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DAnube lighthouse Living Lab for
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Deliverable 3.1

Inventory of at least 8 innovative ecosystem-based practices in local, cross-border, transnational spatial policies in the 4 territorial units & at watershed/basin level of Danube River Basin



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Abbreviations and Acronyms

CSA	Coordination and Support Action
D	Deliverable
DRB	Danube River Basin
EC	European Commission
EU	European Union
IA	Innovation Action
IUCN	International Union for Conservation of Nature
NbS	Nature-based solutions
T	Task
WP	Work Package

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1. INTRODUCTION

1.1. General context

The project **“ECOsysteem-based governance with DANube lighthouse Living Lab for sustainable Innovation processes (EcoDaLLi)”** is embedded in EU Green Deal and the Danube-Black Sea Lighthouse of **Mission “Restore our ocean and waters by 2030” (Mission Ocean)**. It will contribute to marine and freshwater conservation and restoration targets by centralising Danube governance structures in terms of innovative solutions for improved ecological restoration, protection and preservation of the Danube River Basin and Black Sea area by fostering a stronger innovation ecosystem within a well-connected Living Lab System, supported by a digital portal, completely linked to the Mission Implementation Platform. As the Coordination and Support Action (CSA) of the **Danube-Black Sea Lighthouse** EcoDaLLi consolidates the stakeholders, knowledge, structures, and processes in Danube River Basin for innovative and profitable conservation and restoration of river ecosystems and water systems as well as climate change adaptation.

The wider context of Mission Ocean sets three main objectives to be achieved by 2030: (1) protect and restore marine and freshwater ecosystems and biodiversity; (2) prevent and eliminate pollution of the oceans, seas and waters; and (3) sustainable, carbon-neutral and circular blue economy. The Mission’s aim to protect and restore health of the ocean and waters and to play a key role in achieving climate neutrality is attained through research and innovation, citizen engagement and blue investments.

Within this project, **D3.1. “Inventory of at least 8 innovative ecosystem-based practices in local, cross-border, transnational spatial policies in the 4 territorial units & at watershed/basin level of Danube River basin”** is based on two main pillars: 1) the methodology for NbS assessment elaborated and agreed upon in WP2; 2) mapping of innovative ecosystem-based practices performed with tailored stakeholder groups (academia, governance, business, citizens, etc.) and active project partners’ contribution.

While D2.2. “NbS catalogue of implemented best practices” showcases best practices of NbS measures in the four territorial units which are described according to the WP2 methodology for NbS assessment, D3.1. focuses on the ecosystem-based approach and the innovative aspects of the practices. Additionally, D3.1. identifies projects that demonstrate a city-river interaction and integrate links to spatial policies. D3.1 must be submitted by project month 10, whereas D2.2. – by month 20. The inventory is aimed at listing at least 8 innovative ecosystem-based practices, and a catalogue contains more and more detailed information about the design, implementation and monitoring of the practices.

The identification of at least 8 innovative ecosystem-based practices in local, cross-border, transnational spatial policies in the 4 territorial units & at watershed/basin level of Danube River basin sets EcoDaLLi initial database for spatial policies and practices at the level of Danube-Black Sea Lighthouse. The Lighthouse is a key point of exchange & learning on innovation in biodiversity, water systems & climate change for the river cities & cross-border actors. It enables an improved local potential for innovation, innovation upscaling and empowering citizen engagement.

The innovative ecosystem-based practices presented in this inventory serve as examples of successful collaboration and partnership for the implementation of ecological recovery actions of impaired watersheds, including river water quality restoration and biodiversity protection and restoration actions that also address, among others, social innovation and the mitigation of climate change effects. These actions take into account the socio-environmental risks and loss of capital caused by the degradation of freshwater ecosystems.

Task T3.1.2. in the EcoDaLLi project provides an inventory of at least 8 innovative ecosystem-based practices at watershed level within the Danube basin, whose selection is based upon agreed methodology with EcoDaLLi partners which has been elaborated under the leadership of FTN in Task 2.1, Work Package 2. As this methodology relies on some specific societal challenges and benefits considered as fundamental for the definition of ecosystem-based practices, identified by Dumitru and Wendling (2021b), priority has been given to the most relevant to the scope of our project as follows (reference from EcoDaLLi Deliverable 2.1):

- water management (n°1, 2, 3, 5 and 8),
- biodiversity enhancement (n°1, 2, 4, 6, 7 and 8),
- participatory planning and governance (n°1, 2 and 3),
- health and wellbeing (n°3, and 4),
- new economic opportunities and green jobs (n°6 and 8).

The mapping of **innovative ecosystem-based practices considers city-river interactions and spatial policies at the local, cross-border, transnational level in the 4 territorial units (Upper, Middle, Lower Danube, Danube Delta and Black Sea)**. Besides, this mapping process has been inspired and guided by work undertaken under WP2, which relied on agreements made by the International Union for Conservation of Nature (IUCN) to define a set of Global standards for NbS and to define their associated societal challenges. An exhaustive list of indicators for NbS, displayed in Deliverable 2.1, “Methodology for Mission Relevant NbS Assessment” was compiled. This identification exercise was carried out with tailored stakeholder groups engaged by EcoDaLLi and the EcoDaLLi partners below classified according to their geographical area of competence:

- Upper Danube: BOKU, ICLEI;
- Middle Danube: UZ FSB, Municipality of Draz, FTN;
- Lower Danube: ADRM, EAMA;
- Danube Delta and Black Sea: DDNI, IP Tulcea, GeoEcoMar.

The local stakeholders were identified during the **stakeholder mapping exercise** in Task 3.1.1. For more information on the stakeholders mapping process please refer to the EcoDaLLi “Guidelines for Stakeholder Mapping” (MS3.1) and “Database on local actors” (MS3.2.). The EcoDaLLi Stakeholder Mapping exercise aims at identifying the optimal range of stakeholders that can contribute to the project or will be affected by the project and outline appropriate engagement types. The Stakeholder Database on local actors was created following the methodology described in the Guidelines for Stakeholder Mapping.

A project **stakeholder database** is a project-related instrument that includes all the information about the project’s stakeholders – name, type, primary topic, contact data, contact person, type of influence, etc. (it is elaborated as a working table). In the completion of the database, the mapping of governmental structures and stakeholders in the Danube RB, performed in the

Baseline Study (Chanou et al., 2023, pp. 307 - 316) is a key point of reference. Furthermore, a Stakeholder database is a tool for building an effective governance structure for the achievement of the Mission Ocean objectives in the Danube River Basin and the Black Sea area.

The four-dimensional design of EcoDaLLi project instructed the structural organisation of the stakeholder database. The stakeholders were classified in 5 main categories, the first 4 based on the geographical regions of the Danube River basin: Upper Danube, Middle Danube, Lower Danube; Danube Delta & Black Sea. The fifth category refers to “Transversal stakeholders”, which list European level Stakeholders that carry out activities in two or more of the Danube geographical regions. For each category, 4 types of actors are included: Research, Governance, Business, Citizens, following the quadruple helix model.

The approach to the selection of innovative, ecosystem-based policies and practices at local, cross-border and transnational level draws on EU definition of spatial policies, WP2 methodology for selection of Nature-based Solutions and additional criterion for focus on city-river interactions/cross-border and transnational character of the presented practices. The WP2 methodology for the selection of NbS was particularly key to select the case studies presented in this deliverable. Indeed, the emphasis of this methodology on specific challenges related to NbS, such as Water management, Green space management, Participatory planning and governance, Public health and well-being and Potential for new economic opportunities and green jobs, has been applied to select the most appropriate case studies.

1.2. Main concepts

1.2.1. Ecosystem-based approach and Nature-based Solutions

The concept of NbS (Nature-based Solutions) is a relatively novel one, still undergoing establishment. It can be considered to encompass the older term "ecosystem-based approaches," while also expanding it with new elements. The substantial overlap between the two concepts can, on the one hand, result in their being considered as a single entity, and, on the other hand, give rise to unnecessary theoretical analyses that shift the focus away from the subject matter and are not within the scope of this deliverable.

