BioValue

Arenas for Transformation II: Synthesis Report on the Case Studies and Monitoring Progress

WP 4 Transformative Change

Task 4.2 – Case Studies: Arenas for Transformation

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TECHNICAL REFERENCES

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CAP	Common Agriculture Policy
CO_2	Carbon Dioxide
D (followed by number)	Deliverable
DICAM	*Dipartimento di Ingegneria Civile, Ambientale e Meccanica*
EAI	Environmental Assessment Instruments
E&FI	Economic and Financing Instruments
ESS	Ecosystem Services
EU	European Union
GBO	Global Biodiversity Outlook
GI	Green infrastructure
ID	Impact Dialogue
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
KMGBF	Kunming-Montreal Global Biodiversity Framework
LULUCF	Land use, land use change and forestry
MMP	Municipal Master Plan
NBS	Nature based solutions
NGO	Non-Governmental Organisation
PAT	Provincial Technical Offices
PNPOT	Portugal's National Spatial Planning Policy Program
SEA	Strategic Environmental Assessment
SP&MI	Spatial Planning and Management Instruments
SLUPR	State of Land Use Planning Report
TAW	Transformation Action Workshop
UNESCO	United Nations Educational, Scientific and Cultural Organization
WP (followed by number)	Work Package

1. Introduction

1.1 Introducing Task 4.2 and the synthesis report

BioValue is a Horizon EU project funded under the cluster on Transformative Change and Biodiversity. This cluster is constituted by 11 Horizon Europe-funded projects and was created with the explicit goal of providing outputs, options, and evidence for policymakers to accelerate transformative change that has a positive impact on biodiversity. In BioValue we adopt the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) concept of transformative change that is generally understood as a "*fundamental, system-wide reorganization across technological, economic and social factors, including paradigms, goals and values*" (IPBES, 2019)[1]. Within the context of the cluster, BioValue project has a clear role aiming to safeguard and enhance biodiversity by exploring the transformative potential of spatial policy and planning processes by seeking to better articulate three interrelated instrumental perspectives - Spatial Planning and Management Instruments (SP&MI), Environmental Assessment Instruments (EAI) and Economic and Financing Instruments (E&FI) - across different levels of governance.

BioValue used an adapted version of the transformative change framework developed by Wittmer et al. (2021) to spatial policy and planning contexts (see Deliverable 4.1) to be unfold through BioValue Arenas for Transformation (from now on Arenas), in Trento (Italy), Mafra (Portugal) and Mecklenburg-Vorpommern (Germany). The intention is to redesign the framework based on the Arenas experience but also based on the more conceptual theoretical work with the three instrumental perspectives (based on the Deliverables 1.4, 2.3 and 3.4), to support exploring the transformative potential of spatial policy and planning processes for increasing biodiversity values to society.

Each Arena has its own specific characteristics and are set in different decision-making levels:

- *Fersina River (Trento, Italy):* In the Fersina River stream, an Adige River tributary flowing in Trento City, the synergy between spatial planning, environmental and economic-financial assessments are expected to contribute to changes in the urban contexts via ecosystem services and their integration into public and private decision-making. It is expected to transform the Fersina to a river garden capable of protecting biodiversity and being usable by residents and tourists. The area is very long as it follows the course of the stream and has therefore been divided into three different areas: the canyon (from the area upstream of Ponte Alto to the Cornicchio bridge); the urban stretch (from the bridge of the Dame di Sion to the confluence with the Rio Salè); the area of the estuary (the Delta). This Arena aims to provide evidence of the practice-based criteria and local policies, as well as tools, in place that enable the observed outcomes, including the governance mechanisms being adopted. The Arena is of the responsibility of the Municipality of Trento, the decision/policymaker.
- *Mafra Municipal Master Plan (Mafra, Portugal):* The current Municipal Master Plan (MMP) of Mafra Municipality approved, in 2015, a revision of the previous plan of 1995. The spatial

[1] IPBES (2019) Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.

planning process is ongoing, using the legally established framework of spatial planning and management instruments, with its respective Strategic Environmental Assessment (SEA). One of the main justifications for this revision was that the 'idealised' land use model of 1995 was not compatible with the territorial reality, mainly in terms of the safeguard of natural values, and biodiversity, for identity preservation in contexts of increased tourism demand. It is recognised that Mafra's natural identity is one of the differentiation and competitiveness factors of the Lisbon Metropolitan Area dynamics. This Arena aims to explore how the three instrumental perspectives are advancing the promotion of biodiversity in actions already undertaken and engage multiple stakeholders, create dialogical regimes towards enhancing transformative capacity of its MMP to promote biodiversity. The Arena is of the responsibility of the Municipality of Mafra, the decision/policymaker.

- *Peatlands in Mecklenburg-Vorpommern (Mecklenburg-Vorpommern Pomerania, Germany):* In Germany and particularly in Mecklenburg-Western Pomerania, there is approximately 300.000 ha of peatland, a large part of which was drained from 1960 to 1990 for intensive agricultural cultivation. Peatlands are the largest terrestrial carbon reservoir and have a critical role in ecosystem functioning and services by minimising flood risk, ensuring safe drinking water, mitigating the effects of climate change, preserving biodiversity, among others. Despite their importance, these areas have been drained and transformed mainly into agricultural areas, leading to the release of huge quantities of greenhouse gases and the destruction of ecosystems. Following the election in September 2021, Mecklenburg-Vorpommern has now decided to become climate neutral by 2035. At the same time, the new federal government has decided to invest heavily in nature-based solutions. In Mecklenburg-Vorpommern, the EU 2030 climate & energy framework and the Land use and Forestry regulation for 2021-2030 (LULUCF) play an important role within their long-term vision of reducing greenhouse emissions, integrating climate and biodiversity goals oriented to establish near-natural peatland ecosystems as well as the rewetted peatlands. Although there is a clear intention of implementing the initiative by the local government and several local organisations, spatial planning and further implementation face challenges since there is a need for multi-level policy and spatial planning integration. In particular, the EU Common Agriculture Policy (CAP) makes it difficult for rewetted peatland to compete. Stakeholder participation and co-creation of desirable future for these areas is critical and will allow the identification of instruments and tools that could positively transform those areas. The Arena is of the responsibility of CoKown, an interest group in rewetting peatlands in Mecklenburg-Vorpommern.

Task 4.2 aims to develop the experimental component of BioValue to understand how biodiversity is currently considered in spatial policy and planning processes, and to test the application of the analytical frameworks of Task 1.3 and Task 4.1. Task 4.2 entails the following aspects:

1. Elaboration of the Arenas for Transformation methodology together with WP1, WP2 and WP3 leaders, building upon the analytical framework components of Task 4.1, and the IPBES / GBO-5 levers and leverage points.
2. Development and implementation of the Arenas, addressing local planning and project implementation within the context of multi-level planning processes.

3. ES mapping and assessment in each Arena for Transformation, using the framework and methods developed in Task 1.3.
4. Exploration, together with local and regional actors, how the improvements suggested through BioValue can trigger transformative change to enhance biodiversity, what are distributional implications, net gains, and the strategic and operational coherence with the adapted analytical framework criteria.
5. Monitor the learning and capacity-building processes around the transformative potential of SP&MI, EAI, and E&FI in spatial policy and planning processes.

The main objective of this report is to **present a synthesis of the work and results achieved by the Arenas for Transformation, based on the work developed within each Arena**. It represents Deliverable 4.3 (D4.3) 'Arenas for Transformation II: Synthesis Report on the case studies and monitoring progress'. This report focuses on the achievements and work developed by the Arenas between month 3 and month 32.

1.2 Arenas for Transformation: approach and transformative change

This sub-section presents the guidelines for the design of the Arenas for Transformation methodological approach, in such a way that supports empirical investigation on the role and capacity of the instrumental perspectives to generate transformative change that values biodiversity in spatial policy and planning processes. The design adopted builds upon principles of 'transition management', and on knowledge and lessons learnt from existing international / EU projects and initiatives on transformative change (see Milestone 1). The design also builds upon the adapted analytical framework components of Task 4.1 (Deliverable 4.1 – Figure 1), that serves as inspiration, and on the IPBES / GBO-5 levers and leverage points, and drivers of change.

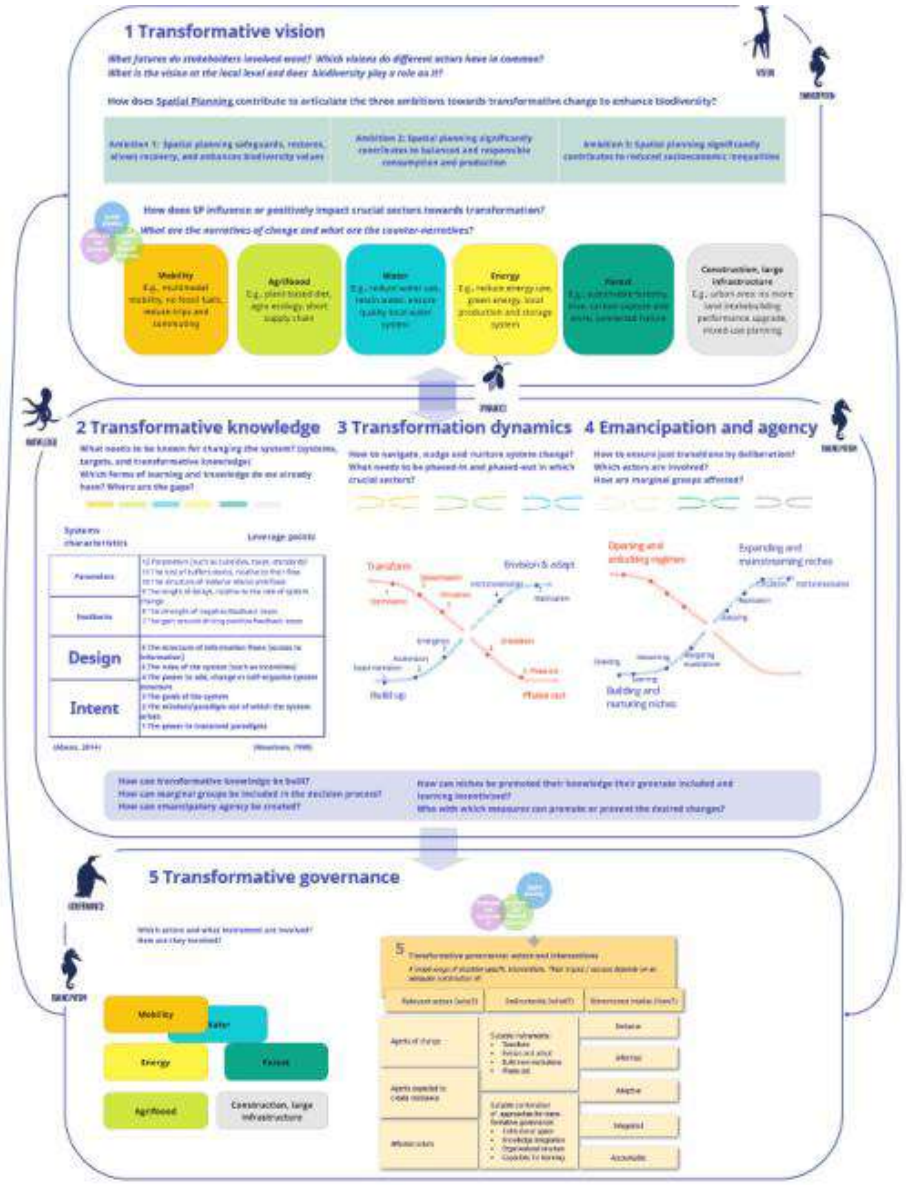


Figure 1. BioValue Adapted Transformative Change Framework (retrieved from D4.1)

The adapted transformative change framework aims to support a better understanding on how to make transformative change possible in a structured and integrated way, seeking to operationalise the analysis of spatial planning transformations that value biodiversity. The framework represents BioValue theoretical understanding of transformative change in spatial policy and planning processes, as well as the specific transformative elements to pay particular attention to (Vision, Knowledge, Dynamics, Agency, Governance). It aims also to support the identification of entry points and try out interventions to trigger the transformation of the Arena's spatial policy and planning systems.

Within the adapted version of the of the transformative change framework, three key ambitions were proposed, outline below, that would help to identify, understand and evaluate the potential and the role of spatial planning in supporting transformative change for biodiversity (see D4.1). Using the key ambitions as orientation formulating objectives, they can help to address cross-cutting challenges that currently affect biodiversity and thereby help to orient change towards more transformative outcomes.

- **Ambition 1:** spatial planning safeguards, restores, allows recovery and enhances biodiversity. As is emphasised in target 1 of the Kunming-Montreal Global Biodiversity Framework (KMGBF), inclusive spatial planning should be ensured to bring the loss of areas of high biodiversity importance, including ecosystems of high ecological integrity, close to zero by 2030. Here, spatial planning usually operates in direct ways by reducing or enhancing certain uses in certain areas. Examples of approaches that significantly contribute to this ambition are Nature-based solutions and ecosystem services.
- **Ambition 2:** spatial planning significantly contributes to balanced and responsible consumption and production without external social and environmental costs. Here, the effects of spatial planning can induce more balanced, sustainable territorial relations between urban, peri-urban and rural communities. Examples of approaches to contribute to this ambition are the reduction (and stop) of land take and land consumption and urban food system production.
- **Ambition 3:** spatial planning significantly contributes to reducing socioeconomic inequalities, for example, in the context of urban areas, which is reflected, e.g., in unequal access to transport, housing, among others that primarily affect the integration of marginalised communities, migrants, youth, and disadvantaged groups.

In BioValue the Arenas are seen as 'experimental' areas for action and territorial expression of the capacity of BioValue instrumental perspectives (SP&MI, EAI, and E&FI) to create transformative change for valuing biodiversity. They function as spaces of interaction where spatial policy and planning processes unfold and co-creation of knowledge and learning is promoted with core local actors for the transformative potential of the instrumental perspectives, but also of the people and organisations in it.

The methodological approach of the Arenas is designed around six main components that support the experimental aims of BioValue as to a) understand how biodiversity is considered in spatial policy and planning processes, b) how can biodiversity be valued and enhanced in spatial policy and planning processes, specifically considering the multi-level nature of planning processes, and c) to test the application of, and further design the BioValue analytical frameworks of Task 1.3 (ecosystem services mapping and assessment to mainstream biodiversity value in spatial policy and planning), and Task 4.1 (BioValue adapted transformative change framework).

Methodologically, the components are interlinked in their objectives and function in a semi-successive way (Figure 2). Also, it is recognised that the transition processes of the Arenas are not concurrent, and that each Arena has its own pace in their works. It is assumed, at first hand, that the transformation of the spatial planning processes of the Arenas is promoted using the three instrumental perspectives, as each has its own transformative potential and can promote conditions for transformation. The integration of the instrumental perspectives is crucial to allow the spatial planning of each Arena to recognise and incorporate biodiversity values, acting upon opportunities to promote the desired transformative change. The work of the Arenas also assumes that how spatial planning is thought and design matters to the transformative potential of the instrumental perspectives and of the spatial planning process itself. It supports the outline of impact pathways towards transformative change valuing biodiversity.

While the ambitions were used as key aspects in thinking of and collaborative discussing the arenas transformative vision, elements of knowledge, dynamics, agency and governance were

central in the work developed by the arenas. Each specific transformative element of the framework was integrated into adopted methodological approach, as shaped the outline of impact pathways towards transformative change valuing biodiversity for each component of the approach, as listed below.

Figure 2. Methodological Approach to the Arenas in BioValue

Problematise

Define the spatial policy and planning challenge.

- Gain an initial understanding of the Arenas and promote early reflections.
- Map the spatial policy and planning system and local priorities and identify the drivers that influence the spatial planning processes.
- Understand local challenges and what drives them.
- Identify the needs.

Envision

Identify expectations for the desired future.

- Explore biodiversity values and the relationships with local challenges and needs.
- Acknowledge the expected outcomes that translate desired futures.
- Understand the Who and their capacities for action.
- Understand and explore transition processes.

Agenda setting

Develop the agenda that accelerate transformative change.

- Identify institutional boundaries and breakthroughs that accelerate (and shape) change.
- Develop actions that reflect the transition process.
- Clarify the strategic agenda.

Activate

Connect and challenge the status quo and co-create critical mass for transformative change.

- Translate the strategic agenda to concrete actions.
- Map the 'Who is Who'.

- Mobilise knowledge and capacities.
- 'Cross-pollinize' potentials of the instrumental perspectives.

Reflect and Evaluate

Create space for learning and reflection on the challenges and expectations.

- Reflect upon / update expectations.
- Provide space for learning on mainstreaming and institutionalisation.
- Evaluate expectations, agendas, actions, and monitor fulfilments.

Scale Up and Out

Impact the spatial policy and planning multi-level system.

- Promote co-creation of knowledge through platforms.
- Participate in events to share and discuss Arena's developments.
- Communicate and disseminate outputs.
- Share innovation.

