastal wetlands

Aim of the session

The aim of the session is to explore how to best apply nature-based solutions (NbS) for biodiversity and climate benefits in riverine and coastal wetlands. We will gain a common understanding of the underlying concept and the Global Standard for NbS, including criteria to avoid "greenwashing" and to implement NbS in an inclusive and adaptive manner. The presentations will highlight potentials and limits for applying NbS for climate change mitigation, such as reducing emissions and increasing carbon sequestration in riverine and coastal wetlands. Moreover, potentials and challenges for scaling up NbS for climate change adaptation will be presented, such as coastal protection and river flood risk reduction. Prevailing knowledge gaps will be identified and barriers and success factors for scaling up NbS implementation throughout Europe will be discussed.

3.1 Talk 1: Introduction of the nature-based solutions standard in the context of riverine and coastal wetlands

Alberto Arroyo Schnell, International Union for Conservation of Nature (IUCN)

Nature-based solutions (NbS) are a key ally in the fight against climate change and biodiversity loss. The internationally agreed definition of UNEA, largely based on the IUCN definition, stresses that NbS address social, economic and environmental challenges, while providing human well-being, ecosystem services, resilience and biodiversity benefits. In the context of freshwater ecosystems, wetlands represent crucial multi-functional systems performing as NbS, improving water management and climate resilience. At the same time, wetlands are witnessing increasing degradation, calling for efforts to maintain their value to nature and society.

Furthermore, NbS have gained prominence in the policy debate. They are mentioned in key EU policy strategies (EU Climate Adaptation Strategy), in several national plans (e.g. Germany and the USA), as well as in the official text of several United Nations conventions (UNCBD, UNCCD, UNFCCC, Ramsar).

Yet, NbS should be implemented following rigorous scientific standards and subject to a regular monitoring framework. To this end, in 2020, IUCN launched the first-ever IUCN Global Standard for NbS to guide users through NbS applications and set benchmarks for their progress. NbS need to be a fundamental part of our future if we want to achieve our goal of living in harmony with nature. Alberto Arroyo Schnell is Senior Manager for Policy and Programme at the European Regional Office of the International Union for Conservation of Nature (IUCN). He has held leading positions on EU environmental policy for the past 15 years. His current focus is working together with the key sectors related to biodiversity and nature, aiming to find ways to achieve the environmental targets jointly and to ensure ownership of these targets by all stakeholders. He is Spanish, with a background in Forestry Engineering.



3.2 Talk 2: Integrative Floodplain Management to address the multitude of upcoming challenges – maximizing benefits, beyond flood protection and biodiversity

Barbara Stammel¹, Martin Pusch², Martin Tschikof³, Mathias Scholz⁴

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For centuries, the management of rivers and floodplains has been aimed at maximising a small number of selected human benefits: floodplains have been converted into farmland, and for that were cut off from their rivers by dykes in order to protect settlements and farmland from flooding. Today, these flood defence measures, which significantly further increase flood risks for downstream areas, are reaching their limits and we are observing and predicting an even larger increase in extreme events with catastrophic impacts for nature and people. At the same time, there is a multitude of emerging challenges in landscape management, such as loss of biodiversity, eutrophication, simplification of food webs and, in general, a reduction in the provision of ecosystem services.

In order to reach these multiple societal goals in floodplain management, the current sectoral approach needs to be transformed towards a more integrative management of this highly complex riverine wetland ecosystem with its many ecological, economic and social interactions and synergies. Such integrative management needs to reflect all relevant interests, which can be valued comparably using a non-monetary ecosystem service approach. In this talk we will present experiences from several research projects (MONDAU, RESI, IDES) in which we have analysed the effects of historical river straightening on ecosystem functions, the synergies of restoration projects on flood protection and differing effects of water management measures on biodiversity and other ecosystem services. We will reflect on the multifunctionality and many positive interactions (synergies) of nature-based solutions for flood-plains, but also discuss the negative ones (trade-offs).

Dr. Barbara Stammel is a senior scientist and deputy head of the Floodplain Institute Neuburg/Danube at Catholic University of Eichstätt-Ingolstadt. After studying landscape planning and obtaining her PhD at the Technical University of Munich, she currently complements here habilitation at the faculty of Geography. Her research interests are in the fields

of vegetation ecology, wetland and floodplain ecology, restoration and ecosystem services. She has been involved in several national and international research projects, including coordinating activities along the Danube for the German RESI Project (2015-2018) and was project leader of the international IDES Project (2020-2022) analysing the entire Danube River Basin.



3.3 Talk 3: Carbon pools and sequestration of hardwood floodplain forests at the Middle Elbe River

Dr. Kristin Ludewig, University Hamburg, Heather A. Shupe, Adrian Heger, Annette Eschenbach, Kai Jensen

Anthropogenic land use and landscape change has dramatically decreased hardwood floodplain forests globally. In Germany, it is estimated that only 1% of the former hardwood floodplain forests still exist today. Natural hardwood floodplain forests provide an abundance of ecosystem services such as the mitigation of climate change through the sequestration of atmospheric carbon. In order to quantify carbon pools and fluxes, local in-situ investigations are required. We quantified and compared carbon pools and sequestration rates of temperate hardwood floodplain forests at a local scale.

Along the Middle Elbe River, we conducted forest inventories to quantify the carbon pools of floodplain forests under different hydrologic conditions (highly dynamic active floodplain, less dynamic seepage water zone and floodplain of tributaries) and of different age and forest structure in the active floodplain. Soil organic carbon stocks were determined to a depth of 1 m. Further, dendrochronological methods were applied to tree cores collected from oak trees (*Quercus robur*).

Average C stocks in the trees ranged from 50 t ha⁻¹ for young plantations in the active floodplain to 180 t ha⁻¹ for old forests with comparable hydrological conditions. Forest soil organic carbon stocks ranged between 100 and 150 t ha⁻¹. An active connection to the river had the strongest effect on soil organic carbon stocks, with former floodplain sites storing 33% less soil organic carbon than the active sites. Within the active floodplains, low sites stored 50% more soil organic carbon than high sites. Carbon sequestration rate was higher during flood years in all hydrological conditions, but was significantly reduced by drought only on active floodplains with a comparatively high elevation.

We conclude that hardwood floodplain forests can store a considerable amount of carbon, and floodplains offer large potential for reforestation to provide natural C sinks.

Kristin Ludewig is a vegetation ecologist and interested in the relationships between plant species communities with their biotic and abiotic environment. An abiotic factor especially in the focus of her interest has been the water regime of ecosystems. Floodplains offer

wet and dry conditions closely intermingled in space and time and are excellent ecosystems for her studies. Since 2017, she is coordinating a project about hardwood floodplain forests at the Middle Elbe River, Germany. In this project, research about the ecosystem services of these forests is combined with implementation, e.g. planting new hardwood floodplain forests. With her two positions at Universität Hamburg and at Loki Schmidt Foundation Hamburg, she combines the scientific and applied view on hardwood-floodplain forests.



3.4 Talk 4: Saltmarsh "blue carbon" – opportunities and challenges as a naturebased solution within scotland

Dr. Corallie Hunt, Nature Scot

Over the last decade, the concept of blue carbon has gained prominence on the global stage. Blue carbon is the carbon captured and stored in the coastal and marine environment. Blue carbon habitats have highly efficient mechanisms that sequester CO₂ into organic material, which can become part of long-term stores. In providing this important ecosystem service, they are valuable 'Nature-based Solutions' for climate change mitigation. Saltmarshes are distributed across Scotland's coastline extending to over 5,800 ha. Scottish saltmarshes are estimated to hold 1.15 million tonnes of organic carbon and sequester an additional 4,385 tonnes annually. The majority of this carbon originates from the terrestrial environment, highlighting the importance of wetland habitats in trapping carbon lost from the land. In addition to contributing towards long-term carbon stores, saltmarshes have a critical role in climate change adaptation through coastal flood protection and defence, and support significant biodiversity. However, despite these benefits, saltmarshes are threatened globally by land use change, climate change, and rising sea levels. Within Scotland, the picture is similar; over the last 400 years, significant areas of saltmarsh have been lost to agricultural and industrial development. This presentation will explore the current blue carbon evidence base for Scottish saltmarshes, the benefits of developing a national inventory, and the critical evidence gaps that remain. The focus will then shift to emerging policy areas within Scotland that present both opportunities and challenges to optimise the potential of saltmarshes as a Nature-based Solution within a coastal wetland setting.

Dr. Corallie Hunt is a Marine Sustainability Adviser at NatureScot specialising in coastal habitat ecology and supporting Blue Carbon policy development within Scotland. She works alongside coastal colleagues to advise on developments, strategies, and policies to secure the best outcomes for Scotland's coastal habitats. She has recently completed a PhD looking at improving methods to map the spatial distribution of marine sedimentary carbon in surface sediments.



4 Session 3: Maximizing ecosystem services in riverine and coastal wetlands

Aim of the session

The aim of this session is to broaden the focus of this conference beyond biodiversity and climate benefits, to integrate the wide range of further ecosystem services that riverine and coastal wetlands provide. Spotlight presentations will highlight selected regulating and cultural ecosystem services, underlining their socio-economic importance. Moreover, we will explore how ecosystem service provision is impacted by climate change and biodiversity loss, and how these impacts can best be assessed and communicated. In an interactive discussion, we will jointly identify best practices for maximizing ecosystem services in the collaborative design and implementation of NbS projects.

4.1 Talk 1: Introduction to wetland ecosystem services and their socio-economic importance

Dr. Jan Macháč, J. E. Purkynê University in Ústí nad Labem`

The world is currently dealing with challenges associated with climate change. Its impacts are becoming increasingly evident (floods, droughts, heat waves, etc.) but the correct solution is still unclear. There has been a gradual shift from grey infrastructure to nature-based solutions (NBS). Compared to grey infrastructure NBS also provide a wide range of benefits to people and nature in a form of so-called ecosystem services (ES). Additionally, NBS significantly increase biodiversity. One of the important NBS that connect green and blue infrastructure is restoration of wetlands, which can be used to address the above-mentioned challenges. In case of wetlands people receive multiple-benefits especially water retention, flood protection and erosion reduction.

However, restoration and maintenance of wetlands are associated with considerable costs and are often in contradiction with existing land use and established practice. To gain necessary support from the side of different stakeholders, provided benefits need to be popularised, explained and presented in units that people understand.

On the basis of research in the Czech Republic, it can be said that after afforestation wetlands are among the most positively perceived NBS regarding their aesthetic aspect. The economic evaluation shows that the whole society actually benefits from implementation of wetlands. Other than flood protection function, there are also co-benefits such as recreation, higher aesthetic value, improvement in water quality etc. that significantly contribute to the positive valuation. Such results support also setting of different policy instruments e.g., payment for ecosystem services.

Dr. Jan Macháč is a researcher and university lecturer at J. E. Purkyně University in Ústí nad Labem. As an environmental economist he focuses his research on green and blue infrastructure, valuation of ecosystem services, exploring resident's preferences related to nature-based solutions and on developing flooding-related role board games.



4.2 Spotlight 1: Snapshots on biogeochemistry and nutrient cycling of riverine wetlands

Dominik Zak^{1,2}, Rasmus J. Petersen¹, Carl C. Hoffmann¹, Joachim Audet¹, Mette V. Carstensen¹, Hans E. Andersen¹, Brian Kronvang¹, Hans Christian. B. Hansen³

¹Aarhus University, Denmark; ²Leibniz-Institute of Freshwater Ecology and Inland Fisheries Berlin, Germany; ³Copenhagen University, Denmark

Presently, there are major attempts to restore wetlands to solve various environmental problems like the loss of biodiversity, increasing greenhouse gas concentrations in the atmosphere and the ongoing eutrophication of terrestrial and aquatic systems because of globalisation and the current land use management. In the last decades, we have substantially increased our understanding of the biogeochemical processes in wetlands, which has enabled us to derive some robust scientific principles for understanding the implications of actions and optimise restoration measures. Much of our knowledge has been generated from research in constructed wetlands over more than 50 years. However, some of the key processes were described already more than 100 years ago. The water table and the sources of water were found to be important drivers but also the chemical composition of discharging water, physicochemical soil characteristics and the dominant vegetation must be considered. A good understanding of these drivers is an important prerequisite both for modelling nutrient removal in wetlands and, eventually, for prioritizing, planning and successfully implementing wetland restoration measures and designing their sustainable management. However, the large heterogeneity of soil properties in space and time and the complex hydrology and knowledge gaps regarding microbial dynamics and functioning still cause large uncertainties in the assessment and prediction of nutrient cycling in all types of wetlands. With this talk I would like to give a brief overview on drivers and uncertainties of biogeochemistry and nutrient cycling in riverine wetlands.

Dr. Dominik Zak is a professor at the Arhus University specializing in the biogeochemistry of wetlands. He studied fishery science and aquaculture at the Humboldt-Universität zu

Berlin focusing on biogeochemistry and ecology of freshwater systems. During his PhD, he delved deeply into the subject of phosphorus mobilization in rewetted wetlands and its implications for ecosystem restoration. His current research revolves around a multidisciplinary approach, integrating aspects of biology, ecology, microbiology, hydrology and hydrochemistry across both aquatic and terrestrial systems. His expertise extends across diverse spatial and temporal scales, ranging from investigating micro-zones to conducting large-scale field sampling campaigns.



4.3 Spotlight 2: Recreational ecosystem services of coastal wetlands

Dr. Ruth Waters, Natural England

Coastal wetlands provide many benefits and ecosystem services to humans, including nutrient recycling, climate and water quality regulation, food, fuel and fibre; but they are under considerable threat from population pressure, development, pollution and climate change. Recreational ecosystem services associated with coastal wetlands are less well studied than other services from these ecosystems although they are highly valued by the people who live in, visit and use the sites. Recreational activities include recreational fishing, hiking, nature tourism, wildfowling and boating and other leisure activities. These activities in turn often confer health and well-being benefits from improvements to physical and mental health, restorative benefits and increased connection to nature and other people. Valuing the breadth of benefits from recreational services can be challenging. Some estimates of the value of tourism and recreation in some coastal wetlands such as mangroves is considerable and have been described as a multi-billion-dollar industry. Other studies have focused on the relational values that people derive from coastal areas through their relationship with nature using approaches such as community voice method. Considering how recreational ecosystem services and associated benefits are experienced and valued by different socio-economic groups in coastal wetlands is critical if we are to manage and restore our pressurised coastal wetlands to benefit all of society.

Dr. Ruth Waters is Director of Evidence in Natural England. She is a strong advocate for inter-disciplinary application of science in uncertain real-world settings. Ruth's has worked on a wide range of projects and has broad multi-disciplinary experience including working with economists, social scientists, artists, health experts, social justice experts, historians and ecologists to seek better ways of understanding, valuing and managing our natural environment for people and nature. More recently Ruth was the lead scientist in the team supporting Prof Sir Partha Dasgupta on the



independent review of The Economics of Biodiversity. She was a co-author on the UK Nature Positive 2030 report published last year.