In this deliverable, we employ a generalised understanding of "ecosystem-based approaches", which is defined as a tool for enhancing ecosystem services associated with protection against the negative impacts of climate change (such as droughts, extreme weather events, and flooding) and biodiversity conservation, primarily through ecosystem restoration. The innovative practices discussed below largely address these aspects.

However, NbS encompass additional solutions with a strong emphasis on societal challenges, including climate adaptation, urban planning, and disaster resilience. **The societal aspect is paramount in NbS, and where this focus is emphasized in the text, the term "NbS" has been used.**

Eventually, the ecosystem-based approach is intertwined with the concept of NbS, as they appear to be a human designed strategy to reincorporate natural processes that were previously eliminated or limited by anthropogenic actions in impaired watersheds (Waylen et al, 2024).

The notion of ecosystem-based focus on restoring and enhancing ecosystem services to protect citizens and the aquatic ecosystem and on the premise of evaluation for potential integration of nature-based solutions (Bahlmann, 2019). Various studies, and the Mission Ocean, underline the demand for solutions supplied by the ecosystem to tackle current water-related concerns, such as the decrease of riverine biodiversity, surface and underground water quality, more recurrent and intense flooding events, etc. Nature can deliver physical, chemical, and microbiological treatment processes (O'Hogain, McCarton, 2018), and Nature-based states the relation to ecosystem approach, ecosystem-based approach, biomimicry or the direct use of biodiversity elements (Bahlmann, 2019). Water-related ecosystem services, such as those included in most NbS approaches, are able to lead towards a wide range of benefits, including those aligned with Mission Ocean: the provision of clean water supplies, greater resilience to extreme climate events like flooding and decarbonization and blue circular economy (European Commission, 2023).

A comprehensive definition of NbS is given by the European Commission (Dumitru, Wendling, 2021):

“Nature-based Solutions provide integrated, multifunctional solutions to critical societal challenges. They are “solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient interventions. Nature-based Solutions must therefore benefit biodiversity and support the delivery of a range of ecosystem services” (European Commission).

There are several elements in the Commission's definition. First, NbS identify and solve environmental and social problems simultaneously. The approach to solving environmental challenges, supports biodiversity enhancement and the delivery of ecosystem services. Second, NbS provide 4 types of benefits: environmental, societal, economic and resilience. Third, NbS are locally adapted. There can be different types of solutions: infrastructure, green, blue and hybrid (combined with grey).

As previously mentioned and analysed within Deliverable 2.1, “Methodology for Mission Relevant NbS Assessment”, Dumitru and Wendling (2021) identify the following challenge areas to be addressed by NbS, including societal challenges, related to urban restoration:

1. Climate Resilience
2. Water Management
3. Natural and Climate Hazards
4. Green Space Management
5. Biodiversity Enhancement
6. Air Quality
7. Place Regeneration
8. Knowledge and Social Capacity Building for Sustainable Urban Transformation
9. Participatory Planning and Governance

10. Social Justice and Social Cohesion

11. Health and Well-being

12. New Economic Opportunities and Green Jobs

Within the EcoDaLLi project, WP2 has established the basic criteria for the selection of NbS that contribute to the main objective of the Mission Ocean and Waters Danube-Black Sea Lighthouse: restoring the Danube, Danube Delta and Black Sea region marine and freshwater ecosystems. The criteria are based on the four challenge areas listed below.

- Water Management;
- Biodiversity Enhancement;
- Health and Well-being;
- New Economic Opportunities and Green Jobs.

For more information on the EcoDaLLi methodology for the assessment of NbS please refer to Deliverable 2.1 “Methodology for Mission relevant NbS assessment”.

Implementation of ecological restoration practices follows three project phases: preparation (co-participatory planning and definition of project design), restoration (implementation of the plan at the site), and operation (including maintenance and monitoring of the action). Each phase contains a decision point where the project is evaluated and terminated if necessary. This approach reduces unnecessary cost and labour.

The project performance is described using the following terms: baseline data collection for description of an initial situation; theory of change for description of the way NbS produce their outcomes; monitoring and evaluation plan that provides methods and timeline for following progress of the NbS project.

1.2.2. Spatial Policies

When we focus on spatial policies, having a holistic territorial approach that integrates hydrology, geomorphology and biodiversity protection can result in the mitigation of water-related risks such as devastating floods, droughts, polluted soils and waters and biodiversity loss. This means that spatial policies for territorial and urban planning necessarily include the identification of vulnerable ecological zones, such as headwaters, riversides, floodplains and floodable areas, to prioritise the protection of main natural processes (Palmer et al, 2005; Gill, 2005; Castaner, 2018). Environmental zoning with designation of critical ecological areas, is key to improve city-river interactions and sustain both the environment and urban populations. NbS, defined as human designed systems that emulate the natural processes of a watershed are important for defining water drainage, public spaces and green urban designs (Bianciardi et al, 2023). Last and not least, green & blue ecosystem-based strategies are part of improving Spatial Policies for Territorial Planning, and break silos between ecology and civil engineering. Before discussing more in detail how NbS and a more ecosystem-based planning are integrated into local planning, we will first bring some further information with regards to spatial policies set up at the European level.

In particular, the European Spatial Development Perspective promotes sustainable development of the EU through a balanced spatial structure. It defines the following three policy guidelines for the spatial development of the Union:

- (1) *“Development of a balanced and polycentric urban system and a new urban-rural relationship;*
- (2) *securing parity of access to infrastructure and knowledge;*
- (3) *sustainable development, prudent management and protection of nature and cultural heritage.”*

The first of these policies relates to achieving well-balanced and mixed urban, rural, and peri-urban land-use. Such spatial developments should contribute to reduced local footprints, CO₂ emissions, harmonised coexistence, and integration, with immediate agricultural, rural, and natural landscape, including freshwater ecosystems. Likewise, the third policy guideline sets the basis for balanced land-use implementation through sustainable development and protection of natural and socio-cultural elements. Following these three guidelines, land-use plans, and spatial policies in the Danube basin territorial units should integrate all the relevant aspects related to sustainable urban development, including suitable waste and wastewater management and disposal, and studies for implementation of NbS to enhance ecosystem services that minimise soil sealing impacts to freshwater ecosystems. These objectives should be pursued by authorities at the European, national, regional, and local level.

Another important definition to keep in mind regarding spatial policy has been set up by the European Committee of the Regions in 2018. According to the EU compendium of spatial planning systems and policies (European Committee of the Regions, 2018):

“Spatial planning refers to the methods used largely by the public sector to influence the future distribution of activities in space. It is undertaken with the aims of creating a more rational territorial organisation of land uses and the linkages between them, to balance demands for development with the need to protect the environment, and to achieve social economic objectives. Spatial planning embraces measures to co-ordinate the spatial impacts of other sectoral policies, to achieve a more even distortion of economic development between regions than would otherwise be created by market forces, and to regulate the conversion of land and property uses.”

As such, spatial policies refer to frameworks for land and water resources planning and use that encompass sectoral policies – ecology (biodiversity conservation and restoration, wastewater and waste management; wetland management), agriculture, fisheries, forestry, energy, transport (ports and navigation), disaster response. The concept of spatial policies entails the objectives for sustainable development and even socio-economic development.

Connecting spatial policies with ecological features in a holistic way is precisely the purpose of the ecosystem-based approach. Indeed, it enables spatial planning to get an integrated vision, considering the specific needs of ecosystems, that can include retention areas, minimum infiltration rates, or riparian buffers to accommodate exceeding storm-water run-off volumes and play a role in sediment control and contaminant removal (Castaner, 2024).

1.2.3. City-river interactions

Good practices compiled in the EcoDaLLi project refer to river-cities interactions and spatial policies across the entire Danube Basin, where NbS are applied in land-use management and planning on water resources (O’Hogain, McCarton, 2018). The idea of the solution process comes through the use or mimic of natural processes, where green, grey, and blue infrastructure can strategically be designed in a combined way. Grey infrastructure represents human built up, engineered and physical structures, green infrastructure is defined as

“strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services” (EC, 2013), and blue infrastructure represents water related elements, such as pools, pond systems, wetlands, rivers, artificial buffer basins or watercourses. The combination of green-blue and grey has the term “hybrid infrastructure” (O’Hogain, McCarton, 2018). The use of these hybrid solutions is likely to produce results that are more effective than one measure alone.