Three types of main activities were developed with and in the Arenas, as explained below:

- Transformation Action Workshop (TAW): TAW are, in BioValue, a series of spaces of collective thinking to co-create action-oriented knowledge and transformative pathways throughout the Arenas processes. Specific objectives of the TAW are to a) support the co-creation of transformation processes of the Arenas, b) formulate needs and opportunities for change, c) promote discussions in the Arenas, d) facilitate knowledge brokerage within and between the Arenas, and e) advance and test improvements for the joint application of the instrumental perspectives. A total of four TAW will take place throughout BioValue life span: 1) Transformation Dynamics (month 9), 2) Spatial Planning Ambitions (month 15), 3) Spatial Planning Process (month 23), and 4) Transformative Potentials (month 30).
- Impact Dialogues (ID): Critical platform for fostering dialogue and advancing innovative approaches to integrating biodiversity considerations into spatial planning, engaging with external actors. Five impact dialogues were developed, each focusing on a specific objective in exploring relevant aspects of BIoValue:
    - ID#1: Towards biodiversity-inclusive and transformative spatial plans in Europe – a comparison of practices (held in March 20th 2024).
    - ID#2: Benchmarking biodiversity – how well are we integrating it in environmental assessments? (held in April 9th 2024).
    - ID#3: Exploring economic instruments in spatial planning for enhancing biodiversity values (held in September 5th 2024).
    - ID#4: Unlocking biodiversity value – biodiversity relevant transformative change in spatial planning (held in November 18th 2024).
    - ID#5: Potentials and challenges for triggering transformative change in arenas for transformation (held in December 2nd 2024).
- Side and Local Events: Place-based activities designed and promoted by the Arenas in their context, structured around their local strategic agenda of development, to promote impact pathways towards transformation in valuing biodiversity in spatial policy and planning processes. Several events promoted by the Arenas are considered in this report, such as

understanding of expectations, identification of biodiversity values, local meetings, workshops, among others.

The work with the Arenas for Transformation started in month 3 (September 2022), and in this document it is reported the development from that date until month 30 (February 2025). The synthesis of work will be presented considering the overall results/outputs of the different dynamics that happened in the reporting period, with explanations per Arena. Other documents can be looked for more detailed information (Milestones 2, 3, 7, 9 and 10, Reports on TAWs Replication, news shared in social media and BioValue website[2]).

Table 1 maps the dynamics (and activities) by its main objective and by methodological component of the approach, according to their specific aims and objectives as detailed below in this section. Section 3 highlights the results of the Arenas, where the integration of the abovementioned frameworks of Tasks 1.3 and 4.1 is considered, as well as results from WPs, supporting the development of a narrative of change of each Arena, and for the valuation and enhancement of biodiversity in spatial planning (overall for BioValue).

Table 1. Activities and Dynamics: Arenas for Transformation

	Problematise	Envision	Agenda Setting	Activate	Reflect & Evaluate	Scale Up & Out
Initial Understandings						
Biodiversity Values						
Spatial Planning Transformation Dynamics						
Spatial Planning Ambitions						
Arenas Transformative Agendas						
ESS Mapping and Assessment						
Spatial Planning Process: Instrumental Perspectives						
Impact Dialogues						
Pathways to Enhance Biodiversity in Spatial planning						
Local & Side Events						

1.3 Spatial Planning Process: Fundamental Understandings for the Arenas for Transformation Process

[*Excerpts from the Policy Brief - Partidário, 2024*]

Territories, and communities, to which spatial planning applies, have their specificities, as well as development and decision cultures, and even legal and governance systems, which establish different requirements. However, in a simplified way, it is possible to identify the key stages and activities that illustrate what a spatial planning process entails, with perhaps variable terminologies.

The generic spatial planning process (Figure 3) is within the competence of public or private administrations/governments at multiple levels and describes a sequence of various stages

[2] https://biovalue-horizon.eu/

where pertinent spatial planning activities take place. The sequence can be interrupted by feed-backs where circumstances require a re-analysis or jumps forward where changes in one stage may require implementation or evaluation for example. The process should be continuous in time and cyclical, with variable time scales and interconnections across different stages of the process. Depending on each case, the spatial planning process will have different feed-back loops across the cycle.

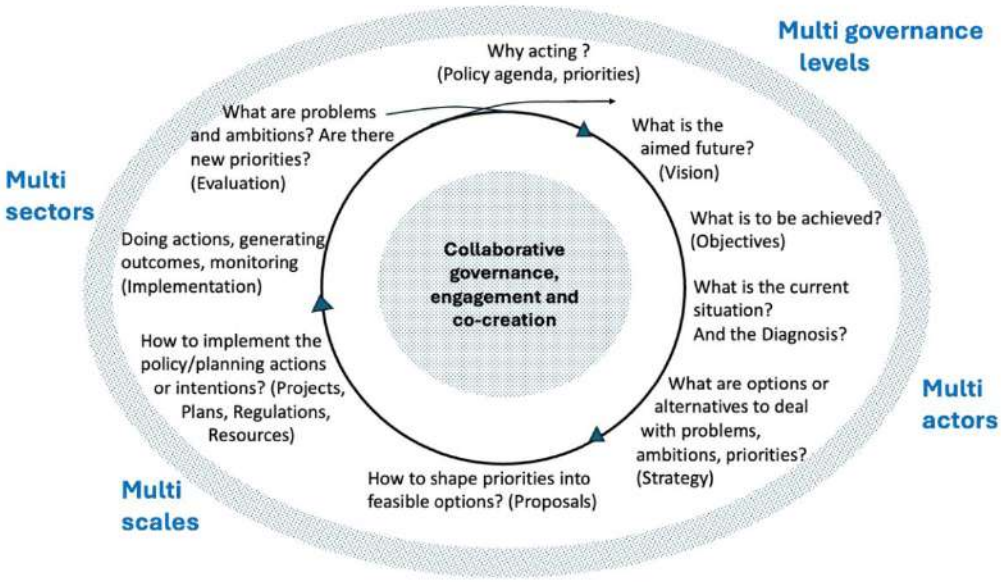


Figure 3. Generic representation of the cyclical spatial planning process (retrieved from Policy Brief - Partidário, 2024[3])

The spatial planning process takes place in a multiple dimensional context (actors, decision levels, sectors, scales as time and space). There are multiple decision levels that embrace multiple governance systems, with vertical and with horizontal organizational structures. The vertical structures invoke local, regional, national and supra-national levels of decision-making where different organizations display different competences, responsibilities and instruments that operate in an interconnected, and often hierarchical, way. The horizontal structures also invoke various organizations, public or private, but in a same level of decision-making, with hierarchical or non-hierarchical connections.

The spatial planning process is also described as operating in a multi-actor (different types of social groups and individuals representing various interests) and multi-sector (usually different economic and administrative sectors of activity) contexts, that require the definition of physical and time boundaries and different scales upon which the operationalization of spatial planning, and its outcomes, can be expressed.

A very important starting point is to recognize that BioValue focus is spatial planning, its policies, decisions and activities in upscaling opportunities for valuing biodiversity. Therefore, the focus of BioValue is not biodiversity, and how to measure biodiversity gains or losses, but instead biodiversity must be seen as the consequent beneficiary of BioValue action and outcomes. The biophysical component in spatial planning is currently still a complement, land take being

[3] https://biovalue-horizon.eu/resources/

dominated by the urbanization mentality. But spatial planning is also often a consequence of the way in which spatial plans manage land use dynamics, or even spatial plans may be absent in such land use and cover change decisions.

It is expected that the outcomes of the project WPs 1, 2 and 3 will be providing the Arenas with the necessary tools to allow experimenting how influential each of the instrumental perspectives can be in valuing biodiversity in their spatial planning processes, in terms of their individual action, in other words, exploring the transformative potential capacity of each instrument to create transformative change in spatial planning. That means using each instrument to:

- Ensure that the ecosystems services approach, and other possible mechanisms, are used as tools in SP&MI to integrate biodiversity as a trigger of a new form of spatial planning; that means use spatial planning to be the driver of land use change by identifying where to change, why (the focus Fundamental understandings in BioValue on the indirect drivers) and how much to change, and even where past changes can be reverted to allow new types of land use where benefits can be accrued from existing biodiversity values;
- Allow EAI to assist spatial planning in exploring different spatial planning options, in terms of types of land uses, and land cover changes that enhance opportunities for biodiversity, adjusting where to make land cover changes, where to revert to natural systems, where to consider the intensity of change, based on contextual realities, exploring different possibilities that result in improved outcomes for biodiversity.
- Expand existing, or formulate new, E&FI that can provide incentives and disincentives, to motivate new values and behavioural changes of various actors towards enhancing biodiversity in their land use planning, programming or project decisions.

Once the transforming capacities of each individual instruments are recognized and tested, their collective action is an integrated consequence of their fluidity with transformative objectives. SP&MI initiates the formulation of innovative land use proposals which are shared with EAI to consider the benefits for biodiversity values, fine tuning in an iterative and collaborative way to find the options that best serve the transformative objectives. E&FI supports this process in two ways: 1) by integrating the financial programme in the SP&MI, creating incentives for spatial planning biodiversity driven actions and disincentives to solutions that lead to biodiversity loss; and 2) by assisting the dialogue between the SP&MI and EAI in creating positive solutions to enhance biodiversity and help to demonstrate the increased value for investors in the medium to long-term.

BioValue could expect to reveal such process in the outcomes of the Arenas, which concurrently should also reveal what are bottlenecks and impediments to such streamlined process (in this report), and which conditions need to be put in place to allow this process to be successful. And this is to be included in the final deliverable of WP1, WP2 and WP3, summarized in the following sub-section.

1.4 Main Lessons from D4.2 (Arenas Interim Report)

From D4.2 (Interim Report on the Arenas for Transformation, M15), six main challenges were mentioned/raised by the three Arenas, expressed as the main path dependencies and obstacles in all the Arenas transition processes:

Perceptions & Awareness: Importance of understanding the different perceptions at stake, working towards change in promoting shared thinking about the importance of biodiversity for territorial development and spatial planning systems. Institutional backgrounds work as hinders / blockers of innovative ways of developing spatial planning processes, as a working style of 'compartmentalisation' of knowledge and responsibilities is taken by one (or a restrictive group of) actors that is seen as the 'authority' on that subject. Divergent perspectives on planning development, and on what constitute biodiversity value, varies among actors within the same territorial context, being a barrier to a collective imagination and construct of a transformative spatial planning process valuing biodiversity. There are still a common understanding and perception of biodiversity as a constraint, a blocker, with no value for development. Sensibilisation of local actors, capacity-building of those actors, is crucial to change perceptions and create more aware societies sensitive to biodiversity values and how those values can work as an anchor for positive territorial changes. An overall recognition that 'green does not have an economic value' and does not 'represent development' hinders transformation, and for that is important to overcome current perceptions of recognising value in all dimensions (economic, social and natural).

Regulations: Current regulations are restrictive in nature and may not be expressing, in a positive way, different policy options for spatial transformation that cope with biodiversity and nature. In the three Arenas, spatial planning is practiced as restrictive in terms of land uses and traditional in term of how it incorporates biodiversity – as it makes biodiversity been perceived as something structural that blocks development There is the need to overcome current practices of 'working in silos', as promoted by spatial planning systems, and to promote cross-sectoral approaches and more positive spatial plans that recognise land value and places biodiversity from a constraint to an enabler at regulatory level.

Ownership: Land ownership, private owners, are crucial in all the three Arenas spatial planning systems. It is important to shift from thinking of biodiversity and natural capital as restrictive to having policymakers/landowners to take ownership of their territories and thus recognize the possible uses of valued biodiversity.

Governance: As mentioned, spatial planning systems are complex systems composed by a range of actors with different institutional expectations and notions of what needs to be considered in spatial planning and what are biodiversity values. And cooperative and collaborative practices are not the norm in spatial planning. Thus, spatial planning governance systems need to promote relational approaches to promote cooperation and collaboration among different decision-making levels.

1.5 Main messages from WP1-3

The adapted analytical framework of T4.1 (on the operationalisation of analysis of biodiversity consideration and enhancement in spatial planning) presumes analysis in terms of how the instrumental perspectives address direct and indirect drivers of biodiversity loss and in terms also of the specific contribution of those perspectives in enhancing transformative change for biodiversity.

Each WP developed research on a specific instrumental perspective (WP1 on SP&MI, WP2 on EAI, and WP3 in E&FI), culminating the three in a capacity gap analysis and recommendations for future pathways in enhancing their transformative potential in valuing biodiversity within spatial policy and planning processes. Such elements are included in D1.4, D2.3 and D3.4, that considered also the work and discussions with the Arenas throughout the project implementation. Also, results are coherent with the main challenges identified in D4.2, as can be seen analysing the previous sub-section and the below summaries of WP findings (for more information please see D14, D2.3 and D3.4).

WP1

Table 2. Main findings WP1 SP&MI with relevancy for the work of the Arenas (retrieved from D1.4 report)

Capacity Gaps	Recommendations
Expertise. Resources. Institutional coordination (internal and external). Horizontal collaboration. Vested interests. Priority on short-term economic gains.	Enhance habitat quality and connectivity through SP&MIs to support biodiversity. Address conflicts and ensure equity and inclusivity. Capacity building and institutional coordination. Promote synergies and avoid trade-offs. Integration of SP&MI, EAI and E&FI.

WP2

Table 3. Main findings WP2 EAI with relevancy for the work of the Arenas (retrieved from D2.3 report)

Capacity Gaps	Recommendations
Limited integration in spatial planning processes. Linear thinking. Disrupted tiering. Inadequate baseline studies. Limited development and use of scenarios and alternatives. Insufficient address of cumulative impacts. Limited use of enhancement and vague implementation requirements. Reactive use of the mitigation hierarchy and limited enforcement of mitigation measures. Inadequate monitoring and evaluation.	Integrating EAI into the vision building. EA built upon systems thinking. Successfully implemented tiering. Broadening studies in the diagnosis phase. Enhancing the development and use of scenarios and alternatives in the strategy phase. Addressing cumulative impacts. Improving focus on and enforcement of enhancement measures. Strengthening proactive application and enforcement of the mitigation hierarchy. Enhancing application of monitoring and evaluation in EAI.

WP3

Table 4. Main findings WP3 E&FI with relevancy for the work of the Arenas (retrieved from D3.4 report)

Capacity Gaps	Recommendations
Lack of concrete biodiversity-related guidance in the design of many E&FI, including essential knowledge and information needed. Lack of assessment on the multi-level biological consequences of human interventions. Need for guidance on comprehensive design that includes resource use aspects. Lack of instructions on adapting E&FIs to different planning contexts.	Account for biological principles. Identify opportunities to promote changes in consumption and production. Think creatively and broadly with empowerment and innovation. Ensure effective stakeholder engagement and use synergies. Built on available data and information from planning processes. Acknowledge transition processes.

Lack of guidance on identifying and engaging stakeholders in terms of their roles in biodiversity and ecosystem-related activities. Insufficient guidance on stakeholder engagement in E&FI design and implementation Capacity to identify financing sources apart from public funds. Absence of monitoring mechanisms to track ecological outcomes of proposed interventions. Need for consistent leadership. Lack of supporting regulatory and institutional environment.	Be pragmatic and adaptive in implementation and where possible in design. Establish reflective follow-up after implementation and explore broader applications. Integrate results from monitoring and evaluating E&FI outcomes into standard processes.

Complementarity between results – integrative recommendations:

An integrative outlook of the results of the WPs 1 to 3 in terms of the instrumental perspectives (SPMI, EAI, E&FI) transformative change potential is indicated below, that allows to explore for each arena how the integrative recommendations were considered throughout the experimental process.

Capacity Building and Institutional Coordination:

- Addressing capacity gaps
- Enhancing expertise and resources
- Improving institutional coordination (internal and external)
- Promoting horizontal collaboration
- Capacity building initiatives

Integrated Planning and Innovative Approaches:

- Integration of spatial planning, environmental assessment, and economic instruments
- Enhancing habitat quality and connectivity through spatial planning
- Promoting synergies and avoiding trade-offs
- Strengthening the mitigation hierarchy and its enforcement
- Enhancing monitoring and evaluation processes
- Accounting for biological principles in instrument design

Multi-actor Collaboration and Inclusivity:

- Addressing conflicts and ensuring equity
- Improving actors identification and engagement
- Promoting creative thinking and empowerment
- Ensuring effective stakeholder engagement in instruments design and implementation

1.6 Reporting structure

First a synthesis of the achievements of the arenas for transformation is made, exploring the use and application of the instrumental perspectives and the overall lessons for the specific spatial planning processes. No specific mention will be made to concrete methods applied, only if necessary, remaining the focus on this report on results instead of processes.

It follows with an identification of key learning points from the arenas for transformation, gleaned key messages to promote transformative change in spatial planning for biodiversity valuation, and suggestions for moving forward.

2. Arenas for Transformation: Synthesis of Achievements

The work of the Arenas is explored in terms of the identification of needs and how those needs are addressed through a series of change activities and events for transforming their spatial planning processes.

This section entails achievements from the Arenas, following a coherent structure for comprehensive and integrative analysis in Section 4. First a context and expected outcomes of each Arena is presented, followed by the Arenas individual methodological approach; is then presented a synthesis per Arena of their innovations and achievements in relation to the spatial planning processes and instrumental perspectives; key messages from the Arenas conclude the synthesis of achievements based on expected BioValue outcomes.

This Section represents the voice of the Arenas, their perspectives, point-of-views and analysis of their own achievements.

2.1 Arenas for Transformation contexts and expected outcomes

Fersina River (Trento, Italy):

The City of Trento, located in the north-eastern Italian Alps, spans 157.28 km^2 and is home to over 119,000 inhabitants. As a medium-sized city, Trento embodies a plural identity, balancing innovation and smart development with the rich historical and cultural heritage of an Alpine town.

Trento's urban development strategy is guided by principles of sustainability, digital transition, and quality of life, consistently placing the city among the top-ranked in Italy for these aspects. The city benefits from a modern service-based economy, supported by a well-established public-private partnership—evident in the presence of the University of Trento and several innovative research centres.

