BioValue

D4.4 Recommendations for policy mixes combining instruments from SP&MI, EAI and E&FI across governance levels drawing on the respective transformative potential

WP 4 Transformative Change

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1. Introduction

This document is Deliverable (D)4.4 presenting (1) General Recommendations for enabling and combining instruments from Spatial Planning and Management Instruments (SP&MI), Environmental Assessment Instruments (EAI), and Economic and Financial Instruments (E&FI) across governance levels, drawing on the respective transformative potential, and (2) the Catalogue of Instruments for policy mixes, with detailed recommendations on the use of the instruments in spatial planning.

1.1. The Objectives of BioValue

The main goal of BioValue is to safeguard and enhance biodiversity by increasing the transformative potential of spatial policymaking, planning practices and infrastructures development, upscaling opportunities for valuing biodiversity.

BioValue aims to leverage transformative change potential for biodiversity in spatial planning by exploring three instrumental perspectives: (i) Spatial Planning and Management Instruments (SP&MI), (ii) Environmental Assessment Instruments (EAI), and (iii) Economic and Financial Instruments (E&FI) across governance levels. Its objective is to safeguard and enhance biodiversity by better connecting these three instrumental perspectives, taking advantage of the instruments' potential for transformative change, individually and in combined action.

BioValue main focus has been on spatial planning, policies and activities, hold responsible, as direct and indirect causes, for biodiversity loss. Recognizing spatial planning as the backbone of multiple sectoral policies, a strategic thinking approach has been undertaken in BioValue to engage the potential transformative change capacity of indirect causes of biodiversity loss in spatial planning, turning them into causes of positive transformation for biodiversity. Whether through policies, assessment mechanisms or incentives, the different instruments have potential different ways to turn their actions into positive biodiversity outcomes.

1.2. The Drivers of BioValue

The BioValue proposal was designed upon the fact that persistent land use and land cover changes have a major effect on biodiversity loss. It was also based on the assumption that a transformative change is needed on paradigms, goals, and values shaping current spatial dynamics by a mix of sectoral policies. Therefore, one of the main drivers of BioValue include the recognition that persistent land use and land cover changes act as major direct and indirect causes of biodiversity loss. Strategically, if we turn problems into opportunities, and make the social, political and economic value of biodiversity relevant in spatial planning, we can start changing mind-sets and values that drive land use change. BioValue draws on scientific findings to promote transformative change as a fundamental, system-wide reorganisation across technological, economic and social factors, including paradigms, goals and values.

Despite international and European policies in place to halt biodiversity loss, the effect of multi-level, and multisector, direct and indirect drivers of change contribute to continuing negative trends. Biodiversity continues to decline at an alarming rate due to human activities, including urban expansion and infrastructure development. To address biodiversity loss, among other sustainability problems, global conventions and organisations have pleaded for a fundamental, system-wide reorganisation across technological, economic, and social factors, including paradigms, goals, and values, which will then lead to transformative change (IPBES, 2019). Spatial planning so far mainly relies on efforts to mitigate biodiversity loss, for example, by applying the mitigation hierarchy – a framework widely applied across European countries that prioritises avoiding harm to biodiversity, minimising unavoidable impacts, restoring affected ecosystems, and, as a last resort, compensating for losses through offsetting measures. However, to "bend the curve" of biodiversity loss (Leclère et al. 2020) and move towards recovery, rather than mere damage control, more ambitious strategies are needed to achieve transformative changes for biodiversity, in and through spatial planning.

The BioValue project explored how biodiversity safeguard and enhancement can be achieved by integrating three instrumental perspectives: Spatial Planning and Management Instruments (SP&MI), Environmental Assessment Instruments (EAI), and Economic and Financial Instruments (E&FI). BioValue builds upon a conceptual framework for transformative change for biodiversity in the context of sustainable management of global commons, developed by Wittmer et al. (2021) (**Figure 1**), to explore the transformative potential of spatial planning process and instrumental perspectives. Wittmer et al. (2021) argue that intended interventions are much more likely to encourage transformation to sustainability if embedded within a more comprehensive framing of transformative change. The Wittmer et al. (2021) framework is structured in five building blocks for sustainability transformations, used in BioValue, notably: (1) a shared transformative vision underpinned by compelling narratives toward achieving it; (2) knowledge on how to change a particular system that connects visions to actions and provides a continuous learning process; (3) navigation of the dynamics inherent in changing development pathways, phasing-in new sustainable solutions and phasing out unsustainable practices; (4) emancipated agency providing room for inclusive deliberation and the emergence of diverse, open-ended, bottom-up processes; and (5) transformative governance reflecting this framing by being inclusive, informed, integrated, adaptive and accountable.

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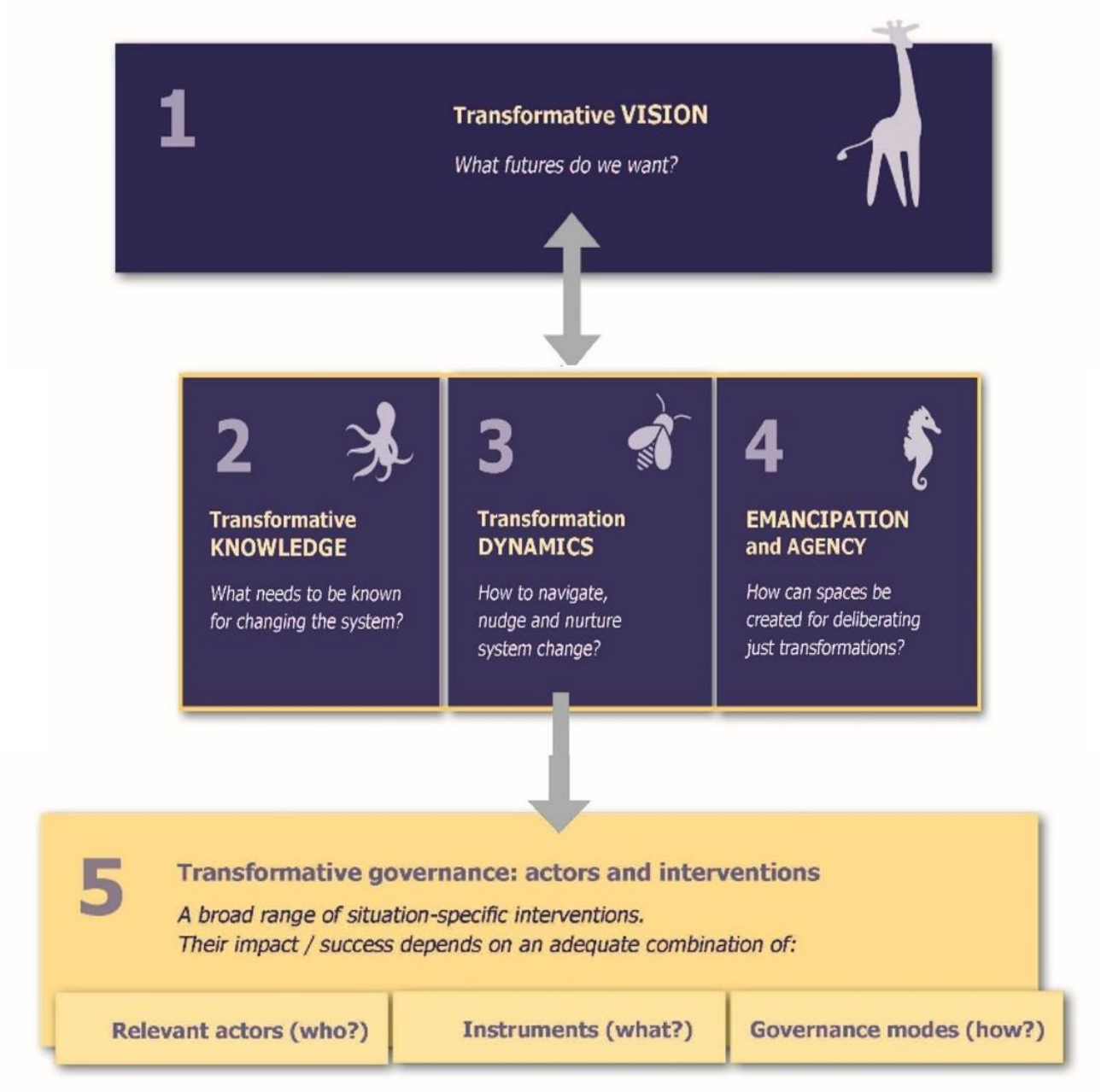

Figure 1. Building blocks from the transformative change framework (Wittmer et al., 2021).

In BioValue this framework is visible namely in the concept of ambitions (**Figure 2**) to identify and evaluate how ambitious an instrument can be in terms of transformation towards sustainability. Using these ambitions as drivers when formulating instrumental objectives can help to address cross-cutting challenges and the processes and actions that can safeguard and enhance biodiversity. The synthesised ambitions are: (ambition 1) spatial planning safeguards, restores, allows recovery, and enhances biodiversity. As emphasised in target 1 of the Kumming-Montreal Global Biodiversity Framework, 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; (ambition 2) spatial planning significantly enables/contributes to balanced and responsible consumption and production without external social and environmental costs;

(ambition 3) spatial planning significantly contributes to reducing socioeconomic inequalities, a central underlying cause of biodiversity loss (IPBES, 2024).