In a frame of ecosystem-based good practices, NbS plays a central role as well as the identification of protected areas which could deliver ecosystem services to contribute to the mitigation of some of the environmental challenges. In the publication DANUBEPARKS (2019) valuable information about barriers, hydropower plants, in seven DRB countries, as well as the issue of protected areas is presented. Protected areas, see IUCN classification, over twelve thousand in DRB, are effective as habitats and for ecological connectivity (EcoDaLLi, D2.1).

The EU Floods Directive (2007/60/EC) is considered to adopt new opportunities for spatial planning in river basins, which come along with developing policies that incorporate both structural and non-structural measures, including NbS and ecosystem-based approaches. This notion is based on the shift from merely treating floods from a flood control perspective to a more integrated approach to risk management via a range of alternative solutions, such as harmonised land-use management system. Further, spatial policies for watershed restoration should be based on zoning instruments that contemplate avoiding land uses negative impacts to water quality and quantity (e.g., reduction of available flood water storage capacity).

2. MAPPING OF INNOVATIVE ECOSYSTEM-BASED PRACTICES

2.1. Context of the inventory and process of collection

The context of the inventory of innovative ecosystem-based practices of spatial policies sets the requirements for their selection and description. To set up this inventory, thorough discussions were held with EcoDaLLi partners and tailored stakeholder groups considering their high expertise and knowledge of the territorial units. Given their long track record in working with NbS in their respective territorial settings, these partners have provided the Task leaders with a list of reference examples in their respective territorial units. As such, this **inventory is not the mere result from desk research or literature review, but rather comes from local expertise with locally-tailored knowledge on NbS**. The respective EcoDaLLi partners who are experienced or well-networked at local level were asked to screen the practices and to provide information about at least 2 per territorial unit.

Table 1 EcoDaLLi partners' contribution to the inventory

Innovative ecosystem-based practice/Territorial unit	Consulted EcodaLLi partner	Knowledge expertise
Practice 1: Upper Danube (DanubeSediment)	University of Natural Resources and Life Sciences in Vienna (BOKU)	BOKU has long-lasting expertise on how to implement & accompany restoration projects using innovative monitoring & modelling, intensive stakeholder engagement & public participation. Also, BOKU provided knowledge on restoration water actions, with a research perspective, in connection to their work within the IA Danube4All.
Practice 2: Upper Danube (Traisen Project)	ICLEI Europe	Especially on NbS and water policies, ICLEI Europe has the expertise in knowledge-sharing, capacity-building, urban greening, transformation & adaptation plans.

Practice 3: Middle Danube (Urban Garden Sarajevo)	Faculty of Technical Sciences of the University of Novi Sad (FTN)	FTN's team is well-experienced and has the understanding of restoration activities that succeed in practice. FTN is a key partner in the implementation of WP2.
Practice 4: Middle Danube (NATURAVITA)	Department of Energy, Power Engineering and Environment (FSB) of the University of Zagreb	
Practice 5: Lower Danube (DANUBE FLOODPLAIN)	Association of Danube River Municipalities "Danube" (ADRM)	The Association of Danube River Municipalities refers to the specific expertise of the local authorities (member municipalities) along the Danube River in Bulgaria.
Practice 6: Lower Danube (IMPLEMENTATION OF PRIORITY MEASURES IN THE RAMSAR SITE "BELENE ISLANDS COMPLEX", Persina Nature Park, Bulgaria)	Association of Danube River Municipalities "Danube" (ADRM)	
Practice 7: Danube Delta & Black Sea (Delta Lady)	Danube Delta National Institute (DDNI)	Danube Delta National Institute for Research & Development performs applied research for scientific support of the management of the Danube Delta Biosphere Reserve and other wetland areas of national & international interest, with particular focus on biodiversity conservation and sustainable use.
Practice 8: Danube Delta & Black Sea (RainSolutions)	Danube Delta National Institute (DDNI)	DDNI's contribution is based on their active research on wetland restoration and environmental assessment

		of the vulnerability of these landscapes.
Practice 9: Danube Delta & Black Sea (COASTAL EROSION REDUCTION PHASE II (2014-2020))	Tulcea County Prefect's Office (IP Tulcea)	Tulcea County Prefect's Office has clear focus on developing innovative approaches regarding environment protection & risk management, embracing a focal point for cooperation. IP Tulcea's contribution is based on their experience in the implementation of public policies on wetland restoration and environmental assessment of the vulnerability of these landscapes.

These innovative ecosystem-based practices are distributed across the four geographic areas defined in the EcoDaLLi project: Upper Danube, Middle Danube, Lower Danube, and Danube Delta & Black Sea.

The innovative ecosystem-based policies and practices at local, cross-border and transnational level were collected and assessed according to the:

- EU definition of spatial policies;
- WP2 methodology for selection of nature-based solutions (D2.1);
- And additional criterion for focus on city-river interactions/cross-border and transnational character of the presented practices.

Additionally, upon agreed methodology in WP2, the EcoDaLLi project partners and identified local actors that took part in stakeholder-tailored formats (e.g. WP3 workshops) were asked to select and provide information on ecosystem-based practices (projects, initiatives, pilots, policies). The following selection criteria had to be met:

- The practice has been already implemented, with allocated funding.
- The practice has ecosystem-based and innovative aspects. We consider practices to be innovative when they demonstrate a new or improved approach, technique, or process that provides a novel solution to a challenge. In most cases, these involve the adaptation of existing knowledge in a new way and, as a rule, were not the initial objectives of the projects but rather the result of addressing specific or emerging challenges. The focus is on challenges that are not unique to a single location but are shared across the four territorial units (Upper, Middle, Lower Danube, Danube Delta & Black Sea).
- The practice has an impact on one of the four EcoDaLLi Danube River Basin territorial units.

- The practice covers one of the following areas of intervention: biodiversity conservation and restoration, disaster response, land use planning and private developers, water management, ports and navigation, agriculture, fisheries, forestry, wastewater, and waste management; wetland management.
- The practice is validated as relevant for the purposes of this inventory based on the knowledge and expertise of EcoDaLLi local partners.

The policies/projects/pilots listed in the inventory have varying scopes reaching from local, regional & national to transnational & cross-border. They address environmental as well as social challenges by improving the environmental status and providing ecosystem services in applying NbS along other measures, in an economically viable way and with involvement of local communities. The varying scopes are defined as follows:

- **Local:** specific geographic area such as a municipality, town, or community, within a single administrative boundary.
- **Regional:** larger geographical area that may span several local communities, within a sub-national administrative boundary like a province, state, or district.
- **National:** Involves the entire country or a large part of it, encompassing all the administrative divisions within the nation's borders.
- **Cross-border:** Refers to the interaction between two or more neighbouring countries.
- **Transnational:** Involves multiple countries that not necessarily share direct borders but are connected by the Danube River.

2.2. Usability of the inventory

The inventory focuses on river-city interactions, which cover the whole spectrum of spatial planning scales (from local to regional, national and transnational) but also the complexity of integrating different spatial policy and land-use legislation frameworks. It contributes to the project-wide identification of research & innovation needs at the Danube River basin level as well as to freshwater ecosystem preservation, restoration and city-river facilities. The inventory feeds into the following EcoDaLLi tasks:

- **T2.4. “Validate the findings from T2.3. during four workshops in each Danube Unit”:** a series of four city-river interactions workshops will be organised with the relevant stakeholders (identified during the stakeholder mapping process in T3.1.) across each unit. The workshops will serve as stakeholder engagement tools aimed at discussing the collected ecosystem-based practices.
- **T3.4. “Ecosystem impact assessment for transformations of urban land-uses (integrated spatial policies for river cities & cross-border areas)”:** the identification of local, regional, national, transnational and cross-border needs with regards to ecosystem connectivity and city-river interactions will support D3.3. “Shared vision on spatial policies for the protection and restoration of freshwater ecosystems and biodiversity in the Danube River basin and its Delta” as a main outcome of T3.4.

2.3. Inventory of at least 8 innovative ecosystem-based practices in the Danube Basin

This section presents the innovative practices collected by the EcoDaLLi consortium and tailored stakeholder groups. For each practice, an introduction of the ecosystem degradation challenge targeted is provided followed by a description of the solutions applied, the security aspects, and the environmental, social, and economic background.