Trento's spatial planning is shaped by its unique geographical setting and environmental assets, which necessitate a careful balance between urban growth and ecological preservation. The city actively integrates green and blue infrastructure, promoting solutions that enhance environmental sustainability while fostering economic and social development. The Municipality of Trento collaborates with subsidiary companies and the Third Sector to implement urban and territorial policies that prioritize regeneration, mobility, and biodiversity conservation. This commitment is reflected in ongoing projects such as the *Metaprogetto*, which outlines a broad framework for urban regeneration, and the selection of the Fersina River course as a key area for biodiversity-oriented planning.

In recognition of its strong civic engagement and participatory governance, Trento has been awarded European Volunteering Capital for 2024, further reinforcing its role as a forward-thinking city committed to sustainable and inclusive urban development. This strategic vision provides the foundation for the city's participation in the BioValue project, where Trento aims to explore innovative ways to integrate biodiversity into spatial planning, ensuring the long-term resilience of its urban ecosystem.

The Municipality of Trento, through its Mobility and Urban Regeneration Project, was invited in September 2021 by DICAM (Department of Civil, Environmental, and Mechanical Engineering) at the University of Trento to take part in the European BioValue project as a case study.

The BioValue project explores decision-making processes and policies that influence biodiversity conservation in urban areas. The invitation to participate stemmed from the strong alignment between BioValue's objectives and the Municipality's urban regeneration efforts, particularly the *Metaprogetto*—a framework guiding sustainable urban transformation. Given this synergy, the Fersina River course was selected as a study area, as it represents a key element in Trento's ongoing urban renewal strategy.

Traditionally, as also felt in Trento, urban planning has treated biodiversity conservation as a matter of protecting specific designated areas. However, new spatial planning approaches—such as green and blue infrastructure and nature-based solutions—are increasingly recognized for their role in integrating biodiversity into urban growth and development.

The Fersina River course, as part of the *Metaprogetto*, provides a testing ground for applying and evaluating these approaches within Trento's broader urban regeneration process. Through BioValue, Trento Municipality aimed to:

- Assess how biodiversity considerations are integrated into spatial planning decisions at different governance levels.
- Identify opportunities to enhance biodiversity within urban ecosystems by leveraging green and blue infrastructure strategies.
- Encourage a shift towards more biodiversity-conscious urban policies that align with EU strategic priorities on nature conservation.

Expected Outcomes: By participating in BioValue, the Municipality of Trento expected to achieve the following key outcomes:

1. Guidelines and Policy Recommendations – Formulation of evidence-based recommendations to enhance biodiversity integration into urban planning and regeneration efforts.
2. Cross-Sectoral Collaboration – Strengthening cooperation between environmental experts, urban planners, and policymakers to create synergies between biodiversity conservation and urban development.
3. Pilot Initiatives – Identifying concrete interventions within the Fersina River area that can serve as models for sustainable urban transformation.
4. Long-Term Urban Strategies – Embedding biodiversity-oriented planning principles into the Municipality's long-term spatial planning framework.

By participating in the BioValue Arena, Trento aimed to move beyond traditional conservation strategies and establish biodiversity as a central element in the city's future development, ensuring both ecological and social benefits for urban communities.

Mafra Municipal Master Plan (Mafra, Portugal):

Mafra is a Portuguese municipality located in the Lisbon Metropolitan Area, covering approximately 292 square kilometres and home to around 86,521 residents (data from 2021).

Situated between the Atlantic Ocean and rolling countryside, Mafra boasts diverse landscapes, from coastal cliffs and sandy beaches to agricultural lands and protected forests.

Mafra has key environmental and cultural landmarks including Ericeira World Surfing Reserve, designated in 2011 as the first surfing reserve in Europe, and *Tapada Nacional de Mafra*, a UNESCO World Heritage Site with rich wildlife that provides opportunities for ecotourism, education, and research.

The municipality supports traditional activities including agriculture, fishing, and handicrafts, which coexist with growing tourism and urban development. Despite its proximity to Lisbon, Mafra has retained much of its rural charm, making it a focal point for balancing development with conservation.

Mafra's spatial planning efforts face several key challenges including urban expansion threatening rural and natural areas, biodiversity loss from land conversion, and effective resource management. The municipality's Master Plan underwent significant revisions in 2015 and 2023, with a second revision initiated in 2024 to address long-term sustainability.

Mafra's current spatial planning focuses on preserving coastal and rural landscapes, promoting sustainable tourism through low-impact ecotourism, enhancing climate change resilience, and integrating community participation through participatory planning workshops.

The Municipality of Mafra was invited to participate in the European BioValue project to explore innovative approaches to spatial planning that balanced development with environmental stewardship. The invitation stemmed from strong alignment between BioValue's objectives and the Municipality's urban regeneration efforts, particularly the ongoing Master Plan revision process.

The BioValue project explored decision-making processes and policies that influenced biodiversity conservation in urban areas. Through BioValue, Mafra Municipality aimed to:

- Assess how biodiversity considerations are integrated into spatial planning decisions at different governance levels.
- Identify opportunities to enhance biodiversity within urban ecosystems by leveraging green and blue infrastructure strategies.
- Encourage a shift towards more biodiversity-conscious urban policies that align with EU strategic priorities on nature conservation.

Expected Outcomes: By participating in BioValue, the Municipality of Mafra expected to achieve the following key outcomes:

5. Guidelines and Policy Recommendations – Formulation of evidence-based recommendations to enhance biodiversity integration into municipal spatial planning and regeneration efforts.
6. Cross-Sectoral Collaboration – Strengthened cooperation between environmental experts, urban planners, and policymakers to create synergies between biodiversity conservation and urban development.
7. Pilot Initiatives – Identified concrete interventions within key areas that served as models for sustainable territorial transformations.

8. Long-Term Urban Strategies – Embedded biodiversity-oriented planning principles into the Municipality's long-term spatial planning framework.

By participating in the BioValue Arena, Mafra sought to move beyond traditional conservation strategies and establish biodiversity and natural capital as a central element in the city's future development, ensuring both ecological and social benefits for urban and rural communities.

Peatlands in Mecklenburg-Vorpommern (Mecklenburg-Vorpommern Pomerania, Germany):

A band of peatland sites stretches from west to east across northern Germany. This North German Peatland Belt today comprises peatland areas of over 1.8 million hectares of which many were drained to use them for agriculture. The rewetting of these areas was one of the key starting points for climate protection in the north-easternmost federal state of Mecklenburg-West Pomerania.

Greenhouse gas emissions from drained peatlands used primarily for agriculture and to a lesser extent for forestry accounted for around 30% of Mecklenburg-Vorpommern 's greenhouse gas emissions. Given the climate protection targets that were set, rewetting these areas and thus turning them from a CO_2 source into a CO_2 sink was necessary.

The state government of Mecklenburg-Vorpommern worked on translating climate protection goals into state legislation and developed climate protection law which was adopted in 2025. Current policies hindered peatland rewetting at the necessary scale of 50,000ha per year to meet the climate targets, particularly the incentives set under the EU's Common Agricultural Policy (CAP) and their translation to the national and federal state level.

The envisioned large-scale rewetting of peatlands was so far-reaching that it could be described as an important step towards transformation in terms of land use changes and the underlying agricultural models. It massively questioned the narratives of progress of the 20th century and brought about new landscapes and farming methods, representing transformative change as defined by fundamental, system-wide reorganisation of technological, economic and social factors, including paradigms, objectives and values.

The natural extent of peatlands was estimated at 287,900 ha. Only 3% of these areas were still in a natural state. 55% was agricultural land, predominantly grassland and to a lesser extent arable land, and around 17% was used for forestry. Small-scale peatland rewetting was already taking place in Mecklenburg-Vorpommern, often motivated by nature conservation concerns or combined with agricultural (paludiculture) or another economic utilisation.

The rewetting of these areas meant changing especially agricultural use by either abandoning agriculture or changing to paludiculture (the agricultural utilisation of wet peatland). Few farmers had endeavoured in these practices. Rewetting peatlands meant that agricultural practices needed to change, with commonly grown products like animal fodder and grains being replaced by plants cultivated in wet soils, including reeds and grasses for energetic or material use, water buffalo, alder trees or typhi grass.

Mecklenburg-West Pomerania was invited to participate in the European BioValue project to explore decision-making processes and policies that influenced biodiversity conservation in urban areas, specifically focusing on the multi-faceted endeavour of large-scale rewetting from different spatial planning perspectives. The arena was characterised by multiple planning

processes developed at different levels, which overlapped, depended on, hindered, and supported each other.

Through BioValue, Mecklenburg-West Pomerania aimed to:

- Observe and facilitate mainstreaming of biodiversity in rewetting as a policy option under the Climate Protection Law
- Consider multi-level aspects of planning while bringing together different actors from different sectors
- Overcome challenges to enable the integration of climate protection with biodiversity conservation
- Assess how different instrumental perspectives could tackle large-scale rewetting challenges

Expected Outcomes: By participating in BioValue, Mecklenburg-West Pomerania expected to achieve the following key outcomes:

1. Policy Integration – Mainstreaming of biodiversity considerations into climate protection policies and large-scale rewetting initiatives.
2. Multi-level Coordination – Strengthening cooperation between different planning levels and administrative sectors to address the complexity of peatland rewetting.
3. Instrument Development – Identifying and developing spatial planning instruments that could enable large-scale transformation while protecting biodiversity.
4. Knowledge Transfer – Sharing insights and pathways for transformation with relevant stakeholders and influence broader policy development.

By participating in the BioValue Arena, Mecklenburg-West Pomerania sought to enable transformative change that would simultaneously address climate protection goals and biodiversity conservation through innovative spatial planning approaches to peatland rewetting.

Arenas expected outcomes – achievements and outputs supporting the work developed throughout BioValue implementation

The results from the arenas reports in this Deliverable are addressing the expected outcomes of the arenas, as showcased in Table 5, that supports the work developed by each of the arenas and the impact pathways implemented for each.

Table 5. Arenas reaching the expected outcomes – outputs from the work implemented

Expected outcomes	Outputs
Fersina River (Trento, Italy)	
Formulation of evidence-based recommendations to enhance biodiversity integration into urban planning and regeneration efforts	SEA actions catalogue (mitigation and enhancement measures). SP&M instruments catalogue for spatial planning processes. ESS indicators and mapping.
Strengthening cooperation between environmental experts, urban planners, and policymakers to create synergies between biodiversity conservation and urban development	Manifesto Fersina. Institutional collaboration for pilot projects implementation and funding. Foundation for future Biodiversity Enhancement Municipal Plan.

Identifying concrete interventions within the Fersina River area that can serve as models for sustainable urban transformation	Manifesto Fersina. Integrating Green Infrastructure for Public Health ad Environmental Sustainability in Trento's New Hospital Project.
Embedding biodiversity-oriented planning principles into the Municipality's long-term spatial planning framework	Institutional change through regulatory integration of biodiversity in upper-level planning instruments (Trento Masterplan Revision). Protocol of Objectives. Support environmental strategies related to Urban Green Plan (e.g., biodiversity-based zoning). SEA actions catalogue (mitigation and enhancement measures).
Mafra Municipal Master Plan (Mafra, Portugal)	
Formulation of evidence-based recommendations to enhance biodiversity integration into municipal spatial planning and regeneration efforts	ESS mapping in land use/land cover map. SMOT Mafra platform (including formal monitoring scheme in the MMP formal evaluation).
Strengthened cooperation between environmental experts, urban planners, and policymakers to create synergies between biodiversity conservation and urban development	Co-creation of the municipal master plan transition pathway.
Identified concrete interventions within key areas that served as models for sustainable territorial transformations	ESS mapping and green infrastructure strategy in building and urbanisation regulations. Financial instrument for sustainable land management integrated in the MMP.
Embedded biodiversity-oriented planning principles into the Municipality's long-term spatial planning framework	MMP terms of reference including biodiversity as a key strategic asset for municipal planning and territorial development. SEA integration in the in the pre-phase of the MMP revision (territorial vision development). Financial instrument for sustainable land management integrated in the MMP.
Peatlands in Mecklenburg-Vorpommern (Mecklenburg-Vorpommern Pomerania, Germany)	
Mainstreaming of biodiversity considerations into climate protection policies and large-scale rewetting initiatives	Strategic Environmental Assessment Policy Brief. Policy Brief on Peatland Futures.
Strengthening cooperation between different planning levels and administrative sectors to address the complexity of peatland rewetting	Strategic Environmental Assessment Policy Brief. Shared vocabulary for interdisciplinary collaboration.
Identifying and developing spatial planning instruments that could enable large-scale transformation while protecting biodiversity	Promotion of Value Chains and Economic Incentives.
Sharing insights and pathways for transformation with relevant stakeholders and influence broader policy development	Strategic Environmental Assessment Policy Brief. Promotion of Value Chains and Economic Incentives.

2..2 Processes and activities developed in the Arenas

Fersina River (Trento, Italy):

The Fersina River arena followed a structured approach to foster transformation, integrating both Transformation Action Workshops (TAW) and Side and Local Events (Table 6). These were designed to support co-creation, knowledge exchange, and the development of biodiversity-sensitive spatial planning.

One of the main objectives has been the active involvement of 144 local stakeholders, including municipal and provincial technical departments, political representatives, local NGOs, research institutions, citizen representatives, sports associations, and educational institutions. This engagement has been facilitated through workshops, technical working groups, and local events, fostering participatory and constructive dialogue.

Table 6. Fersina River arena: activities, methods and stakeholders involved

Phase	Activities Conducted	Methods Used	Stakeholders Involved
Problematise	Identification of key challenges related to biodiversity and urban planning in Fersina River.	Stakeholder meetings, surveys, workshops.	Municipal and provincial offices, NGOs, community groups, educational institutions.
	Reactivation of the train stop near the canyon area to foster public mobility and shift to a more sustainable touristic model in a highly naturalized area.	Technical worktables, best practices presentation, TAW involvement.	Municipal and Provincial Technical offices, National Railway Representatives.
Envision	Definition of expected outcomes for the river's revitalization.	Co-creation workshops, policy discussions.	Municipal and Provincial Technical offices, NGOs, research groups, citizen representatives.
	Area of influence for the New Hospital construction at the river delta to regenerate the Fersina and create a fluvial park in relation to the development of the area.	Technical worktables, best practices presentation, TAW involvement.	New Hospital Commissioner, Provincial Health Services Agency, Municipality Urban Planning Office, University of Trento.
	Manifesto Fersina to disseminate BioValue principles and identify regeneration hotspots and best practices replicable in the Arena context.	Dissemination of Manifesto, through a plenary presentation and press dissemination.	All stakeholders, Mayor, political representatives and local press involvement.
	Discussion on formalizing and establishing a Natural Protected Park in the Canyon Area.	TAWs, Technical Workshops, Institutional discussions.	Municipal and Provincial Technical Offices, Political representatives, NGOs (Ecomuseum, Alpine guides, SAT), District representatives.
Agenda Setting	Development of key intervention pathways for the river.	Participatory planning, working groups.	Institutional and non-institutional stakeholders.
Activate	Initial implementation of identified interventions.	Pilot projects, regulatory discussions.	Municipality, Province, NGOs, scientific institutions.

Phase	Activities Conducted	Methods Used	Stakeholders Involved
	Discussion on the construction of a new bike path in the canyon area (provincial level and funding, project ready) for alternative modes of mobility.	Technical worktables, best practices presentation, TAW involvement.	Municipal and Provincial Technical Offices, Political representatives Municipal and Provincial.
	Integration of the benefits of Green Infrastructure, NBS and ESS assessment in the New Hospital competition brief.	Design brief annex: Report, analysing ESS and suggested actions to mitigate extreme climatic events, produced by the University of Trento.	University of Trento (WP1), New Hospital Commissioner, Provincial Health Services Agency, Municipality Urban Planning Office.
Reflect & Evaluate	ESS mapping of area around the Fersina River, basis of Fersina regeneration masterplan.	Workshops, technical worktables, reviews	Research partners (WP1), local research groups (e.g., MUSE, fluvial ecologists), Urban Regeneration Office.
	SEA and EIA workshops on Mitigation and Enhancement leverage actions.	Workshops, worktables.	Research partners (WP2), Municipal Technical Services: Regeneration Office, Urban Planning Office, Environmental and Ecological Transition Office.
	Economic and Financial Instruments workshop on fund capturing tools	Workshops	Research Partners (WP3) and Urban Regeneration Office
	Discussion on public reception to spatial conversion of streets into new public spaces/ naturalised spaces (i.e. sacrificing street and parking spaces).	Workshops, Technical worktables, reviews.	Municipal and provincial offices, NGOs, community groups, educational institutions.
Scale Up & Out	Strategies for broader policy influence and replication.	Policy recommendations, formal agreements (Protocol of Objectives).	Regional planning offices.

Mafra Municipal Master Plan (Mafra, Portugal):

The Mafra Municipal Master Plan arena followed the BioValue methodological approach to address its spatial planning challenges. The Problematise phase involved exploratory workshops and interviews aimed at understanding systemic barriers to integrating biodiversity into spatial planning. Key challenges identified included urban expansion pressure, fragmented ecosystems, poor inter-institutional collaboration, and data gaps on biodiversity and ESS.

Mafra then developed a vision for its planning process anchored in its unique ecological and cultural assets. The guiding motto, "*Protection of High Natural Values (Biodiversity) of Mafra Associated with Improving Quality of Life*" reflects the municipality's dual goals of ecological preservation and socioeconomic equity. The goals of the vision included establishing a green infrastructure network to protect and enhance biodiversity across urban and rural areas, managing tourism sustainably by promoting eco-tourism and emphasizing local cultural heritage. The vision also highlighted the tangible and intangible benefits of natural assets to foster stronger public support for biodiversity conservation. Stakeholders collaborated to outline an adaptive territorial framework that prioritized the integration of ESS into land-use decisions.