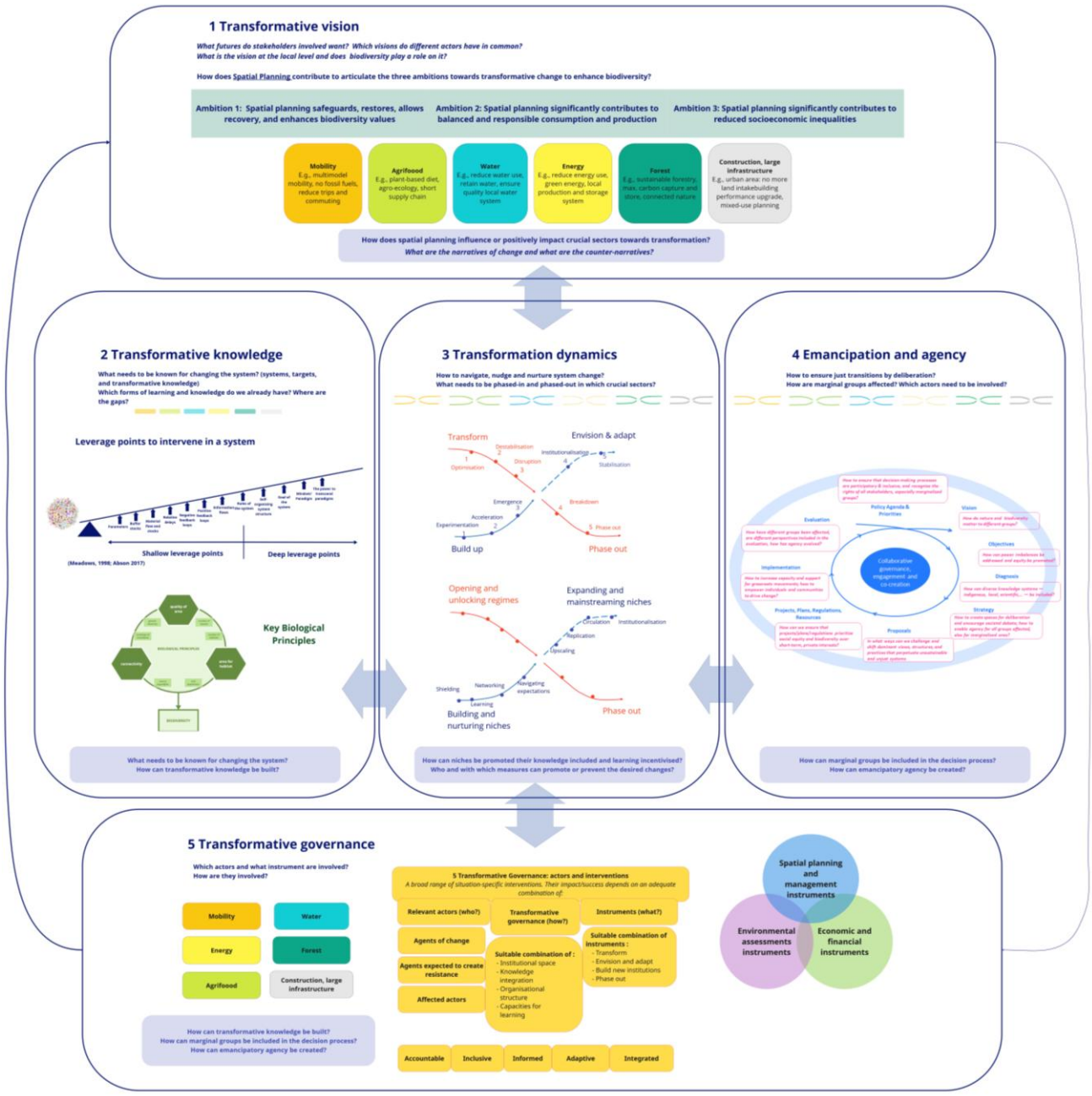

Figure 2. Transformative change framework adapted from Wittmer et al. (2021) for BioValue.

1.3. Core Concepts in BioValue

Several concepts in BioValue needed a clear and consistent definition. In this section we provide a definition for three of them:

Transformative Change
Fundamental shift in views, practices, and structures that addresses the underlying causes of biodiversity loss in ways that foster principles of equity and justice, inclusion, pluralism, respectful and reciprocal human relations, and adaptive learning and action (IPBES, 2024).

Transformative Potential
In the context of biodiversity, refers to the capacity of policies, actions, or frameworks (such as the EU Biodiversity Strategy 2023, Global Biodiversity Framework) to enable or catalyse *transformative change* – that is, fundamental, system-wide shifts in societal structures, values, and practices that address the root causes of biodiversity loss and nature's decline

Instruments with Transformative Potential for Biodiversity in Spatial Planning
Policy tools, legal mechanisms, financial measures, and strategic approaches that guide, regulate, enforce, design or incentivise actions to protect and enhance biodiversity in spatial planning while at the same time improving dimensions of transformative governance (plural, informed, inclusive, adaptive and accountable).

1.4. The Instrumental Approach in BioValue

BioValue supports the European Union's strategic actions for biodiversity conservation by adopting an instrumental approach, bringing together three complementary instrumental perspectives, relevant to spatial planning processes, that enable different sectors and stakeholders to incorporate biodiversity concerns. BioValue explored the use of these instruments individually and in combined action, as lens to investigate how biodiversity is being considered in spatial planning decision-making processes across different levels, and how this can be improved.

The three categories of instruments in BioValue – to be used individually and in combined action – are described as:

1 **Spatial Planning and Management Instruments (SP&MI)** – Instruments that affect the delivery of policy goals implemented under spatial planning such as plans, programs, and projects.

2 **Environmental Assessment Instruments (EAI)** – Instruments designed to systematically integrate environmental considerations into policy, planning and decision-making processes to assess and mitigate negative impacts, enhance biodiversity, and monitor ecological outcomes.

3 **Economic and Financing Instruments (E&FI)** – Mechanisms that encourage behavioural shifts toward biodiversity-friendly practices, helping to correct market and policy failures by incorporating the value of nature's contributions and social and environmental costs into decision-making.

The selection of instruments in BioValue is based on existing research and expanded through BioValue's analytical work across different Work Packages (WP) (WP 1, 2 and 3) – as available in the respective Deliverables – in particular:

- **SP&MI** (WP1 – D1.1, D1.2, and D1.4): Identified through a literature review and work developed along the WP's tasks (including the identification of best practices) (Orta-Ortiz et al., 2023; Batista e Silva et al., 2023, Laporta et al., 2024);
- **EAI** (WP2 – D2.1, D2.2): Developed through benchmarking based on guidance documents on Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) (Larsen et al., 2024), and causal-loop tool of cause-effects relations (Kørnøv et al., 2024a);
- **E&FI** (WP3 – D3.1): Built on prior studies assessing economic and financial instruments relevant to biodiversity conservation (Zhu et al., 2023).

These processes involved reviewing policies and best practices, analysing real-world applications, and assessing instrument effectiveness through the project's case studies, which served as Arenas for Transformation (WP4).

1.5. The Arenas in BioValue

BioValue included three case studies serving as Arenas for Transformation. These spaces for reflection and application have provided real-world contexts for the empirical investigation on the role and capacity of the instrumental perspectives, and how to generate transformative action that values biodiversity in spatial policy and planning processes; and also to test and refine the theoretical conceptualisations, the instrumental catalogue and recommendations proposed.

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 contribute to 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 to explore the transformative potential of the instrumental perspectives, but also of the people and organisations in it.

Each Arena has its own specific characteristics and decision-making levels and contexts:

- **Fersina River (Trento, Italy):** In the Fersina River, 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. This Arena aimed 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. This Arena is of the responsibility of the Municipality of Trento, the decision/policymaker.
- **Mafra Municipal Master Plan (Mafra, Portugal):** The current Municipal Master Plan of Mafra Municipality was approved in 2015 – a revision of the previous plan of 1995. The spatial planning process is ongoing, using the legally established framework of spatial planning and management instruments in Portugal, with its respective 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. This Arena aimed to explore how the three instrumental perspectives are advancing the promotion of biodiversity in actions already undertaken, engaging multiple

stakeholders and creating dialogical regimes towards enhancing transformative capacity of its Municipal Master Plan to promote biodiversity. This Arena is 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. Despite their importance, peatlands 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 to allow the identification of instruments and tools that could positively transform those areas. This Arena is of the responsibility of CoKnow Consulting, a company facilitating multi-level stakeholder processes.

1.6. The Outcomes of BioValue

BioValue main scientific outcome is to contribute to accelerate change in spatial policy and planning with a positive impact on biodiversity. To that end, this document presents recommendations derived from comprehensive insights within the BioValue project along with a catalogue of instruments that help integrate biodiversity considerations into spatial planning decision-making.

Following the work developed in WP1, 2 and 3, the multidisciplinary teams convened for interdisciplinary discussions to critically review, discuss and assess the identified instruments. The purpose has been to ensure coherence across the three categories of instruments, and explore possibilities for their integration, through combined application, to ultimately encourage the enhancement of biodiversity value in spatial planning processes.

In WP4, through a knowledge brokerage approach, interaction and collective learning was enabled, connecting science, policy and society knowledge and perceptions, with a view to finding innovative instruments to mainstreaming biodiversity in spatial planning decisions. BioValue team explored how to structure a comprehensive and accessible catalogue of instruments to enhance its relevance and usability for policymakers, planners, and other practitioners. Strategic and operational policy orientations, as recommendations, were formulated to upscale BioValue objectives.

This document is structured as follows: Section 2 provides context and presents a generic spatial planning process, key agents of change and the typology of instruments; the developed

recommendations are presented in Section 3, and grouped with regard to the spatial planning process; Section 4 provides a catalogue structuring diverse sets of instruments that can be used for biodiversity safeguard and enhancement; Section 5 further presents recommendations for the combined action of the instruments.

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2. Spatial Planning Context: Process, Agents and Instruments

2.1. The Spatial Planning Process in BioValue

Despite the generalisation of spatial planning practice in many parts of the world, there is no single scheme to describe a universal spatial planning process in practice. That is because territories, and communities, where spatial planning applies, have their specificities, as well as development and decision cultures, and even legal and governance systems, which determine 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, perhaps with variable terminologies.

A general spatial planning process encompasses policy alignment, vision-setting, options, and alternative ways of following objectives and shaping priorities, proposal development, implementation, monitoring and continuous evaluation – see **Figure 3**, designed to support the work of BioValue (Partidario, 2024). The represented structured approach is within the competence of public or private administrations/governments at multiple levels and describes a sequence of various stages where pertinent spatial planning activities take place. It reflects the need for collaborative governance, active engagement and co-creation across various sectors, scales, governance levels and stakeholders.