4.4 Spotlight 3: Cultural Ecosystem Services (of riverine and coastal wetlands)

Prof. Dr. Karl Matthias Wantzen, UNESCO Chair "Rivers and Heritage (River Culture)", Universities of Strasbourg and Tours, France

Cultural Ecosystem Services (CES) have been neglected in ecosystem service assessments. This short presentation highlights their importance, provides a typology of cultural practices in riverine and coastal wetlands, and points out the difficulties in making CES compatible with other ES assessments. I will also go into details of the evolution and development of cultural and biological diversities, respectively their similarities and differences. CES provide an important linkage between humans and nature; they are at the same time a motivation to preserve nature better and – along with biodiversity decline – an object requiring targeted conservation schemes. Certain CES such as use of ecosystem-borne assets (including Traditional Ecological Knowledge) may be conflicting with conservation strategies, especially if the used populations (e.g. pharmacological plants, fish) have become small. In the context of climate change and other disruptive processes, CES may gain great importance to foster perception of environmental problems and to communicate/help implement unprecedented approaches and management schemes.

Karl M. Wantzen is professor for ecology at the University of Tours, France. He is member of two Interdisciplinary Research Centers by the French Research Council (CNRS UMRs) for Cities, Territories, Environment and Society (CITERES) at Tours and for Image, City, Environment (LIVE) at Strasbourg universities, and lectures on conservation, environmental restoration and water-related issues in the Engineering Course GAE-IMA (in french) and the International Master Course on Urban Planning and Sustainability. Since 2014, Karl Matthias Wantzen heads the UNESCO Chair "Fleuves et Patrimoine - River Culture".



4.5 Optional evening program

Movie "Water Lost and Returned"

Michael Bender, LIVING RIVERS Foundation & Grüne Liga

Michael.bender@living-rivers.eu; https://www.riverfilmfest.eu/; https://www.grueneliga.de/wasser

An emotional artistic documentary about the return of wetlands to the landscape of the Šumava National Park. The unique shots of Radek Plíhal, captured during a three-year filming in the fascinating environment of Šumava, completed with the music of Lenka Dusilová and

Petr Ostrouchov, tell the story of water. The story of her journey starting in the forest springs, wet meadows and bogs, passing through the streams to the river floodplain. The story of her deliberate damnation not long ago and the efforts of hundreds of people to bring it back. The film depicts the fundamental importance of water for the landscape, nature and for the unceasingly diverse life it brings.

The LIVING RIVERS Foundation engages in the protection of free rivers and freshwater life, sustainable management of water resources and the revitalisation of rivers landscapes – in Europe and internationally. Together with our partners, we advocate the better implementation of policies that treat water as a cross-cutting issue. Besides holding conferences and publishing factsheets, newsletters and policy papers on German, European and global water policy, the LIVING RIVERS Foundation organizes Riverfilmfest events in Germany and Europe involving local and regional partners engaged in river restoration and dam removal projects.

We believe that Europe can do better in protecting the last wild rivers and removing dams. Therefore, we advocate the establishment of a growing network of strictly protected free rivers across Europe.

LIVING RIVERS Foundation is a member of the European Environmental Bureau (EEB) in Brussel, Europe's largest federation of environmental citizen's organizations.

Michael Bender works as project manager for Living Rivers Foundation with focus on the protection of freshwater aquatic ecosystems. He has been coordinating water related positions of German NGOs regarding the EU-Water Framework Directive including respective daughter directives and their implementation into German Law. He has been involved in the water working group of the European Environmental Bureau (EEB) since 1998.

Michael Bender heads the Water Policy Office of the German environmental NGO GRÜNE LIGA. He has coordinated the water working group of the German Forum on Environment and Development from 2000 to 2013 and has been involved in the first successful EU-citizens initiative on the human right for water and sanitation.

Michael Bender is an observer in the International Elbe River Commission and was a Chair Persons of the successful 2011 Berlin Water referendum.



Movie "The No man's land"

Rainer Holz, Gerd Sälhoff, Ostseelandschaft Vorpommern e.V.

The film is dedicated to the beach meadows, a largely overlooked habitat on the Baltic Sea. Beach meadows are coastal areas with the unique ability to adapt to changing sea levels. The film describes the history of the beach meadows over the past 1000 years, their adaptations to climate change, with a significant role played by human use for livestock farming over the centuries. At the interface of land and sea, this human activity created habitats for an admirable plant and animal world. The film illustrates how the beach meadows, which were once our unique natural bulwark against the sea, succumbed to outdated notions of coastal protection and stabilization.

The association "Ostseelandschaft Vorpommern - Association for the Protection of the Landscape and its Natural Diversity e.V." was founded in 2011 in Stralsund with Hermann Baier as the association's chairman. It is dedicated to preserving the originality and unique character of the Vorpommern Baltic Sea landscape. Our interests lie in the protection and conservation of its characteristic ecological and biological diversity, as well as promoting land use that supports these values and natural landscape processes.

In addition to practical project work such as habitat maintenance and care, we collaborate closely with environmental and nature conservation associations and authorities, organize specialist conferences and seminars, and initiate projects and studies.

Rainer Holz (71) was born in Usedom Stadt. He began his professional journey with vocational training in agriculture. His career spanned from 1978 to 2003, during which time he was actively engaged in various scientific and administrative roles within institutions dedicated to nature conservation. Upon his retirement, Rainer Holz continued similar activities with associations and forums, particularly focused on the intricate dynamics of landscapes, viewing them through the lens of biodiversity.



Day 2: Wednesday, September 27th 2023

5 Session 4: Wetland restoration in practice: overcoming barriers and scaling up implementation

Aim of the session

The aim of this session is to develop concrete recommendations for scaling up the restoration of riverine and coastal wetlands in Europe. In the initial keynote and panel discussion, large-scale restoration initiatives from across Europe will be presented and common barriers and success factors identified. The rest of the day is dedicated to interactive workshop sessions, giving all participants the opportunity to share their expertise on selected focal issues of implementing wetland restoration in practice, and to jointly develop key recommendations.

5.1 Keynote: Rewilding wetlands: opportunities for wetland restoration to benefit biodiversity and climate change mitigation and adaptation

Prof. Dr. Liesbeth Bakker, Netherlands Institute of Ecology (NIOO-KNAW) and Wageningen University & Research

At present societies face multiple challenges or crises at once including climate change and biodiversity declines. Whereas these sometimes spark different policies, there are strong opportunities to find solutions towards solving multiple crisis at once. In particular wetlands are superior solutions to mitigate and adapt to climate change as well as bending the curve of biodiversity decline. Whereas the concept of rewilding is often associated with wildlife, abiotic rewilding is equally important and perhaps even more promising and especially relevant in restoring wetlands. Rewilding, defined as 'giving more room to natural processes' includes water dynamics and the natural role of water in landscapes. Hence, restoring wetlands in places where wetlands naturally occurred means rewilding landscapes by bringing back the natural role of water in these landscapes. Here, we explore what the benefits are for climate change mitigation and adaptation as well as the recovery of biodiversity and what the opportunities are for rewilding wetlands.

Liesbeth Bakker is a wetland and wildlife ecologist studying ecosystem functions and services, food webs, restoration ecology and rewilding. She is particularly interested in the impact of rewilding on biodiversity, ecosystem functions and landscape structure in relation to global change and human pressure. She is a senior scientist at the Department of Aquatic Ecology of the Netherlands Institute of Ecology (NIOO-KNAW) and professor in Rewilding Ecology at Wageningen University & Research in the Netherlands.



5.2 Moderated Panel Discussion

Prof. Dr. Liesbeth Bakker, Netherlands Institute of Ecology (NIOO-KNAW) and Wageningen University & Research

See above

Georg Frank, Nationalpark Donau-Auen

Georg Frank is a biologist and has been working as a nature conservationist in the Donau-Auen National Park (Austria) for more than 20 years. Since 2007, he has initiated and developed the Danube River Network of Protected Areas. As Secretary General of DANUBEPARKS, he promotes and coordinates the transnational cooperation of national parks, biosphere reserves and nature parks from all Danube countries and plays a leading role in large-scale transboundary restoration projects and transnational nature conservation initiatives.



Prof. Dr. Daniel Hering, Universität Duisburg-Essen

Daniel Hering is professor for Aquatic Ecology at the University of Duisburg-Essen in Germany. His main research interests include the restoration of rivers and floodplains, the assessment of freshwater ecosystems and the effects of multiple stressors. He is co-speaker of the Collaborative Research Centre RESIST and coordinator of the EU-funded project MERLIN.



Anis Guelmami, Mediterranean Wetlands Observatory

Anis Guelmami is the coordinator of the Mediterranean Wetlands Observatory, based in the Research Institute for the Conservation of the Mediterranean Wetlands of the Tour du Valat (France). He has more than 12 years of experience in the development of Earth Ob-

servation (EO) based tools for the assessment and monitoring of wetlands in all Mediterranean countries. He is also involved in supporting national and local wetland practitioners in the implementation of global and regional conventions and policy frameworks related to these ecosystems. Lastly, he is actively committed to promoting and transferring the tools developed by the MWO for monitoring wetlands (EO and non-EO), in particular through the organization of training and capacity-building workshops with wetland practitioners, in English, French and Arabic.



5.3 Workshop Session

5.3.1 Workshop 1: Ensuring Participation: How to integrate local stakeholders and build acceptance for wetland restoration? (Simone Wulf, BfN)

Spotlight 1: Citizen scientists show that a large part of German agricultural streams are in a poor ecological status

Julia von Gönner^{*1,2,3}, Jonas Gröning^{*4,5}, Volker Grescho^{1,2,3}, Lilian Neuer⁶, Matthias Liess^{4,5}, Aletta Bonn^{1,2,3}; *shared first authorship

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High pesticide concentrations and habitat degradation are major causes of insect declines in lowland streams. Standardized stream monitoring data and public support for freshwater conservation are needed to effectively conserve and restore stream habitats.

More than 90 citizen science (CS) groups with over 700 volunteers participated in the CS project 'FLOW' in 2021, 2022 and 2023, which trains citizen scientists to assess the ecological status of small streams according to European Water Framework Directive (WFD) standards. The biological indicator SPEARpesticides is used to assess pesticide exposure at the stream's sites based on benthic invertebrate community composition.

Citizen scientists found that 66% of sample sites in agricultural catchments (n=112) didn't achieve good ecological status in terms of macroinvertebrate community composition (SPEARpesticides index rated 'moderate' (27%), 'poor' (24%) or 'bad' (15%)). Of the n = 20 reference sample sites with near-natural catchments, 20% didn't reach a good SPEARpesticides status class. For stream hydromorphology, CS monitoring results revealed that 70% of the agricultural sites didn't achieve a good ecological status.

To quantify CS data accuracy, we compared CS and professional macorinvertebrate taxa lists for 56% of the monitored stream sites (n=75). We found that SPEARpesticides values determined by the citizen scientists were highly correlated to the professionally generated SPEARpesticides values (p<0.001, r=0.88).

This monitoring evidence on stream status provided by citizen scientists could play a critical role in advancing the implementation of the Water Framework Directive goal of restoring and protecting freshwater ecosystems.

PLEASE NOTE: These results remain unpublished until October 4th, 2023! The authors are therefore asking that, until then, journalists or others do not specifically mention the results to the public.
Julia von Gönner studied biology and education science at the Friedrich Schiller University Jena. She is currently a project coordinator and doctoral researcher at the Helmholtz Cen-

tre for Environmental Research and iDiv Leipzig. Together with Friends of the Earth Germany (BUND), she leads the Germanywide citizen science stream monitoring project FLOW. She was also involved in the development of the White Paper Citizen Science Strategy 2023 for Germany. Her research focuses on participant outcomes of biodiversity-related citizen science as well as community management and data quality in citizen science projects.



Spotlight 2: Initiative for Conservation of Coastal Wetlands and Shorebirds at the Arid-Semiarid Pacific Coast of South America

Johannes Burmeister, Manfred-Hermsen Stiftung Bremen & Elier Tabilo-Valdivieso, Centro Neotropical de Entrenamiento en Humedales, Chile

The chain of coastal wetlands at the arid-semiarid Pacific coast of South America comprises unique sites of exceptional conservation value for biodiversity, nearby communities, and our global population on the whole. Human activities and global changes expose immense pressure onto these wetlands, and local conservation efforts alone often don't manage to entirely resolve the underlying causes of degradation and introduce adequate measures for adaptation.

The Coastal Wetlands Initiative aims to address conservation gaps by strengthening governance, fostering regional collaboration, and supporting networking among wetland conservationists between Ecuador, Peru, and Chile.

Commencing with a rapid assessment of 34 coastal wetlands between northern Peru and central-northern Chile in 2015, we raised awareness and promoted a wetland conservation movement among key stakeholders, including the public sector. Collectively, an Action Plan was elaborated in 2017/18, followed by a revised version in 2022/23.

Based on this Action Plan, three project idea competitions were launched (2019, 2021, and 2023), providing local non-profit organizations with funds for the realization of wetland conservation projects and facilitating their cooperation. Furthermore, an interactive Online Wetland Atlas was created, comprising key wetland data and serving as a tool for monitoring and citizen science.

Many important results have been achieved so far, including dialogues between government representatives, followed by a first commitment for collaboration in coastal wetlands conservation between Chile and Peru. Future efforts are directed towards the creation of a regional agenda for joint conservation measures, strengthening of civil society organizations, and improving the management of information on the coastal wetlands.

Johannes Burmeister is the manager of the German Foundation 'Manfred-Hermsen-Stiftung for Nature and Environment'. The foundation is devoted to the protection of nature, our environment, and the sustainable use of natural resources. Johannes has more than 10 years of experience in conservation projects and has worked as an engineer in water and solid waste management before (M Eng in Civil and Environmental Engineering, Cardiff University).



Elier Tabilo-Valdivieso holds a Ph.D. in Biology and Applied Ecology from the University of La Serena, Chile, and a M.Sc. in Wildlife Conservation and Management from the National University of Costa Rica. He is the director of the Chilean non-governmental organization 'Centro Neotropical de Entrenamiento en Humedales' which is dedicated to international cooperation in wetland conservation.



5.3.2 Workshop 2: Finding space: How to tackle the issue of limited land availability and choose priority areas to scale up wetland restoration? (Aletta Bonn, UFZ)Spotlight 1: Wetlands4Cities, a solution to develop Urban Wetlands

Lander Wantens, Natuurpunt vzw (Belgium)

Urban wetlands can serve as a solution to bring wetlands into people's environment, creating support for measures that restore wetlands. With the wetlands4Cities project, Natuurpunt has worked out 7 pilot projects across Flanders over the past 2 years. The result is more than 2,000 ha of wetland restoration near urban areas. The areas are also very diverse, from valley areas to polders and peatlands. The partners around the different wetlands are also very different from local governments to Regional governments to private partners and landowners.