The agenda-setting phase translated the vision into actionable goals. Specific strategies included developing agroparks to encourage sustainable farming practices, establishing mechanisms like a Municipal Soil Reserve to regulate land allocation based on its ecological and productive potential, and integrating green and blue infrastructures to enhance connectivity between habitats while providing urban resilience to climate change (e.g., flood management). Innovative ideas were introduced, such as green credits to incentivize sustainability-oriented activities and a system for transferring development rights to limit urban sprawl while compensating landowners. This phase also emphasized the importance of reducing institutional silos and improving interdepartmental coordination within the municipality.

The activation phase involved mobilizing knowledge, engaging stakeholders, and implementing concrete actions based on the agenda. Highlights included the revision of the Municipal Master Plan (MMP), which incorporated biodiversity as a central consideration, with expanded indicators to monitor connectivity, ESS and protected areas. A participatory process brought together municipal technicians, local businesses, environmental groups, and academia to co-develop policies and prioritize conservation efforts. Stakeholders contributed to mapping key ecological areas and identifying ESS critical to both biodiversity and community well-being.

Mafra integrated regular reflection and evaluation mechanisms to ensure its actions remained aligned with its vision. Key activities included reports like State of Land Use Planning Report (SLUPR) to include new biodiversity-related metrics, such as ESS valuations and ecological connectivity. These indicators provided a framework for monitoring progress. Workshops and meetings with stakeholders were held to gather feedback on the effectiveness of planning measures, allowing for iterative adjustments.

In the final phase, scale-up efforts aimed to influence broader regional and EU-level goals. Mafra's approach aligned with Portugal's National Spatial Planning Policy Program (PNPOT), contributing to the promotion of sustainable territorial development across Portugal. The municipality's emphasis on habitat restoration and ecological connectivity directly supported EU-wide goals of protecting at least 30% of land and sea by 2030, as outlined in the EU Biodiversity

Strategy for 2030. Mafra also participated in regional and international knowledge-sharing events, positioning itself as a model for biodiversity-integrated planning.

Peatlands in Mecklenburg-Vorpommern (Mecklenburg-Vorpommern Pomerania, Germany):

The work in the Mecklenburg-Vorpommern (MV) Arena was implemented using a methodology adapted to a context of stakeholder fatigue and a dynamic political situation following elections. Consequently, the primary mode of engagement was conducted through a series of key informant interviews instead of larger workshops, following the thematic guidelines provided for the Transformation Action Workshops (TAWs).

The work of the Meck-Pomm arena explicitly used the three key ambitions from the TC framework of D4.1 integrated in the TAWs, having been translate as:

- Ambition 1: The large-scale rewetting in Mecklenburg-West Pomerania is implemented considering biodiversity as an objective
- Ambition 2: Mecklenburg-West Pomerania implementing large-scale rewetting contributes to balanced and responsible consumption and production
- Ambition 3: Mecklenburg-West Pomerania implementing large-scale rewetting contributes to reducing socioeconomic inequalities

From Ambition 1, analysis centred in rewetting has having have both positive and negative effects on biodiversity. However, the overall sustainability of the area is in any way increased as greenhouse gas emissions are reduced, and the soils are not degrading further as they do under drained conditions. Biodiversity benefits mainly arise through habitats being created for animals and plants that have long lived in the area but have been restricted to small remains of wet peatlands with the large scale draining of soils in the last centuries

From Ambition 2, analysis centred in rewetting expectedly reducing negative externalities of production, as the emission of climate harming gases from the soil is lowered, groundwater recharge is given, and the soil organic matter is no longer depleted. However, the potential for improving consumption by using sustainable products from paludiculture, like reed roofs, house insulation or packaging materials is still underdeveloped. The value chains are missing, and it is a hen and egg problem as processing companies claim that there is too little product to upscale production and farmers claim that there is no secure outlet market yet.

From Ambition 3, analysis centred in recognising that land ownership and land management are not the same group of people (i.e., people who own the land do not manage the land). The land ownership is commonly divided between many different owners, which means that farmers that want to change land-use (e.g. with rewetting) need to get consent from many people. The issue of land ownership makes it difficult to assess ex ante who would benefit or be disadvantaged by large-scale rewetting. For climate protection, rewetting is eligible for funding under the AECM scheme. However, crops produced to not feed into an existing value chain just yet and therefore mean insecurity regarding income and value of the land. The value of the land is an important parameter for farmers who have taken out a loan from the bank as the land is often used as a surety.

Over the project's lifespan, four rounds of data collection were undertaken:

- The first round (July 2022 - May 2023) consisted of eleven interviews. These aimed to identify current rewetting activities impacting biodiversity, outline subsystems and elements for phasing in/out, understand the transition process state, and test the X-Curve visual tool. Stakeholders' categories included were from the Federal State Ministry, Academia, Planning consultants, and Farmers Association.
- The second round (December 2023 - February 2024) comprised four interviews following TAW II guidelines. These focused on understanding interventions for transformative change, exploring the Arena's contributions to BioValue ambitions, and identifying transformative pathways. Stakeholders' categories included were from the Academia. Water sector, Nature Conservation, and Planning Administration
- The third round (February 2024 - May 2024) combined three interviews with a stakeholder workshop during the project consortium meeting in Germany to gather input for TAW III. Stakeholders' categories included were from the Planning Administration, Nature Conservation, and Private Sector.
- The fourth round (Summer 2024) combined eight interviews with a co-facilitated workshop in November 2024, focusing on economic instruments and incentives in collaboration with WP3. Stakeholders' categories included were from the Private sector, Public Administration, Farmers Association, Nature Conservation, Funding agency, and Academia.

In addition to the formal interviews, the arena team engaged in participant observation at locally and regionally organized events, such as public consultations and workshops organized by other projects and ministries (Table 7). This approach allowed for the sharing of BioValue knowledge and furthering discussions in existing local forums. The final engagement of this type was the BioValue ID Webinar 5 in December 2024.

Table 7. Peatlands in Mecklenburg-Vorpommern: events of participant observation

Timeline	Activity
Nov 22	Participation in a public consultation process concerning the development of the climate protection law of the Ministry of climate protection, agriculture, rural areas and environment, Mecklenburg-West Pomerania, Germany
Nov 22	Participation in a multi-stakeholder Workshop organized by the Ministry of climate protection, agriculture, rural areas and environment, Mecklenburg-West Pomerania, Germany
Feb 23	Organisation of a university seminar to discuss the arena problems and options with students of landscape ecology
Apr 23	Participation in a public consultation process concerning the development of the climate protection law of the Ministry of climate protection, agriculture, rural areas and environment, Mecklenburg-West Pomerania, Germany
Nov 23	Workshop participation in Malchin organized by the project MoorReturn
Nov 23	Participation in a workshop organized by the Federal Office of Agriculture and Food, Germany
Jan 23	Participation in a workshop organized by the German NGO AbL "Zukunft braucht Höfe"
Feb 24	Organisation of a university seminar to discuss the arena problems and options with students of landscape ecology
Dec 24	Impact Dialogues Webinar 5

2.3 Arenas for Transformation experiments: innovation and achievements synthesis in relation to the spatial planning processes and instrumental perspectives

Fersina River (Trento, Italy):

Transformation Action Workshops

The first Transformation Action Workshop was conducted on June 22, 2023, using the "X Curve" method with broad stakeholder involvement, bringing together a diverse and representative group of participants. The workshop included citizens representing the four districts bordering the river (Povo, Argentario, San Giuseppe-Santa Chiara, and Oltrefersina) including district Presidents; Municipality of Trento representatives from departments of Mobility and Urban Regeneration, Sustainability and Ecological Transition, Urban Planning, Primary Urbanisation Works, and Road and Park Management; Province of Trento experts from Mountain Basin Services, Urban Planning and Landscape Protection, Environmental Enhancement, APPA Environmental Protection Agency water quality sector, and the Commissioner for the new Trento hospital complex; University of Trento DICAM Department; energy production companies Director of Dolomiti Energia and NOVARETI; and other organizations including MUSE, Next-Step, Ecomuseo Argentario, SAT, Alpine Guides College, Fishermen's Association, Liceo Galilei and Scuole Savio, and a Fersina river residence representative.

Figure 4. Fersina River arena: TAWs group discussions

The study area was divided into three sections with distinct physical characteristics and usage potential: The Canyon, The Urban Area, and The River Mouth. Participants addressed four key questions regarding current perceptions of the Fersina River, expectations for transformation, available tools, procedures, and constraints, and next steps to achieve meaningful change. The methodology helped identify challenges and weaknesses to be minimized while emphasizing key values and opportunities to be reinforced.

The enthusiastic participation and proactive contributions reflected high interest and expectations surrounding the river's redevelopment, while highlighting the complexity of coordination among various governing bodies as a major challenge. Main findings included improving river access by reconsidering embankments in urban and mouth areas and better

managing the canyon zone; enhancing connectivity between the river, surrounding areas, and sustainable mobility networks; strengthening environmental aspects, promoting renaturalization and biodiversity where possible; and highlighting the historical, cultural, and recreational value of the river, particularly in the canyon area.

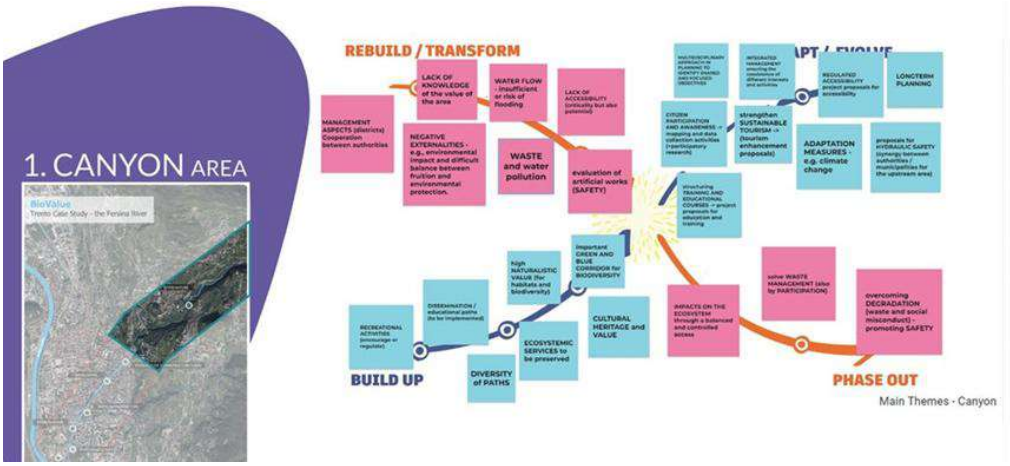


Figure 5. Fersina River arena: Canyon X-Curve example

Seven main concerns were identified: excessive artificiality of the river with need to renaturalize riverbanks while balancing flood risk protection; loss of biodiversity and aggressive vegetation management leading to habitat loss with strong demand for green corridors and fluvial parks; limited accessibility and public use with citizen desire for dedicated areas allowing closer water interaction; lack of integrated governance requiring improved collaboration between government levels; water pollution and environmental degradation from various sources; lack of awareness and cultural recognition with demand for educational initiatives; and need for improved soft mobility and public spaces through reduced car traffic and enhanced public transport options.

The second Transformation Action Workshop (TAW II) held on the 26/03/2024, was a significant milestone, as it brought together stakeholders, institutional representatives, citizens, and the press to present the results of TAW I and the Technical Tables. The entire body of work—its vision and objectives—was condensed into what is now called the Manifesto Fersina. This document serves as a visual guide for the Arena, capturing the aspirations voiced by stakeholders and providing key project references.

A video survey of the entire section of Fersina River within Trento's municipal boundaries was presented, conducted by the department as a narrated documentary aimed to enhance communication about the BioValue project, strengthen public awareness of the Fersina River's historical and ecological significance, and serve as visual survey document to support project development. Furthermore, during the workshop, a survey was conducted to assess how stakeholders and citizens perceived and engaged with the discussed themes—particularly those related to biodiversity preservation and enhancement.

The Manifesto Fersina is divided into three sections, each represented by a distinct colour:

- Green – The Canyon
- Yellow – The Urban

- Red – The Delta

It highlights potential hotspots along the river, identified through stakeholder consultations, and includes site photographs. These hotspots represent areas that would benefit from regeneration efforts, focusing on biodiversity enhancement, preservation, and recreational activities. Some of these locations will serve as pilot project sites, with one already entering the construction phase.

Additionally, reference projects discussed during the technical worktables were mapped to relevant, replicable locations within the municipality. These are complemented by a set of nature-based solutions (NBS) tailored to the local context and inspired by the showcased projects.

Figure 6. Fersina River arena: Manifesto Fersina

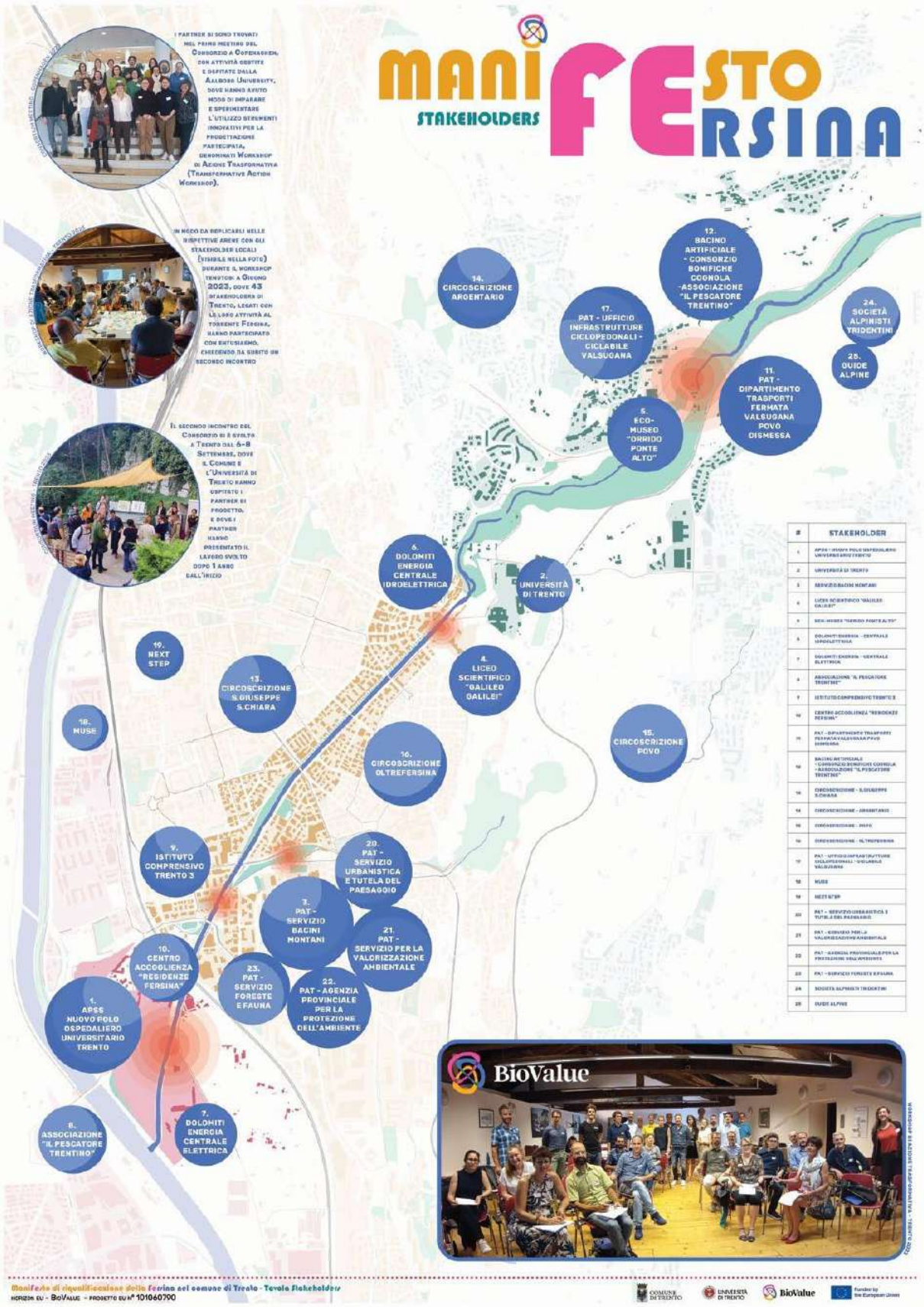


Figure 7. Fersina River arena: Manifesto Fersina stakeholders mapping of priorities for intervention

Thematic worktables

Following the workshop, insights were shared with BioValue partners, and further stakeholder meetings were held to address common themes across all three study areas. Key discussions included:

- Hydraulic safety and management with the PAT Mountain Basin Service.
- Green space planning and maintenance with relevant municipal and provincial offices, including the Parks and Gardens Office and the Environmental Enhancement Service.
- Mobility planning and management with the PAT and National representatives
- Showcasing Worldwide examples of relevant projects adaptable in the Trento Context

This collaborative effort shaped a shared vision for the Fersina, ensuring its environmental, cultural, and recreational potential is fully realized. The worktables were structured into three different sessions, dividing them according to the thematic area and asking the relevant Stakeholders to participate, some already present at the TAW others new participants.