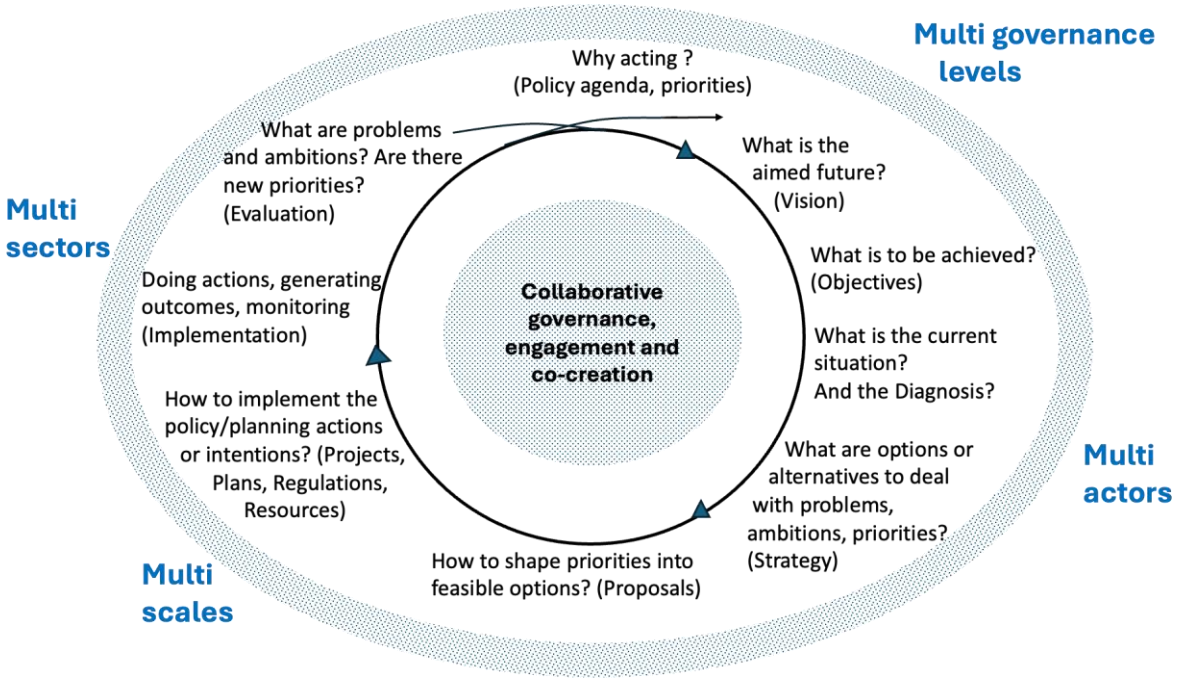

Figure 3: The cyclic spatial planning process as represented in BioValue (Partidario, 2024).

The looping sequence indicated by the central arrows represents the expected dynamic, iterative process that ensures planning remains systematic, inclusive, and adaptable to evolving conditions

and new insights. The sequence can be interrupted by feed-backs where circumstances require a re-analysis or jumps forward where changes in one stage may require, for example, implementation or evaluation. 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. The Policy Note on the generic spatial planning process and integration of instrumental perspectives, in Partidario (2024), describes each of the steps represented in the diagram.

2.2. Multi-dimensions in Spatial Planning Governance and Geographies

The spatial planning process takes place in a multiple-dimensional context. There are multiple decision levels that embrace multiple governance systems, with vertical and horizontal organisational structures. The vertical structures invoke local, regional, national and supra-national levels of decision-making where different organisations display different competences, responsibilities and instruments that operate in an interconnected, and often hierarchical, way. The horizontal structures also invoke various organisations, public or private, but at the 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 operationalisation of spatial planning and its outcomes can be expressed.

We consider planning authorities, environmental practitioners, policymakers, and other relevant authorities as key agents of change in spatial planning. All of them play important roles in implementing transformative strategies for biodiversity enhancement. Planning authorities are primarily responsible for the implementation and enforcement of spatial planning and management instruments, act on the ground, and can drive change by integrating biodiversity considerations into, for example, local planning and zoning regulations. Spatial planning and environmental practitioners, including external consultants and professionals within these authorities, are instrumental in developing and implementing spatial planning and management instruments, applying economic and financial instruments, and conducting environmental assessments, which are desirably translated into effective strategies within spatial planning. Policymakers at the EU/ national/ local level shape and revise policies that govern the application of all three instrumental perspectives, embedding biodiversity priorities into broader environmental and economic frameworks. Additionally, other authorities, like regional bodies and sector-specific agencies, ensure compliance with planning and other regulations, coordinating across sectors and scales to mainstream biodiversity in spatial planning.

The set of recommendations and catalogue of instruments presented here are targeted at these agents of change, tailored to catalyse transformative change in spatial planning practices and, thereby, enhancing biodiversity. This sets the stage for a deeper exploration of the spatial planning process itself.

2.3. Three Instrumental Perspectives to be Used in Spatial Planning to Enhance Biodiversity Value

As previously highlighted, BioValue's focus is spatial planning, its policies, decisions and activities in upscaling opportunities for enhancing biodiversity value. Therefore, the focus of BioValue is not on how to assess or measure biodiversity gains or losses, but instead biodiversity in BioValue is targeted to be the consequent beneficiary of spatial planning actions and outcomes.

If, as recognised, land use and cover change, normally formulated and foreseen in spatial plan-making processes, are among the main direct and indirect drivers of biodiversity loss, then it is pre-empting the level where these land changes are formulated, foreseen, and decided, that we need to act to change the causes of negative impact, turning them into generators of positive impact. It is this strategic perspective and approach that BioValue wishes to endorse.

BioValue aims to strategically address the causes of the negative impact of land use and cover change on biodiversity loss, not the consequences. That means addressing the paradigms, goals, and values that shape current spatial dynamics, by a mix of sectoral policies, implicit or explicit, that determine the priorities of future land uses. As such, in BioValue we take as causes of biodiversity loss not the impacts resulting from land use change, but instead the policies, assumptions, and philosophy that orient the practice of spatial planning and which determine the nature and type of decisions and activities (indirect and underlying causes). Recognising that we will only change this outcome by changing the priorities of policy and decision-makers, and how decisions are taken.

BioValue addresses transformative change for biodiversity in spatial planning by better articulating three complementary instrumental perspectives. That means the need to explore the transformative potential of spatial planning, but also of each of the three categories of instruments selected when used in the context of spatial planning, establishing that these instruments could operate individually and in combined action. Ideally this leads to a transformation of spatial planning practice and potentially the spatial planning system.

This section elaborates on the role of each category of instruments mentioned in Section 1.4, acting individually and in combination. BioValue investigated:

- the potential of spatial planning and management instruments to contribute to transformative change within spatial planning;
- the potential of environmental assessment instruments to contribute to transformative change within spatial planning;
- the potential of economic and financial instruments to contribute to transformative change within spatial planning;
- how each of the instruments individually, and in combined action, can lead spatial planning to have a transformative change potential towards upscaling opportunities for valuing biodiversity.

In WP1 Spatial Planning and Management Instruments, the European spatial planning landscape was revised, and policy directions in spatial planning benchmarked. WP1 further explored

innovative spatial planning and policy tools for mainstreaming biodiversity and explored ecosystem services to mainstream biodiversity value in spatial planning.

WP2 Environmental Assessment Instruments, benchmarked and systematised best practices in contributing to biodiversity in spatial planning with EIA and SEA as main EAI. WP2 built a causal-map tool of cause-effect relations and biodiversity mitigation hierarchy connected to SP&MI and explored the causal mechanisms in spatial policy and planning, used in EIA and SEA, to understand how these might be improved to enhance its role in generating transformative actions in spatial planning for biodiversity. Further, WP2 conducted case studies on tiering focusing on the relationship between higher-level planning frameworks and project-level assessments and also compiled a catalogue of measures to guide both mitigation and enhancement of biodiversity values through spatial planning.

WP3 Policy and Financial Instruments, screened which economic and financial instruments can best be applied within spatial planning processes along the mitigation hierarchy of biodiversity, as well as their impact or capacity to enhance processes that reveal the economic values of biodiversity. WP3 further analysed the EU sustainable finance strategy from the perspective of the spatial policy and planning.

The outcomes of these tasks provided the Arenas for Transformation with the necessary tools to allow experimenting how influential each of the instruments can be in enhancing biodiversity value in the spatial planning processes in Trento, Mecklenburg-Vorpommern, and Mafra in terms of their individual action. In other words, exploring the transformative potential capacity of each instrument to enhance the transformative potential of spatial planning for biodiversity. 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 using spatial planning as the driver of land use change by identifying where to change, why (the focus on the indirect drivers), 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;
- enable 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, including exploring and adjusting where to make land cover changes, where to revert to natural systems, and how to adjust intensity of change, based on contextual realities. This should be informed by ecological principles – such as species-area relationships, source-sink dynamics, and connectivity – which, while included by the WP2, are broadly applicable beyond EAIs and relevant for spatial decision-making more generally.
- 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 were recognised and tested, their collective action was explored considering their alignment to transformative elements and potentiality to contribute to enhance biodiversity. The outcomes of this process are revealed in the outcomes of the arenas for transformation, which concurrently should also reveal what are

bottlenecks and impediments to such streamlined process (available in D4.3 and in the report of Task 4.3 – Locher et al 2024), and which conditions need to be put in place to allow this process to be successful.

3. Recommendations for Enhancing Biodiversity through Spatial Planning

The general 14 Recommendations formulated in BioValue are structured in three sections along the spatial planning process:

(a) Strengthen the Capacity of the Spatial Planning Process to Enhance Biodiversity – five recommendations;
(b) Address the Spatial Planning Process Altogether – five recommendations;
(c) Embed change within the Spatial Planning Process – four recommendations.

These recommendations are directly applied to the core activities of spatial planning. Some deliberately focus on policymaking, capacity building, and community engagement issues that lie beyond the immediate spatial planning activities but are essential to enable the desired changes (a). The remaining refer to the entire spatial planning process (b) or illustrate, in each stage from agenda-setting to continuous evaluation (c), how biodiversity concerns can be effectively integrated. Together, the recommendations aim to reshape internal planning 'mechanics' and point to the changes in broader governance structures and societal norms that can promote a holistic approach to biodiversity.

These recommendations for enhancing and protecting biodiversity through spatial planning are summarised in **Figure 4** and organised as follows:

(a) recommendations concerning the spatial planning system that aim to **strengthen the capacity of the spatial planning process** to enhance biodiversity. This includes international agreements and national legal frameworks, planning functions, and governance structures at higher levels than the spatial planning process itself, such as central organisations and institutions that develop policies with consequences for the planning process;

(b) recommendations to **address the spatial planning process altogether**, typically performed by the administration to define policies and initiatives, program public investments, and control, regulate, and guide the actions of private entities through multiple generic (e.g., legal and financial) and specific instruments (e.g., spatial plans, projects);

(c) recommendations to **embed change within the spatial planning and management process** which should be seen as a cyclical and temporally continuous process – responding to an agenda and political priorities and involving several stages from the construction of a future vision to the implementation of actions and solutions (**Figure 1**) which are monitored and evaluated.