There is also a scaling-up of the project in the form of a wetland plan for the whole of Flanders, with 1000 ha of wetland restoration over the next 5 years. This is based on a scientific study by the Institute for Nature and Forest Research that mapped Flanders' wetland potential based on historical data.

Lander Wantens works at Natuurpunt, the largest Belgian NGO dedicated to nature management and restoration. There, he is the project coordinator of the LIFE project wetlands4Cities, which aims to restore urban wetlands in Flanders and the Netherlands. He is further working on a global wetland restoration plan with which natuurpunt wants to restore at least 1000 ha of wetlands in Flanders (Belgium) over the next 5 years.



Spotlight 2: Assessing floodplain ecosystem functions as a tool for protecting areas suitable for nature-based solutions

Jakubínský, J.1*, Krásná, K. 1, Štěrbová, L. 1, Babej, J. 1, Pechanec, V. 2, Cudlín, P. 1

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Floodplains include unique environments shaped over a long-time horizon along rivers and smaller streams and formed by alluvial sediments. As floodplains are flat, often with highly fertile and well-accessible land, they have become the intrinsic focus of human society while providing a variety of goods and ecosystem services. Intensive land use of floodplains is degrading their natural values and significantly reducing their ecosystem functions and services. A significant part of these key services is related with the ability of floodplains to retain water and nutrients, which can be understood as a flood and extreme runoff control.

Quantifying the ecosystem functions performed by floodplains and, in particular, identifying land use thresholds, is an important source of information for the needs of water management and landscape planning in floodplains, whose goal should be to maintain good status or improve currently unsatisfactory status. We hypothesize that floodplain corridors are a more ecologically valuable component of the landscape structure, while especially in agricultural and urban areas, preserved floodplains form the backbone of ecological stability, and provide a greater number of ecosystem functions compared to their surroundings.

This work presents interim results of the project currently underway to develop a comprehensive methodological approach to determine the extent of floodplain disturbance under current conditions based on the identification and assessment of key floodplain ecosystem functions and services. The results showing the quality of selected ecosystem functions (soil water retention, mass flow and sediment regulation, carbon sequestration, flood control and habitat provision) for several floodplain reaches in the Czech Republic are presented.

Jirí Jakubínský is a scientist at the Global Change Research Institute CAS (CzechGlobe), based in Brno, Czech Republic. He is the head of the Department of Ecosystem Functional Analysis of the Landscape. His research specialization lies in environmental hydrology, fluvial geomorphology, and interactions between the ecological status of river network and the intensity of anthropogenic pressures on the landscape. He is currently engaged in research into ecosystem functions and services provided by riparian zones and floodplains under long-term human pressures.



5.3.3 Workshop 3: Maximizing climate benefits: How to increase carbon sequestration in riverine and coastal wetlands in practice? (Katrina Marsden & Carla Klusmann)

Spotlight 1: LIFE Wetlands for Climate: enhancing wetland conservation for climate change mitigation

Sánchez-Ortega, Vanessa²*°; Camacho, A. ¹, Rochera, C.¹, Morant, D.¹, Picazo, A.¹, Miralles-Lorenzo, J.¹, Camacho-Santamans, A.¹, Carballeira, R.¹, Aguirre, E.², Guillem, A.², Ruiz, J.², Monferrer, S.², Miguelez, D.², Bello, A.², Mediavilla, L.², López-Onieva, M.², Servera, E.³, Fernández-Checa, J.⁴ *lead presenter; ° corresponding author

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The EU LIFE project "Wetlands4Climate aims to establish management guidelines for Mediterranean wetlands so that they function as carbon sinks while maintaining their ecological integrity, functionality, and providing the services of a healthy ecosystem. We try to maximize the C-sink capacity of Mediterranean wetlands through practical management actions on wetland vegetation, water, and soils, demonstrating that such management is aligned with biodiversity conservation. We intend to transfer the lessons learned in management to stakeholders in other Mediterranean wetlands in Europe.W4C also would like to involve the private sector in financing climate change mitigation and adaptation measures focused on water management and wetland restoration, as well as to integrate wetland conservation and management with EU climate change mitigation objectives. After the design of an experimental protocol to assess the sink capacity of wetlands based on their conservation status and management actions, these actions are being developed in 10 pilot wetlands (coastal, inland freshwater and inland saline) in Spain. These actions are related to wetland's carbon fixation (biogeochemical process rates. structure and function of microbial communities) and ecological quality indicators. Experimentation and upscaling of the best management measures for vegetation, soil and water, give the results for the development of management matrices to evaluate the actions and their relationship with the natural values of the wetlands and their ecosystem services, especially carbon sequestration and climate change mitigation, while assessing the trade-offs. Communication and networking is focused in different groups, namely school and university students, citizens in general, company technicians, administration staff and experts. The project is also designed in a practical protocol that assesses the capacity of wetlands as carbon sinks or sources, the influence of environmental variables, and management actions and recommendations.

Vanessa Sánchez holds a BSc in Environmental Sciences and she joined Fundación Global Nature in 2002. Since then, she has been involved in different European projects related to nature protection, wetlands restoration and management, agrifood sustainability and Climate Change. She currently coordinates the LIFE "Wetlands4Climate" which objective is to establish guidelines for the management of Mediterranean wetlands to foster their capacity as carbon sinks.



Spotlight 2: How is carbon storage increased in altered rivers? Lessons from historical riverscape changes

Sofia. F. Santos¹, M.R. Fernandes¹, A. Correia¹, M.J. Martins¹, R. Rivaes¹, G. Duarte¹, M.T. Ferreira¹ and F.C. Aguiar¹

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Riverine woodlands are fundamental carbon (C) sinks to mitigate climate change, particularly in water-stressed regions like the Mediterranean Basin. However, many rivers in this region are impaired by hydropower dams and Land-use Land-cover (LULC) changes, which impact the C storage capacity of riverine areas. This research aims to assess the C storage in riverine areas downstream of dams. The study was conducted on the Rivers Lima and Alva, Portugal, downstream of hydropower dams with moderate and high flow regulation, respectively. Aerial images were analysed to assess Riparian Vegetation (RV) cover before and after dam construction. Total C stocks were estimated by accounting for the C stocks for the RV and the surrounding LULC classes (e.g. forests, agriculture), using field data and literature estimates. Results showed that flow regulation combined with LULC changes, predominantly agricultural land abandonment and the increase of managed forests, led to a significant increase in accumulated C stocks of riverine areas. RV was mostly composed of alders, ashes and willows and exhibited the highest C values of the riverine landscape (163.0 Ct/ha), accounting for c. 50% of the total estimated carbon. C stocks increased in both areas, especially in River Alva, due to the vegetation encroachment into the former active channel and the occupation of abandoned agricultural land. Acacia dealbata, a woody invasive alien species, also contributes to the C stock increase, which poses management and conservation concerns. This study highlights the need to preserve native RV and restore abandoned areas for an ecologically healthier Carbon sink.

Sofia Santos has a degree in Biology (2017) and a Master's in Ecology (2019) from the University of Coimbra, Portugal. From 2019 onwards, she worked on several national and LIFE projects in the Azores Archipelago – S. Miguel Island, Portugal. She is a fellowship since

the end of 2022, supported by the Portuguese Foundation for Science and Technology for developing Ph.D. studies on the Doctoral Program Sustainable Land Use - Forest and Natural Resources, at the School of Agriculture, University of Lisbon. Her Ph.D. studies are focused on riparian forests as ecosystem services providers in the context of global change, using both field and remote sensing data. She has authored/co-authored three articles in WoS journals on the thematic fields of ecology and conservation.



5.3.4 Workshop 4: Monitoring success: How to evaluate success of wetland restoration for biodiversity objectives and build evidence of socio-economic benefits? (Mathias Scholz & Ute Susanne Kaden, UFZ)

Spotlight 1: Global nature conservation and the apparent ineffective adaptation to climate pressures

Cor Schipper, Ministry of Infrastructure and Water Management, The Netherlands*, Titus W, Hielkema, Berry Gersonius, * cor.schipper@rws.nl

The Intergovernmental Panel on Climate Change projects climate change effects based on several scenarios and highlights the potential regional changes of bioclimatic pressures up until 2100. Understanding the effects of climate change on the ecosystems is of utmost importance for nature conservation; biodiversity in riverine and coastal areas is threatened by weather-related events like floods and droughts. This study evaluates the impact of climate change on the performance of a given naturebased solution and nature conservation management plan's success (or failure) to account for climate change. For the purpose of the evaluation, management plans are analysed against the UN Sustainable Development Goals targets.

The case studies analysed include twelve nature-based solution sites in riverine and coastal areas, distributed across Europe, Oceania and North America. Their sustainable development goals performance is analysed quantitatively for the Sustainable Development Goals-Sustainable Index Score, open-source indicator data and qualitatively for the nature conservation management plans. Sustainable development goals considered include the following: clean water and sanitation (6); industry, innovation & infrastructure (9); sustainable cities and communities (11); responsible consumption and production (12); climate action (13); life below water (14); life on land (15). The International Panel on Climate Change projections under the SSP1-2.6 and SSP5-8.5 scenarios are used to gain evidence of the role nature-based solutions and nature conservation management plans can play in adaptation trajectories for climate change and biodiversity conservation.

The results highlight that most nature conservation management plans and the nature-based solution they typically rely upon, do not pay sufficient attention to climate change. The evidence suggests that the studied nature-based solution sites are not on track to achieve selected sustainable development goals when climate change impacts under the SSP1-2.6 and SSP5-8.5 scenarios are factored in. Through this evaluation, riverine conservation areas are identified as requiring more rigorous climate adaptation strategies and nature conservation planning to enhance resilience and to have the potential of fulfilling the addressed SDGs.

Dr. C.A. Schipper currently works for Ministry of Infrastructure and the Environment,

Rijkswaterstaat at the department Zee en Delta/NOVP. Several publications have been made on the Sustainable Development Goals with focus on a wide range of global climate pressures in coastal areas. Now he is program manager of the nourishment of Galgeplaat flat in the Eastern Scheldt, The Netherlands. Due to reduced tidal amplitude and flow, the building-up of tidal flats by tidal currents has reduced, which results in erosion of the flats. He does research in



climate change, marine biology, ecotoxicology and sustainability. His current preparation of the manuscript is "Bioclimatic impact on the biodiversity of Nature Based Solutions: ecosystem under pressure".

Spotlight 2: Biocoenotic method to control the success of restoration measures in floodplains

Kathrin Januschke¹, Daniel Hering¹, Barbara Stammel², Stefan Brunzel³, Mathias Scholz⁴, Andrea Rumm⁵, Julia Sattler⁶, Christine Fischer-Bedtke⁷, Alexandra Makiej¹ & Francis Foeckler⁸

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Rivers and their floodplains are increasingly subject to restoration measures. While there are standardized methods for biotic assessment of rivers that are used for implementing the Water Framework Directive, there is a wide variety of approaches to assess floodplains. However, the demand for standardized methods to monitor and assess the biotic success of restoration measures in floodplains is increasing. Here we present such a method for riparian zones and floodplains that has been co-developed by stakeholders. The new method is based on the occurrence of key floodplain habitats and indicator species of the organism groups vascular plants, terrestrial and aquatic mollusks, carabid beetles, amphibians, and birds. The assessment uses a comparison of two floodplain sections (e.g. before-after) and considers reference conditions of 18 floodplain types which cover all of the 79 German rivers and large rivers (catchment area > 1.000 km2). Excel templates provide formulas and indicator species lists to screen effects of restoration on habitat conditions and biological elements, e.g., indicator species of the floodplain type, endangered species according to the German Red List.

Due to the high interest of stakeholders in application, the assessment method will be applied in a nationwide on-road test which comprises existing monitoring data of the Federal States and aims on a validation and further development of the method. Kathrin Januschke is a scientific assistant at the Faculty of Biology, Department of Aquatic Ecology, at the University of Duisburg-Essen since 2008. In her research activities she addresses the effects of river restoration measures on aquatic and terrestrial organism groups which includes the development of biological assessment systems to quantify success of restoration measures in rivers and floodplains. Kathrin Januschke further organizes and realizes fieldwork in the context of several European and national projects, especially on ground beetles. She supports the work of the European Topic Centre Biodiversity and Ecosys-



tems (ETC BE) concerning several aspects of European floodplains. She teaches courses in ecology, zoology, and biology for Bachelor and Master students.

Parallel Workshop Session 2

5.3.5 Workshop 5: Tackling land use conflicts: How to reconcile agriculture and other uses with wetland conservation and restoration? (Katrina Marsden & Carla Klusmann, adelphi)

Spotlight 1: Landowner integration in the Tullstorp stream project – a water restoration project in Trelleborg, Sweden

Christoffer Bonthron, Tullstorp stream project

Land is a finite resource, however needed for both agriculture and for creating wetlands in order to break negative environmental trends and meet changing climate conditions. How can we do this without interfering with the agricultural need of land?

In the Tullstorp stream project the land use question has been carefully treated through a dense dialogue between the project manager, the landowners and the designers of wetlands and with alternative approaches to manage the situation. Different methods have been used during the project based on experiences achieved but also based on widened focus. Initially the project focused on environmental measures, today the changing climate and all challenges related to this is also part of the project scope.

The success stories from the project will be presented.

Christoffer Bonthron is the project manager for the Tullstorp stream project. He further advises sustainable water management solutions at several larger farms in the region of

Southern Sweden. Christoffer studied Risk Management in at the University of Lund and has worked with sustainable water management measures in the agricultural landscape since 2014. He received the WWF Baltic Sea farmer of the year award 2018 for the development of a sustainable irrigation system. This includes several measures contributing to the reduction of nutrient emissions; such as addition of wetland areas, restoration of two ponds, cleaning and



recycling of drainage water and a modern technique for precision irrigation at Karlsfälts farm Ystad, Sweden.