- Urban Technical Worktable - 16/11/2023
    - Participants: 14
    - Institutional Level: Provincial Technical Offices (PAT), Municipal Technical Offices (Comune di Trento)
    - Non-Institutional Level: University Researchers (UniTN)
- Delta Technical Worktable - 30/11/2023
    - Participants: 14
    - Institutional Level: Provincial Technical Offices (PAT), Municipal Technical Offices (Comune di Trento), Health Services Agency (PAT)
    - Non-Institutional Level: University Researchers (UniTN)
- Canyon Technical Worktable - 14/12/2023
    - Participants: 22
    - Institutional Level: Provincial Technical Offices (PAT), Municipal Technical Offices (Comune di Trento)
    - Non-Institutional Level: National Railway Representative, University Researchers (UniTN), Energy Production Representative, Ecomuseum, Fishermen Association

Figure 8. Fersina River arena: Technical worktable replicable examples in the Arena

Integrating Green Infrastructure for Public Health ad Environmental Sustainability in Trento's New Hospital Project

Following its successful participation in TAW 1 and subsequent technical work sessions with the New Hospital Commissioner and the Head of the Provincial Public Department, the Urban Regeneration Office, in collaboration with the University of Trento, proposed integrating BioValue objectives into the New Hospital Design Competition Brief to support the regeneration of the Fersina River Delta. As part of this effort, the University of Trento conducted an analysis and assessment of the area, which was annexed to the competition brief.

The document Green Infrastructures for Enhancing Public Health: A Review Tailored to the New Hospital Area (Trento) explores the role of ESS in guiding the implementation of green infrastructure (GI) around the new hospital. Conducted by researchers from the University of Trento, the study evaluates the benefits of GI in key areas, including microclimate regulation, air quality improvement, physical activity, mental well-being, and biodiversity conservation. Findings suggest that green spaces can help mitigate urban heat island effects, filter pollutants, encourage outdoor activities, and promote patient recovery through nature exposure.

The study also considers the hospital's strategic location at the Fersina River Delta, highlighting the opportunity to create a fluvial park as part of the area's regeneration. The integration of nature-based solutions (NBS) and ESS assessments has been incorporated into the New Hospital Competition Brief, ensuring that environmental sustainability remains a central focus of the project. Additionally, an annex to the design brief includes a University of Trento report analysing the area's ESS and recommending actions to mitigate extreme climatic events.

The research underscores the urgent need for urban planners to integrate GI into hospital design, emphasizing its potential to improve health outcomes, enhance biodiversity, and address climate challenges. Key recommendations include designing multifunctional, well-connected green spaces, selecting tree species for optimal canopy coverage while minimizing allergenic effects, and ensuring accessibility. With strategic planning, the hospital project can serve as a model for sustainable urban development, benefiting both public health and the environment.

Co-design and the Protocol of Objectives

Following the Technical Worktables, a series of co-design meetings were held with the PAT Provincial Mountain Basin Service to define the practical implementation of the outlined vision and objectives. These meetings were particularly productive in addressing hydraulic safety issues, establishing collaborative goals, and refining institutional protocols.

These discussions laid the foundation for what has become Pilot Project #1 on the Fersina, which focuses on enhancing one of the hotspots identified in the Manifesto Fersina. The pilot project is regarded as both an experiment in an alternative type of public space focused on biodiversity and recreation, yet to be introduced in Trento, and a new bureaucratic process. Notably, the PAT Mountain Basin Service has formally granted the Municipality of Trento an experimental concession, allowing for the implementation of the proposed actions.

Additionally, the political administration is working on establishing a Protocol of Objectives, a formal agreement among institutional stakeholders involved since the outset of the dialogue with provincial technical departments, local citizens, and NGOs. This initiative lays the groundwork for

structured collaboration. Concurrently, efforts are underway to institutionalize the project by drafting a Memorandum of Understanding to formalize shared objectives and strategies.

This protocol aims to:

- Strengthen collaboration between different institutional levels,
- Ensure that the objectives of regeneration, biodiversity protection, and enhancement are met, and
- Streamline the design and implementation process.

Regarding Pilot Project #1, the first intervention area, identified as one of the "hotspots" in the Manifesto Fersina within the urban area, is the confluence of Rio Salé with Fersina River. The proposal involves creating stepped and ramped access to the riverbed without affecting road infrastructure, as work will be carried out exclusively on the embankment separating the two watercourses.

The design includes redesigning existing gravel islands to provide direct access to the riverbed, integrating walkable platforms and pathways; increasing the river's natural sinuosity to enhance aquatic ecosystems; treating the riverbed as park-like space with continuous vegetation management to support biodiversity and improve landscape quality; de-cementifying the confluence area of Rio Salé, restoring its natural course with gravel bed and boulders to improve water quality and oxygenation; and creating a "counter-façade" on left bank of Rio Salé to promote natural colonization of plant and animal species.

This intervention does not require major road modifications, except for construction of a pedestrian crossing connecting the area with Alexander Langer Garden, transforming it into natural extension and scenic viewpoint over the river.

The project is included in municipal budget as "Work No. 6758 -- Fersina-Rio Salé Confluence Remodelling," consisting of site studies, inspections, and project execution; upgrading existing ramp on right bank of Rio Salé for safe access to Fersina River's gravel areas; placing stepping stones to enable crossing of Rio Salé near gravel beaches; installing protective railings and security gate at staircase to restrict access during weather alerts, along with safety instruction signage; installing traffic deterrents to reduce vehicle impact; building raised pedestrian and cycling crossing to link intervention area to Alexander Langer Garden; planting trees and shrubs to enhance biodiversity; and installing urban furniture for public use.

Future phases envision comprehensive transformation of the area into a river park, including redesign, de-cementing, and renaturalization of Rio Salé riverbed; reconstruction of existing riverbed access ramp; creation of stepped terraces and barrier removal along entire embankment; redesign of Fersina River's embankments within intervention area; development of green façades to support river habitats; installation of low-impact lighting to minimize light pollution; and implementation of safety devices where necessary.

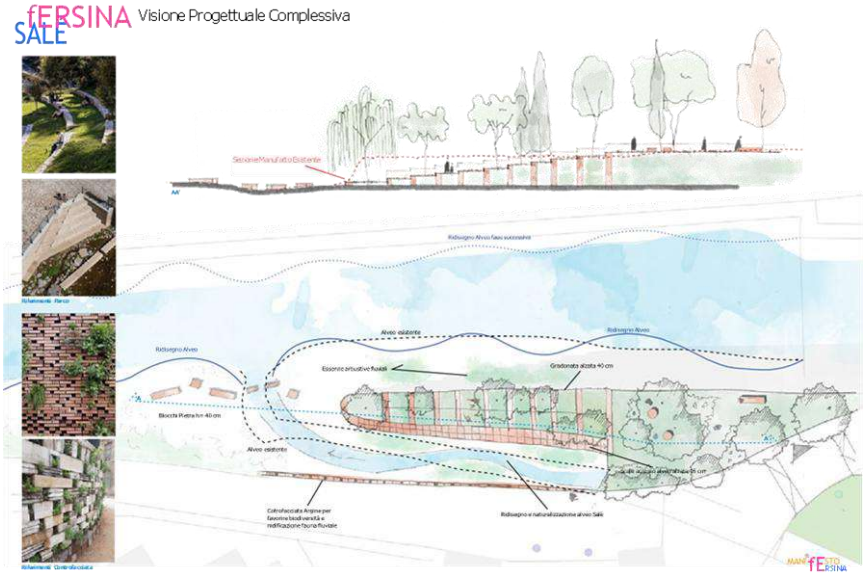


Figure 9. Fersina River arena: Pilot Project #1 - Render View of the final intervention; below, section of the project indicating the abacus of materials and references

Integration of BioValue in the Municipal Planning Tools

The last trimester of 2024 saw a fruitful integration of the BioValue iter in the Municipal ongoing revisions of the planning instruments. Most notably, two major milestones were achieved. In October 2024 the first technical variant of the PRG (the Urban Masterplan) was published and is currently under the revision process that will take approximately 3 years. Specifically, in article 86, the results of the TAWs and the BioValue principles were integrated, where preservation of spontaneous non-alien riparian vegetation must be applied, "choice cutting" to allow both hydraulic security and habitat maintenance, and the restoration of the river morphology through ecological enhancement interventions.

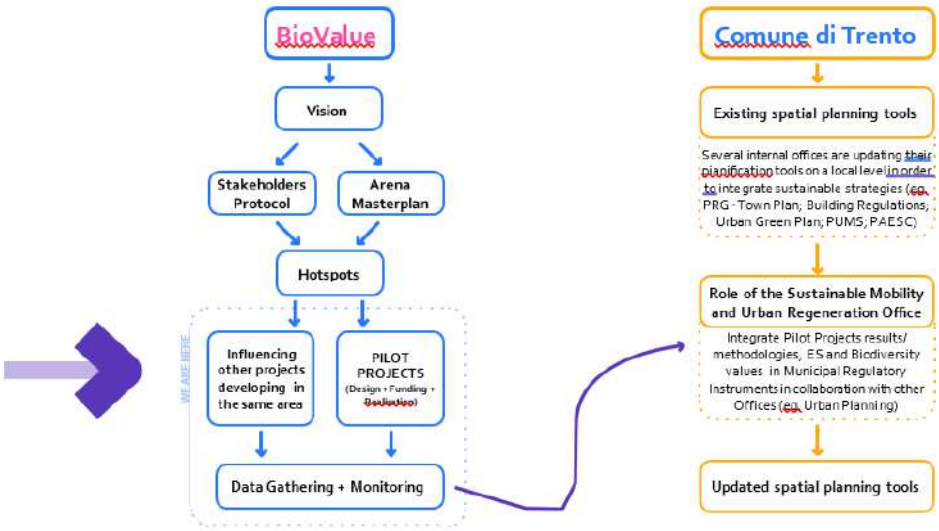


Figure 10. Fersina River arena: Spatial Planning Transition Pathway

The second milestone, achieved in December 2024, was integration of Fersina regeneration project and BioValue in environmental strategies related to Urban Green Plan. Under section B.3:

Enhancing and Redeveloping Urban Stream Corridors (Fersina and Salè) as Connections Between Valley Floor and Hills, guidelines and strategies from BioValue Project include improving biodiversity levels in urban and suburban river areas through alternative management approaches; establishing and formally protecting municipal area recognized at provincial level for high environmental and landscape value; and developing pilot project in urban area serving as model for enhancing and implementing ecosystem services locally.

These milestones demonstrate how BioValue has successfully influenced and become integrated into ongoing policies and planning instruments, laying foundation for comprehensive incorporation of biodiversity protection and enhancement principles. Following completion of pilot projects and monitoring phase, the goal is to fully embed biodiversity enhancement within planning instruments and methodologies.

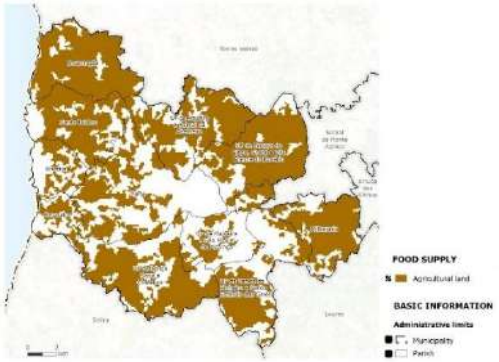
Mafra Municipal Master Plan (Mafra, Portugal):

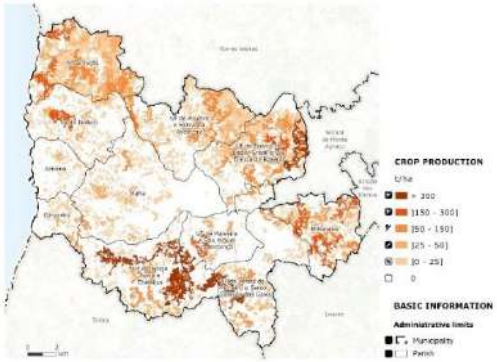
Ecosystem Services (ESS):

This work is fundamentally aimed at enhancing biodiversity in two key aspects: on the one hand, this mapping effort contributes to the Green Infrastructure, ensuring that these areas receive some form of legal protection; on the other hand, it seeks to assign economic value to these territories, including monetary valuation. This is particularly relevant given the significant discrepancy between the economic value of land designated for construction and that which is not.

At the municipal level, and within the framework of spatial planning, a truly transformative impact can be achieved by thoroughly understanding the benefits that biodiversity brings to the quality of life of citizens and determining its actual value. This valuation should be reflected in a well-structured ESS payment scheme.

From the broad spectrum of existing ESS, have been identified and selected ten that best represent the identity of our municipality: crop production, water supply, carbon sequestration, flood regulation, erosion control, pollination, habitat quality, recreation, "naturalness" (as a measure of landscape identity and habitat quality), and water quality (both freshwater - representing the network of water streams that connect the territory and coastal waters, which are linked to recreational opportunities). Out of these ten, so far have been successfully mapped only two; however, this remains an ongoing effort to complete by the end of the project and extend beyond its duration.





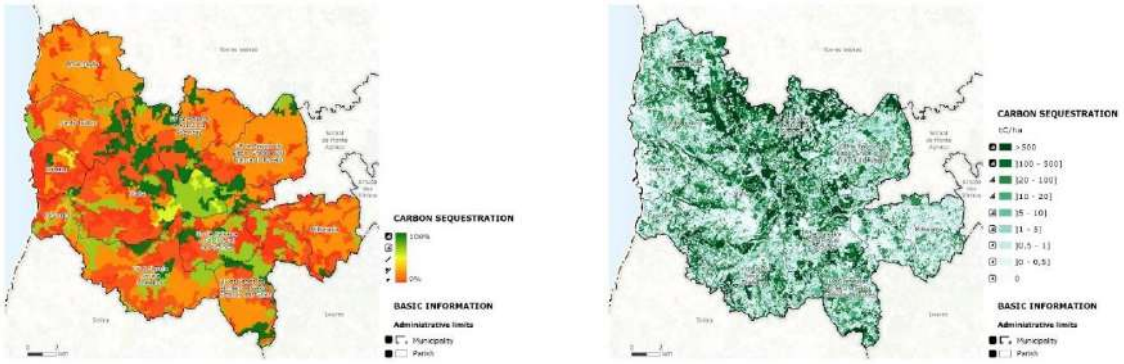


Figure 11. Mafra's MMP: Example of the ES mapping update (from right to left)

Although the mapping of ESS is a task of critical importance in Mafra Municipality, it does not have a direct correlation with Biodiversity itself. Recognizing this and following internal discussions with the various BioValue project partners, a complementary methodological approach has been proposed. This approach is intended to be developed either as a subsequent phase of the ongoing mapping work or in parallel with it, ensuring a more comprehensive understanding of the interactions between ESS and Biodiversity.

The proposed methodology involves the integration of a biodiversity scoring system alongside the valuation of ESS. This scoring system would be determined based on land use classification and aligned with the three fundamental principles of biodiversity conservation. The objective is to establish a quantitative framework that allows for a more precise evaluation of how different land uses contribute to Biodiversity preservation and ecosystem functionality.

By implementing this approach, the municipality aims to create a more holistic assessment of ecosystem value one that not only recognizes the economic and ecological benefits of ESS but also explicitly accounts for biodiversity considerations. This dual-layered analysis would provide valuable insights for spatial planning, environmental policy, and decision-making processes, ultimately fostering a more sustainable and biodiversity-conscious territorial management strategy.

Figure 12 illustrates a conceptual sketch of how this methodology would be applied, demonstrating the relationship between biodiversity scoring, ESS valuation, and land occupation patterns. This integrated approach is expected to strengthen the municipality's ability to implement targeted conservation measures and to develop innovative mechanisms, such as biodiversity-based incentives or ESS payment schemes, to support long-term sustainability goals.

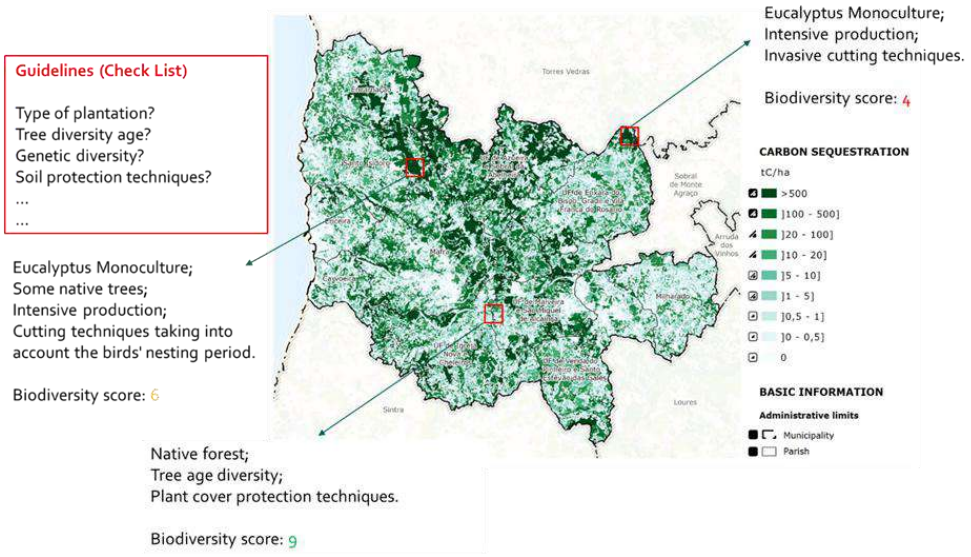


Figure 12. Mafra's MMP: Example of the Biodiversity/ES methodology for the Carbon Sequestration

Spatial planning transition pathways – co-creation:

In TAW I, the initial step involved identifying key local stakeholders capable of providing valuable insights based on their roles within the Mafra territory and their expertise in territorial dynamics. The first TAW was organized, bringing together a diverse group of participants, including representatives from local parish councils (those working directly within the territory), municipal technicians from departments related to environmental management, strategic development, urban planning, and civil protection. Additionally, the session included representatives from the agriculture sector, biodiversity conservation organizations, academia (universities and secondary schools), and the tourism sector. In total, 30 stakeholders actively participated in the workshop, contributing to a comprehensive and multidisciplinary discussion.