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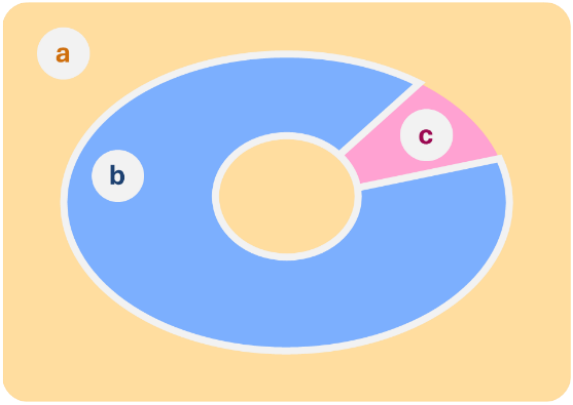

(a) Strengthen the Capacity of the Spatial Planning Process to Enhance Biodiversity

1 Evolve planning mindset to achieving net-gain of biodiversity

2 Integrate systems thinking approach

3 Strengthen the regulatory framework for biodiversity enhancement

4 Adjust frameworks for fiscal and economic tools to broaden local governments' options for enhancing biodiversity

5 Establish multilevel monitoring systems for biodiversity

(b) Address the Spatial Planning Process Altogether

6 Empower and build capacity

7 Secure early integration of biodiversity concerns

8 Ensure successful planning and policy cohesion

9 Address cumulative aspects

10 Strengthen proactive application and enforcement of the mitigation hierarchy

(c) Embed Change Within the Spatial Planning Process

11 Integrate challenges and opportunities into the vision building and formulation of objectives.

12 Broaden baseline studies to support diagnosis stage and ensure effective use of data at later stages

13 Improve the development and use of scenarios and alternatives in the strategy stage

14 Embed action-oriented monitoring into planning practices

Figure 4: Overview of Recommendations for Enhancing and Protecting Biodiversity in and through Spatial Planning.

3.1. Strengthen the Capacity of the Spatial Planning Process to Enhance Biodiversity

Recommendation 1 Evolve planning mindset to achieving net-gain of biodiversity

Agents: EU, national, and local policymakers, planning authorities, environmental practitioners, other relevant authorities

Increased focus on safeguarding and enhancement of biodiversity through spatial planning can be a way of supporting the shift from the traditional no-net loss mindset, aimed at avoiding and remedying significant impacts, to a net-gain mindset, where biodiversity conditions are improved beyond current conditions. This can be achieved by strategic consideration and effective use of a combination of the instruments addressed in BioValue (see Section 4) and by increasing substantive and procedural coherence in the spatial planning process. For example, SP&MI should include biodiversity within the spatial planning vision and objectives, and leaders should adopt biodiversity as a flagship of their mandate. EAI should adopt the goal of net gain and proactively integrate enhancement measures into the visions, objectives, and strategies of the spatial planning process and its instruments. In addition, E&FI, when carefully selected, designed, and implemented, can highlight opportunities within spatial planning to enhance ecosystem services and biodiversity. Embedding a net-gain mindset into key public policy goals and instruments outside the spatial planning process, such as biodiversity conservation policies, taxation policies (e.g., carbon taxes or land and property taxes), or agriculture policies, can

further support these efforts by incentivising biodiversity-positive practices. For example, developing a National Strategy for Biodiversity and Nature Conservation and assess the impact of Sectoral Policies on the National Biodiversity Policy and its implementation; or ensure the national information systems do monitor, and publish – through appropriate metrics and graphic maps for easy communication – the national situation of biodiversity, using local information systems that locally support the spatial planning process.

Recommendation 2 Integrate systems thinking approach

Agents: EU, national, and local policymakers, planning authorities, environmental practitioners, other relevant authorities

Breaking conventional linear approaches – particularly within spatial planning and EA governance systems – and adopting systems thinking allows for a more integrated and systemic understanding between causes and effects of activities (namely through causal loops analysis) and forms of avoiding and off-setting their negative impacts, as well as enhancing their positive ones. This means, for example, understanding how national infrastructure projects are planned and how they recognise the need for biodiversity net gains, or what are biodiversity conservation national policies and policies for land saving. This shift in method – but also in mind-sets – increases the ability to address complex socio-ecological systems, recognising not only the multiple level linkages but also the identification of critical leverage points that will enable action in support of biodiversity objectives. The three framework ambitions further outline stimulus for how spatial planning should proactively address root causes and indirect drivers. Embracing complexity in this way contributes to learnings in early planning processes to trigger design decisions and the undertaking of enhancement initiatives.

Recommendation 3 Strengthen the regulatory framework for biodiversity enhancement

Agents: EU, national, and local policymakers, planning authorities

Biodiversity protection in urban planning practice is focused on minimising, restoring, or offsetting environmental harm, which does not actively improve biodiversity. This recommendation calls for a regulatory shift at multiple decision-making levels to mandate biodiversity enhancement as a fundamental component of spatial planning, ensuring that policies not only prevent damage but actively contribute to nature recovery and sustainable land use. It emphasises strengthening the broader strategic role of spatial planning and SEAs to further encourage, facilitate, and mandate the more challenging integration of biodiversity enhancement requirements at project development levels in EIA wherever possible.

To achieve this, a multi-level approach must be undertaken. The review of existing EU and national regulatory frameworks must be considered to explicitly require biodiversity enhancement measures at the policy and planning levels to leverage ecosystem restoration and ecological connectivity in spatial planning. Additionally, enhancement measures at the project level should contribute positively to biodiversity rather than simply mitigating harm. At the local

level, spatial planning regulations should define and integrate explicit, clear, and enforceable biodiversity requirements into municipal master plans and other binding spatial planning tools. This would ensure that initiatives such as ecological restoration and green infrastructure are integrated into urban development strategies and practices. This policy shift would align regulatory measures with urgent calls for comprehensive strategies that address and reverse biodiversity loss. Effectively integrating biodiversity enhancement into regulatory frameworks at different levels of governance first requires embedding existing SP&MI, EAI, and E&FI into these frameworks so they can be efficiently leveraged.

Recommendation 4 Adjust frameworks for fiscal and economic tools to broaden local governments' options for enhancing biodiversity

Agents: National and local policymakers

Enhancing biodiversity requires adjustments of fiscal and economic frameworks beyond the spatial planning legal framework. While spatial planning guides land-use decisions, its impact is limited unless supported by complementary fiscal and local government financing policies and tools. These complementary instruments are mostly framed at the national or regional level, which means that local efforts to integrate biodiversity objectives often depend on higher-level regulatory and budgetary decisions. For example, review the National Fiscal System by creating or increasing the Value of Nature and Biodiversity as a form of creating incentives, or compensate public and private owners that are forced, or are voluntarily willing to conserve and contribute to biodiversity – instead of, for instance, developing intensive agriculture or plant forest for wood production (in some measure and in some places, not as a bold measure).

Therefore, fostering vertical coordination between planning authorities and fiscal policymakers is essential to align incentives, unlock funding opportunities, and ensure coherent implementation across governance levels. Stronger coordination between these policy spheres is essential to ensure that biodiversity objectives can be systematically integrated into local governance and financial decision-making in an economically and financially viable manner. To effectively ensure this level of political coordination, a strong articulation between E&FI, EAI, and SP&MI is essential.

One key measure is to reform fiscal transfers from central to local government to create incentives for biodiversity enhancement, for example by allocating higher shares of central funding to municipalities that implement nature-based solutions, protect ecological corridors, and restore degraded ecosystems. Such incentives could also be aimed at supporting mitigation measures established in EIAs of spatial planning to enhance biodiversity. Adjusting local tax structures – such as offering tax reductions for properties that support ecosystem services – can also promote biodiversity-friendly land use.

Another effective approach is to link local government financing mechanisms, such as impact fees or other land value capture (LVC) tools (e.g. betterment contributions, land readjustment schemes, or the transfer of development rights) to biodiversity objectives. Depending on how they are structured and articulated with other sectoral policies, LVC tools have significant potential as instruments for promoting biodiversity, particularly in urban contexts due to their

ability to redirect revenues from urban development. Legal adjustments on national laws may be needed to earmark a portion of those revenues – for example, from development charges or land and property taxation toward biodiversity protection and enhancement. When properly structured and aligned with spatial planning and local government financing needs, LVC tools such as land-based taxation tools serve both as revenue generating mechanisms and as policy tools as they influence behaviour of property owners, developers, and other stakeholders.

Recommendation 5 Establish multilevel monitoring systems for biodiversity

Agents: EU, national, and local policymakers, planning authorities, environmental practitioners, other relevant authorities

A multi-level approach to monitoring is indispensable. While studies such as the Millenium Ecosystem Assessment, the TEEB and the IPBES Global Assessment at international level, and European Environment Agency at the EU level provide ongoing information that sets the context for spatial planning, desirable cooperation and integration of the different levels of planning and governance below the national level is fundamental to establish national data bases for biodiversity. For example, local administration can develop data acquisition and ongoing assessment on habitats, flora and fauna species, ecosystem typology, etc., in its territory while the administration at higher levels (regional and national) integrates local level monitoring into supra-local information systems, in turn acquiring basic data and satellite imagery to make available to lower levels.

The systems thinking approach and ongoing evaluation based on an ecosystems approach – essential for an integrated understanding of biodiversity with other policies concerning urban and rural areas and natural spaces – require not only the continuous acquisition of data and basic information to support monitoring, but also devices, technological platforms, and the know-how underlying them. Incorporating system-level indicators can help monitor long-term outcomes, such as habitat connectivity or species recovery, and provide ongoing feedback for future planning cycles. Feedback loops must evaluate the effectiveness of the plan, including mitigation and enhancement measures linked to EA. This will enable adjustments of activities and measures, allowing for using adaptive management and informing future planning.

3.2. Address the Spatial Planning Process Altogether

Recommendation 6 Empower and build capacity

Agents: National and local policymakers, planning authorities, environmental practitioners, other relevant authorities

To address capacity gaps that hinder the effective implementation of spatial planning and management instruments, planning authorities must invest in enhancing internal expertise through training programs and recruitment of biodiversity specialists. Building partnerships with academia, as demonstrated in the BioValue project, can provide additional technical expertise

and funding opportunities. Encouraging cross-departmental collaboration is essential to overcome siloed decision-making, fostering better integration of biodiversity into land-use planning. Planning authorities should establish dedicated biodiversity units to lead the implementation of SP&MI and monitor their effectiveness over time or promote solid collaborations with other offices and academic institutions to this end.