5.3.6 Workshop 6: Restoring coastal dynamics: How to manage coastal wetlands in the face of climate change? (Simone Wulf, BfN)

Spotlight 1: Environmental trajectories and integration of local communities in coastal wetlands restoration in the context of climate change

Louise Quinio, PhD candidate in geography, Nantes University / LETG (CNRS UMR 6554); Céline Chadenas, Professor, Nantes University / LETG (CNRS UMR 6554); Vincent Andreu-Boussut, Associate Professor, Le Mans University / ESO (CNRS UMR 6590)

In Europe, strategies for thinking coastal adaptation to face sea level rise or compensating habitats losses began around forty years ago, although in very different ways depending on which countries embarked on the process. Natural areas, whether protected or not, can be the starting point for an adaptation project thought out on a larger scale involving urban issues and lead to evolution in nature conservation in the context of climate change (Ervin, 2011 Hoffmann & Sgro, 2011). This involves many changes at different scales for coastal areas, so it is interesting to study the way in which local communities are involved in these projects. Case studies in the United Kingdom and France will support the demonstration, based on semi-directive interviews with site managers. Sometimes, agricultural lands were gradually purchased to transform the site with a vast operation of wetland restoration to create a mosaic of environments partly reconnected to marine dynamics (Esteves, 2015, Brown, 2022). Other times an exceptional one-off event has transformed the site without human planning (Almeida et al., 2017). These wetlands' environmental trajectory is a mean of understanding how these projects are constructed, in terms of political and social logic in particular, in order to analyse the process leading to ecological restoration, the obstacles that have been encountered but also the way in which these have been overcome. Are there determinants that will enable us to better understand these projects, to understand the transformation of the sites in the future, and what levers can be used to improve their acceptability to local communities?

Louise Quinio is a PhD candidate at Nantes University – LETG UMR 6554 CNRS (France), where she works on natural coastal areas and their protection in the context of climate change within the in the human geography department. Her research focuses on local community involvement in restoration processes and their perception of coastal wetlands' future.



Spotlight 2: Ecological restoration and managed realignment on the German Baltic Coast -An Inventory

Anne Cristina de la Vega-Leinert¹, Julia Kaufmann¹, Nadine Reinwardt¹, Maike Wermes¹, Geronimo Gussmann², Lars Honsel², Niels Riesinger³

¹ Department of Geography and Geology, University Greifswald, Germany; ² Global Climate Forum; ³ Humboldt University, Berlin, Germany

Managed Realignment (MR) is receiving increased attention among academics, policy-makers and practitioners. This coastal management approach departs from classical protection to encourage synergies via nature-based solutions. Indeed, this can help to reduce the environmental impacts of hard coastal defence, restore near natural dynamics and buffers, optimize coastal protection budgets, and increase long-term resilience.

However, in Germany, there is restricted systematic information on the process and outcomes of MR. We focus on coastal ecological restoration projects on the Baltic coast, which often involve MR, although they pursue conservation goals (e.g., climate mitigation, habitat protection) rather than coastal adaptation per se. Practitioners have gathered key know-how in planing and implementing such projects. We formalize this rich, locally situated empirical knowledge to draw lessons from past experiences and identify enablers and barriers, as a contribution towards generic strategies towards resilient coastal management.

We produced the first comprehensive inventory of coastal restoration projects involving (plans for) MR on the German Baltic coast. In our analysis, MR involves the removal, relocation or opening of protective structures, but also decisions to allow breaching through natural processes (e.g. by not maintaining protective structures).

Based on document analysis and in close collaboration with coastal authorities, conservation actors and water boards, we identified and investigated over 80 relevant ecological restoration projects between 1989 and 2022, half of which successfully implemented MR.

We argue that ecological restoration measures help to articulate conservation, coastal management and regional planning goals, especially where MR is polemic and social acceptance fraught with obstacles.

A physical geographer by training, **Cristina de la Vega-Leinert** holds a PhD from Coventry University (UK) on Quaternary coastal environmental change. Between 1999 and 2005 she investigated issues relating to vulnerability and adaptation to climate change at the Flood Hazard Research Centre (London, UK) and the Potsdam Institute for Climate Change (Germany). Now she is a senior researcher and lecturer at the University of Greifswald, Germany. Her current research focus includes: coastal policy and management, nature-based adaptation. land use and land cover changes and transdisciplinary re-

adaptation, land use and land cover changes and transdisciplinary research.

Within the ECAS-BALTIC Project, Cristina leads the Work Package on social acceptance of nature-based coastal adaptation. She investigates enablers and obstacles to managed realignment, including management approaches and financial instruments towards ecological restoration and land use extensification.



5.3.7 Workshop 7: Restoring river connectivity: How to achieve 25.000 km free-flowing rivers in the EU? (Mathias Scholz & Ute Susanne Kaden, UFZ)

Spotlight 1: Reviving Europe's rivers: seven challenges and opportunities to improve river connectivity and biodiversity

Twan Stoffers^{1*}, Florian Altermatt^{2,3}, Damiano Baldan^{4,5,13}, Florian Borgwardt⁴, Anthonie D. Buijse^{6,7}, Elisabeth Bondar-Kunze^{4,5}, Nuria Cid⁸, Tibor Erös⁹, Maria Teresa Ferreira¹⁰, Andrea Funk^{4,5}, Gertrud Haidvogl⁴, Leopold A. J. Nagelkerke⁶, Jakob Neuburg⁴, Stefan Schmutz⁴, Gabriel A. Singer¹¹, Günther Unfer⁴, Sonja Jähnig^{1,12**}, Thomas Hein^{4,5**}

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The EU Nature Restoration Law represents a significant opportunity for river restoration and the conservation of freshwater biodiversity. Its successful implementation, however, is expected to face a number of challenges. Furthermore, the current version of the law proposal lacks clarity in some areas, posing risks to freshwater biodiversity protection and restoration. Here, we explored the current gaps in the proposed legislation, the potential consequences of leaving these aspects open to interpretation during the implementation process, and potential solutions to these problems that could aid in ensuring that the law's objectives are met. We propose that river network structure and connectivity dimensions be considered, as well as clear definitions of free-flowing rivers, barriers, and reference areas be developed. In addition, we advocate for the development of methods for determining integrated connectivity across river networks, as well as the prioritisation of actions that ensure an adequate quantity and quality of free-flowing rivers. To improve the efficacy of restoration efforts, it is critical to incorporate meta-ecosystem thinking into restoration planning at larger spatial scales, as well as consider potential conflicts with other legal frameworks and carefully navigate these areas. Furthermore, stakeholder and citizen engagement should be increased to ensure inclusive decision-making processes. The identified challenges and recommendations emphasise the importance of proactive member state participation, adequate resource allocation, and careful planning and implementation of freshwater restoration. Because these conservation challenges extend beyond freshwater ecosystems, this essay will be useful for policymakers, conservationists, and other stakeholders involved in the NRL or other policy initiatives.

The passion of **Twan Stoffers** for fish ecology and biodiversity conservation runs like a

thread through his scientific career. His areas of expertise include fish biology and behaviour, and river-floodplain ecology and restoration. Communication, dedication, perseverance, and patience are all key parts of his work. Twan Stoffers strength lies in conducting fundamental research, communicating with scientists and volunteers from various research fields, and providing constructive solutions by balancing the interests of various stakeholders. He is always looking for new ways to get people and organisations to collaborate effectively in order to protect biodiversity. He



believes that transboundary and transdisciplinary cooperation is critical for effective freshwater biodiversity protection and recovery, and that it should be facilitated as much as possible.

Spotlight 2: ECOSTAT Core-Group "Free-Flowing Rivers": 25.000 km in praxis

Ann-Kristin Schultze, North Rhine-Westphalia State Agency for Nature, Environment and Consumer Protection

The importance of free-flowing rivers (FFR), which allow free movement of water, sediment, fish and other organisms, is increasingly recognised by the European environmental policy, in particular, the Water Framework Directive (WFD) and the Biodiversity Strategy 2030 adopted under the European Green Deal.

The Biodiversity Strategy 2030 reinforced the importance of restoring the natural connectivity of rivers by setting a target of "at least 25,000 km of rivers to be restored into free-flowing rivers by 2030 through the removal of primarily obsolete barriers and the restoration of flood-plains and wetlands".

According to this guidance document, the 25.000 FFR target emphasises to achieve stretches of free-flowing rivers (absence of artificial obstacles) within a network of fully continuous rivers (WFD – barriers taken down or adapted to allow the achievement of good ecological status). The guidance also recognises the need for the definition of free-flowing rivers to be made operational, by defining a set of criteria to be able to say whether a (stretch of) river is free-flowing or not.

For this purpose, an ECOSTAT-core group was established and is working on a technical report aiming to support Member States in identifying (stretches of) rivers that could contribute to the target of 25.000 km FFR.

The spotlight talk will give an overview of this group's activities and the political framework.

Ann-Kristin Schultze started working for the North Rhine-Westphalia State Agency for Nature, Environment and Consumer Protection in 2016 right after finishing her master's degree in Geography at the University of Bonn.

Her field of activity includes managing the statewide database of river structures and constructions in rivers, organizing corresponding field surveys as well as supervising the implementation of federal requirements (e.g. the assessment of the connectivity of rivers for sediments) and other tasks related to hydromorphological questions.



5.3.8 Workshop 8: Securing funds: How to harness private and public financing opportunities for wetland restoration? (Aletta Bonn, UFZ)

Spotlight 1: Key innovations in financing nature-based solutions for coastal adaptation

Fausto Favero, Global Climate Forum e.V, Berlin; PD Dr. habil. Jochen Hinkel

The implementation of Nature-based Solutions (NBS) for coastal adaptation is limited by a well-documented lack of financing (Nalau et al., 2018; Toxopeus and Polzin, 2021). The literature has articulated that financial innovation can contribute to overcoming financial barriers to NBS implementation (Hallstein and Iseman, 2021; Kapos et al., 2019; Seddon et al., 2020), however, empirical evidence on this hypothesis is fragmented across literature, and, despite high relevance, contract theories have not been leveraged.

The paper addresses these gaps by analysing the role of transaction properties in creating barriers to NBS finance and by identifying fitting solutions; a review of case studies of successful implementation of innovative financing mechanisms supports the results of the study.

Our research findings showcase innovative arrangements which have demonstated successful implementation in different contexts, and we highlight how their contractual structuring addresses key properties of the NBS underlying transactions. Moreover, we find that the most promising arrangements rely on private financial intermediaries for the structuring of the transaction and the definition of standards, taxonomies, and disclosure frameworks. We raise concerns over potential conflict of interests and transparency issues that the consolidation of private-led oversight of green financial innovation entails, recommending the engagement of policy-makers and researchers on this matter.

Fausto Favero is a PhD student at Thaer-Institute of Agricultural and Horticultural Sciences at Humboldt University in Berlin. He works as a researcher in Adaptation and Social Learn-

ing at the Global Climate Forum (GCF). His research efforts focus on the innovation of financing and funding instruments for nature-based solutions for coastal adaptation, in Europe and beyond.

Fausto acquired a master degree in Political Economy of European Integration from the Berlin School of Economics and Law (HWR), and a bachelor degree in Political Science and International Relations from the University of Parma. Before starting his Doctoral journey, he worked as a research assistant at Eco-logic Institute in Berlin and as a junior consultant for sustainable finance at Afore Consulting, in Brussels.



Spotlight 2: The Sebou Water Fund (Morocco): A sustainable financial mechanism for wetlands conservation and restoration

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The Sebou Water Fund, launched in 2019, is a pioneering initiative in the Mediterranean region aiming at conserving water-related ecosystems and their biodiversity in Morocco's Sebou river basin, while fostering the socio-economic and cultural activities that depend on these resources. It is a sustainable financial mechanism based on payments for ecosystem services, focusing on wetlands conservation and restoration while encouraging collaboration with water management authorities, the private sector, civil society and the general public to influence policy. Thanks to this innovative tool, concepts such as Integrated Water Resource Management, Ecological-flows, Nature-based Solutions and sustainable agriculture are now being incorporated into management plans and programs at both river basin and national scales. The Fund currently provides technical and financial support to 15 local Non-Governmental Organizations to carry out various projects linked to wetlands conservation and restoration, as well as the rational use of water and lands. It is also used to provide the basic scientific knowledge needed to better manage and protect water-related ecosystems. For instance, as part of the implementation of the Sebou Water Fund, a set of relevant indicators for monitoring wetland status and trends has been developed and integrated into a digital platform. The goal is to widely disseminate knowledge and data about these ecosystems, in order to raise awareness on the importance of adopting sustainable water resources management measures that also take account of their specific needs to maintain their ecological functions and provide their numerous services to society.

See above, Panel Discussion 5.2., for Anis Guelmamis biography.

Day 3, Thursday, September 28th 2023

6 Session 5: Wetland policy: How to move forward in Europe

Aim of the session

The aim of this session is to discuss how biodiversity and climate policies can effectively support the protection, restoration and sustainable use of riverine and coastal wetlands throughout Europe. We will assess the role and potentials of the upcoming EU Nature Restoration Law, and explore which further policy action is needed to overcome prevailing barriers and create enabling conditions for scaling up NbS implementation. Moreover, potentials for further strengthening the science-policy-practice interface will be discussed.

6.1 Keynote: Wetland policy: How to move forward in Europe.

Dr. Florian Claeys, on behalf of Director Humberto Delgado Rosa, European Commission, Directorate-General for Environment

If forests are the world's lungs, wetlands could be its kidneys and liver, organs that are just as vital to our societies, starting with tackling the triple planetary crisis of climate change, biodiversity loss and pollution. Key for water security, food security and other ecosystem services, wetlands are also critical to public safety in terms of drought and flood risk prevention.

Yet wetlands are enduring destruction since centuries, accelerated in recent decades and now exacerbated by climate change. While 20% of the world's wetlands have been lost, this figure is much higher in Europe, above 80% in some countries. Even today, most of European wetland habitats are in an unfavourable conservation status, with deteriorating trends.

Faced with these challenges and following the impetus of the Ramsar Convention, the EU has made wetland conservation a pillar of its environmental acquis, notably through the Birds, Habitats, Water and Marine Framework Directives. The European Green Deal has led to much greater recognition of wetlands importance in a wide range of policies relating to agriculture, biodiversity, climate, research and development, circular economy and sustainable finance. In particular, the proposed Nature Restoration Law would unlock the potential of wetland restoration, a highly profitable investment returning €25 to €35 for every €1 invested.

European action for wetlands can include greater policy coherence to enable biodiversity-climate synergies, better planning, monitoring and reporting instruments, and new business models. This would encourage the active involvement of citizens, landowners, companies and stakeholders in protection, restoration and sustainable management of wetlands. **Florian Claeys** is a policy officer on nature restoration and biodiversity-climate synergies at the Directorate General for Environment (DG ENV), European Commission. Involved in ecological restoration projects since 2010, he did his PhD in environmental sciences on the impacts of climate change on forest management in Central Africa and the potential of

market-based instruments to increase the sustainability of forestry practices. He then specialised in international negotiations and public policies on climate change, biodiversity and the land sector, first at the French Ministry of Agriculture and Food Sovereignty, then as a seconded national expert to DG CLIMA. He is now particularly involved in the development and the implementation of the incoming EU Nature Restoration Law and in strengthening synergies between EU climate action and biodiversity action.



6.2 Moderated Panel Discussion

Dr. Florian Claeys, European Commission, Directorate-General for Environment

See above

Prof. Dr. Dietrich Borchardt, Helmholtz Centre for Environmental Research UFZ

Dietrich Borchardt is a trained hydrobiologist and a full professor of Aquatic Ecosystem Analysis and Management at the TU Dresden. He is also the head of the Department of Aquatic Ecosystem Analysis and the thematic area of Water Resources and Environment at the Helmholtz Centre for Environmental Research - UFZ.