In this workshop, the X-Curve tool was employed to stimulate critical thinking and analyse the key dynamics influencing territorial planning and land management in Mafra. The overall results, presented in Figure 13, are structured around five main aspects that outline what needs to be transformed, adapted, created, or eliminated in urban planning to enhance biodiversity. These aspects include the role of stakeholder intentions, emphasizing the importance of understanding the aspirations and influence of different actors in shaping territorial planning decisions. Another crucial element is outdated legislation, as several legal frameworks are no longer aligned with current sustainability goals and require urgent revision. Governance also plays a central role, given that decision-makers with authority over land-use policies exert significant influence on the future of biodiversity integration. Additionally, awareness emerged as a key factor, highlighting the need to reinforce the understanding of biodiversity's role in improving the quality of life in Mafra and ensuring its integration into planning processes. Finally, valuation is imperative, as assigning economic and strategic value to biodiversity-rich areas is essential to enable them to compete equitably with urban land for investment and development considerations. By addressing these five dimensions, the workshop provided a structured approach to fostering a more sustainable, biodiversity-conscious urban planning framework in Mafra.

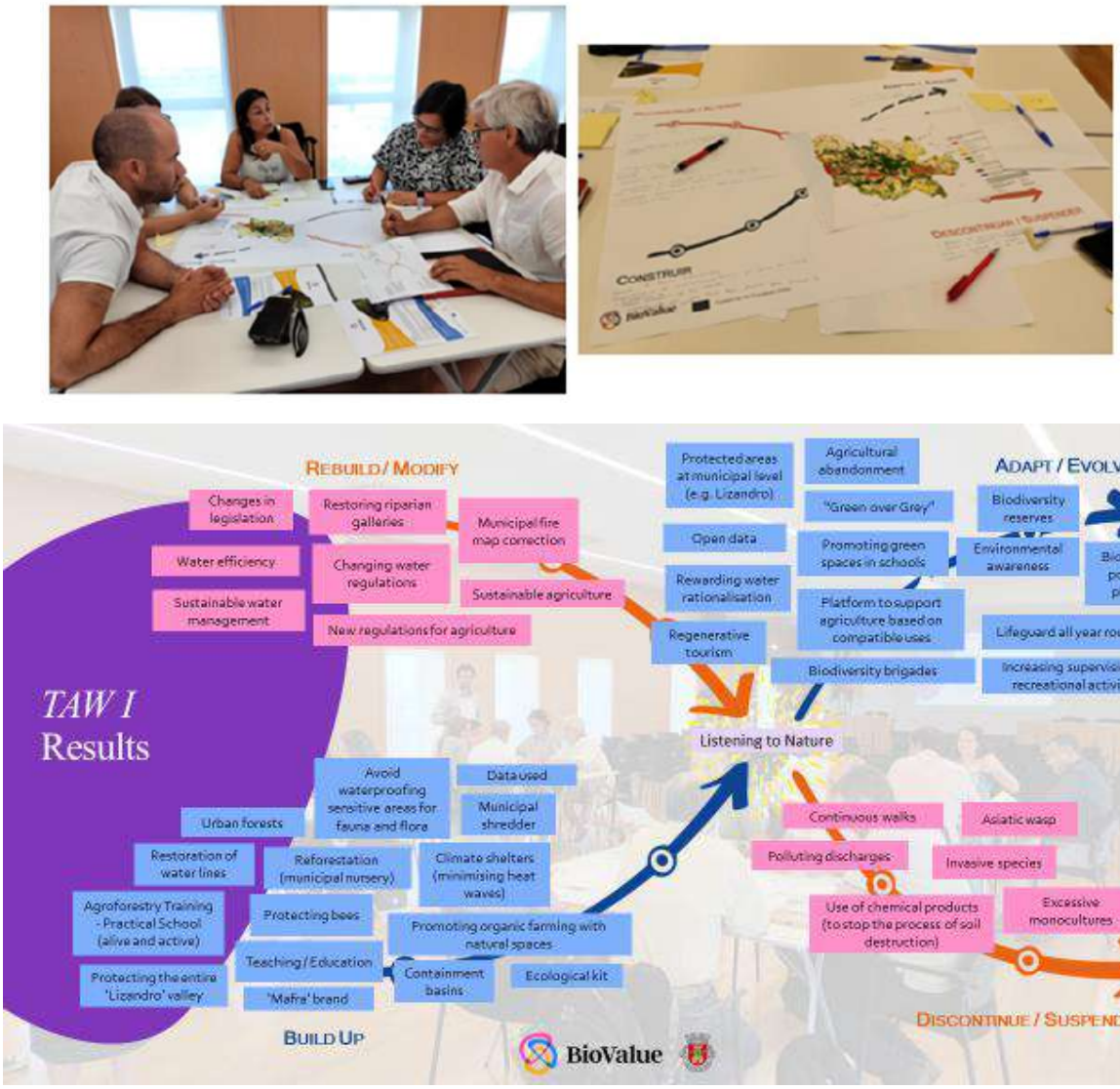


Figure 13. Mafra's MMP: Photographs taken during the workshop and overall results of TAW I.

Regarding TAW II and building upon the work carried out in the first workshop, was subsequently conducted, bringing together a broad range of stakeholders to discuss future scenarios and implementation strategies that balance biodiversity preservation with land-use planning. The group of stakeholders included representatives from central government, local parish councils, municipal technicians from departments related to environmental management, strategic development, urban planning. Also involved representatives from the agriculture sector, biodiversity conservation organizations, educational sector and tourism sector.

The workshop focused on establishing the connection between spatial planning instruments and the three strategic ambitions: safeguarding, restoring, recovering, and enhancing biodiversity through territorial planning policies; promoting balanced and responsible consumption and production, ensuring the integration of biodiversity in agricultural activities and urban development; and reducing socioeconomic inequalities by emphasizing environmental valorisation as a key element of territorial cohesion.

The workshop was structured into three main activities. The first activity involved the presentation of 20 images, created using artificial intelligence, which depicted various future

scenarios of land use/occupation for the Mafra territory. Participants were invited to engage with these images by briefly associating them with the three ambitions. Following this, they were tasked with constructing a composite image by "cutting and pasting" elements from the AI-generated images to represent all the ambitions or selecting one ambition (see the Introduction section) based on the group's preference. The summarized outcomes of this exercise included the following key themes: boosting renewable energies in the municipality; urban space with low-density multi-family buildings (3 storeys) with a division of opinions between green roofs or renewable energy roofs and a balance with kitchen gardens and green spaces; preservation of natural areas (riverside zones, woodlands and native forest); division of opinion between land reparcelling and not reparcelling rustic agricultural properties; preserving the traditional agricultural identity of the *Saloia* (variety of crops) in conjunction with the modernisation of agriculture, essentially for reasons of efficiency; protecting the coastline free of buildings; responsible tourism; very important environmental education and training; environmental certification. These elements reflect the values and priorities identified by participants regarding the desire future for Mafra.

The second activity focused on associating various spatial planning instruments with the composite image that had been created in relation with the assigned ambition. The instruments that emerged as most significant included: regulation of activities, direct payment mechanisms, environmental education and training programs, the integration of SEA in the formulation of the strategic vision, as well as monitoring Biodiversity and the provision of ecosystem services. This activity was essential for linking theoretical aspirations with practical implementation tools and provided valuable insights into the most effective means of realizing the ambitions for Mafra.

The third and final activity of the workshop was designed to foster individual commitment from each stakeholder. In this session, participants were provided with a blank letter, which they were asked to complete by writing down their personal or professional contributions to achieving the future in the composite images. This exercise aimed to create a sense of ownership and responsibility among stakeholders, ensuring that they actively engage in the project's long-term goals. These activities collectively contributed to deepening the understanding of the project's objectives, aligning the stakeholders' views, and laying the groundwork for future actions to enhance biodiversity in Mafra.

Figure 14. ;Mafra's MMP: Photographs taken during the workshop and overall results

The workshops had a highly positive impact on the municipality, as they facilitated the establishment of new institutional relationships between key stakeholders who significantly influence biodiversity in Mafra and the Municipal Chamber of Mafra. These workshops also contributed to reducing working in "silos" within the municipality by fostering better coordination between the various departments and divisions of the municipal organizational structure. A series of opportunities and ideas were raised due to the close interaction between the primary public entity in Mafra and its most relevant stakeholders.

Valuing biodiversity in Mafra's territory

As part of the BioValue project, several academic studies were conducted in which Mafra served as a case study, contributing to a deeper understanding of ESS and spatial planning. One of the key research efforts focused on the mapping of ES. Their work provided valuable insights into the spatial distribution and functionality of ESS within the municipality. Additionally, within this thematic scope, analysis was conducted on land value capture mechanisms in Ericeira. The study explored the role of equitable land-use planning tools in promoting sustainable urban development while ensuring a fair distribution of benefits and responsibilities among stakeholders. These academic contributions have reinforced the project's methodological approach, integrating scientific research into local policy and planning processes.

The research conducted by IST-ID has so far been structured into four workshops, all exclusively involving technicians from Mafra Municipality. The first workshop, divided into two sessions with different groups of participants but the same objective, aimed to identify ESS on a land use/land cover map based on the knowledge of municipal technicians. This exercise led to the mapping of eight ESS: visitation - recreation and tourism (2015–2017), crop production percentile (2018), avoided erosion (2018), total carbon sequestration (2018), baseflow index (2018), runoff retention (2018), pollination abundance index in spring – Apismellifera (2018), and habitat quality index (2018). The second workshop focused on presenting and validating the identified ESS and analysing the associated trade-offs, ensuring that the mapped data aligned with local knowledge and perceptions. The third workshop involved the construction of plausible future scenarios for

Mafra in relation with ESS, building upon the work carried out in the previous sessions. Finally, an additional workshop was held to link the developed scenarios with AI-generated futuristic images of Mafra's territory, combined with a deck of cards representing various spatial planning instruments studied within the project. This structured approach provided a comprehensive and participatory methodology for integrating ESS into local spatial planning processes, ensuring that decision-making is informed by both scientific data and stakeholder insights.

Figure 15. Mafra's MMP: participatory dynamics

Another research focused on the mapping of cultural ESS through a series of surveys carried out both internally within the Mafra Municipality and on a larger scale with the citizens. This study primarily involved a structured questionnaire comprising a set of questions related to cultural ESS, allowing participants to express their perceptions and values regarding these services. Additionally, respondents were asked to identify a specific location on a map (point), providing a georeferenced dataset that linked ESS to places within the municipality. This approach enabled a spatially explicit analysis of cultural ESS, facilitating their integration into local planning and decision-making processes.

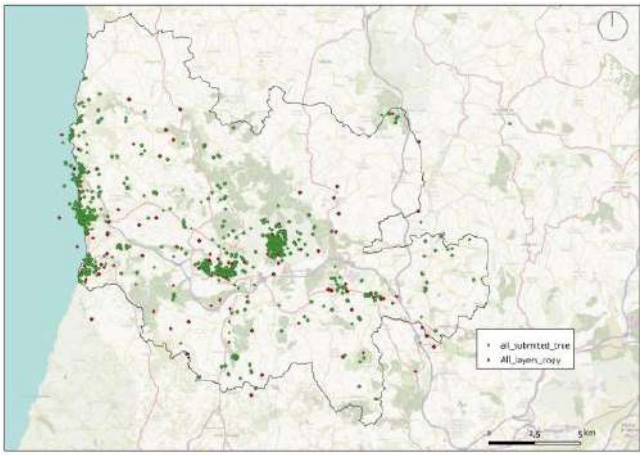


Figure 16. Mafra's MMP: participatory mapping of cultural ecosystem services

Another topic explored was the one of land value capture mechanisms in vacant plots within the urban area of Ericeira, aiming to enhance ecological connectivity and identify the most suitable

plots for providing recreational ESS. Were explored strategies to integrate these vacant areas into the broader urban and ecological network, ensuring that land-use planning decisions contribute to both environmental sustainability and public well-being. By assessing the potential of different plots, were provided valuable insights into how urban green spaces can be strategically managed to maximize biodiversity benefits and improve quality of life for local communities. Such insights will be carefully considered in the revision of the MMP, as well as at urban level planning.

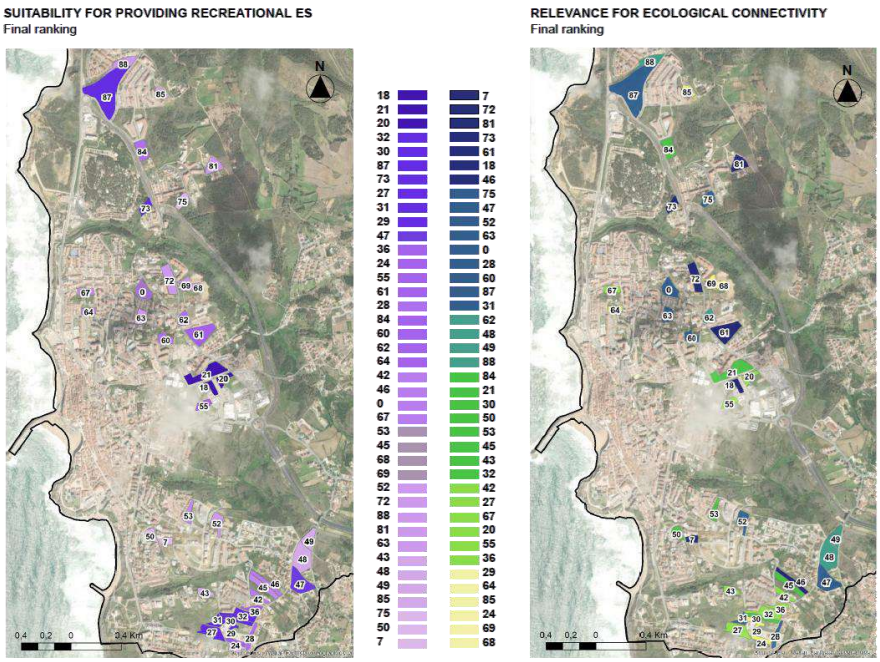


Figure 17. Mafra's MMP: ESS and land value examples of results

Peatlands in Mecklenburg-Vorpommern (Mecklenburg-Vorpommern Pomerania, Germany):

In the Meck-Pomm arena, the existing instruments of spatial planning, land consolidation programmes, strategic environmental assessment and promotion of value chains & economic incentives were used to discuss options of large-scale rewetting with key stakeholders. The aim was to elicit pathways of using or transforming existing instruments or to elaborate on new instruments needed to enable the transformation of the landscape and with it the economic and social impacts.

The work centred on instruments perceived as most powerful and influential, identified through a literature review and key stakeholder interviews. Actors were selected across different administrative and spatial levels using a snowball sampling approach. The analysis assessed the instruments' effectiveness, implementation challenges, and potential improvements.

The following instruments were mentioned in the interviews and subsequently analysed:

German name of instruments	English translation
AUKM Moorschonende Stauhaltung	AECM peatland rewetting
AUKM Paludikultur	AECM paludiculture
Baugesetzbuch	Building Code

Einmalentschädigungen	One-off compensation
Flächennutzungsplan	Land utilisation plan
Flurbereinigung	Land consolidation programme
Gutachterlicher Landschaftsplan MV	Expert landscape plan MV
Landesaufforstungsprogramme	State afforestation programmes
Landesplanungsgesetz	State Planning Act
Landesraumentwicklungsprogramm (LEP)	Federal State Spatial Development Programme
Landeswassergesetz	State Water Act
Markstrukturverbesserungs-Richtlinie	Market structure improvement scheme
Mittelständische Beteiligungsgesellschaft	Mid-tier investment firm
Mooragentur Mecklenburg-Vorpommern	Peatland Agency MV
MoorFutures / MoorFuturesflex / NABU Klima Plus (Treibhausgas-Zertifikatehandel)	MoorFutures / MoorFuturesflex / NABU Klima Plus (GHG emission certificate trading)
Naturparkplan	Nature park plan
Nutzungsuntersagung (befristet)	Prohibition of use (temporary)
Ökokonten	Eco-accounts (Pool of areas for compensation for the Impact compensation regulation)
Planfeststellungsverfahren nach Wasserrecht	Planning approval procedure under water law
Raumverträglichkeitsprüfung (projektbezogen)	Spatial impact assessment (project-related)
Regionale Raumentwicklungsprogramme/Regionalpläne	Regional spatial development programmes/regional plans
Raumordnungsgesetz (ROG)	Spatial Planning Act
Strategische Umweltprüfung (SUP)	Strategic environmental assessment (SEA)
Umweltverträglichkeitsprüfung (UVP)	Environmental impact assessment (EIA)
Vorbehaltsgebiete	Reserved areas (designated areas for special purposes)
Vorranggebiete	Priority areas (designated areas for special purposes)
Windenergieflächenbedarfsgesetz (bundesweit)	Wind Energy Area Requirements Act (nationwide)
Wasserrahmenrichtlinie (WRRL)	Water Framework Directive (WFD)
Zielabweichungsverfahren	Deviation procedure
Zuschuss für Unternehmensgründungen und -entwicklungen von Kleinstunternehmen im ländlichen Raum	Assistance for business creation and small businesses in rural areas

Spatial development programmes at state level and the regional spatial development programmes

In MV, spatial planning is implemented through two main instruments: the Federal State Spatial Development Programme (German: Landesraumentwicklungsprogramme) and the Regional spatial development programmes (Regionale Raumentwicklungsprogramme). In the latter, the designated areas for special purposes (Vorranggebiete und Vorbehaltsgebiete) are determined.[1] In the current developments of the climate protection objectives in MV, it is discussed, to establish the category of designated areas for climate protection or even more specific, for peatland protection.