To navigate conflicts arising from vested interests in sectors like agriculture, urban development, and infrastructure, practitioners and decision-makers should promote early and transparent stakeholder engagement in environmental assessment and planning processes. Planning authorities must prioritise inclusivity in the design and implementation of spatial planning instruments to avoid exacerbating socio-economic inequalities. Participatory governance processes are essential to identify stakeholders and fairly distribute benefits and burdens, contributing to solve conflicts between different interests and address potential risks such as gentrification or displacement. For example, involving communities in rehabilitating urban spaces ensures that biodiversity-focused efforts also promote social cohesion, potentially reducing inequalities. It is also important to be creative and think broadly with active consideration of empowerment and innovation opportunities for affected stakeholders in EA processes. This includes evaluating the potential for reallocating land use rights in spatial planning and effectively using relevant E&FI. Sometimes such instruments can be combined with establishing new markets and enabling communities to participate in them (e.g., credits, knowledge, information, user rights).

Recommendation 7 Secure early integration of biodiversity concerns

Agents: National and local policymakers, planning authorities, environmental practitioners, other relevant authorities

Early integration of biodiversity concerns in the spatial planning process enables planners and policy-makers to embed biodiversity and ecosystem service priorities into the policy agenda from the outset. Specifically, this can be done through early and continuous integration of EAI and the spatial planning process. By specifying key environmental challenges and opportunities, SEA ensures strategic planning aligns with biodiversity goals, such as habitat restoration and ecosystem connectivity. This approach provides the necessary knowledge for establishing clear benchmarks, driving visionary planning policies, and enhancing habitat size, quality, and connectivity while proactively mitigating unintended biodiversity and other sustainability impacts. These insights should also inform the design of the E&FI instruments, for instance, by incorporating biological principles such as area-species relationship and the source-sink dynamics into their objectives and measures to ensure positive contributions to biodiversity.

The early integration in SP&MI of the economic value of biodiversity impacts on the territory, particularly on the real estate market, further strengthens the case for biodiversity-driven planning. LVC tools have already been mentioned for significant potential as instruments for promoting biodiversity, particularly in urban contexts. Understanding the economic implications of biodiversity gains allows planning authorities and environmental practitioners to align conservation priorities with economic incentives, making it easier to justify biodiversity-focused

policies and strategies. This approach encourages stakeholders to invest in biodiversity enhancement and consider the long-term economic benefits of a healthy ecosystem.

Recommendation 8 Ensure successful planning and policy cohesion

Agents: National and local policymakers, planning authorities, environmental practitioners, other relevant authorities

Policy cohesion ensures the effective coherence and communication between planning levels. To ensure coherence and coordination of planning levels, it is crucial that tiering is effectively and successfully implemented in both higher- and lower-tier spatial planning. This includes ensuring that lower-tier planning levels adhere to planning decisions and future actions that are delegated to them from higher-tier planning and that higher-tier makes use of insights collected for preexisting plans and projects in the area. This is also a matter of increased transparency by explicitly documenting and communicating how insights from other planning levels are incorporated. This will ensure that each planning tier contributes meaningfully to the overarching spatial strategy.

Ensuring cohesion between policies and plans and to the operationalisation at the project level, entails the communications of data, alternatives and scenarios, assessment of (cumulative) impacts, mitigation and enhancement measures, and monitoring measures between planning levels. Successful cohesion requires the early consideration of biodiversity, already in strategic planning and through the early integration of SEA in the planning process, as suggested through R6. Here the SEA has the potential to set a framework for, and delegate further actions for later stages in the planning process (the development of lower-tier plans or project implementation) to ensure that decisions are made at the appropriate planning level. It is also essential to recognise the economic value of biodiversity early in the process, including its role in sustaining ecosystem services that support economic activities, enhancing climate resilience, and reducing long-term costs associated with environmental degradation. Integrating a strategic economic assessment that accounts for these benefits can improve decision-making and ensure that biodiversity considerations are systematically incorporated into different levels of planning frameworks. Equally important for ensuring cohesion between policies, plans, and the project level is clarifying responsibilities and financial arrangements to enable effective execution. This includes specifying who is responsible for each action, identifying funding sources, establishing equitable compensation mechanisms, and detailing the planning and programming of intended actions.

Recommendation 9 Address cumulative aspects

Agents: National and local policymakers, planning authorities, environmental practitioners, other relevant authorities

Considering that biodiversity is complex, integrated, and dependent on connectivity across scales, it is crucial for spatial planning practice to address the cumulative processes that impact biodiversity over time. Spatial planners should use Geographic Information Systems to map

activities that coincide in either time or space, visualising their potential cumulation. Moreover, planners are encouraged to conduct integrated assessments, including cumulative impact studies, to thoroughly consider the joint possibilities and potential aggregate impacts they may give rise to. To fully address cumulative biodiversity processes, planners should apply a systems-thinking perspective, recognising that ecosystems are dynamic and interlinked across space and time (R2). This includes understanding how the fragmentation or degradation of core ecosystem areas – even incrementally – can trigger negative cascading effects that compromise ecological functions and long-term resilience. This approach can involve active data sharing and collaboration across different planning authorities and sectors, as well as robust engagement with local communities and stakeholders to gather diverse insights and identify concerns regarding cumulative aspects. By incorporating these practices, spatial planners can adopt a more systemic approach, recognising the interconnectedness of spatial planning activities on biodiversity and ecosystems.

Recommendation 10 Strengthen proactive application and enforcement of the mitigation hierarchy

Agents: National and local policymakers, planning authorities, environmental practitioners, other relevant authorities

To counteract the reactive application of the mitigation hierarchy and ensure robust enforcement of mitigation measures, the mitigation hierarchy should be integrated as a fundamental principle at the earliest stages of the planning cycle, ensuring the prioritisation of impact avoidance and enhancement of biodiversity before any planning formulations and decisions start being made. Applying the mitigation hierarchy entails analysing alternatives and prioritising first options that prevent harm to biodiversity, as only in unavoidable cases should minimisation be considered. As such, implementing the mitigation hierarchy entails a structured way of thinking which should be embedded throughout the spatial planning process with a focus on the small and large decisions made during the process. Strategies and mitigation measures should be formulated with enforceable language, such as "must" rather than "should" and must be tightly aligned with existing legal and regulatory frameworks to ensure binding commitments during approval and/or permitting phases. Linking to R5, capacity building should be prioritised, ensuring that spatial planners and EA practitioners are equipped with the necessary skills and resources to consistently apply the hierarchy.

3.3. Embed Change Within the Spatial Planning Process

Recommendation 11 Integrate challenges and opportunities into the vision building and formulation of objectives

Agents: Local policymakers, planning authorities, environmental practitioners, other relevant authorities

While earlier recommendations (R1, R6, and R9) emphasise the importance of early-stage planning, R11 reinforces the need to align biodiversity ambitions within the stages of vision-building and objective formulation. This strategic integration is essential to move from high-level ambition to actionable planning frameworks. Incorporating biodiversity from the outset clarifies the level of recognition it receives within administrative agendas and among the stakeholders shaping long-term planning directions. This is particularly important during stage 1 (policy agenda and priority setting) and stage 2 (vision outlining) (see also R5 and **Figure 3**), where early commitments can influence the direction and effectiveness of implementation of instruments. An example is the integration of policies and requirements of the EU regulation on Nature Restoration, targeting forest, agriculture and urban ecosystems. It also allows acknowledging the economic value of biodiversity and ecosystem services, as well as recognising the role of indirect drivers. It is important to specify which drivers can be addressed at the appropriate level (municipal or regional), and to match them with the appropriate combination of policies, tools, and planning actions.

Additionally, opportunities should be identified to influence changes in consumption and production patterns in sectors like mobility and energy. These changes can then be integrated into the design of E&FI, with support from spatial planning actions such as infrastructure planning and zoning, ensuring the alignment of policies across levels and sectors. By ensuring that biodiversity-related challenges and opportunities are strategically integrated into vision building, this recommendation helps create a coherent foundation across policy levels and sectors – supporting a shift from reactive to proactive mitigation, with a systemic approach that positions biodiversity as a core component of sustainable development.

Recommendation 12 Broaden baseline studies to support diagnosis stage and ensure effective use of data at later stages

Agents: Local policymakers, planning authorities, environmental practitioners, other relevant authorities

Knowledge on the current and evolving situation, and its diagnosis, depend on reliable and as complete as possible data and information. It also enables the use of artificial intelligence, which can speed up the analysis when using multiple instruments that depend on organised data and information. Surveys, inventories and mapping related to sensitive ecosystems, habitats, wetlands, species, but also regional biodiversity networks, habitat connectivity, carrying capacity and cumulative pressures are important sources of data. Developing ecosystem services based accountability and identifying vulnerabilities, such as areas prone to habitat fragmentation, should be a priority during this stage to guide enhancement and mitigation measures.

Monitoring frameworks are relevant to track biodiversity and ecosystem changes over time, enabling adaptive planning and management, and ensuring the formulation of targets in terms of its objective's achievement. This includes recognising the economic implications of biodiversity changes, which is critical to ensure sustainable and informed decision-making. Collaboration with e.g. local communities, conservation groups and regional networks with

other authorities is essential to share data and knowledge, enabling a more collaborative planning.

This can lead to the enhancement of biodiversity and the protection of nature, as well as better control of new urban developments in those areas. Data collection and analytical studies must adopt a broad, systems-oriented approach to provide a comprehensive understanding of existing conditions and interdependencies. This also allows for increased awareness among the population and media, which in turn can lead to increased levels of public participation and consequent political pressure, leading to transformative change.

Recommendation 13 Improve the development and use of scenarios and alternatives in the strategy stage

Agents: Local policymakers, planning authorities, environmental practitioners, other relevant authorities

The development of scenarios as representations of possible and desired futures enables interactions with representatives of communities and stakeholders, in a limited but very useful and fruitful way, allowing to debate and agree on desired futures concerning biodiversity and nature in the territory and in cities. The use of scenarios is more appropriate when preparing plans with a low level of detail – for example, plans for cities, municipalities or even regions involving entire communities. For detailed planning, scenario development is difficult to apply and concerns about design, form and functionality prevail. Scenarios must incorporate biodiversity goals and visions, consider long-term and cumulative impacts and explore trade-offs and synergies between biodiversity and other planning objectives. When embedding scenario testing and alternative development directly into the strategy stage of spatial planning, the EA instrument can help shape sustainable development pathways from the outset.