When applicable, additional information on co-participatory processes, stakeholder involvement, success and limiting factors, and a costs and benefits assessment is provided.

Links to references and sources are included in the descriptions as well.

Since D3.1. is an inventory of practices, it is structured in a way that provides a detailed overview of the collected practices yet focuses on their ecosystem-based approach and spatial policy dimension. The information is summarised as a factsheet and is retrieved mainly from the official websites of the respective practices. Given the fact that they have been implemented with the financial support of EU programmes and funds, this information should be considered validated and official, hence trustworthy. Further illustrations & visualizations of the case studies can be found in the official website of the respective featured projects.

9 practices, at least 2 per each territorial unit (3 for the Danube Delta & Black Sea), have been selected by the local EcoDaLLi partners who have the local knowledge and expertise on the ground. This is how the connection to the local communities and citizens, which is at the heart of the Mission Ocean and Waters approach, is enhanced.

2.3.1. INNOVATIVE ECOSYSTEM-BASED PRACTICE №1: UPPER DANUBE

General information	
Title DANUBESEDIMENT Danube Sediment Management – Restoration of the Sediment Balance in the Danube River	Area of intervention – biodiversity conservation and restoration – disaster response – water management
Implementation period 01.01.2017 – 30.11.2019	
Budget and source of funding 355.8581,62 Euro Interreg Danube Transnational Programme	
Scope Cross-border (Danube Basin)	
General description More than a decade ago, the ICPDR identified a changed sediment regime in the Danube River as an issue. As the Danube flows through ten counties from the Black Forest to the Black Sea, a transnational project on sediment management was needed to obtain a full picture. The aim was to improve the sediment and water management as well as the morphology of the Danube River. To tackle these challenges, 14 project partners and 14 strategic partners came together in the DanubeSediment project for almost three years.	
Innovative aspects Danube-wide sediment balance that analysed the sinks, sources and redistribution of sediment within the Danube. Different monitoring instruments and methods used to collect sediment data by the Danubian countries were compared. To understand the impacts and risks of sediment deficit and erosion, the project partners analysed the key drivers and pressures causing an alteration of the sediment balance. Targeted Stakeholder Workshops for Knowledge Transfer ■ transfer of knowledge to key target groups throughout the Danube River Basin, for example hydropower, navigation, flood risk management and river basin management, which includes ecology. These target groups were also involved in the development of the project results, for example in the frame of national events. Sediment Manual for Stakeholders ■ concrete examples and information for implementing good practice measures	

<i>Environmental and strengthening governance</i>	Danube Sediment Management Guidance (DSMG) It contains recommendations for reducing the impact of a disturbed sediment balance, e.g. on the ecological status and on flood risk along the river. By feeding into the Danube River Management Plan (DRBMP) and the Danube Flood Risk Management Plan (DFRMP), issued by the ICPDR, the project directly contributes to transnational water management and flood risk prevention.
<i>Social</i>	-
<i>Economic</i>	-
<i>Other aspects</i>	-
Link to spatial policy Strengthen transnational water management and flood risk prevention.	
Challenges & solutions applied To calculate the entire sediment balance of the Danube, our partners also analysed bathymetrical data, bed material as well as dredging and feeding. In total, about 733 river kilometers of analysed river length is dominated by erosion. In the Lower Danube, 670 kilometers show an erosional trend, especially downstream of the Iron Gate 2, but a lack of data hinders a detailed analysis, meaning local sedimentation may exist in stretches of general riverbed erosion. When we add this up, over half of the Danube River shows a tendency to erosion, whilst 857 river kilometers are dominated by sedimentation.	
Stakeholder engagement Targeted international stakeholder workshops to transfer knowledge and Sediment Manual for Stakeholders https://dtp.interreg-danube.eu/approved-projects/danubesediment/outputs	
Key take-away(s) for replication (lessons learned, why should/could be applied to other areas) The project recommends establishing a harmonized quantity monitoring network, setting-up new monitoring stations and a centralised data storage. The project results confirmed the assumption that there is a sedimentation tendency when the river is dammed, while erosion mainly occurs in the free-flowing river sections.	
Links to websites/documents/references https://dtp.interreg-danube.eu/approved-projects/danubesediment	

2.3.2. INNOVATIVE ECOSYSTEM-BASED PRACTICE №2: UPPER DANUBE

General information	
Title TRAISEN PROJECT	Area of intervention - biodiversity conservation and restoration - land use planning - water management - fisheries - wetland management
Implementation period 2009-2019	
Budget and source of funding The total project budget amounted to 30 million Euros. What needs to be underlined is the fact that the project was financed by a mix of different financing sources: VERBUND Hydro Power GmbH (15 million Euros) and other financing partners: Office of the Lower Austrian Provincial Government, Federal Ministry of Agriculture, Regions and Tourism, EU-LIFE+ Nature and Biodiversity Fund, Lower Austria Landscape Fund, Lower Austrian Provincial Fishing Association, via Donau.	
Scope National. The project encompassed Austria's largest land restoration project, with impact on the Traisen river, one of the largest rivers in the country.	
Description The Traisen project, which was financed under EU LIFE+ Programme, is Austria's largest land restoration project aiming at transforming the lower reaches of the Traisen river near the Danube power plant in Altenwörth into a diverse floodplain landscape. The Traisen is one of the largest rivers in Lower Austria. During the construction of the Danube power plant in Altenwörth between 1973 and 1976, the Traisen was lengthened by 7.5 km. Nowadays this river section meets with the Danube downstream of the power plant. The riverbed used to run in an even, straight line through the floodplain between Traismauer and Zwentendorf. As a result of the LIFE+ Traisen project, the straightened section has been broken up and the mouth of the Traisen into the Danube has been completely recreated.	

The main objective of the LIFE+ Traisen project was to improve the habitat situation in the part of the European conservation area “Tullnerfelder Au” near the Danube. The specific objectives were the following:

- To protect the existing natural wetland area and immediate environments.
- To avoid detrimental changes to the local resident’s flood risk.
- Establishment of a meandering river, recreated as a dynamic and ever-changing waterscape which can further develop dynamically in future and provide new habitats in bodies of flowing water.
- Creation of manifold structures in the water-to-land transition of the bank area of the new Traisen river to perform as buffer zone.
- Establishment of new bodies of standing water, enriching the wetlands hydrological connectivity, recreating a complex and interconnected superficial and underground hydrological network with a variety of waterbodies.
- Creation of a floodplain along the new course of the river with frequently flooded sites, which requires integration of soft wetlands, especially the white willow wetlands.
- Increasing the share of the typical wetland and river habitats, which today amount to just 6% of the surface in the entire Natura 2000 area.
- Integration of fish corridors in the wetland area and the new Traisen river.

Continuous fish-passable network in the new Traisen river - sustainably promoting the fish fauna of the Danube, the Traisen river and the bodies of water in the wetlands. As a result, the ecosystem habitat and corridors should benefit for at least 30 species of fish.

Innovative aspects

The construction of the new Traisen was carried out in three years, but the preparation phase, including design, planning, and financing, lasted for more than 10 years. Despite this long preparation phase, LIFE+ Traisen is everything but a classic river restoration project. Indeed, in that case, the river course was not restored, but a new river course has been created in the floodplain. In addition, another novelty is that large quantities of excavated material were necessary for the riverbed to be shaped in an ecologically functional manner, which appears to be a key specificity of the project. Eventually, the project was the largest Life+ project in Austria, regarding planning area and construction volume.