These plans are regularly revised. Sometimes they are completely revised, but there are also partial updates, such as the current one (Regionaler Planungsverband Mecklenburgische Seenplatte 2024).

These formal planning instruments, which are governed by the Spatial Planning Act, offer the opportunity to integrate multifunctional multiple uses of land and to weigh up different utilisation claims and interests before the plan is approved. To this end, public bodies (German: Träger öffentlicher Belange), such as specialised authorities and associations, submit comments that are considered by the planning authority. There are also open participation procedures in which anyone can make comments and suggestions, and public hearings are also held.

Spatial planning in MV has several tasks. On the one hand, it defines the objectives and principles of spatial planning Ministerium für Wirtschaft, Infrastruktur, Tourismus und Arbeit Mecklenburg-Vorpommern 2024). Secondly, it attempts to bring together and weigh up the different interests and needs of the various stakeholders in the process of creating the planning documents. Spatial planning aims to weigh up all essential interests and concerns against each other and find a compromise solution. The federal state spatial development programme is updated every ten years and coordinated in a two-stage public participation procedure and discussion processes.

The federal state spatial development programme forms the basis for the regional spatial development programmes (Ministerium für Wirtschaft, Infrastruktur, Tourismus und Arbeit Mecklenburg-Vorpommern 2024). The areas designated for specific objectives, e.g. nature conservation or peatland protection, are defined at regional level. This is also where the priority areas for climate protection discussed at national level would be explicitly formulated in spatial terms.

These would have the advantage that climate protection would be prioritised in these areas. This use would therefore generally be given preference over other uses in the approval process and other uses that conflict with this would no longer be eligible for approval.

Designation as a priority area for climate protection or for peatland protection in the regional plans would also have the advantage of simplifying planning processes at regional and local level. This would also relieve the burden on the administration and send a signal to society.

Designated areas for rewetting or reserved areas for peatland protection

It is also conceivable to designate areas with priority for peatland protection in regional spatial development programmes. This would eliminate the need for costly and lengthy regional planning or deviation procedures and thus also relieve the burden on the regional planning authorities.

Local authorities have the option of “depicting such areas in the land use plan and designating them in the development plan” (Schlacke & Sauthoff 2024[4]: 199). In practice, however, in some places no land use plan is drawn up or it is only partially updated due to a lack of personnel and capacity. The instrument of land-use planning is particularly useful when a connection can be established with other development measures or concerns, such as flood protection.

Management plans

[4] https://moorwissen.de/news-detail/what-s-the-problem.html

In the implementation of nature conservation in the context of peatland protection through rewetting, the instrument of the management plan is mentioned by Uhl et al. 2024. This instrument, which is used in the planning of nature conservation areas, can set guidelines for management and impose conditions, such as bans on certain substance inputs, e.g. pesticides. However, for agricultural areas, this does not necessarily mean that for example use of pesticides is not allowed anymore, as often, agricultural land-use is given exemptions to ensure production. But, for the rewetted areas, management plans could be used to ensure sufficient water management. Additionally potential uses could be listed in them. The plans would be prepared in the planning process of the rewetting, together with the consultancy agency that does examine and appraise the rewetting. It is not yet clear how this would work legally though. Sectoral administrative agencies, like nature protection or water agencies would need to be involved in formulating and approving management plans.

Land consolidation programmes

Another instrument that was mentioned in the interviews and that could address the challenges associated with land ownership is the land consolidation programme (German: Flurneuordnungsverfahren). It addresses fragmented land ownership, and aims at combining property and building rights, and improves infrastructure in collaboration with stakeholders (Ministerium für Klimaschutz, Landwirtschaft, ländliche Räume und Umwelt Mecklenburg-Vorpommern 2022[5]). The objective in peatland rewetting is, to create large areas, where land ownership is in the hands of people willing to participate. Owners that are unwilling, can swap their land for parcels outside the area that is designated for rewetting. This is an important step towards large scale rewetting, as it cannot be implemented per individual land parcel, but always affects larger sections of the landscape, because drainage must be reduced or stopped and the water level below ground level must be raised.

As large, continuous areas are needed for large-scale rewetting, land swapping can be a good way of giving landowners the option to “opt out” of areas where many actors have agreed on rewetting. The arena of transformation in Mecklenburg-West Pomerania shows one example, where, for a large area, many land-owners have agreed to rewetting but one farming family who has recently invested in a large new stable cannot afford to change their land-use from fodder to paludiculture biomass production. This family is currently impeding the process and progress could be made, when their land within the area could be exchanged for land outside the area designated for rewetting.

Land consolidation programmes are used in rural planning to determine and reorganize ownership structures and rural land ownership and to shape rural areas through measures in accordance with the Land Consolidation Act and the Agricultural Adjustment Act (German: Landwirtschaftsanpassungsgesetz).

The instrument is already used for large scale spatial planning of infrastructure, e.g. for road planning. And it also has been used for nature conservation purposes already. This is indeed one

[5] Ministerium für Klimaschutz, Landwirtschaft, ländliche Räume und Umwelt Mecklenburg-Vorpommern (2022): Flurneuordnungsprogramm für das Land M-V 2022. Regierung Mecklenburg-Vorpommern. https://www.regierung-mv.de/Landesregierung/lm/Laendliche-Raeume/Flurneuordnung/

major advantage of this instrument: the federal state agency for this instrument already exists, so the administrative structures are in place and are well established.

However, large-scale rewetting has not been done yet using this instrument and it is unclear if capacities within the administration can be built up quickly to implement this option. Additionally, it needs to be considered that current land consolidation processes take 10 years or longer as to its complexity and the number of involved actors (Hirschelmann et al. 2023[6]). Also, climate protection is not yet a priority within this agency and would need to be put onto the agenda by a higher-level administration body.

However, there is great hope that the instrument of land consolidation could prove to be very effective, as it is well established and accepted by various stakeholder groups. Through large scale effects on the landscape, connectivity or other aspects of biodiversity could be enhanced in combination with climate protection.

Strategic Environmental Assessment Policy Brief

An analysis of SEAs in the context of the BioValue project found, that SEAs are often conducted at a rather late stage of processes, entailing a strong focus on mitigation strategies. Adopted earlier, SEA unfold potential to enhance positive outcomes, e.g., the integration of climate protection and biodiversity conservation. It is an effective tool to avoid trade-offs and highlight synergies. Additionally, it helps building acceptance of outcomes with the public. A policy brief was developed for higher-level of decision-making as ways of influencing the climate protection policy development in terms of assuming rewetting as a policy option.

For the example of large-scale rewetting, this would mean in practice, that, while rewetting large areas of formerly drained peatland, legislation would foster creating habitats simultaneously, making sure, these habitats are sufficient in size for endangered species, have a certain quality and help connect existing habitats. While in some cases, it might not be possible to reach all of this, SEA would help to assess the options to maximize benefits. It could additionally be useful to integrate nature conservation efforts and existing concrete measures for e.g. birds. Management plans could be established to enhance biodiversity.

Promotion of Value Chains and Economic Incentives

To implement peatland rewetting on a large scale and to support the change of land use in Mecklenburg-West Pomerania, different economic incentives for land-users and landowners are currently installed. One central approach is the promotion of value chains for agricultural products grown on wetlands, so called paludiculture. The biomass being grown on wetlands i.e. sedge, reed and typha can be processed into different products like cardboard packaging, raw cellulose, bioplastics and insulation for buildings.

The stage of technological development and the degree of implementability at scale of the different products however varies strongly. While cardboard packaging with paludiculture biomass as an additive is currently being piloted on a larger scale by the ‘alliance of pioneers’ a group of companies led by OTTO, a large German online retailer, the use of paludiculture biomass

[6] https://www.dbu.de/app/uploads/Ueberblick-zu-Hemmnissen-und-Loesungsansaetzen-in-Planung-und-Genehmigung-Ergebnisse-einer-Befragung-in-den-moorreichen-Bundeslaendern-Sophie-Hirschelmann-GMC.pdf

in bioplastics is still at an early stage. Accordingly, the value chains of the individual products are heterogeneous, especially since the different end products require different types of biomass, with the different cultivation approaches being subject to different legal conditions. For example, areas grown with reed are considered endangered biotopes under the German national environmental protection law, which requires a special permission to harvest reed. Typha is not currently considered an agricultural product under Annex 1 of the Treaty on the Functioning of the EU, which inhibits its cultivation. This means when looking at the incentivization of value chains for rewetting peatland, we are in fact looking through a kaleidoscope with a broad variety of instruments required at different policy levels.

In addition, the fields of biomass production and biomass processing are very separate fields of incentivization and do not tie into each other. The earlier is associated with agricultural policy, while the latter is part of economic development policies. In the field of agriculture, financial incentives are provided through the CAP in the form of subsidies to individual farmers, like the Agri-environment-climate measures (AECM) “peatland rewetting” and “paludiculture”.

The creation of value chains processing paludiculture biomass entails a different type of incentivization. Since its objective is the creation of a new market for products that in parts are not yet technically and economically viable, it needs to respond to the logic of business investment and risk capital. From the development of a product, over technical certification to the setup of a mass production line, a timeframe of several years is required and considerable funding must be invested. An additional challenge to the incentivization of biomass processing is posed through its ambivalent categorization between primary production with funding directed at agricultural businesses on one side and the secondary sector with funding directed at economic development on the other side. Currently at the state level in MV, there are no funding instruments directly targeting paludiculture biomass processing and there is no clear stance within the administration regarding its eligibility for economic development funding. For example one typical instrument for economic development, the federal programme for improving regional economic structures (German: Gemeinschaftsaufgabe Verbesserung der regionalen Wirtschaftsstruktur - GRW) is seen to exclude paludiculture biomass processing from the side of the state ministry of economic affairs since the programme excludes projects from the primary sector, while the state ministry of agriculture would see it as fulfilling the funding criteria under the condition that products with high added value are produced.

Beyond that the core challenge for setting up a paludiculture value chain is described as a ‘hen egg problem’. If there is no market demand for paludiculture biomass, farmers won’t venture into the field. At the same time industry will not set up production, if there is no steady supply of biomass. Accordingly, insecurity is very high on both ends of the value chain. To facilitate knowledge exchange and build trust between different actors in the field, different networking institutions have emerged in the last years. One of them being the Mooragentur Mecklenburg-West Pomerania, which is funded by the state and has the objective to inform farmers about funding opportunities and assist with technical implementation. Another economic incentive for the rewetting of peatlands independently of their agricultural use, are emission certificates. The state led certificate program ‘MoorFutures’ has pioneered payments for ecosystem services from rewetted peatlands since 2011.

As part of the second pillar of the EU's Common Agricultural Policy (CAP), the Agri-Environment and Climate measure (AECM) for rewetting peatland was introduced in Mecklenburg-West Pomerania in 2023. The instrument rewards raising the average water level on agriculturally used peatlands to 30 cm below ground with 150€ per hectare, and to a water level of 10 cm below ground with 450€ per hectare. If, on top, the land is used for paludiculture (the cultivation of wetland plants i.e. sedge, typha, reed) additional 450€ per hectare are paid. The modelling, technical planning and later the monitoring of specific rewetting projects is undertaken by a private service provider (or consultant) that is entitled by the state. Through the economic incentivization the AECM fulfils a long-standing demand from the farmers' side, to reward the rewetting of peatland and to compensate for the loss of income (as the produced crop can only be sold at lower prices than the products from drained peatlands).

In the first year of its existence the instrument was very well received, to the extent that the technical service provider was challenged by the amount of demand. Currently, in the implementation of rewetting projects barriers have arisen from the lack of financial support for the technical infrastructure required to raise the water levels. While the state supports the repair of certain existing water management infrastructure, no funds are made available for further technical means required to reach the respective water level. In consequence farmers are not willing to carry the additional costs, which in parts are significant. Looking at the potential impact of the AECM on land use, one can say that it represents an obligatory requirement for large-scale rewetting of peatland, yet its technical implementation remains a challenge.

Beyond that, the instrument cannot be seen as a stand-alone solution. It addresses the need of land users to be compensated for their direct loss of income from the crops farmed yet neglects the facts that the value of the rewetted land decreases. To address this last point, the only existing solution at this stage is the selling of the land to or the exchange of land with the state. However, both approaches are currently not being followed through by the state, due to insufficient financial capacities.

Regarding the mainstreaming of biodiversity, a differentiated look at paludiculture is required. Except for dry habitat types, in general the rewetting of peatland has a positive impact on biodiversity compared with the previous drained area, by favouring rare moor-specific and moor-typical taxa. However, the method of cultivation can be more, or less beneficial for certain species or others. For example, in order to preserve the whole biodiversity range in typha cultivation (as the most intensive form of paludiculture), areas with different management intensity should be implemented (Martens et al. 2023[7]) With the time of the harvest, the pattern of mowing and the mowing technology, several biodiversity-promoting measures can be taken in the management of rewetted peatlands (Tanneberger et al. 2022[8])

In summary, when looking at the three challenges: Land ownership issues, Loss of income and Mainstreaming biodiversity, one can say that the AECM only addresses the loss of income effectively. The challenge posed to land ownership through the decreasing value of the land is not

[7] Martens, H.R., Laage, K., Eickmanns, M. et al. (2023): Paludiculture can support biodiversity conservation in rewetted fen peatlands. Sci Rep 13, 18091. https://doi.org/10.1038/s41598-023-44481-0

[8] Tanneberger, F., Birr, F., Couwenberg, J. et al. (2022): Saving soil carbon, greenhouse gas emissions, biodiversity and the economy: paludiculture as sustainable land use option in German fen peatlands. Reg Environ Change 22, 69. https://doi.org/10.1007/s10113-022-01900-8

being met, while the assessment regarding biodiversity is ambivalent: when done right, paludiculture can promote biodiversity, yet the AECM does not set the criteria for this, the rationale for paludiculture essentially being climate protection

While the production of paludiculture biomass has gained political attention in the last years and several instruments to support cultivation practices on rewetted peatlands have emerged, the policy landscape regarding the processing of paludiculture biomass and the creation of value chains looks rather deserted. In fact, at the state level in Mecklenburg-West Pomerania there are currently no economic incentives that are directly targeted at building an economy around the processing of paludiculture biomass.

In interviews with officials from the ministry of agriculture and the ministry of economic affairs it however became apparent that general financing schemes exist that could as well be used regarding paludiculture biomass under certain conditions, the core challenge being the underlying policy logic of the instruments. Incentive schemes managed by the state ministry of agriculture are essentially targeted at the production of agricultural raw products and are restricted to products listed in the Annex 1 to the Treaty on the Functioning of the European Union. The treaty's title III being the foundation for the CAP. Incentive schemes managed by the state ministry of economic affairs are directed at economic development independent of agricultural products and focus on products with high value added. Since Paludiculture Biomass i.e. sedge, typha and reed are not listed in the Annex 1, their production is not eligible for typical funding instruments in the field of agricultural subsidies.

When looking at how promoting biomass processing responds to the three challenges: land ownership issues, loss of income, mainstreaming biodiversity, one can say that the instruments in this category exclusively address the loss of income by creating value chains and a better market for products from paludiculture biomass. The mainstreaming of biodiversity is not a criterion for funding eligibility and the challenge of decreasing land value through rewetting is not being tackled by the instruments.

Instrument analysis

Overall, the results show, that the chosen instruments have, even in their current setup, the potential to enable large scale rewetting in Meck-Pomm. But this always means that the administrative institutions that govern these instruments are 1) willing to do so, 2) have the necessary resources and 3) the political mandate is given to the actors.

The table below gives an overview of the analysis of the instruments and if they are currently designed to enable large scale rewetting.

Table 8. Meck-Pomm arena: instruments pathways in addressing main challenges

Instruments as pathways	Challenge 1: Land ownership issues	Challenge 2: Loss of income	Challenge 3: Mainstreaming biodiversity
Regional planning/ designated and reserved areas WP 1	yes	depends	depends
Land consolidation programmes WP 1 (Flurneuordnungsverfahren)	yes	yes	no

Strategic Environmental Assessment (SEA) WP 2	no	no	yes
Promotion of value chains & economic incentives WP 3	no	yes	depends

2.4 Key messages from the arenas for transformation overall work

The overall work of the Arenas supported the framework of BioValue research key expected results and practical outcomes from experimentation in terms of:

KER1. Analytical framework for biodiversity transformative change in spatial policy and planning

The Arenas work can be seen as a showcase of positive transition pathways towards biodiversity integration and enhancement in spatial policy and planning. More information and knowledge can be found in Deliverable 5.5 (Report on Communication and Dissemination Activities and Impacts)

Multi-level governance for integrating and enhancing biodiversity in spatial policy and planning requires aligning legal instruments, funding streams, technical guidance and stakeholder processes across local, regional and EU scales. While the Fersina River arena and Mafra's Municipal Master Plan arena explored institutional change and needed regulatory adaptation through processes of multi-actor collaboration, the Peatlands in Mecklenburg-Vorpommern arena engaged in informal processes of institutional coordination focusing on developing knowledge, guidance and policy-briefs.