In parallel, at all planning levels, including detailed planning, it is essential to consider and explore the range of alternatives to ensure not only good choices in decision-making but also to develop awareness, encourage public discussion, and improve political debate. Discussing alternatives clarifies the values involved and facilitates the decision-making process regarding the promotion of biodiversity and nature protection.

The selection and design of instruments, particularly E&FI, should explicitly acknowledge the dynamics of transition processes. In the early phases of transformation, high subsidies and other support might be needed to trigger experimentation, while in later phases access to credits might be sufficient. At the same time, it is essential to address phasing-out of unsustainable practices, ensuring that the transformation supports long-term biodiversity objectives and avoids locking in ecological degradation.

For the use of E&FI, it is also important to be pragmatic and adaptive in implementation and where possible in design by building on potential synergies with established instruments. These synergies can arise in terms of legal framework, institutional set-ups, networks, leadership, etc., and they help to lower entry barriers and reduce transaction costs for E&FI implementation. Adapt when and where necessary both during set-up and after implementation whenever problems occur.

Recommendation 14 Embed action-oriented monitoring into planning practices

Agents: Local policymakers, planning authorities, environmental practitioners, other relevant authorities

Implementing spatial planning involves executing policies and plans, projects, and other types of actions through regulations, public and private actions, and other initiatives and activities often engaging negotiation and the preparation and utilisation of further planning instruments. To follow-up these complex processes, monitoring is essential.

The purpose of monitoring biodiversity in spatial planning must be clearly defined in advance, and in an integrated manner with other policies and objectives, formulating metrics (indicators, descriptors, assessment scales), establishing possible future goals and targets and the process of regular acquisition of data and information, meeting the intended objectives.

Theoretical and practical advances in monitoring, and ongoing evaluation in planning, include the improvement of ICT tools (hardware and software), namely Planning Support Systems and Geographic Information Systems, and significant improvement in spatial cognition by citizens – largely driven by the dissemination of geographic tools such as Google Earth, Google Maps and the multiple "Apps" providing spatial services via smartphones. We have been observing a true explosion of measures, metrics, and various indicators in different sectors, initially driven by environmental concerns and multiple environmental impact analyses, but later also by public administration management by objectives and by the emergence of new ideas and approaches, such as the concepts of Smart Cities, Analytical City, Big Data, Open Data and Artificial Intelligence.

It is recommended that the success factors that may underlie the success of biodiversity promotion policies are also monitored: public perception related to the protection and promotion of biodiversity and the success of the respective policies in progress, given a certain degradation of people's connection with nature (particularly in urban areas); the factors linked to its promotion, such as the timely availability of data and information; the consistency of the public decision making; clear, readable and regular disclosure of monitoring outputs; and carrying out corrective actions as a result of effective monitoring.

Given the difficulties in obtaining economic resources from local administration for the increasing digitalisation of services and corresponding ICT, distributed monitoring can be considered for certain dimensions of biodiversity, where, instead of the administration, certain actors such as Universities, research centres, NGOs, and citizens' or business associations can take on this task with commitment. Monitoring can be supported by stakeholders/citizens science data collection, which can also increase their engagement and capability building.

Regarding the individual instruments, particularly E&FI, it is recommended to establish reflective follow-up after their implementation. This aims to explore opportunities for improvements, or the need for modifications when entering new stages of the transition; and to explore potential collaboration opportunities with others for wider application of cross governance levels, spatial scales, and sectors. Additionally, it is also important to consider the integration of results from monitoring and evaluating E&FI outcomes into standard monitoring and evaluation processes

within spatial planning. This will make positive outcomes visible and thereby support continuity of biodiversity enhancement practices and knowledge accumulation – as well as its effective use in subsequent planning cycles.

3.4. Implications for transformative change

This section explores the transformative potential of the recommendations using the transformative change framework adapted from Wittmer et al. (2021) in the BioValue project (Locher-Krause et al., 2023). The framework combines different elements that enable transformative change and presents them in a structured and integrated way, seeking to operationalise how spatial planning can contribute to biodiversity transformations.

The conceptual framework structures analysis and recommendations from social science research – most importantly Scoones et al. (2020), Loorbach et al. (2017), and Bulkely et al. (2020) – in five building blocks for sustainability transformations:

- **Building Block 1**: A shared vision ideally integrating biodiversity with other objectives and concerns, underpinned by compelling narratives that outline how this vision can be achieved; "a story illustrating how to get there";
- **Building Block 2**: Knowledge on how to change a particular system, how visions lead to actions and provides a continuous learning process;
- **Building Block 3**: Navigation of the dynamics inherent in changing development pathways, phasing-in new sustainable solutions and phasing out unsustainable practices;
- **Building Block 4**: Emancipated agency providing room for inclusive deliberation and the emergence of diverse, open-ended, bottom-up processes;
- **Building Block 5**: Transformative governance reflects this framing by being inclusive, informed, integrated, adaptive, and accountable.

3.4.1. Building Block 1, Transformative Vision

A transformative vision provides strategic orientation and motivation for the establishment of spatial planning goals and objectives (**Figure 5**). It also contributes to early consideration of biodiversity issues and values from initial stages stimulating mindsets towards prioritisation of biodiversity along the planning process (R1, R7, R11). Particularly, mobilising new narratives that link biodiversity values or other nature features to the goals and needs of other sectors (e.g., wild coastal cliffs as tourism attractors, ample landscapes in housing neighbourhoods) can provide strong motivation for biodiversity enhancement and broader sustainability (R1, R2, R3, R8).

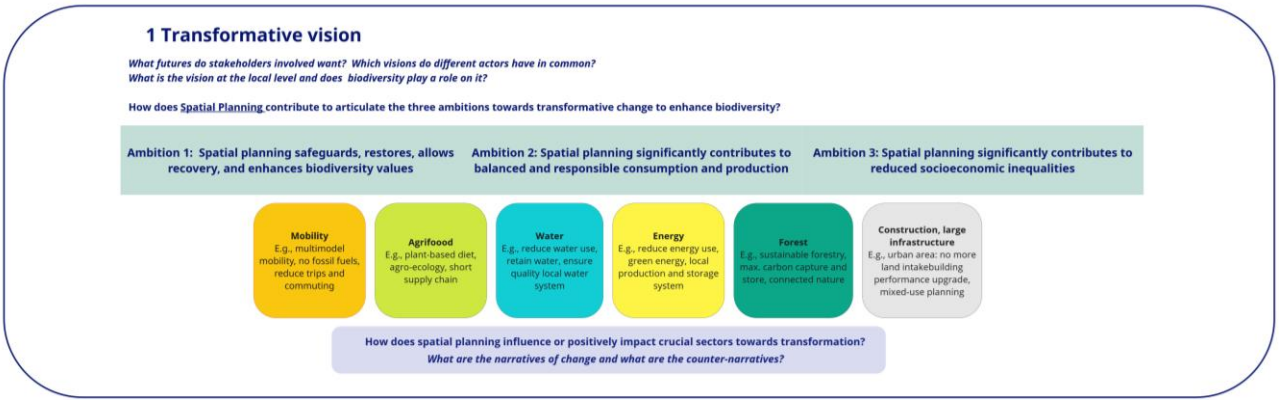

Figure 5. Transformative Vision building block.

Transformative visions enable decision makers and spatial planners to consider the interconnections within socioecological systems; following the ambitions (introduced in Section 1.2) ensures that spatial planning contributes to social well-being. In the context of spatial planning, the early use of key regulatory frameworks, such as SEA and EIA, should ensure maintaining and improving the environmental conditions required to realise those ambitions (such as significantly reducing socio-economic inequalities) (R3). Measures such as reforming budgetary transfers from central to local government to create incentives for biodiversity enhancement can allocate funding to local municipalities, strengthening coordination between fiscal policies and spatial planning, acting as a key component for sustainable local development (R4, R9).

Because a transformative vision often challenges existing norms and interests, it will likely face resistance. Early legitimacy-building is therefore essential. This is achieved by emphasising the common ground (context), facilitating inclusive debate, and integrating challenges and opportunities at an early stage (R11). In practice, this means ensuring that EA instruments, particularly SEA, are integrated early and continuously into the spatial planning process, so that biodiversity concerns help shape – not just assess – planning priorities (R7).

Developing a legitimate vision can ensure policy coherence both vertically (across planning levels) and horizontally (across sectors) which is critical for a desirable multi-level and multi-sectoral integration. In the different arenas for transformation the development of a common vision that included different actors and sectors had an important role, and several participatory processes were held to design a common future (R8, R11).

3.4.2. Building Block 2, Transformative Knowledge

Transformative knowledge is the knowledge needed to achieve desired changes (**Figure 6**). It is about targets, and about learning and actions on how to achieve these targets, which often requires changes in the system or its functions. BioValue recommendations and instruments can help planning practitioners to gather and turn knowledge into on-the-ground change.

We encourage practitioners to integrate system thinking (R2) to map the connections between main ecological processes and spatial planning actions, feedback loops and leverage points affecting biodiversity in their territory. Acknowledging these issues early in the planning process

(e.g., bringing biodiversity to the table on day one) will help practitioners to identify knowledge gaps and knowledge needs so that these can be addressed in a timely manner. This means identifying data that is still missing and building a plan to collect or commission it before key decisions are taken. In this way, planning goals can be strategically aligned with biodiversity goals – such as increasing habitat quality and habitat connectivity (R7, R8) – and practitioners can design strategic plans that already embed net-gain objectives for biodiversity instead of trying to retrofit them later.