The main focuses of his research are scientific concepts, methods, and models for hydrological-ecological analysis of coupled human-environment systems, their application in integrated water resources management, and adaptation to climate change. His research projects are embedded in national, European, and global contexts, with various interfaces between science and policy.



Paul Brotherton, Wetlands International Europe

Paul Brotherton is the focal point at Wetland International Europe seeking to accelerate implementation of EU freshwater laws, restore and protect free-flowing rivers, and deploy and upscale nature-based solutions for inland waters. He has spent the past three decades at the intersection of conservation science, policy and communications in the EU, US and globally. Rivers run through his experiences – including the Hudson, Niger and Rhine. Before working at the global and European levels for Wetlands International, he spent more

than a decade in Washington, DC as the Legislative Director for environmental champion and member of the US House of Representatives Maurice Hinchey, and the Research Director at the League of Conservation Voters. He has field experience researching wetland-dependent species, from the Everglades in the US to the Bolivian Amazon, and for almost 20 years as a volunteer for the Delaware Bay Shorebird Monitoring Program in the US.



Dr. Flore Lafaye de Micheaux, Ramsar Convention on Wetlands

Dr Flore Lafaye de Micheaux has a broad background in environmental and water policies, international cooperation, and diplomacy. Her 25-year career brought her to Ethio-

pia, India, Switzerland, Germany and France. She worked for IUCN and IPBES Secretariat from 2018 to 2021, leading the IUCN-IPBES strategic partnership. She was a member of the General Inspectorate for Environment and Sustainable development (IGEDD) in France from 2021 to 2023. Since June 2023, she acts as Senior Advisor Europe at the Secretariat of the Ramsar Convention on Wetlands. Flore Lafaye de Micheaux holds a PhD in geography (political ecology) from the University of Lausanne, Switzerland.



7 Outlook and Closing

7.1 Closing remarks by Inka Gnittke, German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection

At the end of this 5th European Conference on Biodiversity and Climate Change, I will share a few closing remarks on behalf of the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection. I will briefly reflect on selected key findings from the conference sessions and encourage all participants to keep up the momentum built over the past three days. I hope the conference participants will take home fresh inspiration for fostering the protection, restoration and wise use of riverine and coastal wetlands, and for addressing biodiversity and climate change in an integrated manner throughout science, policy and practice. I look forward to continuing our exchange on strengthening the biodiversity and Climate Change, hosted by the BfN and the ENCA network.

Inka Gnittke has been Deputy Director General for the Department of Nature Conservation at the German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) since 2022. Since 2003, she has worked at BMUV in various functions, including Head of Division for International Cooperation on Biodiver-

sity from 2018 as well as Head of Division for Protected Areas, Natura 2000 and Habitat Management from 2015. From 2001 to 2003, she worked at the Ministry of Environment and Nature Conservation, Agriculture and Consumer Protection Northrhine-Westphalia as an assessor in landscape management. Inka Gnittke has studied Landscape Planning and Nature Conservation at the University of Hannover, Germany and is a Degreed Engineer for landscape management.



8 Poster Presentations

Review of long-term wetland monitoring using the Landsat Archive: focus on opportunities for Essential Variables derivation

Quentin Demarquet^{1*}, Sébastien Rapinel¹, Simon Dufour¹ & Laurence Hubert-Moy¹

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Wetlands, which provide multiple functions and ecosystem services, have decreased and been degraded worldwide for several decades due to human activities and climate change. Managers and scientists need tools to characterize and monitor wetland areas, structure, and functions in the long term and at regional and global scales. To this aim, Essential Variables (EVs) are an effective opportunity for wetland monitoring, especially when derived from remote sensing products, by aggregating primary information to spatially and temporally standardized variables. The Landsat Earth observation program has collected satellite images since 1972, which makes it the longest global earth observation record with respect to remote sensing. In this review, we describe how Landsat data have been used for long-term (≥20 years) wetland monitoring and look for relationships between Landsat outputs and Essential Biodiversity and Climate Variables (EBV, ECV) to assess Landsat potential in deriving such information. A total of 351 articles were analysed based on 5 topics and 22 attributes that address long-term wetland monitoring and Landsat data analysis issues. Results showed that (1) the open-access Landsat archive successfully highlights changes in wetland areas, structure, and functions worldwide; (2) recent progress in artificial intelligence (AI) and machine learning opens new prospects for analysing the Landsat archive; (3) numerous EVs can be derived from the Landsat archive analysis (e.g., habitat structure, ecosystem physiology, spatial configuration, soil moisture) helping to characterise wetlands in the long term. The possibilities will be presented based on a few examples of essential variables monitoring.

Quentin Demarquet is a French PhD student working on using remote sensing in conservation biology. His background in ecology gives him a helpful understanding of how satellites can provide crucial information for conservation issues. His research mainly focuses on wetland conservation, primarily through remote sensing data analysis. He is interested in extracting information over the long and short-term, particularly concerning changes in wetland structure and functions, with an operational aim for managers and conservationists.



Initiative for Conservation of Coastal Wetlands and Shorebirds at the Arid-Semiarid Pacific Coast of South America

Villarreal M., Burmeister J., Tabilo E.

The chain of coastal wetlands at the arid-semiarid Pacific coast of South America comprises unique sites of exceptional conservation value for biodiversity, nearby communities, and our global population on the whole. Human activities and global changes expose immense pressure onto these wetlands, and local conservation efforts alone often don't manage to entirely resolve the underlying causes of degradation and introduce adequate measures for adaptation. The Coastal Wetlands Initiative aims to address conservation gaps by strengthening governance, fostering regional collaboration, and supporting networking among wetland conservationists between Ecuador, Peru, and Chile.

Commencing with a rapid assessment of 34 coastal wetlands between northern Peru and central-northern Chile in 2015, we raised awareness and promoted a wetland conservation movement among key stakeholders, including the public sector. Collectively, an Action Plan was elaborated in 2017/18, followed by a revised version in 2022/23.

Based on this Action Plan, three project idea competitions were launched (2019, 2021, and 2023), providing local non-profit organizations with funds for the realization of wetland conservation projects and facilitating their cooperation. Furthermore, an interactive Online Wetland Atlas was created, comprising key wetland data and serving as a tool for monitoring and citizen science.

Many important results have been achieved so far, including dialogues between government representatives, followed by a first commitment for collaboration in coastal wetlands conservation between Chile and Peru. Future efforts are directed towards the creation of a regional agenda for joint conservation measures, strengthening of civil society organizations, and improving the management of information on the coastal wetlands.

Mauricio Villarreal is a conservationist with a B.Sc. in Biology and a M.Sc. in Ecosystem Services. He currently works as a project officer in nature conservation for the 'Manfred-Hermsen-Stiftung' (Bremen, Germany), focusing on biodiversity and ecosystem services. He is deeply passionate about nature, birdwatching, and ornithology.



Setting site-specific conservation objectives for N2000 – where river restoration is necessary and possible?

Lauma Vizule-Kahovska, Nature Conservation Agency, Republic of Latvia

Connectivity and natural hydrological regime of rivers in Latvia are affected by alterations obstacles and riverbed modifications, also on N2000 sites. The concept of a free-flowing river, indicated in Barrier Removal for River Restoration by ensuring both longitudinal and lateral continuity of rivers, supports the achievement of Habitats Directive as well as Water Framework Directive objectives. To achieve the goal of a free-floating river, it is necessary to define river sections which need to be restored. The existing network of Natura 2000 sites constitutes a priority, as it aims to ensure the conservation of rare and protected habitats and species. However, these rivers also should be evaluated considering and balancing various aspects.

In project LIFE IP LatViaNature an assessment of rivers within Natura 2000 sites is being carried out to determine the target area of protected habitat Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation, considering a wide

spectrum of criteria – hydro-morphological characteristics of river, e.g., its size and flow velocity, the existing degree of re-naturalization, the time that has passed since the transformation, land use and amelioration in the coastal zone, benefits for riparian habitats to whom restoration of natural flood regime is essential, amount of obstacles and their importance in the conservation of fish fauna, connection with WFD – longitudinal and lateral connectivity objectives for waterbodies, the significance of transformations, importance in flood risk protection, and additionally river importance in the state electricity supply and ensuring national borders.

Lauma Vizule-Kahovska holds a master's degree in Environmental Science. Her work field includes freshwaters, dealing with ecological quality assessment, macrophyte sampling,

participation in preparation of River Basin Management Plans, supervising the inventory of protected freshwater habitats of EU importance in Latvia. She is head of N2000 Boreal region freshwater habitats working group and head of national working group on Habitats directive and Water framework directive harmonization. Now she works in LIFE Integrated project "Optimising the Governance and Management of the Natura 2000 Protected Areas Network in Latvia" which aims to improve the nature protection system in Latvia to ensure favourable conservation status of protected species and habitats.



Assessment of restoration activities of riparian forests in Bulgaria

Georgi Hinkov Ivanov, Assoc. Professor, Forest Research Institute at Bulgarian Academy of Sciences, Sofia, Bulgaria

A methodology has been developed for the assessment of restoration activities in Bulgarian riparian forests. Such an assessment is necessary due to the restoration projects carried out in various regions of the country along the biggest rivers Danube, Maritsa, Kamchia, Tundzha, Struma and Mesta. These restorations are the following - reforested riparian forests, naturally seed-regenerated young forests with local tree species, measures to limit invasive plant species, declared old growth forests and built urban forest parks. The country already has several reforested riparian forests that are over 70 years old. However, the predominant reforested forests are young and less than 30 years old. By their nature, they imitate to a large extent the riparian natural habitats - 91F0, 91E0 and 91C0. For them, an assessment is needed to indicate whether restoration activities are successful. Also, to show the lessons learned over the last few decades. Permanent sample plots were made, in which standard tree growth and forests indicators were measured. A comprehensive assessment of restored forest habitats was performed by determining the following 7 parameters: 1. Coverage/fullness, 2. Evenness of projective cover, 3. Degree of naturalness, 4. Health status, 5. Productivity, 6. Straight-stemmed, 7. Price per unit area. The assessment is applicable to restored habitats, management plans for protected areas, including from the Natura 2000 network, when checking restoration projects such as LIFE or under the Environment Operational Program, donor programs and others.

Georgi Hinkov is a researcher for 27 years at the Forest Research Institute at Bulgarian Academy of Sciences in Sofia. From 2007-present is Associate Professor, Department of Silviculture. His research work in the last years is related to close-to-nature forestry, riparian forests, assessment and monitoring of invasive plant species, impact of climate change on forests, old growth forests, forests in protected areas of the European ecological network Natura 2000, phylogenetics of forests of Quercus sp. It is due to be printed in 2023 his book "Good practices in the restoration of riparian forests in Bulgaria".



Monitoring of aquatic habitats (EUNIS: C1: Surface standing waters) in wetland mosaics using UAV photogrammetry (Middle Danube)

Dušanka Cvijanović^{1*}, Maja Novković1, Djuradj Milošević², Milica Stojković Piperac², Laszlo Galambos³, Dubravka Čerba⁴, Bojan Damnjanović⁵, Ana Anđelković⁶, Minučer Mesaroš¹, Dragoslav Pavić¹, Nusret Drešković⁷, Snežana Radulović^{1,7}

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Monitoring and mapping aquatic habitats along the huge floodplain mosaics can be challenging. One of the potential solutions is UAV imaging and photogrammetry. The aim of this study was to explore which aquatic EUNIS habitat types can be detected from RGB orthomosaics along the four Middle Danube wetlands in Serbia. Phantom 4 FC330 (12.5MP) RGB camera within the altitude range of 60-125m, at 8 lentic ecosystems in 2019 and 2020, acquired RGB UAV imagery of the water bodies. Obtained orthomosaics were processed using object-based image analysis to develop a single layer containing different aquatic habitats. In total, 43 macrophyte taxa were recorded in the study area, forming vegetation stands of free-floating duckweeds, occasionally submerged anchored ceratophyllids, and rooted aquatic vegetation. The analysis revealed that the EUNIS habitat types dominated by floating-rooted and free-floating macrophytes can be detected with high accuracy.

Acknowledgments: This study was supported by the Rufford Foundation (Grant No. 28388-1) and the Horizon EU Restore4Life project (No. 101112736).

Dr Dušanka Cvijanović is an Associate Professor at the University of Novi Sad, Serbia. Dušanka is an expert in ecology and classification of aquatic habitats, focusing on remote sensing tools and artificial intelligence in the monitoring of freshwater ecosystems; remote sensing-based tools for monitoring ecosystem resilience and carbon sequestration in wetland mosaics; digitalization of environmental data (EU GreenData4All Initiative, EU

Green Agenda for the Western Balkans); and environmental communication.

Currently, prof. Cvijanović coordinates the project of the Provincial Secretariat for Higher Education and Scientific Research, AP Vojvodina, Republic of Serbia, "Assessment of the trophic status of the Danube floodplain using UAV photogrammetry" and is an administrator of the ERASMUS+ capacity building project "ECOBIAS - Development of master curricula in ecological monitoring and aquatic bioassessment for Western Balkans HEIs".



Accelerating restoration of Mediterranean wetlands to safeguard and bring back societal resilience to climate and environmental change

Teresa Zuna, Wetlands International, Netherlands

Wetlands are the pearls of the Mediterranean providing havens for unique and spectacular wildlife and contribute to a liveable and inspiring environment for people. The current state of Mediterranean wetlands is shocking with more than half lost or degraded in the last 50 years alone. Intensive agriculture, urban development, over-exploitation, invasive species, dams, water abstraction and climate change are the main pressures driven by population growth, unsustainable tourism, lack of inclusive governance and inequalities in the distribution of resources. Together, these factors affect wetlands from habitat to landscape scale, impacting people's well-being, compromising societal goals and potentially leading to a decline in ecosystems' capacity to sustain human life.

Wetlands need to be seen as a key part of developing societal resilience to climate change and sustainable development. Policy, planning and investments need to make wetlands integral to landscape scale development and restoration goals. Without healthy landscapes with functioning wetlands, reaching climate action and sustainable development goals won't be possible in the Mediterranean.

Wetlands 4 Mediterranean Resilience (W4MR) initiative was conceived to inspire, mobilise

and upscale wetland solutions to maintain societal resilience in the Mediterranean. Through this initiative, we will enable CSOs, government and private sector to convene innovative multi sectoral partnerships, visions, plans and measures to mobilise landscape scale restoration of wetlands.

Teresa Zuna is a geographer and one of the coordinators of the Mediterranean Alliance for Wetlands, facilitating activities and



disseminating information to members. Also leads the Wetlands 4 Mediterranean Resilience. This initiative aims to accelerate restoration of Mediterranean wetlands to safeguard and bring back societal resilience to climate and environmental change.