Environmental

Main environmental aspects include:

- Creation of 30 ha of running water habitats
- Development of riparian forests along the newly created flood zones (60 ha)
- Development of local vegetation on the new bank zones
- Creation of new wetland ponds to foster local biodiversity (15 ha)
- Creation of a fish passable network that connects the river to the Danube (about 40 local species inventoried)
- Permanent improvement of the state of natural meadows (30 ha)

	• Natural removal of invasive and undesired species on an area of 25 ha
<i>Social</i>	Main social aspects include: • Agreements with landowners for permanent maintenance on third-parties land
<i>Economic</i>	Main economic aspects include: • Significant improvement of fish stocks with lasting impact on the fish fauna in the Danube • Economic compensation for landowners for various pecuniary disadvantages without the use of LIFE money
<i>Other aspects</i>	
Link to spatial policy The project resulted in the creation of new flood zones, covering about 60 ha on the new river, which represents a key feature in terms of spatial policy as previously defined in this deliverable.	
Challenges & solutions applied The LIFE+ project implemented a set of measures in the area between the Danube and the former Traisen canal to create a whole new to create a new 10 km-long Traisen river. This includes surrounding bank zones and a large estuary at the Danube. Near the Altenwörth power plant, the Traisen's waters were diverted into this new riverbed, while the old canal was retained for flood relief and as a standing water body. Unlike a revitalization of an old river section, this project involved the creation of a completely new, dynamic river and wetland habitat. The new Traisen river, with meandering banks and an active interplay between water and land, spans approximately 30 hectares of running water habitats. Flood zones were established over 60 hectares, providing a habitat for silver willow wetlands, which are typical of the riparian forests in the area. Additionally, large standing water bodies, or wetland ponds, were created along the new river and its adjacent wetlands, featuring natural banks and shallow amphibian zones. The project also established a fish-passable network linking the new Traisen, its water bodies, and the Danube, allowing fish to migrate freely and enhancing fish populations in the Danube. Conservation efforts were bolstered by improving the status of the typical meadowscapes and successfully controlling invasive plant species (neophytes) across 25 hectares in the newly created river section and meadows.	
Stakeholder engagement In 2004 a feasibility study for the restoration of the lower reaches and estuary of the Traisen River was developed. In 2011 citizen informational events were held in Zwentendorf, Traismauer and Altenwörth in Austria.	
Key take-away(s) for replication (lessons learned, why should/could be applied to other areas)	



This project will significantly reduce flood risks in the area, while ensuring possibilities for local biodiversity to thrive in restored ecosystems. Its cross-sectorial approach is a key success factor, as it implied environmental, social, and economic benefits in the long term. Another important take-away lays in the involvement of third parties and landowners to effectively proceed with Nature-based Solutions implementation.

Links to websites/documents/references

Project website (main source): <https://www.life-traisen.at/>

Project resources: <https://www.life-traisen.at/en-at/information-events>



2.3.3. INNOVATIVE ECOSYSTEM-BASED PRACTICE №3: MIDDLE DANUBE

General information	
Title URBAN GARDEN SARAJEVO	Area of intervention – land use planning – water management (water quality)
Implementation period 06.2017 – 05.2022	
Budget and source of funding Connecting Nature is a 11.400.000 € five year project funded by the European Commission's Horizon 2020 Innovation Action Programme. Part for Urban Garden Sarajevo 190.000 €.	
Scope Focused on river Miljacka in Sarajevo.	
General description This is kind of pilot study for restoration, if possible as NbS of city, performed in a frame of EC project <i>Connecting Nature</i>. IT Includes greening of river Miljacka riparian vegetation and improvement of water quality ETC. River Miljacka flows into river Sava, which is a tributary of the Danube. In Sarajevo, the NbS exemplar proposed is to create urban garden in a state-run Children's Home which is located next door to a Centre for Healthy Ageing. A core feature of the exemplar is to promote and encourage intergenerational learning through the joint design, management and maintenance of the garden. If successful, the City of Sarajevo intends to roll out the model in similar settings across the city. This can be treated as initiative for future restoration. It was created targets to be reached, kind of Theory of Change.	
Innovative aspects Co-production, engaging citizens in project development, contribution to the costs reduction and green jobs Developed (available on the website) ■ Co-production Guidebook ■ A practical guide to using co-production for nature-based solutions	
<i>Environmental</i>	Riverine greening
<i>Social</i>	Protection of pollution and aesthetic
<i>Economic</i>	Engaging volunteers

Other aspects	Recreation zone
Link to spatial policy Related to the planning implementation of ecosystem-based restoration of city Sarajevo, especially riverine vegetation of river Miljacka.	
Challenges & solutions applied ■ Water Quality ■ Biodiversity Enhancement ■ Green Space Management ■ Health and Wellbeing ■ New Economic Opportunities and Green Jobs	
Stakeholder engagement Citizens involved in a frame of co-production.	
Key take-away(s) for replication (lessons learned, why should/could be applied to other areas) Can be applied for other cities in the region.	
Links to websites/documents/references https://connectingnature.eu/sarajevo https://connectingnature.eu/sarajevo-process https://connectingnature.eu/innovations/co-production	

2.3.4. INNOVATIVE ECOSYSTEM-BASED PRACTICE №4: MIDDLE DANUBE

General information	
Title NATURAVITA	Area of intervention – biodiversity conservation and restoration – forestry
Implementation period 23.03.2015 – 23.09.2023	
Budget and source of funding 49.100.000 Euro European Union Operational program Competitiveness and Cohesion for the period 2014-2020, under the specific objective Demining, restoration and protection of forests and forestland in protected and Natura 2000 areas.	
Scope Local, along rivers Drava and Danube	
General description “Demining, restoration and protection of forest and forestland in protected and Natura 2000 sites in Danube-Drava regions – NATURAVITA” is one of the largest nature conservation project in Croatia, financed by the European Structural and Investment Funds. It is a strategic project aimed at demining, reconstruction and protection of forest, forestland and water resources. The project area is degraded due to long-term mine contamination that does not allow safe accesses to visitors and management bodies, as well as the implementation of forest and Natura 2000 management plans. The project is fully implemented in the Osijek-Baranja County area and covers forest and forestland in Natura 2000 and protected area, parts of Nature park Kopački rit and the Regional park Mura-Drava. The project implementation period is from June 23, 2015. until September 23, 2023. Through the implementation of project activities, 5,97 km² forest and forestland will be cleared of mines and other unexploded in the Nature park Kopački rit and 19,37 km² in the Regional park Mura-Drava. The firefighting infrastructure will be improved through the construction and reconstruction of 107 ha of fire breaks, 33 km of fire roads and 4 bridges. The biological restoration of forest and forest land will be carried on s surface of 1.021 ha, including through replacement of alien species with native species on 441 ha of the project area. The plan is restoration 100 ha of rare wetland lawns. The educational and visitor Centre “Podravlje” will be renovated and to build 4 educational and recreational trails will build. The project will raise public awareness on the importance of biodiversity and the risk of mine contamination through the development and implementation of educational programs for school children, students and the local population.	

The quality of waters and the level of conservation of ecosystems depend on water will be improved through definition of retention capacities, management objectives, definition and implementation of monitoring and the development of a Study on revitalization of the wetlands in the Nature Park Kopački rit.

Innovative aspects

- **Establishing educational infrastructure, conducting education and raising awareness:**
Reconstruction of the Podravlje forest house
Development of educational programs for target groups and development of educational materials
- **Implementation of educational programs for target groups**
- **Development of a long-term management plan for the Education-Visitor Center “Podravlje”**
- **Educational materials**

Environmental

Biological restoration of forests and forest land;
Renovation and construction of forest infrastructure;
Protection and conservation of waters and ecosystems dependant on water

Social

Establishing educational infrastructure

Economic

Engaging volunteers

Other aspects

Demining of forests and forest land

Link to spatial policy

Demining of Forests and Forest Land: Completed in December 2019, this initiative cleared 25.3 km² of land, removing 5,611 explosive remnants. This action has made the area safe for ecological restoration and public use.

Biological Restoration: The project focuses on reforesting 1,021 hectares with native species such as white willow, black poplar, white poplar, pedunculate oak, and plain ash. This effort aims to replace non-native species and rehabilitate areas degraded by past conflicts.

Renovation and Construction of Forest Infrastructure: To enhance fire protection, the project has established 33 km of firebreaks with road elements, 92 hectares of firebreaks, and constructed a bridge over the Barbara channel.

Educational Initiatives: The project has renovated the Podravlje Forest House into an energy-independent educational center and developed educational trails and programs to raise public awareness about biodiversity and sustainable forest management.