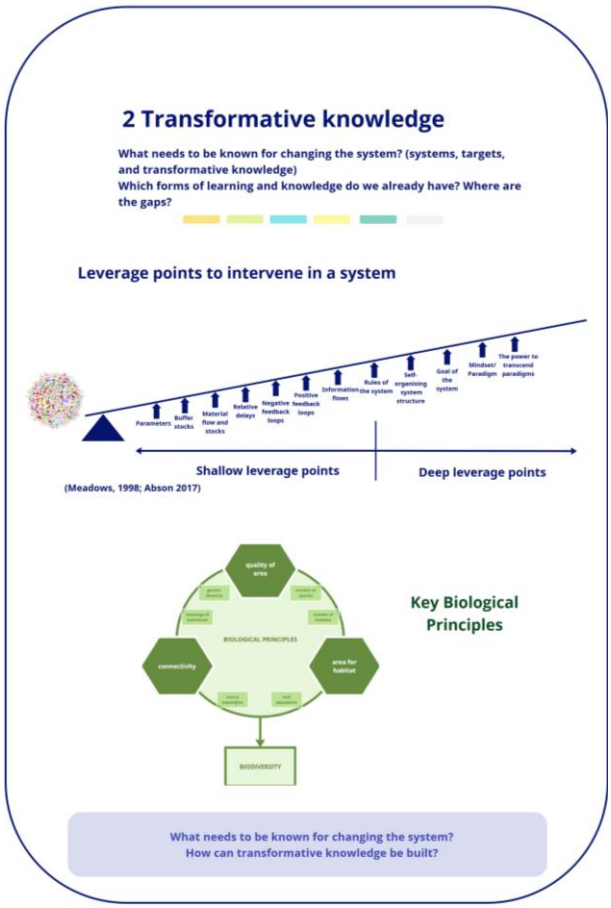

Figure 6. Transformative Knowledge building block.

We also encourage a "vertical chain" of information flow. Practitioners need to ensure that every tier in the planning process (from a national framework to a local permit) shares adequate biodiversity datasets, scenarios, cumulative assessments, and monitoring measures (R8, R9, R12). This also means they should assess impacts and mitigation measures downstream and feed monitoring results back upstream to adjust higher-level policy.

Additionally, our recommendations call for the use of scenarios to handle uncertainty in planning (R11). For instance, we encourage practitioners to develop more strategic interventions by running co-design processes that include technical sessions involving targeted stakeholders to sketch "what-if" futures and to test how specific planning interventions stay robust across all futures.

In terms of transforming the planning system, the recommendations have the potential to intervene at deep leverage points (**Figure 7**). For instance, we recommend a shifted mindset

towards net-gain for biodiversity – e.g., "leaving nature better than you found it" – as the default mode for planning practices (R1). We also encourage the early integration of biodiversity – e.g., putting biodiversity objectives in the same paragraph as housing or transport targets, not as annexes (R7) – and the proactive enforcement of the mitigation hierarchy – e.g., *avoid-reduce-restore-offset* should be applied *before* plans are finalised, not during implementation disputes (R10). The combination of these three recommendations might actually leverage the goal of the planning system as far as biodiversity is concerned. Integrating system thinking approach (R2), empower and building capacity (R6) as well as ensure successful planning cohesion (R8) can also highly contribute by adding balancing and reinforcing loops that enable the spatial planning system to evolve structures independently, self-organising the system structure. Moreover, recommendations linked to strengthen the regulatory framework to enhance biodiversity (R3), adjust frameworks for fiscal and economic tools (R4) and integrate challenges and opportunities into visual building have the potential to intervene the goals of the spatial planning system.

Finally, all of our recommendations have potential to produce positive system-level ripple effects for transformative change. Specifically at the knowledge building block, our recommendations contribute to a planning practice with (i) better information flows (restructuring data access, e.g., data should be better and shared earlier), so decisions reflect real ecological conditions and limits; (ii) new rules (interventions should be tied to net-gains for biodiversity); and (iii) cross-scale alignment (plans and projects at different levels should talk to each other) so cumulative impacts can be tracked and properly managed (**Figure 7**).

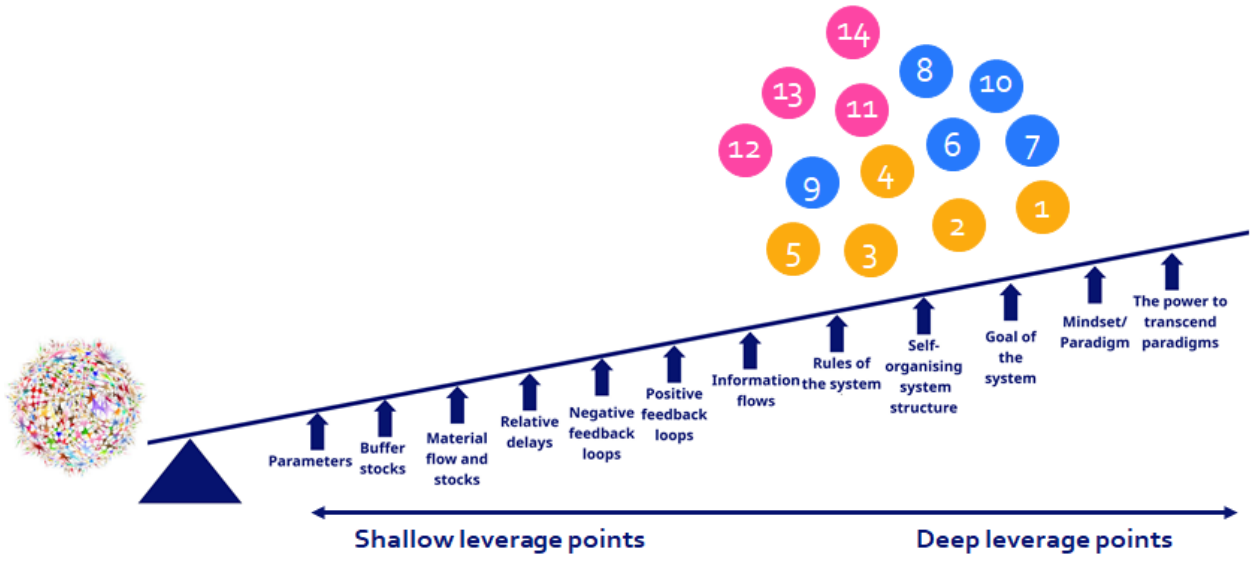

Figure 7. Representation of how BioValue Recommendations can be seen to contribute to the deepest Leverage Points to intervene in the system.

3.4.3. Building Block 3, Transformative Dynamics

Transformative dynamics involve both innovation and the establishment of new solutions, so actively enhancing biodiversity ("phase-in"), and the reduction and eventual removal of practices

that threaten biodiversity or prevent its enhancement ("phase-out") often addressing indirect drivers or underlying causes (**Figure 8**). For example, prioritising sustainable modes of transportation such as pedestrians and bicycles often requires active measures to limit motorised traffic and road infrastructure or urban sprawl (phase out). This reduces direct pressure on biodiversity and can free up areas in cities (car parking) that can then be repurposed to enhance biodiversity (phase in).

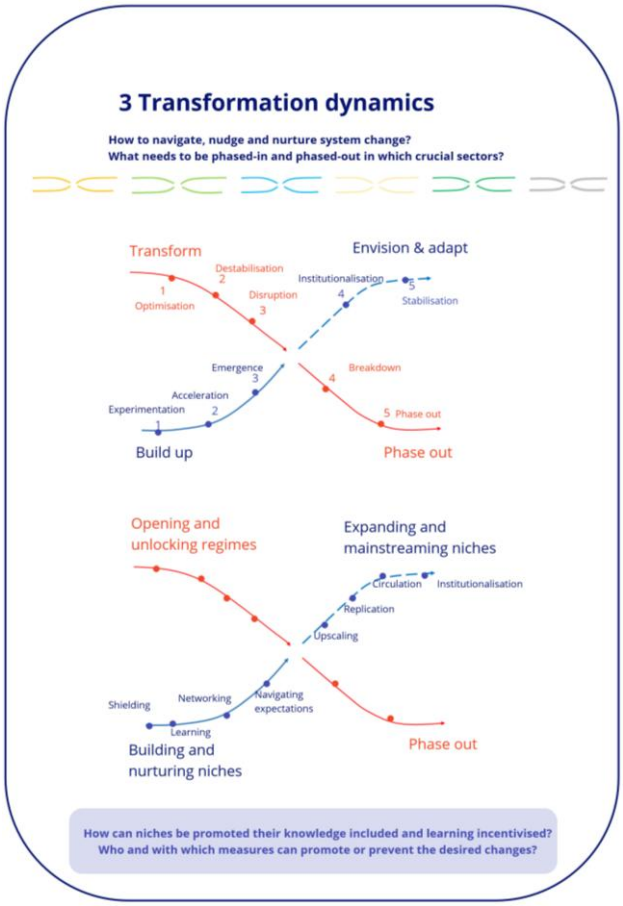

Figure 8. Transformative Dynamics building block.

Understanding which instruments support phasing-in and phasing-out processes affecting biodiversity can help planners to identify what is needed to actively enhance biodiversity within spatial planning. Enhancement requires an approach to planning that is much broader than just trying to limit biodiversity loss (R1). For example, in early phases soft instruments such as subsidies, pilot projects, and awareness campaign might be sufficient to trigger experimentation and encourage public acceptance. In later stages more structural policy changes – such as new land-use regulations, fiscal incentives for regeneration, or legal enforcement mechanisms – are likely needed to consolidate progress.

Understanding the needs for phasing in and phasing out is one aspect of integrating systems thinking into spatial planning, rather than linear thinking. Overall, the system approach can help to understand which processes and instruments generate momentum and how to proactively address

resistance to proposed changes (R2). In many cases the positive impact of spatial planning could be greatly enhanced by enabling complementary fiscal, environmental and local government financing policies and tools (R4). Policy cohesion at plan and project level plays a crucial role and can contribute to having biodiversity requirements transparently integrated throughout the process, providing pathways that nurture system change (R9).

In phasing-out processes, obstacles to transformative dynamics often stem from vested interests that benefit from existing system configurations or institutional legacies ("lock-ins"). For example, infrastructure development (including the construction of roads, energy systems, supply and transportation networks), housing development and land development in general have been widely recognised as key drivers of economic growth while, frequently, impacting very negatively on biodiversity objectives. Spatial planning processes should understand these lock-ins by, for example: identifying and handling pressures for biodiversity arising from cumulative impacts of a large number of development projects across different areas (R9); strengthening the proactive application and enforcement of the mitigation hierarchy in infrastructure developments (avoid rather than offset impacts) (R9); broadening baseline studies on biodiversity-related impacts during the diagnosis stage in plan-making and ensuring effective use of this data when determining concrete actions and projects to be implemented (R11); and improving the development and use of scenarios and alternatives in formulation of planning strategies (R12).