Ponds contribution to marsh organic matter sinks: insights from sediment geochemistry analysis

Syra Reese Serrano^{(1)*,} I. Carneiro⁽¹⁾, Sónia Cristina⁽¹⁾, A. Rita Carrasco⁽¹⁾

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Wetlands have a high capacity to accumulate and store organic carbon (blue carbon) in their sediments and biomass over the long term. This makes them important organic carbon sinks. Inside their platforms, wetlands form pools, frequently referred to as ponds, where shallow depressions are filled with saltwater throughout the tidal cycle. These features have an important ecological function as a shelter, feeding ground, and spawning area for a large variety of fish, shellfish, and crustaceans, and they are worldwide increasing in number and areal coverage.

For several decades, sediment from varying locations across wetlands platforms has been analysed for its geochemical properties and microphytobenthos communities, but only a few studies have looked inside ponds. The current research presents results on grain size, organic matter, and chlorophyll-a concentrations (biomass of benthic microalgae) distributions, in sediment samples collected in the marsh ponds of the mesotidal Ria Formosa lagoon (southern Portugal). Sampling was conducted during two contrasting seasons, in ponds exposed to varying hydrodynamic conditions. A comparison between sediment samples collected inside and outside the ponds was performed. This is a benchmark study on pond sediment geochemical analysis and contributes to the overall assessment of total organic carbon on platforms that are prone to fragmentation. Results showed significant negative correlations between the biomass of benthic microalgae and the grain size distribution. So far, we found no clear correlation between the organic matter content and grain size distribution, probably due to the small number of collected samples. However, over the two seasons, we found an increase in organic matter content in the ponds located in the high marsh. The surrounding vegetation type, bed elevation, and local hydrodynamics were selected as the main drivers influencing the BMA biomass sediment in studied ponds.

Syra Reese Serrano studies Biology Bc. in Oldenburg, Germany. During her Erasmus + programm in Faro (Portugal), she wrote her thesis on "Ponds contribution to marsh organic matter sinks: insights from sediment geochemistry analysis" at the CIMA – Universidade do Algarve. She is also active in the nature conservation youth in the Landesbund für Vogelschutz e.V. (Bavaria) and completed her federal voluntary service at the Schutzstation Wattenmeer e.V., where she found her fascination for mudflats and salt marshes.



Source to Sea – enabling coherent, efficient and synergistic outcomes

Dr. Corallie Hunt & Chris Leakey, Nature Scot

Extensive dialogue and workshops explored the challenges, solutions, opportunities and enablers for more holistic source to sea management in Scotland. Opportunities within key biophysical flows from land to sea were explored: carbon, nutrients, materials, contaminants, sediments and water (flooding and drought) through case studies and workshops involving practitioners working in the policy and practice of environmental management. This inwardlooking exercise in Scotland is set against the context of global ambitions, as reflected by the growth of the global Action Platform for Source-to-Sea (S2S) Action, UNEPs creation of a source-to-sea pollution unit, the recent UNECE Global Workshop on S2S Management, and the S2S focus of Interactive Dialogue 3 on 'Water for Climate, Resilience and Environment' at the UN Water Conference 2023.

Key messages include:

- A source-to-sea approach can support more efficient and synergistic implementation of existing and emerging policy. Tackling the twin climate and nature crises is a key driver, but with great potential for broader social and economic benefits.
- Better coordination is required between marine planning and systems of terrestrial planning and land use strategies.
- Recognition of the links between terrestrial and marine environments is increasing, with good intent signalled in high-level government strategy and policy; however, there is limited implementation of these policies in decision-making.
- Science, improved environmental surveillance, technical innovation and circular business design are key to developing understanding and solutions, and eliminating problems at the source.
- A source-to-sea approach can ensure we optimise benefits from our actions and investments for communities, the environment and the economy.

See above, Talk 4 3.4., for Corallie Hunt's biography.

USF's Florida Environment and Natural History Program – Facilitating Historical Natural

Ann B. Hodgson, USF Library – Special Collections, University of South Florida, ahodgson@usf.edu; AMANDA BOCZAR, amandaboczar@usf.edu, Library – Special Collections, University of South Florida; CHRISTOPHER KIAHTIPES, Library – Special Collections, University of South Florida, kiahtipes@usf.edu; and ANDREW HUSE, Library – Special Collections, University of South Florida, ahuse@usf.edu.

Natural resource management has incurred knowledge loss as research memorialized in archival datasets produced in physical formats across the 20th century past was inaccessibly archived and, thus, became inapplicable to contemporary evaluations of global biodiversity changes. In 2011, the University of South Florida Libraries Special Collections launched the Florida Environment and Natural History (FLENH; https://flenh-usflibrary.hub.arcgis.com) collection initiative to retrieve historic natural resource research archives in Florida. FLENH, focused on Florida's environmental history, aggregates previously inaccessible scientific research materials to augment USF's Florida Studies collections in openly accessible digital collections, exhibits, and instructional materials. The spatial and chronological scope of these collections provides direct observations of both global-scale impacts of anthropogenic climate change and localized responses to management policy, land-use decisions, and development in Florida and beyond. The FLENH collections now include impressive holdings in ornithology such as documents from Florida's century-old Audubon research centers and five decades of the Florida Ornithological Society's archives, giving scholars world-wide access to some of the state's foundational ornithological and wetlands ecological research. The digital FLENH portal facilitates searchable archival materials with complementary metadata, curated data, and online exhibits tiered to the collections. FLENH staff are focused on providing relevant metadata to increase user access. In 2023, the USF Libraries are poised to expand the FLENH initiative, including recent infusions of additional personnel and expertise, to address the challenges in making these remarkable collections openly accessible in the digital commons.

Dr. Ann Hodgson is a wildlife and wetlands ecologist with >35 years of professional experience in the USA and internationally, specializing in conceptual ecological population models, wildlife hazard management, water resources, and hydrogeomorphic wetlands studies. Her research focuses on colonial waterbird and shorebird population dynamics and habitat restoration in coastal and freshwater wetlands. She is President of Resource Designs Inc., consultants in wildlife research and management, and a Research Associate (Courtesy) with the University of South Florida - Libraries, Special Collections, Florida Environment and Natural History Program.



Green Light: A system to promote wetland restoration activities in the Mediterranean

Lisa Ernoul, Antoine Gazaix, Lorena Segura ; Tour du Valat Foundation

Presented by Anis Guelmami, Tour du Valat Foundation

The Mediterranean Alliance for Wetlands is a coalition of 32 civil society organisations and research organisations with the aim of increasing the capacity of Mediterranean civil society to ensure the protection, restoration and sustainable use of wetlands. Together, we are supporting the nature restoration movement with the Green Light protocol.

The Green Light is a protocol from the Alliance to support civil society organisations to conceptualise, advocate, communicate and finance a new restoration initiative.

The protocol fosters dialogue between stakeholders, scientists and landscape architects to build together a first concept note for a restoration project. As an Alliance, we mobilise our members to provide the best professional expertise to local organisations to create concept notes, visualizations and communication materials. We believe that initiating and communicating the restoration opportunity as an international network of experts can make it easier to convince decision-makers to get involved in the process and help the stakeholders to find the right donors to invest. In this way, the protocol facilitates access to private and public funds for restoration.

Mediterranean wetlands are particularly vulnerable to climate change. Capacity building accelerates the implementation of wetland restoration as a nature-based solution to climate change. Empowering civil society by providing technical and financial support in the Mediterranean area is crucial to ensure ecological restoration and strengthen the resilience of nature to climate change.

The first pilot site for the Green Light is Akyaka in Turkey. Over the next two years, four sites will have the opportunity to take part in the Green Light protocol.

See above, Panel Discussion 5.2., for Anis Guelmami's biography.

Large-scale mapping of existing and lost wetlands: EO-based tools to support restoration prioritization

Guelmami A.¹

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Mediterranean wetlands are crucial for climate change adaptation and mitigation, yet they have suffered significant destruction over time. We estimate that half of the natural wetlands have been lost since the 1970s, and the regional trend shows no signs of slowing down. It is therefore urgent to implement concrete solutions that can preserve the remaining wetlands and restore those that have been lost. The increasing availability of free and open Earth Observation (EO) data has provided a basis for mapping these ecosystems and monitoring their status and trends. In this work, we demonstrate how EO-based tools can support the pre-identification of candidate sites for wetlands restoration at large-scale, through the mapping and delineation of existing and lost wetland habitats, their current land use status and the

estimation of the efforts needed to re-create the lost and transformed ones. We tested this approach in the Sebou river basin in Morocco and the transboundary Medjerda watershed between Algeria and Tunisia. The resulting products, i.e. Potential Wetland Areas and Potentially Restorable Wetlands maps, enabled the identification of over 7,000 km² and 1,700 km² of lost wetland habitats that could be regained in both basins respectively. These outputs hold immense value for water resources management and land planning as they can enhance and assist coordination and prioritization efforts for wetlands restoration at a broad scale. They can serve as baseline data to identify candidate sites to implement wetland restoration actions as Nature-based Solutions, regenerate their habitats and restore the ecosystem services they provide.

See above, Panel Discussion 5.2., for Anis Guelmami's biography.

3,000 river kilometres, 9 Danube countries, 900 islands: The Danube WILDisland Habitat Corridor as best practice for river restoration and preservation crossing all borders

Georg Frank^{1,2} & Elena Kmetova-Biro²

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The Danube is an ecological corridor of outstanding relevance for Europe, connecting more bio-geographic regions than any other European river, and hosting extremely rich biodiversity.

Danube-wide monitoring expeditions carried out in 2021 and 2014 stressed the outstanding value of Danube islands for characteristic biodiversity. As a follow-up, the first ever inventory of all Danube islands, showed that the Danube Wild Island Habitat Corridor comprises about 900 islands with an area of more than 138,000 ha; 385 islands can be characterized as "near-natural", of which 147 islands (14,000 ha) are still largely pristine. These islands represent unique sites in river ecosystems, stand for intact river dynamics and sediment regime, preserve valuable habitats with characteristic fauna and flora and demonstrate the original beauty of natural rivers.

The survey inspired the Danube WILDIsland Habitat Corridor initiative, which aims to strengthen the ecological connectivity along the Danube river; preserve the natural wilderness in the heart of Europe; promote river dynamics as the key driver for undisturbed nature and demonstrate good practice for cross-sector and cross-border cooperation.

The concept came to LIFE with the LIFE WILDisland project, joining the efforts of 15 partners from 8 countries with pilot actions in the Middle, Upper and Lower Danube.

See above, Panel Discussion 5.2., for Georg Frank's biography.

Analysis of Ecosystem Services in Cities Located in Wetland Sites in the Colombian Amazon region, Study case: Inírida city

Diego Alexander Guarín Cifuentes

Colombia, known for its exceptional biodiversity, has not thoroughly assessed the Ecosystem Services (ESS) in many regions, despite having environmental policies in place. While in some areas, such as the Andes and the Caribbean, there has been progress in ESS management strategies and socio-environmental development, others, such as the Amazon and Orinoquia regions, lack comprehensive assessments of ESS, including biophysical and cultural aspects. This gap hinders effective environmental management and policy implementation in the country.

This is a shortcoming this research aims to address in some of the less studied areas in this regard in the northern Amazon region like the Ramsar wetland site, the Inírida Fluvial Star (IFS). The main purpose of this research is to assess the current state of the Urban Ecosystem Services (UES) in the city of Inírida located in the IFS, and its vulnerability to climate risks such as floods through the InVEST methodology.

The UES characterization performed so far has allowed the identification of the potential zones that provide ESS in the city, as well as the effects of extreme climate events such as floods and nature-based adaptation measures that mitigate the impact of these phenomena and, in turn, contribute to improving the quality of life of the inhabitants.

The relevance this study holds is the generation of new in-depth data for this region to contribute to the development of the city along with the conservation and management of the wetland, which will be an asset for further studies at a national level

Diego Guarín is a PhD candidate in Landscape Ecology and Ecology and Landscape Planning at TU Dortmund. Diego has worked from an interdisciplinary perspective on the assessment and management of projects in vulnerable ecosystems mainly in Colombia. Currently, his research focuses on an integral assessment of ecosystem services in wetlands in the northern Amazon region.



VITAL // VenIce naTurAl capitaL: an innovative partnership for Venice and the lagoon

Jane da Mosto, Camilla Bertolini, Alessandro Gasparotto, Eleonora Sovrani and Margherita Scapin, We are here Venice ETS

Vital represents a multistakeholder initiative coordinated by We are here Venice, committed to addressing the maintenance and enhancement of the natural capital of the Venetian Lagoon, guided by scientific research and local knowledge. By considering the different types of wealth contained in the ecological heritage of the Lagoon, Vital has been working since 2020 on developing ways to protect and enhance these assets, specifically the unique biodiversity and role of the salt marsh in providing benefits for society, including mitigating anthropic processes like climate change that threaten the city of Venice itself.

These aspects urgently need a more rigorous quantification in order to attract the public and private resources for optimally maintaining Venice's ecosystem and limiting further damage

to the lagoon and biodiversity degradation. Pilot "soft" interventions and innovative monitoring programmes in the central lagoon on recently executed infills, using dredged sediments from port maintenance, are providing insight into the potential of restoration and revitalization of the salt marsh.

Concrete propositions for companies to counterbalance their environmental impact by contributing to protecting the Lagoon are under development. The synergy between the dynamic world of business and scientific research, together with governance support provided by local authorities as well as civil society and innovation in the design of lagoon interventions, makes it possible to create innovative and resilient sustainability options embedded in the urgent call to restore European natural ecosystems. The context of Venice combines the agenda of global change with the urgency of action to improve resilience locally.

Jane da Mosto is co-founder of We are here Venice. She received her scientific training at the University of Oxford and Imperial College London. She has been living and working in Venice since 1995 and is involved in consulting and activism in the field of climate change and the safeguarding of Venice and its Lagoon, collaborating with local institutions and various international organisations.



The deteriorating ecological health of the Sakumo Ramsar Site: implications for wetland ecosystem services provision

Jones K. Quartey¹ and Yaa Ntiamoa-Baidu²

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Wetlands are one of the world's most productive ecosystems. Healthy wetland ecosystems provide functions and services such as flood control, nutrient recycling, shoreline stabilization, filtration, groundwater recharge and habitat for aquatic biota. Humans may also derive direct benefits from wetlands and offer livelihood support. The Sakumo Ramsar Site, a small urban wetland in coastal Ghana, is ecologically important for waterbirds and lagoon fishery and socio-economically and culturally important for surrounding communities. For example, in the 1990s, income from fisheries in the Sakumo lagoon was 3-4 times higher than the minimum government wage for an 8-hour working day. Using waterbird counts, lagoon fishery productivity and vegetation cover changes, we provide a rapid assessment of the ecological health of the wetland and explore how the changes in the ecological health influence the wetland's capability to provide ecosystem benefits. Available data over four decades show a 32.7% reduction in the size of the open waterbody and ca. 82.5% increase in built-up areas. Trend analysis of shorebird populations shows a general decline and disappearance of some species. The mean size of the most abundant tilapia species Sarotherondon melanotheron harvested from the lagoon declined from 10.5 cm to 6.87 cm. The observed changes show that the ecological character of the Sakumo wetland has been affected adversely due to the degradation of the habitat. We discuss the impacts of the deteriorating ecological integrity of the Sakumo

wetland on ecosystem services and benefits derived and recommend possible interventions to restore the ecological character of the wetland.