Challenges & solutions applied

- **Demining of forests and forest land**
- **Biological restoration of forests and forest land**
- **Renovation and construction of forest infrastructure**
- **Protection and conservation of waters and ecosystems dependant on water**

Stakeholder engagement

The NaturaVita project places significant emphasis on stakeholder engagement to ensure the success and sustainability of its activities. Here are key elements of stakeholder engagement within the project:

1. Involvement of Local Communities

Public Awareness Campaigns: The project organizes workshops, presentations, and public discussions to inform local communities about project goals, including demining, reforestation, and biodiversity conservation.

Educational Programs: Schools and educational institutions are engaged through programs and visits to the Podravlje Forest House, helping raise awareness about sustainable forest management and biodiversity.

2. Collaboration with Environmental and Forestry Experts

The project engages experts in forestry, ecology, and environmental science to guide restoration efforts. For example, selecting native species for reforestation involves consultation with scientists and conservationists.

Stakeholders include academic institutions, NGOs, and private sector partners specializing in environmental restoration.

3. Cooperation with National and Regional Authorities

Coordination with government bodies, such as environmental ministries and forest management agencies, ensures alignment with national policies on conservation and spatial planning. Local governments and municipalities are directly involved in planning and monitoring project activities.

4. Engagement with International Organizations

Collaboration with international environmental organizations and funding bodies, such as the European Union, highlights the project's broader environmental and conservation goals.

5. Multi-Sector Partnerships

The project actively seeks to involve stakeholders from different sectors, including tourism, education, and agriculture, to integrate sustainable practices into these areas.

6. Feedback Mechanisms

Community feedback is sought and incorporated into the project to adapt to the specific needs of local stakeholders. This includes ensuring that reforestation and infrastructure projects do not adversely affect traditional livelihoods.

Key take-away(s) for replication (lessons learned, why should/could be applied to other areas)

This practice brings a valuable legacy, which in the future, with continuation of work, will ensure hydrological conditions with the introduction of natural solutions, i.e., unhindered entry of waves and flooding in the mentioned area.

Links to websites/documents/references

<https://naturavita-project.eu/en/naturavita-en/>

[https://naturavita-project.eu/wp-content/uploads/2021/12/Brosura o sumama ENG.pdf](https://naturavita-project.eu/wp-content/uploads/2021/12/Brosura_o_sumama_ENG.pdf)

2.3.5. INNOVATIVE ECOSYSTEM-BASED PRACTICE №5: MIDDLE / LOWER DANUBE

General information	
Title DANUBE FLOODPLAIN Reducing the flood risk through floodplain restoration along the Danube River and tributaries	Area of intervention – disaster response – land use planning – biodiversity conservation and restoration – water management – forestry
Implementation period 01.06.2018 – 30.11.2020	
Budget and source of funding 3672655.88 Euro Interreg Danube Transnational Programme ERDF Contribution: 2899428,55 Euro IPA Contribution: 222328,9 Euro ENI Contribution: 0	
Scope Local, cross-border and transnational. The project addresses local flood risks needs through spatial planning and practical implementation, strengthens cross-border cooperation by managing shared flood risks, and advances transnational objectives by creating tools, frameworks, and strategies applicable across the Danube River Basin.	
General description The main activities of the project are, as follows: updating the floodplain areas inventory and their ranking using the Floodplain Evaluation Matrix-FEM; assessing, by using the pre-selected pilot areas, of the efficiency of floodplain projects in the Danube District and developing tools for increasing the knowledge and cooperation of experts, practitioners, decision makers and stakeholders on floodplain restoration.	
Innovative aspects Traditional flood risk management measures are local and entirely infrastructure-based. In this project, models have been developed to reduce the impact of floods at a regional level, considering a wide range of measures. The analysis of the Lower Danube and Yantra River basin are particularly comprehensive. Innovative hydrological analyses have been conducted on a cross-border scale Romania-Bulgaria and national scale in Bulgaria to assess the impact	

of floodplain restoration on flood risk management capabilities. The solutions proposed in this project represent the classic approach to Nature-based Solutions (NbS), focusing on the restoration of river floodplains. An original manual has been developed to assess the restoration potential of passive floodplains.

Environmental

The evaluation is based on the following ecological criteria:

- Connectivity of water bodies;
- Presence of protected species;
- Presence of protected habitats;
- Naturalness of ecosystems and
- Potential for typical natural habitats.

Social

The key socio-economic criteria for assessing the restoration potential of floodplains are:

- Potentially affected buildings;
- Land use.

Economic

In this innovative tool, the economic aspects are not considered independently.

Other aspects

Hydrologic parameters and their associated assessments of floodplain restoration potential are at the forefront of this manual. Three individual parameters were used:

- Peak Flood Wave Reduction;
- Delay in peak flood;
- Impact on extreme flows;

Additionally, an original complex indicator is also considered.

Link to spatial policy

At its core, the Floodplain Evaluation Matrix-FEM is a spatial planning tool. In this sense, the project can be seen as an example of a spatial planning-based approach to NbS.

Challenges & solutions applied

The project faced challenges in balancing flood risk reduction with biodiversity conservation, coordinating transnational efforts among Danube Basin countries, and aligning with the Flood Directive and Water Framework Directive (WFD) objectives. Stakeholder interests, lack of information and limited technical knowledge on floodplain restoration further complicated implementation. These challenges were addressed by prioritizing floodplain restoration areas using the Floodplain Evaluation Matrix (FEM), conducting pilot projects to demonstrate the effectiveness of natural retention measures, and promoting collaboration through knowledge-sharing platforms. The project enhanced integrative water management by combining classical and green infrastructure while actively engaging stakeholders.

Stakeholder engagement

In addition to the standard stakeholder engagement tools, the Danube Floodplain Online Course has been developed as an innovative approach. The course consists of six modules: Introduction, Flood Risk Management, Floodplain Management and lessons learned, technical aspects of restoration studies, Supporting decisions in floodplain management, Decision support tools, and Conclusion. The tool is open access and free of charge.

Key take-away(s) for replication (lessons learned, why should/could be applied to other areas)

- Upgraded Floodplain Evaluation Matrix (FEM) tool, tested in pilot areas, demonstrated its value for prioritizing restoration projects through data-driven assessments. Its GIS compatibility enhances replicability in other regions.
- Ecosystem services mapping, historical floodplain analysis, and feasibility studies.
- Catalogue win-win measures
- The combination of hydraulic modeling (1D and 2D), cost-benefit analysis (CBA), ecosystem services (ESS), and biodiversity considerations in decision-making emphasized a holistic and adaptable methodology for floodplain management globally.

Links to websites/documents/references

Project website:

<https://dtp.interreg-danube.eu/approved-projects/danube-floodplain>

Results of activities at national level Bulgaria:

<https://www.bd-dunav.bg/content/proekti-i-programi/proekt-danube-floodplain/novini-za-danube-floodplain/>

2.3.6. INNOVATIVE ECOSYSTEM-BASED PRACTICE №6: LOWER DANUBE

General information	
Title IMPLEMENTATION OF PRIORITY MEASURES IN THE RAMSAR SITE “BELENE ISLANDS COMPLEX”, Persina Nature Park, Bulgaria Project BG16M1OP002-3.015-0003	Area of intervention – biodiversity conservation and restoration – disaster response – land use planning – water management – fisheries – wetland management
Implementation period 31.07.2020 – 30.11.2020	
Budget and source of funding 1,660,383 BGN (847,870 Euro), of which 1,411,326 BGN is funded by the European Regional Development Fund, and 249,057 BGN is national co-financing from the state budget of the Republic of Bulgaria.	
Scope Local, cross-border. The project includes specific local measures within the boundaries of Persina Nature Park in Bulgaria but also has a transboundary impact on biodiversity (primarily fish and birds) and the water regime across the entire transboundary Ramsar site (Romania and Bulgaria).	
General description The project has achieved three specific objectives: ■ Enhancing the management and control of incoming waters in the "Persin Island" wetland by modernizing and automating the operation of sluices, originally built under the project "Restoration of Wetlands and Reduction of Pollution," funded by GEF and the World Bank, and implemented by the Ministry of Environment and Water. ■ Improving the conservation status of the "Kaykousha" marsh by reed mowing and supporting the processes of creating open water areas. ■ Improving the conservation status of habitat 2340 – Pannonian inland dunes* by limiting the spread of the invasive species false indigo bush (<i>Amorpha fruticosa</i>).	
Innovative aspects	

The project features innovative modernization of the sluices by implementing autonomous power supply, mechanized gate operation, remote control, and a system for real-time monitoring of wetland parameters.