The **Fersina River arena** process was able to:

- Engage a broad set of stakeholders, and potentiate institutional relationships;
- Promote inter-departmental (Trento municipality) collaboration and co-operation in the development of pilot projects;
- Promote the development of specific contributions to other Trento municipality departments, specifically in terms of influencing Trento Masterplan Revision, in supporting the design of Trento Green Plan, and in setting parameters for the revision of Trento Building Construction regulation.
- Increase the relationship with the community, promoting inclusion, transparency and capacity-building;
- Potentiate political will, with the engagement of municipal politics in supporting funds for putting into motion pilot projects.

The **Mafra's Municipal Master Plan** arena process was able to:

- Strategically integrate SEA in the spatial policy process, getting political will to integrate SEA in the vision development of the municipality;
- Increase data and knowledge on Mafra's natural capital, with the mapping and assessment of ecosystem services that led to improved spatial planning evaluation processes (with the new state of planning report), and the setting up and implementation of the new municipal monitoring scheme (MAFRA SMOT[9]) with open data;

[9] https://smot-cmmafra.opendata.arcgis.com/

- Promote institutional change in terms of promoting inter-departmental relationships and setting up a 'new' formal norm of engagement of the different municipal departments in supporting and being active in the spatial planning process.
- Potentiate multi-actor collaboration and strengthening of institutional relationships, alongside with the empowerment of Mafra's community in the spatial planning process.

The **Peatlands in Mecklenburg-Vorpommern arena** process was able to:

- Promote the strengthening of relationships and of multi-level discussions with different stakeholders from different levels of responsibilities in the planning process of rewetting;
- Develop a SEA policy brief with different SEA options for climate protection.

Also, results achieved allows for scaling up and out the arenas transition pathways and main results by turning them into standardized, evidence-backed blueprints, indicator-based monitoring packages (e.g., Fersina and Mafra's arenas) and cost–benefit case studies that can be feed into EU guidance and model legislation.

KER2. A set of tools for spatial planning transformations

Since each arena spatial policy and planning process have their own characteristics (different timings, different levels, different stakeholders and different regulatory schemes and institutional designs), the way the instruments were used and experimented were different in nature and in scale, been adjusted according to contextual specificities.

The **Fersina River arena**, due to its local scale and project-level approach on the requalification of the Fersina stream, make as central the participatory approach of BioValue, integrating such moments in the different stages of the urban planning process. Figure 18 indicates the specific entry points where the different instruments were experimented.

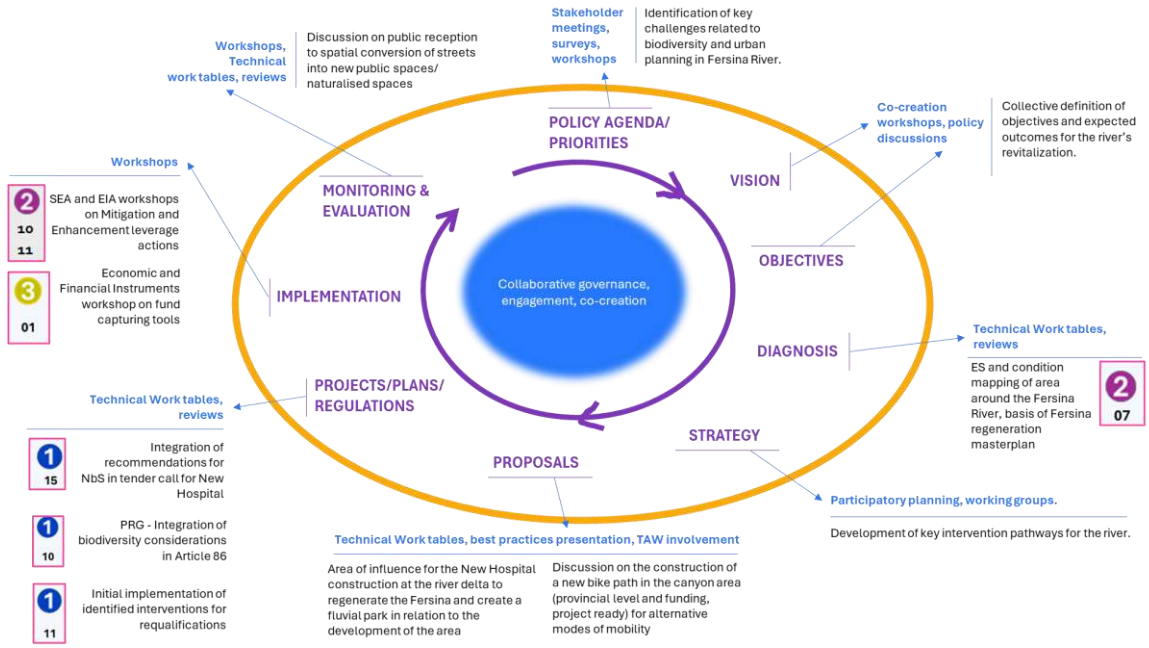


Figure 18. Trento Arena - The generic planning process depicted in BioValue (inside the orange donut), highlighting the different participatory approaches (blue) and specific instruments (pink boxes) integrated in the urban planning process.

The implementation of biodiversity monitoring and ecosystem services assessments was explored to support the monitoring process of design-based and regulatory instruments, specifically the requalification intervention projects of the Fersina River and ultimately the review of the PRG (Urban Municipality zoning instrument). Though not designed to respond specifically to a formal Environmental Assessment (EA) process, this assessment can and should be integrated with baseline assessments and monitoring to support formal EA instruments (such as EIA or SEA). Based on the stakeholder interactions promoted within BioValue in the early stages of the planning process, a set of specific ecosystem services and condition indicators were prioritized. Collaborations between Trento Municipality, the University of Trento, and other local partners allowed for exchange in knowledge and datasets that enabled the detailed mapping of urban ecosystems and the spatial assessment of ecosystem services and ecosystem condition.

Also, the implementation of guidelines for promoting good practices in private spaces was explored in Trento Municipality, particularly in the context of a new hospital development and the integration of specific recommendations for nature conservation and enhancement in the tender call for private developers. The implementation of design-based instruments in Trento refers specifically to the projects for requalification and remodeling of hotspots identified along the Fersina stream. This instrument was later integrated into the Urban Green Plan for the city of the Trento (Regulatory Instrument).

The implementation of land-use zoning in the Trento Arena refers specifically to the adaptation and revision of the PRG (Municipal Urban Zoning instrument, also referenced as Masterplan), and to the adaptation of the formal Urban Green Plan for the city of Trento. In October 2024, the first technical variant of the PRG Masterplan was published and is currently under the revision process that will take approximately 3 years. Specifically, in article 86, the results of the TAWs and the BioValue principles were integrated, where preservation of spontaneous non-alien riparian vegetation must be applied, “choice cutting” to allow both hydraulic security and habitat maintenance, and the restoration of the river morphology through ecological enhancement interventions. This was possible through the definition and classification of “River Protection Areas - River Areas of Ecological Interest”, which was added to the PRG Masterplan revision document under article 86 as a new land-use class.

Regarding the establishment of a recognized Natural Park in the Canyon area, steps have been taken to discuss the financial managerial aspects related to it. Currently the Ecomuseum agreement of fruition of a natural public feature, results in a surplus revenue (once removed managerial costs of the museum) that is currently being re-invested in public interventions in neighbouring areas. These funds could easily be reinvested directly in the management of the Canyon Park and the managerial activities themselves could become an extension of the museum.

Main challenges in the experimentation and implementation of the instrumental perspectives laid upon issues of formal agreements, public funding, specialised technicians, availability of human resources, legal complexity, data availability, and different institutional views on biodiversity.

The **Mafra’s Municipal Master Plan arena**, with its municipal spatial planning scale, focused on setting the grounds for the spatial planning process, with important regulatory aspects and knowledge datasets established.

Mafra's included biodiversity and natural capital as one strategic objective for the revision of its MMP in its Terms of Reference, a formal document needed to trigger the process. Also crucial for the municipality, was the effort in mapping ESS through different methods allowing, this way, to develop and out online a dataset for monitoring and evaluating of the state of play of its spatial planning process.

Mafra's also initiated the SEA process of the MMP, including in its tender documents the need for SEA to be integrated (and contributing to) the establishment of its territorial vision and for the development of its territorial model and options of development, setting a innovative approach in how normally such EAI is considered and integrated in spatial planning processes.

Main challenges are all like the ones of the Fersina River arena, mainly issues of political agreements, availability of human resources, legal complexity, data availability, and different institutional views on biodiversity. Adding, the municipal political cycle influencing the policy decisions and shaping policy intentions shaping the municipal master plan.

The **Peatlands in Mecklenburg-Vorpommern arena**, due to its regional scale, directly influenced by the national process of the German Climate Act, focused its efforts in creating a strong relational basis, knowledge-sharing, and informal negotiation mechanisms. Also, the fact that partners were not decision-makers or policymakers set several difficulties to the expected spatial planning process. Nevertheless, important result in terms of the EAI triggered discussion on the need to use SEA in the Climate Act process, and in supporting rewetting as an opportunity for German to achieve its climate targets.

KER3. Guidelines on the pathways to include the tools in spatial planning

In overall, and based on the WP1-3 integrative recommendations, the arenas experience on the integration of tools and instrumental perspectives can be visualised in Table 9.

Table 9. Arena's experience based on WP1-3 integrative recommendations

Recommendations	Fersina River	Mafra's MMP	Peatlands MV
Capacity Building and Institutional Coordination			
Addressing capacity gaps			
Enhancing expertise and resources			
Improving institutional coordination (internal and external)			
Promoting horizontal collaboration			
Capacity building initiatives			
Integrated Planning and Innovative Approaches			
Integration of spatial planning, environmental assessment, and economic instruments			
Enhancing habitat quality and connectivity through spatial planning			
Promoting synergies and avoiding trade-offs			
Strengthening the mitigation hierarchy and its enforcement			
Enhancing monitoring and evaluation processes			

Recommendations	Fersina River	Mafra's MMP	Peatlands MV
Accounting for biological principles in instrument design			
Multi-actor Collaboration and Inclusivity			
Addressing conflicts and ensuring equity			
Improving actors' identification and engagement			
Promoting creative thinking and empowerment			
Ensuring effective stakeholder engagement in instruments design and implementation			

Legend: Green – fully experienced, confirming; Orange – further experiences needed for confirmation; Grey – Residual achievements, no inference possible

3. Transformative Change in Spatial Planning: Contributions of the Arenas for Transformation for BioValue's Outcomes

Two level of contributions are here explored: in relation to BioValue's outcomes (suggestion to also to read D5.5 for more complementary data and exploitation of each arena results), and in relation to the specific expected outcomes initially identified by the arenas. The contributions are showcased in Table 10, with specific outputs achieved by the arenas throughout BioValue, being a demonstration of all work previously presented in this report and level of achievements resulted from the project implementation.

In overall, the following aspects can be retrieved based on the Arena's processes of change and outputs achieved:

- The three arenas repeatedly used participatory moments to promote co-creation, dialogues and institutionalise collaboration. Such participatory approach was central to legitimise the arena's spatial policy and planning processes of change, decisions made, and spatial planning values for biodiversity enhancement. Also, generated locally legitimate knowledge that can be feed into (other/new/future) formal spatial policy and planning instruments
- Central was also awareness raising and knowledge brokerage, supporting capacity-building on biodiversity-oriented planning options and on a co-creation of shared understandings for science-policy-society interface. Will support policy uptake combining translated scientific knowledge with public/policy discourses.
- Multi-level collaboration and inter-departmental coordination is key for successful institutionalisation of change, dialogue, durability of actions. Cross-department/institutional dialogues and formal monitoring/contractual documents will increase the likelihood that biodiversity enhancement measures persist beyond individual projects.
- Participatory moments and instrumental perspectives (as of the SP&MI, EAI, and E&FI) are emphasised as successful levers mechanisms for impact pathways development and reaching out intended outputs and outcomes. Also, such levers mechanisms created evidence and narratives that may support future formal institutional adoption of biodiversity enhancement measures beyond project lifespan.

Table 10. Contributions and achievements of the Arenas regarding BioValue outcomes

BioValue Outcomes	Arenas activities contributing to BioValue Outcome	Arenas outputs related to BioValue Outcome
Promote dialogues and interaction between the instrumental perspectives in spatial planning processes	FR – Participatory moments with a broad range of stakeholders. MMP – Participatory moments with a broad range of stakeholders. MV - Participatory moments with a broad range of stakeholders.	FR – Integration of BioValue's principles in art. 86 of PRG, in Urban Green Plan, signature of Protocol of Objectives MMP – Participatory moments main results integrated in spatial planning process. MV – Understanding of complementarity between spatial planning instruments in Germany
Achieve 'do no harm' in spatial planning processes	FR – SEA actions catalogue MMP – Raising awareness on the value of biodiversity (and natural capital) for the quality of life. MV – Awareness raising through knowledge brokerage (dialogue with other projects), and knowledge development on EAI	FR – Catalogue integration in current reviews of SP&MI MMP – Introduction of relevant biodiversity-related information in official spatial planning reports influencing political decisions. MV – SEA policy brief
Improve how biodiversity is considered in spatial planning and plan making	FR – Pilot Project #1 MMP – Data collection, participatory moments, development of official reports, institutional dialogue. MV - Awareness raising through knowledge brokerage (dialogue with other projects), interviews with a broad range of stakeholders	FR – Integration of BioValue's principles Urban Green Plan, foundation for future Biodiversity Enhancement Municipal Plan MMP – Formal monitoring scheme, formal contractual documents including biodiversity aspects. MV - SEA policy brief
Multi-level governance transformation in spatial planning systems	FR – Open worktables MMP – Inter-departmental dialogues, mayor and councillors actively involved in discussions. MV -Interviews with a broad range of stakeholders	FR – Pilot Project #1 experimental management MMP – Science-policy promotion, translation of scientific knowledge for daily work application. MV - /
Innovation in environmental and territorial related policies and strategies	FR – Manifesto Fersina MMP – Influencing MMP process, inter-departmental coordination and collaboration activities. MV - Interviews with a broad range of stakeholders	FR – Integration of BioValue's principles in art. 86 of PRG, in Urban Green Plan MMP – Influencing MMP process for integrating ESS and green infrastructures, influencing revision of municipal building and urbanisation regulations

BioValue Outcomes	Arenas activities contributing to BioValue Outcome	Arenas outputs related to BioValue Outcome
		with the inclusion of new measures related to biodiversity MV - /
Showcase pathways to promote biodiversity value enhancement in spatial planning	FR – Participatory moments with a broad range of stakeholders MMP – Introducing SEA in the pre-phase of the MMP revision, political public discourses on biodiversity values in Mafra. MV - Interviews with a broad range of stakeholders	FR – Basis of the regeneration masterplan MMP – Introducing SEA in the pre-phase of the MMP revision, political public discourses on biodiversity values in Mafra. MV -SEA policy brief

Legend: FR – Fersina River arena; MMP – Mafra's Municipal Master Plan arena; MV - Peatlands in Mecklenburg-Vorpommern arena

4. Conclusions

BioValue is a Horizon EU project funded under the cluster on Transformative Change and Biodiversity. This cluster is constituted by 11 Horizon Europe-funded projects and was created with the explicit goal of providing outputs, options, and evidence for policymakers to accelerate transformative change that has a positive impact on biodiversity. Specifically, Task 4.2 aimed at developing the experimental component of BioValue to understand how biodiversity is currently considered in spatial policy and planning processes, and to test the application of the analytical frameworks of Task 1.3 and Task 4.1. The main objective of this report was to present a synthesis of the work and results achieved by the Arenas for Transformation (the Fersina River arena, the Mafra's MMP arena, and the peatlands in Mecklenburg-Vorpommern arena).

The Arenas demonstrated that integrating biodiversity requires fundamental governance shifts beyond technical fixes. The methodology effectively revealed transformative potentials and persistent barriers. Key lessons emphasize the paramount importance of capacity building, innovative instrument integration, and participatory co-creation for sustainable and equitable futures. The approach of BioValue offers a replicable approach to spatial planning transformation, directly contributing to the EU Biodiversity Strategy and the Kunming-Montreal Global Biodiversity Framework. Also, practice partners were engaged actively in the research processes, nota s mere applicants, but also as thinkers, chasing approaches and solutions for problems they are too much familiar with. They acted as leaders in their Arenas, engaging local stakeholders in analysing and discussing situations, and in making decision in their own processes, testing and exploring the application of BioValue's scientific results and outputs. This led to empowered practitioners, actively involved in the research process and in the translation of research into practice.

Practice partners were central to knowledge co-creation and brokerage throughout the project. Through joint problem definition, theoretical and practice-oriented discussions, co-design and co-implementation of workshops, piloting and testing, and reflective learning cycles they generated empirical evidence and refined theoretical propositions grounded in everyday practice. They also acted as brokers—converting research findings into accessible context-specific formats (toolkits, guidance, policy briefs), connecting researchers with local stakeholders and decision-makers, and enabling transfer and scaling of innovations across organisational and institutional boundaries. This twofold role both improved the project's scientific validity (by testing theory in context, producing policy-ready outputs for real-world uptake) and maximised societal impact (by embedding change in practice and policy).

In conclusion, the arenas processes of change promoted durable governance changes: pilots and policy/public discourses created possibilities for uptake pathways, inter-departmental coordination (and collaboration), monitoring enhance persistence, and multi-level dialogue that aligns instruments across scales—moving biodiversity concerns from awareness to formal policy and practice enhancement.