I am **Jones Quartey** (PhD), a faculty member with the Department of Animal Biology and Conservation Science, University of Ghana, Accra, Ghana. My research interests include wetland ecology and management, waterbird ecology, water quality, and vertebrate ecology with a keen interest in foraging ecology. I have been researching wetland ecology and conservation for a decade and a half now. My recent studies include using bio-indicators (e.g. waterbirds, macroinvertebrates) in assessing the quality of water and the overall health of wetland ecosystems in Ghana.



Nature-based solutions within flood risk management in Romania – meeting challenges of climate change and biodiversity loss through an integrated approach

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Within the 2nd Flood Risk Management Plan under the Floods Directive (FD), Romania has developed and successfully implemented an integrated approach to promote the use of nature-based solutions reducing flood risk. Beyond identifying green flood risk management measures more resilient to climate change, significant benefits for both biodiversity and water quality according to the Water Framework Directive (WFD) were determined.

As a key instrument, a Floodplain Study was undertaken on a national level in an early stage of the process. This study identified floodplains, riparian and catchment areas with high potential for nature-based solutions such as dike relocation and afforestation, on a large-scale. Desk-based analysis of available data enabled to generate morphological floodplains along all large rivers across the country. Complementary analyses were used to reflect biodiversity based on e.g., Natura 2000 areas and lateral connectivity pressures from WFD monitoring.

Combined with this top-down approach, an intensive bottom-up public consultation process took place to identify and locate viable measures. Where possible, multiple benefits of green measures beyond flood risk reduction were captured and valued through a multi-criteria analysis and cost-benefit analysis. The most beneficial measures were integrated into the 2nd Flood Risk Management Plan. One such example is a large-scale dike relocation measure at the Lower lalomita River.

Overall, the approach enabled to identify priority areas for scaling up floodplain and wetland restoration supporting the objective of 25.000 km free-flowing rivers in the EU under the Biodiversity Strategy 2030 and enhancing adaptation to climate change in an integrated way. **Sebastian Döbbelt-Grüne** has more than 15 years of experience as an engineer for landscape development with special focus on landscapes and freshwater ecosystems. His key areas of interest are integrated landscape, water and flood risk management, freshwater ecology, planning of restoration measures and nature-based solutions at different scales as well as consultancy in related fields. He is the founder and Head of Landscape integrated.



Are climate changes shifting migration of some birds of Atanasovsko Lake, Bulgaria?

Petar lankov, Bulgarian Society for the Protection of Birds – BirdLife Bulgaria (petar.iankov@bspb.org)

The poster presents some results from the monthly monitoring of the birds of Atanasovsko Lake (Bulgaria) carried out in the framework of the EU LIFE Project 'Lagoon of Life' (LIFE17 NAT/BG/000558). It covers the period 2019-2023 and the data are compared with these from similar monitoring counts on the same place in two previous periods: 1996-2003 and 2014-2018. With three species (Pied Avocet Recurvirostra avosetta, Black-winged Stilt Himantopus himantopus and Kentish Plover Charadrius alexandrinus) some shifts of the spring migration peak toward earlier months have been observed within the current monitoring in comparison with these in the previous periods.

With the Pied Avocet Recurvirostra avosetta the spring peak in 1996-2003 is in April, while in 2014-2018 and 2019-2023 it is in March. With the Black-winged Stilt Himantopus himantopus in 1996-2003 it is in May, same is in 2019-2023, while in 2014-2018 it is in April. With the Kentish Plover Charadrius alexandrinus the spring maximum in 1996-2003 is in June, in 2019-2023 – in May, and in 2014-2018 – in March.

It is difficult to suggest strong conclusion concerning the role of the earlier and warmer springs for these changes, but their possible effect can be considered. Further investigation and comparisons with other similar sites are recommended.

Petar lankov is wildlife ecologist with BSPB-BirdLife Bulgaria, working for protection of some threatened bird species and key sites for birds. Author and chief editor of number of articles and books on bird protection, including the Atlas of the breeding birds in Bulgaria (2007).



Conservation actions for restoring the coastal lagoon habitats: the case study of LIFE Lagoon Refresh

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Recovery of natural ecosystems can follow natural trajectories after pressure removing or can be redirected through ecological restoration by anthropogenic interventions. Theoretical indications for restoration should include: (i) Environmental context from which it began; (ii) Desired state to be achieved; (iii) Policies and socio-economic context; (iv) Typology of recovery and/or improvement of habitats and ecosystems; and (v) Methods for monitoring the impact of the project.

The case study of LIFE Lagoon Refresh showed the effectiveness of a multidisciplinary method, which met the application of theoretical advice with a methodological approach. That is relevant for restoration of coastal lagoon habitats, i.e. highly productive ecosystems, rich in flora and fauna of conservation interest and subjected to multiple threats endangering their quality status or existence. The project took place in the northern Venice Lagoon (Italy), started in 2017 and lasted 5 years. To improve the conservation status of habitats and biodiversity, the project included conservative actions: (i) diversion of a freshwater flow from the Sile River into the lagoon; (ii) restoration of intertidal morphology, through biodegradable structures; (iii) reed and aquatic angiosperm transplantations with the involvement of local fishermen and hunters, and (iv) reduction of hunting and fishing pressures in the intervention area. To achieve the restoration of the environment, the strategy included: planning activities, through the involvement of local Institutions and communities; stakeholders' involvement to increase awareness of environment conservation and socioeconomic value improvement; an ecological engineering approach; numerical models as a supporting tool for planning and managing of conservation actions; environmental monitoring performed before and after the conservation actions.

Federica Cacciatore is a marine biologist expert on ecology of transitional waters, working in ISPRA (Italian Institute for Environmental Protection and Research) since 2003. The major topics she dealt with in her career are: Monitoring and assessment of contamination in biota, water and sediments in transitional and marine environments. Imposex. Environmental Assessment in transitional waters. Ecological restoration assessment. Statistical data analysis. Scientific and technical support to the Italian Ministry of Environment.



Unraveling a Safe Operatign Space for Floodplain Lakes Under Anthropogenic Modifications and Climate Change

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Anthropogenic river alterations and climate change synergistically impact floodplain ecosystems, diminishing water residence time and threatening biodiversity. We investigated 37 floodplain lakes near the Elbe River in Magdeburg, Germany, to establish a Safe Operating Space (SOS) against eutrophication and habitat loss. Lakes' connectivity was determined. Water isotopes, ions, chemistry and chlorophyll a were analyzed. Hazard scores were determined using threshold values and the worst detectable condition of the lake. The occurrence of high chlorophyll a and low surface oxygen concentrations were determined as an impairment of the ecosystem. H2S, fish death, siltation and dry out were determined as habitat loss with increasing urgency. Low oxygen, H2S presence, fish death, and dry-out occurred predominantly in less-connected lakes. The SOS decreased with reduced connectivity and increased drought, emphasizing the urgent need to maintain connectivity for floodplain biodiversity conservation.

Luisa Coder grew up in Hausen (Wied), close to Neuwied in Rhineland-Palatinate. She obtained her Bachelor's degree in Environmental Science at the Bielefeld University and her Master's degree in Ecotoxicology at RWTH-Aachen. She additionally participated in two Erasmus exchange programs at the Umeå University in Sweden and at the NTNU in Trondheim, Norway. In October 2022 she started her PhD at the UFZ in Magdeburg about "The connectivity of floodplain lakes and their resilience to drought".



Investigating the role of brushwood groynes – Supporting salt marshes for coastal protection

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¹Leibniz University Hannover, Ludwig Franzius Institute of Hydraulic, Estuarine and Coastal Engineering

To adapt coastlines and their management to future sea level scenarios, resilient foreshores with salt marsh ecosystems are a key element of coastal protection. Salt marshes act as a buffer zone in the coastal foreshore. The vegetation structure attenuates wave action and stabilizes the coastline, which is why the foreshore provides regulating ecosystem services in terms of coastal protection, in addition to other valuable ecosystem services. However, the dike foreshores in the Wadden Sea have largely been designed by anthropogenic interventions, such as constructed brushwood groyne fields. The groynes provide calmed hydrodynamic conditions, this allows the deposition of suspended sediments. The resulting vertical growth enables the establishment of different salt marsh successional stages. A salt marsh ecosystem is formed that contributes to a spatial expansion of the foreshore: a nature-based

solution for supporting coastal protection is constructed. However, little is known about the interaction-based biogeomorphological processes in groyne fields, although this is crucial for the successful development of future-oriented foreshore management strategies. To provide a robust knowledge base and successfully implement salt marsh management, the research project VeMoLahn actively involves local coastal protection and nature conservation authorities as stakeholders. This collaboration enables the transfer of knowledge between science and practice to better adapt sustainable coastal protection strategies. The transdisciplinarity of the project is already apparent in the field measurement setups in the foreshore of the island of Pellworm, where the existing brushwood groyne fields were manipulated and investigated with respect to their interactions between groynes, vegetation, hydrodynamics, and morphodynamics.

Christina Bischoff finished her Master of Science in Civil Engineering with a focus on Coastal Engineering. Today she works as a research associate at the Ludwig-Franzius-Institute for Hydraulic, Estuarine, and Coastal Engineering at Leibniz University Hannover. In

the field of ecosystem-based coastal protection, she specializes in studying brushwood groyne structures within the coastal wetlands of the Wadden Sea. She studies the relationships between these structures and the interaction of salt marsh vegetation and morphodynamics within the dike foreshore. With the goal to transfer her research findings into practical applications for sustainable coastal management strategies, she collaborates closely with coastal protection and nature conservation authorities.



Biosaline agriculture – a new approach for climate change adaptation and preserving saltscapes – examples from Bulgaria and Portugal

Diyana Kostovska, Bulgarian Biodiversity Foundation (Bulgaria); **Márcia Vaz Pinto**, Salina Greens (Portugal)

Biosaline agriculture is an innovative approach for preserving man-made coastal wetlands turned into salinas and for their climate change adaptation.

Atanasovsko Lake is a coastal lagoon on the Black Sea coast of Bulgaria where traditional salt extraction started in 1906. The low economic efficiency of salt production in its current form is considered a serious threat to the maintenance of the wetland in general. In Salinas do Samouco - Alcochete, near Lisbon, the salt extraction dates back to the 13th century. Salt marshes previously used for the production of sea salt have been abandoned over 5 decades.

Both sites support one of the most significant biodiversity in Europe and have particular value in providing habitats for migratory waterfowl. Without human intervention and continuous efforts to maintain the water regime, these modified ecosystems could disappear.

Biosaline agriculture is a new economic activity and a valuable opportunity to contribute to the conservation of local biodiversity while producing new foods and ingredients in saline environments. Salinas, active or non-active, are key sites for many edible halophytes (Salicornia,

Sarcocornia, Suaeda and others) that show high resistance to drought. Salicornia and other halophytes are used for the production of green salt in both wetlands and demonstrate the new value of the salinas. Benefits from biosaline agriculture are more:

- management of water levels for birds;
- new food crops with salty water;
- new products with added value;
- protection and restoration of landscape and biodiversity;
- blue carbon sink.

Diyana Kostovskas experience as a project manager for the Lagoon of LIFE project at the Bulgarian Biodiversity Foundation involves the restoration of the ecological processes supporting the unique biodiversity of the coastal lagoon Atanasovsko Lake, both Bulgaria's richest bird place and largest salt production site. The Lagoon of LIFE project is one of the

most complex and intricate attempts at habitat restoration in Europe and certainly, the most advanced coastal wetland active management undertaken in Bulgaria now. It put efforts into solving the problem of the low cost of salt and increasing the benefits of salt production and established the first steps in biosaline agriculture in Bulgaria.

Her background and experience with a large number of projects have been reinforced by a strong belief that working for biodiversity and people can only be achieved through innovation, cross-sector collaboration and partnerships.

Márcia Pinto has worked as a marine biologist since 2004. Her main work has been the conservation of salinas in Alcochete-Portugal, connected to the largest Portuguese wetland – the Tagus estuary. She is the founder and CEO of Salina Greens, dedicated to the production and valorization of native halophyte plants. These plants can be used as food, for cosmetics and pharmaceuticals. Due to climate change, these plants are also a tool to manage landscape in natural environments. Slow gardening and restoration of estuarine ecosystems are new activities starting in 2023.




Carbon sequestration of wetland wilderness areas and carbon opportunity costs of bioenergy crops in Germany

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¹ Ifeu- Institute for Energy and Environmental Research Heidelberg gGmbH, Germany

Wilderness areas can play an important role in natural climate change mitigation. When in their natural state, wetland wilderness can sequester considerable amounts of carbon while being a safe haven for wetland specific biodiversity at the same time. Nevertheless, wetland wilderness areas have faced and are still facing land-use change pressures threatening to minimize their sequestration potential and release their stored carbon. In light of advancing promotion of bioenergy crops for energy production, this land-use change can lead to a forgone storage effect on wetlands, the so-called carbon opportunity cost.

Here the average annual sequestered carbon in German wetland wilderness areas was calculated, and carbon opportunity costs of bioenergy crops on former wetlands were determined to inform decision-makers of the important role of wetland wilderness areas in natural climate change mitigation and the possible adverse effects of bioenergy crops.

To provide information on sequestered carbon in wetland wilderness areas and the carbon opportunity costs when transforming and occupying wetland areas to agricultural land for bioenergy crops, areal extensions were multiplied by wetland specific average annual carbon sequestration rates.

In Germany, wetland wilderness areas can sequester considerable amounts of carbon in relation to their areal extension. Depending on the underlying sequestration rate and areal extension wetlands can sequester up to 0.2 Mt CO2-eq. a-1. The carbon opportunity costs of bioenergy crops on former wetlands amounts to around 35 Mt CO2-eq. a-1 deriving from drainage for agricultural land.