Environmental

The solutions provided are a model for maintaining a water regime that closely resembles the natural one and for restoring the typical riverine ecosystem of the Lower Danube.

Social

One of the effects of the improved water regime is the restored fish population of species that reproduce in wetlands. This has a socio-economic impact on fishing, a traditional livelihood in the region.

Economic

The mentioned innovative solutions also have other economic effects, such as on tourism, hunting, forestry, livestock farming.

Other aspects

Climate resilience have not yet been assessed.

Link to spatial policy

The project is closely connected to several spatial policies, particularly those related to land use, wetland restoration, and water management in river basins.

Challenges & solutions applied

Restoring the lateral connectivity between the river (Danube) and the riparian wetlands (Persin Island wetlands) faces many challenges. The presence of protective dikes and infrastructure in the former floodplain areas severely limits the potential solutions. One of the most common compromise solutions is the use of sluices and connecting channels, which have been applied on Persin Island. The management of these sluices should ideally replicate natural processes before the construction of protective dikes. This task is complicated by the fact that these sluices are manually operated and located in hard-to-access areas. An additional challenge is the lack of operational data on water levels in the wetlands. Key challenges in managing the water regime include ongoing deterioration of the hydromorphological conditions in the Danube River, climate change, and hydropicking caused by the Iron Gate dams.

Stakeholder engagement

The involvement of stakeholders has been at the local level and was not the focus of the project. This is an example of a significant initiative that requires additional promotion to fully realize its replication potential.

Key take-away(s) for replication (lessons learned, why should/could be applied to other areas)

The solution for sluice modernization is successful and innovative for the region. It has the potential for widespread replication in other riparian wetlands along the Lower Danube (such as Kalimok, Srebarna, and others).

Links to websites/documents/references

Directorate of Persina Nature Park

<https://persina.bg/>

The project does not have a separate website or a dedicated section on the website of the Persina Nature Park administration.

2.3.7. INNOVATIVE ECOSYSTEM-BASED PRACTICE №7: DANUBE DELTA & BLACK SEA

General information	
Title DELTA LADY	Area of intervention – wetland management – biodiversity conservation and restoration – land use planning
Implementation period 2019–2022	
Budget and source of funding 1,745,494.00 Euro, co-funded by the European Regional Development Fund (ERDF) under the Interreg Europe Programme.	
Scope Transnational – involving six European delta regions: Rijn delta (Netherlands), Danube delta (Romania), Camargue delta (France), Albufera delta (Spain), Po delta (Italy), and River Blackwater delta (Ireland).	
General description Delta Lady focused on enhancing the sustainable use of natural and cultural heritage in European river deltas. The project aimed to improve regional policy instruments to foster the utilization of ecosystem services, thereby strengthening regional economies. Activities included interregional learning events, development of action plans, and stakeholder engagement to address challenges unique to delta regions.	
Innovative aspects ■ Focused on improving policy instruments by integrating the valuation of ecosystem services into regional and local governance strategies. ■ Fostered transnational cooperation among six European delta regions to share best practices and address common challenges. ■ Emphasized the development of sustainable economic activities, such as eco-tourism and sustainable agriculture, linked to ecosystem services. ■ Created Action Plans to ensure long-term policy improvement and implementation of ecosystem service-based development strategies.	
<i>Environmental</i>	Promoted the conservation and restoration of wetland ecosystems by integrating ecosystem service approaches into policy frameworks.

<i>Social</i>	Strengthened local stakeholder involvement in governance, emphasizing community-driven approaches to regional development.
<i>Economic</i>	Encouraged sustainable use of delta resources to create jobs and improve livelihoods in delta communities.
<i>Other aspects</i>	Supported cultural ecosystem services by highlighting the importance of delta heritage in regional identity and development.
Link to spatial policy Policies were influenced by regional and interregional learning. For example, the Action Plans aimed to directly integrate ecosystem service valuation into local development policies, aligning with EU Biodiversity Strategy and the European Green Deal.	
Challenges & solutions applied Addressed the financial limitations of biodiversity-rich delta regions by developing strategies to capitalize on ecosystem services. Solutions included policy improvements, governance enhancements, and the creation of sustainable business models tailored to each delta's context.	
Stakeholder engagement Engaged a diverse group of stakeholders, including regional and local public authorities, education and research institutes, and local communities. Regular Regional Stakeholder Group (RSG) meetings provided platforms for local actors to discuss challenges and expectations, ensuring their input was integral to the project's outcomes.	
Key take-away(s) for replication (lessons learned, why should/could be applied to other areas) ■ Cross-regional learning and cooperation are vital for developing effective strategies to utilize ecosystem services in delta regions. ■ Active stakeholder engagement ensures that policies and initiatives are grounded in local realities and have greater chances of successful implementation. ■ Integrating ecosystem services into regional development policies can lead to sustainable economic growth while preserving natural and cultural heritage.	
Links to websites/documents/references https://projects2014-2020.interregeurope.eu/deltalady/	

2.3.8. INNOVATIVE ECOSYSTEM-BASED PRACTICE №8: DANUBE DELTA & BLACK SEA

General information	
Title RESEARCH-BASED ASSESSMENT OF INTEGRATED APPROACHES TO NATURE-BASED SOLUTIONS RainSolutions	Area of intervention – water management – disaster response – wetland management – land use planning
Implementation period 2019–2022	
Budget and source of funding The total budget for the project was 1,745,494.00 Euro, co-funded by the European Regional Development Fund (ERDF) under the Interreg Europe Programme.	
Scope Transnational – involved partners from Sweden, Romania, South Africa, Ireland, Brazil, and Estonia.	
General description RainSolutions developed an integrated framework to plan, assess, and implement Nature-Based Solutions (NbS) to address urban water management challenges. The project focused on sustainable water retention, ecosystem service delivery, and socio-economic impacts of NbS. By leveraging international collaboration and pilot studies, it established best practices for scaling NbS in diverse urban contexts.	
Innovative aspects ■ The project developed an integrated framework for planning, assessing, and implementing Nature-based Solutions (NbS) tailored to urban water systems. ■ Focused on identifying ecosystem services and their delivery through NbS to address climate variability and urban water challenges. ■ Created a web-based framework supported by machine learning to provide recommendations for NbS in urban contexts. ■ Conducted pilot studies in multiple global regions to simulate climate impacts and evaluate the socio-economic and environmental benefits of NbS.	
<i>Environmental</i>	Promoted sustainable water management by implementing natural water retention measures and improving urban resilience to flooding and drought.

<i>Social</i>	Increased community well-being through enhanced public spaces and urban ecosystems while engaging disadvantaged communities in water reuse and management strategies.
<i>Economic</i>	Developed guidelines fostering green jobs and local businesses providing NbS-related services, creating cost-effective and scalable urban solutions.
<i>Other aspects</i>	The project integrated legal and governance frameworks to ensure the long-term adoption of NbS, emphasizing their role in inclusive urban planning.
Link to spatial policy RainSolutions aligned with the EU Water Framework Directive, Horizon 2020 priorities, and local urban planning strategies. By promoting integrative management approaches and adaptive water governance, the project aimed to influence regional and global policies supporting sustainable development, particularly through natural water retention and restoration techniques.	
Challenges & solutions applied Challenges included resistance to integrating NbS into urban infrastructure and gaps in policy frameworks. Solutions focused on education, capacity building, and development of tools for seamless integration of NbS into urban systems.	
Stakeholder engagement Collaborated with municipalities, NGOs, universities, and local communities. Stakeholders were involved in design, implementation, and evaluation phases, ensuring their perspectives and needs were considered.	
Key take-away(s) for replication (lessons learned, why should/could be applied to other areas) ■ Integrated frameworks for NbS enhance adaptability and sustainability in diverse urban settings. ■ Multi-stakeholder involvement is critical for successful implementation and acceptance. ■ Providing evidence-based, scalable solutions ensures replicability and long-term adoption.	
Links to websites/documents/references http://opendata.waterjpi.eu/dataset/rainsolutions	