Silvana Bürck studied Geography and International Forest Ecosystem Management (B.Sc.) at the Albert Ludwig University of Freiburg and Geography (M.Sc.) at the Ruprecht-Karls University of Heidelberg with a focus on Environmental Monitoring (especially Geoinformatics & Remote Sensing), Disaster Management, and Environmental Education. After study stays in France, she wrote her master's thesis in cooperation with ifeu gGmbH Heidelberg and the 3D Geospatial Data Processing (3DGeo) Research Group Heidelberg in the

field of remote sensing methods for assessing environmental hazard potentials in mining. Since July 2019, Silvana Bürck has been working at ifeu in the Resources department, focusing on the research fields of Bioeconomy, Biodiversity, and biogenic carbon storage. In the context of biodiversity, she is currently working on the further development of the Hemeroby concept for use in ecological assessments, quantifying the climate impact of wilderness areas, and developing Biodiversity Footprints.



Viviann Bolte studied Environmental Sciences (B.Sc.) at Leuphana University Lüneburg and Climate and Environmental Sciences (M.Sc., 2022) at the University of Augsburg, with a focus on Resource Geography. During her studies, she already specialized in Life Cycle Assessments. At the ifeu (Institute for Energy and Environmental Research Heidelberg), she developed the "area-based Hemeroby approach" by Horst Fehrenbach et al. as part of her

master's thesis, based on the "Hemeroby method," applied to the marine environment in the life cycle assessment of offshore wind turbines. Since 2023, she has been working as a junior researcher at ifeu, contributing to various projects related to biodiversity, climate protection, bioeconomy, and footprinting. Notable projects include "Pri-o-biodiv - Determining the ecological footprint of biodiversity-related products and services," "The significance of wilderness areas for climate protection and climate adaptation," and Symobio2.0.



Conservation and rehabilitation of Prespa's riparian zones: a holistic approach to biodiversity and ecosystem management

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Prespa's riparian zones are crucial in preserving biodiversity, including EU priority habitats like alder forests (*91E0). Located in Greece along the Agios Germanos River, five streams, and a segment of the Great Prespa Lake shoreline, these zones provide a habitat for endemic fish, notably the Prespa trout, and serve as critical bird habitats and movement corridors for large mammals. However, their integrity faces threats from hydrological shifts, pollution, logging, waste disposal, and climate change. Stakeholders often lack a comprehensive perspective, focusing on flood risk.

The SPP initiated the DIMFE/PONT project "Prespa's Green and Blue LifeLines" to consolidate knowledge and deepen understanding of the streams and riparian habitats. By evaluating riparian area quality, identifying threats, and analysing climate-related impacts, the project aims to promote holistic management. It also aims to raise awareness, foster a socio-ecological identity, and implement strategies for habitat restoration and threat mitigation. These efforts establish an inclusive wetland management model, leading to a comprehensive guideline framework.

However, the realisation of a rehabilitation plan for Agios Germanos River demands further technical studies, focusing on restoring the hydrological balance, enhancing water quality, and preserving the intricate inter- and intra-annual variability. This effort involves maintaining fish migration zones and preserving fluvial morphology, including riparian vegetation and aquatic biota. The anticipated outcome is mutually beneficial for both the river ecosystem and Lesser Prespa Lake.

Furthering these objectives, the SPP collaborates with WWF Greece on the "Prefeasibility Study on Rehabilitation of Agios Germanos River" project, aiming to finalise strategic planning for effective rehabilitation measures.

Androniki Tourlouki studied as a Civil Engineer and is currently in her last year of an MSc in Hydraulic and Environmental Engineering for Sustainable Infrastructures at the University of Patras, specializing in the Pollution of Inland and Coastal Waters. She has worked as a research associate in the Environmental Engineering Lab at the University of Patras, involved in laboratory and field activities. Androniki has been working for the Society for the Protection of Prespa since 2022 as coordinator of the 'Prespa's Green and Blue LifeLines' project.



Tidal Willow Floodplain Forest Restoration: Nature-based Solution for Flood Risk Reduction and Biodiversity Conservation

Heike Markus-Michalczyk¹; Matthias Michalczyk²

¹ NIOZ Royal Netherlands Institute for Sea Research, department of Estuarine and Delta Systems, and Utrecht University; ² University Bonn; Department of Geography

Nature based Solutions, physical structure, and social policy can build a climate resilient coastal environment and combinations of these categories represent an adaptation strategy to combat flooding as a key risk. NbS like floodplains can mediate some of the limitations of grey infrastructure like high costs, negative side effects and a lack of flexibility but provide flood risk reduction (IPCC 2022). Tidal wetlands like salt marshes are suggested for coastal protection since they attenuate waves even under storm surge conditions (Möller et al. 2014). Hydrodynamic reducing effects through the floodplain forest key stone species white willow in the leafy and the leafless status where found in both: wave attenuation via trees even under extreme conditions in the Delta flume (van Wesenbeek et al. 2022); flow velocity attenuation via juvenile floodplain willows in the race track flume (Markus-Michalczyk et al. 2020). In the field, tidal willow floodplain forests were found in fragments along the Elbe, Ems, Dutch Delta, and the Eastern and Western Scheldt up to the estuarine mouth (Markus-Michalczyk & Michalczyk 2022). Tidal wetland floodplain willow forests (TWFF) may play a significant role in flood risk reduction. Moreover, Conservation and restoration of TWFF (habitat type 91E*0) is indicated according to the EU Habitats Directive. A restoration concept has been developed based on the Integrated Management Plan for the Elbe Estuary (2012). Restoration is being implemented and monitored since then. We present results on the restoration success of Tidal Floodplain Forests on restoration sites in the tidal freshwater wetlands near Hamburg.

Matthias Michalczyk is currently researching on block glaciers in the Alpes. But as a geog-

rapher he is also interested in connectivity and downstream reaches of watercourses. He works also together with Heike, a biologist, on tidal willow floodplain forest restoration as a nature-based solution in European coastal lowland estuaries. The current tidal wetland restoration in the Elbe estuary is science-based, planned together with the Elbe Habitat foundation, and set in practice by the nature conservation agency Hamburg. Here we show parts of the process and first results of our recent monitoring.



Rewilding: a New Paradigm for Wetlands

European Young Rewilders (Antoine Scherer, Fedra Herman, Georg Messerer, Giulia Testa, Søren Thomsen)

Rewilding is about restoring natural processes that support biodiversity (e.g. thanks to restored connectivity after barrier removal), help with mitigating climate change (e.g. restored wetlands that store carbon) and make ecosystems resilient to it (e.g. natural flood management with meandering rivers). This innovative approach to ecosystem restoration aims to actively restore natural dynamics and missing species, and supporting the functional roles of keystone species in the landscape. This may be done through barrier removals, re meandering, species introductions, nutrient neutrality, and other such interventions. The goal is to have ecosystems fully functioning and taking care of themselves with low to no human management in the long term. In addition, one of the principles of rewilding is giving society a chance to experience and (re)connect to a self-governing nature for recreation, inspiration and economic activities, which can be possible due to healthy ecosystem services. Local communities and the wider public can therefore shift their baseline of normality, learning what the state of nature can (and should) be if released from human management and suppression. Integrating and involving local communities, and the private and public sector in the rewilding process is vital to inspire ownership of the restored land and seascapes.

Søren Thomsen is a 25-year-old Nature Manager working with a 26-hectare family rewilding project on the Danish island of Bornholm. He is also the Danish National Contact for the European Young Rewilders and founder of the science-communication website 'The Extinctions'.



Water. People. Stories.

Pia Parolin, Max-Planck-Institute of Animal Behavior, Radolfzell, Germany

This project explores the importance of water in our daily life. I tell the stories of people whom I encounter along my journeys around the world. The aim is to understand and transform how societies see, value and impact freshwater in rivers and wetlands.

I do not look for the spectacular places that you may find in the news. I search for the normal, daily routines and their changes.

I observe and document the impacts linked to the water crises, and the role these play for the local people. I analyse the connection between people and their water, focusing on the cultural significance of rivers and wetlands, and on the links – or missing connection – to their freshwater.

As a photographer, I employ visual communication to integrate scientific knowledge and data with nature conservation. I rely on the synergies of science, visual communication and art to communicate over borders and find solutions which help protect and conserve wetlands, and the people who live there.

Pia Parolin is a biologist, wetland ecologist and photographer. Her fields of specialization are tropical floodplain ecology, biodiversity, use and conservation of forests. She worked

with the Max-Planck-Institute in the Brazilian Amazon and Pantanal for over 3 decades and was a lecturer at the University of Hamburg. Her latest additional focus lies on science communication and alternatives to scientific publications, with a strong focus on photography, journalism and conceptual artistic works.

Pia writes scientific biological studies and books on photography soft skills. She has exposed her photos in many countries, gives workshops and online talks. She participates at round tables and debates about how to use art for a better world.



9 Project Team

Simone Wulf, German Federal Agency for Nature Conservation

Simone Wulf has been working at the German Federal Agency for Nature Conservation (BfN) since 2019, as a scientific officer in the Division of International Nature Conservation.

Her responsibilities include the scientific supervision of the fifth BfN-ENCA European Conference on Biodiversity and Climate Change. Beyond the biodiversity-climate interface, her current thematic work fields include EU biodiversity policies and naturefriendly consumption. From 2018 to 2019, Simone Wulf worked at the nature conservation planning office 'Planungsbüro Mordhorst-Bretschneider GmbH' in Schleswig-Holstein. She holds a MSc in Environmental Management from Kiel University, where she wrote her master's thesis about managed realignment for wetland restoration at the German Baltic coast.



Bettina Hedden-Dunkhorst, German Federal Agency for Nature Conservation

Bettina Hedden-Dunkhorst studied international agricultural development at the Technical University in Berlin and completed her doctorate in agricultural economics at Hohenheim University (Germany) in 1993. Since 2004, she heads the Division for International

Nature Conservation at the German Federal Agency for Nature Conservation (BfN). Before joining BfN, she worked at the Center for Development Research (University of Bonn) and for many years in research and teaching institutions in various African countries. There, she engaged in matters of natural resource management (water, soils and tropical forests), smallholder agriculture and food security. Her current work focuses on the conservation and sustainable use of biodiversity and ecosystem services at a global scale and more recently with regard to climate change.



Aletta Bonn, Helmholtz Centre for Environmental Research (UFZ), Leipzig

Aletta Bonn is Professor and Head of Ecosystem Services at the Helmholtz-Centre for Environmental Research – UFZ within the German Center for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig and at the Friedrich Schiller University Jena in Germany. She is interested in biodiversity and ecosystem services and their links to human well-being. With experience of more than 10 years in participatory conservation science in National Parks and with IUCN, she relishes the challenges of working at the science-policy interface. This means working across



disciplines and sectors to facilitate meaningful knowledge exchange processes, including citizen science approaches.

Ute Susanne Kaden, Helmholtz Centre for Environmental Research (UFZ), Leipzig

Ute Susanne Kaden has been working as a research associate at the Helmholtz Centre for Environmental Research (UFZ) in Leipzig since 2017. As a member of the Floodplain Ecol-

ogy Group she is actively involved in projects focused on ecosystem functions and biodiversity, particularly nutrient retention and hydrological connectivity. Since 2020, she is also a PhD student at the University of Natural Resources and Applied Life Sciences (BOKU) in Vienna, working on determining denitrification potentials of floodplain soils. Besides scientifically co-designing the fifth European Conference on Biodiversity and Climate Change, she is also dedicated to floodplain restoration activities in different EU projects, pursuing transnational strategies to integrate the ecosystem services approach.

Mathias Scholz, Helmholtz Centre for Environmental Research (UFZ), Leipzig

Mathias Scholz (Dr. rer. nat., m) is head of the Floodplain Ecology Group and deputy head

of the Department of Conservation Biology and Social Ecological Systems at the UFZ. He is a landscape planner and ecologist with special expertise in riverine wetlands. An important research field in the last years was to work on assessments of ecosystem functions and services in floodplains. Within several EU-research projects, he was working on the functional assessment of wetlands and the impact of climate change on floodplain functions. He has worked on conservation priorities. Currently he is working on ecosystem services and restoration perspectives of floodplains in Germany and Europe in several national and international projects.

Katrina Marsden, adelphi

Katrina Marsden is a Senior Manager Biodiversity at adelphi leading the topic area of Biodiversity and Nature Protection. Over the course of her career, her key interests have been the cross-overs and conflicts between EU land use and nature policy. Katrina is specialised in policy analysis from the European to the local governance levels. One of her focus areas is participatory processes with stakeholders on topics such as agricultural practices or conflict species such as large carnivores or Invasive Alien Species.





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Before adelphi, Katrina worked as an advisor on agriculture at the Scottish Parliament information centre and an agriculture policy officer at RSPB Scotland.

Perry Oehmigen, adelphi

Perry Oehmigen is the Head of Event Management at adelphi. In his role as conference manager, he creates the space and framework for exchanges on all possible levels and further offers support in various key tasks around the planning and coordination of events. His main focus of work is also on providing conceptual advice and creating event formats and communication strategies.

By conceptually designing the European Conference on Biodiversity and Climate Change, he promotes the possibility for dialogue among scientists, policy-makers and practitioners.

Lilith Gerlach, adelphi

Lilith Gerlach supports the Event Management team at adelphi as Junior Event Manager since 2021. She takes on all relevant organizational and logistical tasks, ranging from invitation management to venue and catering selection, coordination with involved partners and subcontractors, as well as travel planning and logistics. She is the team's focal point for streaming productions and therefore has strong competencies in the coordination of hybrid events as well as in-person events offering a parallel live stream.

Carla Klusmann, adelphi

Carla Klusmann is an Analyst in the areas of biodiversity and nature conservation at adelphi. She studied biology and biodiversity sciences and is now working at the interface of science, policy, and practice of these topics by providing consultation for political actions. She is involved in different research projects that implement national and European nature and environmental protection goals. She is further dedicated to promoting the communication of environmental topics to various societal groups and stakeholders.









10 Relevant Links and futher reading

For further up-to-date information on the 5th European Conference on Biodiversity and Climate Change, please visit the conference website:

https://bioclim2023.adelphi.de

Further relevant links and resources for the conference:

- Background Paper on the conference topic: <u>https://www.bfn.de/en/publications/back-ground/riverine-and-coastal-wetlands-europe-biodiversity-and-climate</u>
- Conference Website: <u>https://bioclim2023.adelphi.de/</u>
- Project website by UFZ: <u>https://www.ufz.de/bioclimwet/index.php?en=49534</u>
- BfN website on biodiversity and climate change: <u>https://www.bfn.de/naturschutz-und-klimawandel-eine-internationale-aufgabe</u>

Previous BfN-ENCA European Conferences on Biodiversity and Climate Change:

- Virtual library of the ENCA network, including ENCA Recommendations: <u>https://www.encanetwork.eu/library</u>
- Open Access Book "Biodiversity and Health in the Face of Climate Change" <u>https://link.springer.com/book/10.1007%2F978-3-030-02318-8</u>
- Open Access Book "Nature-Based Solutions to Climate Change Adaptation in Urban Areas" <u>https://link.springer.com/book/10.1007%2F978-3-319-56091-5</u>



Conference banner and QR-Code leading to the Conference Website

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