2.3.9. INNOVATIVE ECOSYSTEM-BASED PRACTICE №9: DANUBE DELTA & BLACK SEA

General information	
Title COASTAL EROSION REDUCTION PHASE II (2014-2020)	Area of intervention – biodiversity conservation and restoration – disaster response – land use planning – climate change
Implementation period 2015-2023 (it was prolonged since 2024)	
Budget and source of funding Financed by Large Infrastructure Operational Programme 2014-2020, Priority Axis 5 – Promoting adaptation to climate change, risk prevention and management, Specific Objective 5.1 Reducing the effects and damage on the population caused by natural phenomena associated with the main risks accentuated by climate change, mainly floods and erosion coastal. 761.128.400 Euro. The amount of EU co-financing is 543.000.000 Euro.	
Scope Regional: the project covers the Romanian Black Sea shore.	
General description The Dobrogea – Coastal Water Basin Administration implements the project "COASTAL EROSION REDUCTION PHASE II (2014-2020)" SMIS Code 2014+ 122927 co-financed by the Large Infrastructure Operational Program (POIM) 2014 – 2020, Priority Axis 5 – Promoting adaptation to climate change, risk prevention and management, Specific Objective 5.1 Reducing the effects and damage on the population caused by natural phenomena associated with the main risks accentuated by climate change, mainly floods and erosion coastal. The purpose of this project is to ensure adaptation to climate change, the prevention and management of risk through the erosion protection of the shoreline in average annual conditions and during events with a recurrence period of up to 1/100 years, for a projected lifetime of 50 years.	
Innovative aspects Through the implementation of the project, 226.16 ha of new beach will be created, thus contributing to the improvement of the conditions of the marine ecosystem and to the socio-economic development of the entire Romanian coast.	

<i>Environmental</i>	It will be ensured the protection of the Black Sea coastline on the territory of Romania from the effects of coastal erosion by developing a program of specific works that have in mind the rehabilitation and protection of the shoreline, the adjacent lands and the land and marine ecosystems during the lifetime of the investments (50 years). The project envisions the reduction of damage and loss of habitats risks in case of non-implementation of the project – ROSPA0076 Black Sea, ROSCI0066 Danube Delta-marine area, ROSCI0065 Danube Delta, ROSPA0031 Danube Delta and the Razelm-Sinoe Complex, ROSCI0197 Submerged beach Eforie Nord-Eforie Sud, ROSCI0269 Vama Veche- 2 May, Reserve 345 Vama Veche -2 May, ROSCI0094 Submarine sulfur springs from Mangalia, ROSCI 0281 Cap Aurora, ROSCI0293 Costinesti-23 August, Danube Delta Biosphere Reserve. Implementation of an integrated program for monitoring the coastal zone to support operations and maintenance works, monitoring of investment works, but also of medium and long-term environmental components.
<i>Social</i>	After the implementation of the project, the effects and damages on the population caused by natural phenomena associated with coastal erosion for the entire lifetime of the investments (50 years) will be reduced.
<i>Economic</i>	Together with the protection of environmental factors, there will be provided also economic infrastructure and to reach social objectives endangered by marine erosion processes during the projected lifetime of the investments.
<i>Other aspects</i>	-
Link to spatial policy The project is closely connected to several spatial policies, particularly those related to wetland restoration, and water management in river basins.	
Challenges & solutions applied	

The Romanian 244 km long coastal area consists of low-altitude shores - beaches (80%) and relatively high shores - cliffs (20%), where there are intense concentrated socio-economic activities strongly based of natural resources. At the same time, this area includes both natural shoreline (beaches and cliffs - approx. 84%) and "constructed" shoreline (ports, hydrotechnical protection constructions - approx. 16%).

The multi-annual monitoring of the coast highlighted the general tendency of degradation through erosion, even if the intensity of the phenomenon varies from year to year. The evolution of the beaches is determined by the sedimentary balance, i.e. by the ratio between the amount of sediments available in the coastal marine area and the marine hydrodynamic regime, represented in the coastal area by the energy of waves and coastal sea currents. The imbalance of the sediment ration vs. hydropower factor ratio leads to the appearance of environmental changes and the appearance of the erosion/deposition process. Imbalances can have natural causes, or they can be determined by anthropic interventions.

The problem of coastal erosion processes is considered by many states to be of national importance. Beach erosion leads to loss of territory, but above all it compromises the ecosystems of the coastal sea and the socio-economic value of the coastal area, causing significant damage to the national economy and the sustainable development of the country.

Stakeholder engagement

The Dobrogea – Coastal Water Basin Administration collaborated with municipalities of Tulcea and Constanța, NGOs, the local University “Ovidius”, and local communities. Stakeholders were involved in implementation and evaluation phases, ensuring that their perspectives and needs were considered.

Key take-away(s) for replication (lessons learned, why should/could be applied to other areas)

1. Edighiol and Periboina - coastal protection and rehabilitation of weirs and related structures;
2. Mamaia – coastal protection 6950 ml and 53 ha newly created beach;
Proposed works: extension of the existing embankment, artificial sandblasting;
3. Tomis (Casino) – coastal protection between Constanta port and Tomis tourist port 790 ml;
Proposed works: demolition of existing coastal structures, cliff consolidation;
4. Agigea – coastal protection and 1200 ml cliff consolidation and 0.62 ha newly created beach; Proposed works: Consolidation of the cliff, new seawalls embedded in the shore, artificial sanding, artificial reefs;
5. Eforie - coastal protection 5750 ml and 33 ha newly created beach;
Proposed works: Demolition of existing coastal structures, construction of new marine breakwaters embedded in the shore; artificial sanding, artificial reefs;
6. Costinesti - coastal protection 2550 ml and 16 ha newly created beach;
Proposed works: demolition of existing structures, construction of new marine piers embedded in the shore, artificial sanding, artificial reefs;
7. Olimp - coastal protection 3500 ml and 32 ha newly chalked beach; Proposed works: demolition of existing structures, construction of new marine piers embedded in the shore, artificial sanding, artificial reefs;
8. Jupiter - Neptune - coastal protection 2550 ml and 30 ha newly created beach; Proposed works: demolition of existing structures, construction of new marine piers embedded in the shore, artificial sanding, artificial reefs;

9. Balta Mangalia – Venus – Aurora – coastal protection 3100 ml and 37 ha newly created beach; Proposed works: demolition of existing structures, construction of new marine piers embedded in the shore, artificial sanding, artificial reefs;

10. Mangalia - Saturn - coastal protection 2500 ml and 20 ha newly chalked beach; Proposed works: demolition of existing structures, construction of new marine piers embedded in the shore, artificial sanding, artificial reefs;

11. 2 May – coastal protection and 1650 ml cliff consolidation and 4.5 ha newly created beach; Proposed works: Demolition of existing structures, construction of dikes and new seawalls, cliff consolidation, artificial insemination, artificial reefs.

Links to websites/documents/references

https://dobrogea-litoral.rowater.ro/?page_id=551

3. CONCLUSION & OUTLOOK

The inventory of innovative ecosystem-based practices in local, cross-border, and transnational spatial policies will serve as an initial database for city-river interactions to be presented and discussed with local stakeholders across the territorial units in the Danube River Basin. The innovative elements in the reviewed projects are the result of addressing local and often specific problems, but they have the potential to be scaled up and applied across the 4 territorial units (Upper, Middle, Lower Danube, Danube Delta & Black Sea). The inventory is connected to MS3.3 and the list of at least 8 ecosystems-based practices is made available to the public and EcoDaLLi stakeholders on the EcoDaLLi website.

The inventory will be published on the EcoDaLLi portal with filtering options that allow interested stakeholders to browse the catalogue and find information and inspiration on practices that are relevant for their local context and issues. Stakeholders will also have the opportunity to suggest new practices to be added to the catalogue and can reach out to the EcoDaLLi experts for further guidance and information on applying innovative ecosystem-based approaches.

As D3.1 is an important repository of innovative practices for stakeholders to take inspiration from, it serves as a basis for other activities in EcoDaLLi such as the “Danube Innovation Action Plan”.

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