3.4.4. Building Block 4, Emancipation and Agency for Transformation

Emancipation and agency are important for transformation because, even when there is agreement on a joint vision and common goals, there are still several pathways possible to achieve goals and different contexts will require different strategies and actions (**Figure 9**). In spatial planning this means diverse priorities, governance structures and needs from different actors must be negotiated and balanced. Inspired by the environmental and social justice frameworks, marginalised groups must be considered in distributional, representative, and procedural dimensions of the planning process (Langemeyer and Conolly, 2020). For example, representation should be ensured in the phases of visioning, setting objectives, and diagnosing problems; procedural justice must be embedded in the strategy design, proposal development, and evaluation; and distributional justice should guide the selection of projects, plans, and implementation priorities.

Opening political and institutional spaces to empower individuals and communities to what Scoones et al. (2020) describe as "take action on their own behalf" – requires more than just political will; it demands structural efforts across all stages of the planning cycle. Justice-oriented approaches acknowledge the diversity of social needs and call for spatial planning to recognise the distinct characteristics of different territories. For instance, it is recommended to adopt methodologies that enable the co-production of territorial models with diverse citizen groups from the earliest phases of the planning process. To support this, it is useful to create territorial units that identify and engage target groups, ensuring their involvement in subsequent planning steps.

Integrating local communities in the design and management of multifunctional landscapes spatial planning can increase ecological and social benefits. Ensuring participation in planning processes

so that decisions are negotiated collaboratively will make synergies and trade-offs more transparent, and planning outcomes more equitable and resilient (R3). Ecological restoration can also create green jobs, support local food systems, and enhance cultural values. Within the spatial planning process, empowerment by mobilising actors for a collective good, can contribute to navigating conflicts arising from vested interests across sectors. This must be accompanied by a commitment to pluralism – actively including diverse knowledge systems and marginalised perspectives (R6). Spatial planning can actively contribute to transformative change by addressing historical inequalities in access to land and resources (as an extreme example of R12).

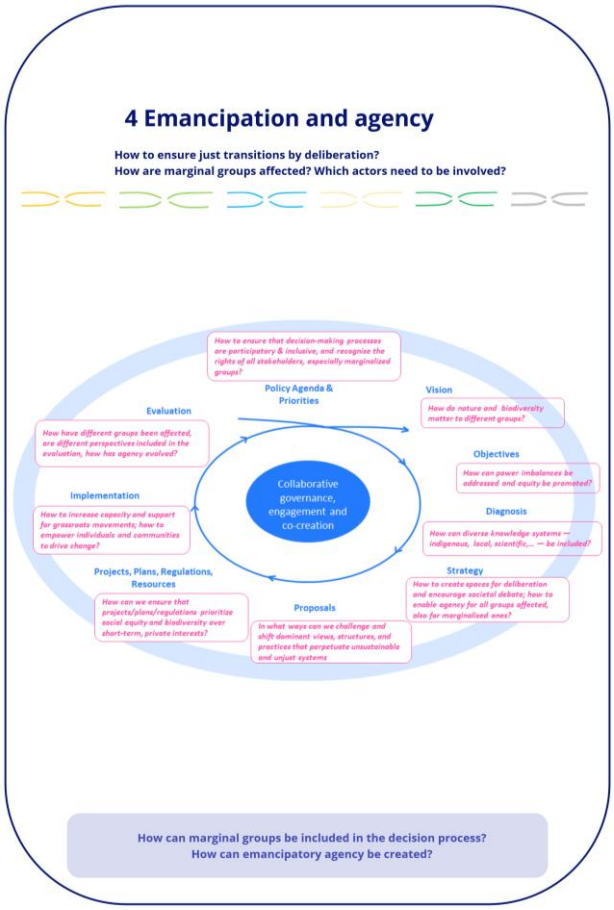

Figure 9. Emancipation and Agency building block.

Tools such as zoning reforms, land use reallocation, or community land trusts can help redistribute use rights and empower marginalised groups. To promote both the active demand for these tools and their broader acceptability, it is essential to simplify their definitions and applications. This means translating the technical language of spatial planning into accessible examples and practical uses. By doing so, citizens – especially those with low planning literacy, who often coincide with marginalised groups – can better understand, appreciate, and engage with these tools. Embedding such instruments in planning frameworks not only supports environmental goals but also strengthens social justice and long-term stewardship.

Considering that legitimacy depends on multiple factors – such as trust building and long-term processes – it is essential to promote early and transparent stakeholder engagement in the

planning process, embedding biodiversity-connected aims and incorporating sustainable iterative learning and collective action in institutions (R6). For example, empowerment in spatial planning goes beyond consultation – it includes creating conditions for communities to benefit from and influence transformations that enhance biodiversity. Moreover, one option can be to incentivise access to emerging environmental markets (e.g. carbon or biodiversity credits) and ensure communities have the knowledge, data, and digital infrastructure to participate meaningfully. When spatial planning combines and aligns enabling conditions with local aspirations, it can foster innovation and inclusive development. Furthermore, planning authorities must prioritise inclusivity in designing and implementing spatial planning instruments to avoid exacerbating socio-economic inequalities.

3.4.5. Building Block 5, Transformative Governance

Transformative governance means actively shaping how decisions are made towards actions and solutions that support deep, long-term change (**Figure 10**) – in this case, placing biodiversity conservation and enhancement at the core of spatial planning. This goes beyond simply producing good policies; it requires organising processes that drive systemic change (transformative dynamics) by connecting clear goals (transformative visions), shared understanding (transformative knowledge), and the mobilisation of actors (emancipation and agency) to enable transformation.

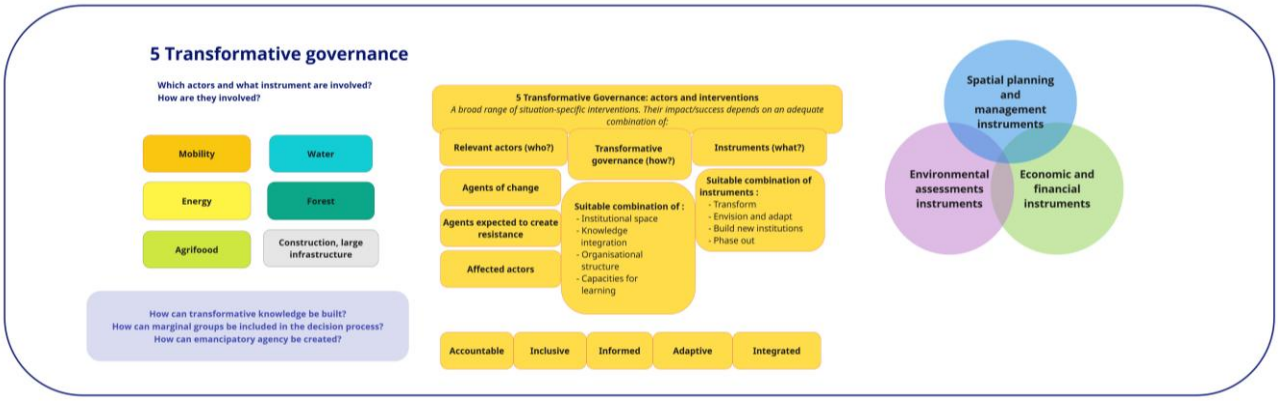

Figure 10. Transformative Governance building block.

To support this, the desegregation of governance into 'who' the key actors involved are, 'how' decision-making operates, and 'what' policies and instruments are in place is critical for identifying which elements of the system can be adjusted to better support biodiversity-enhancing spatial planning processes (R3, R8).

Within the transformation process, it is important to recognise that actors may take on different roles: they may enable and advance the process as 'agents of change', oppose or delay it as 'agents expected to create resistance' (who require engagement), or be influenced by it as 'affected actors' – who may shift towards either role depending on how they are impacted. When enabled and empowered, 'agents of change' can provide guidance and instruments that explicitly address and reverse biodiversity loss (R3, R14). The ways in which these actors interact and make decisions play a key role in shaping the transformative process. Therefore, this process must be supported by an

enabling environment – comprising appropriate institutional spaces, integrated knowledge, effective organisational structures, and strong learning capacities – and by a suitable combination of transformation instruments that address the root causes of biodiversity loss in an inclusive, informed, adaptive, integrated, and accountable way.

Spatial planning is already a cross-sectoral process, making it well placed to facilitate the interaction of multiple actors across governance levels and to adjust frameworks for enhancing biodiversity across policy areas through land use decisions (R3, R4, R8). It therefore plays a key role in creating the conditions for change, ensuring that biodiversity objectives can be systematically integrated into local governance and financial decision-making in ways that are both economically and financially viable – and thus effectively implementable (R4, R8).

4. Catalogue of Instruments

Biodiversity safeguarding and enhancement in spatial planning can use a diverse set of instruments to help integrate biodiversity considerations into decision-making. The instruments presented in this catalogue result from the research developed in WPs 1, 2, and 3. They are categorised by Function, and by Objectives and Needs. In this section, it is first presented the grouping of instruments per Function, explaining the Functions. Then the instruments are grouped by spatial planning Objectives and Needs, which are also explained. In a third section the understanding of Political Acceptability and Feasibility of Implementation is presented. A fourth section further explores synergies between the instruments and strategies for their transformative change. Then, **Table 1** provides a structured overview of all instruments according to the three categories used in BioValue, and an explanation of what are the Functions of each instrument, the spatial planning Objectives and Needs they can address and the Arenas' interpretation as to the instruments Political Acceptability and Feasibility of Implementation.

Selecting instruments as a function of its role and spatial planning objectives and needs allows practitioners to consider using the most relevant instruments for biodiversity conservation in spatial planning. By aligning the instruments with strategic objectives, decision-makers can ensure that biodiversity is effectively protected and enhanced across different planning contexts.

The method followed to achieve this outcome included a refinement and classification process by the research team to enhance the coherence, strategic alignment, and practical applicability of the instrument catalogue. This iterative, collaborative process aimed to:

- **Review and Consolidate** – Instruments were systematically analysed to identify overlaps, redundancies, and those with limited practical relevance. This led to a refinement of the initial set, with some instruments being grouped and others excluded if they did not align with the agreed definition;
- **Classify by Function** – Instruments were categorised based on their primary role within the spatial planning cycle, ensuring consistency across different types;
- **Group by Objectives and Needs** – The instruments were then classified to align them with specific policy objectives and practical implementation needs, supporting spatial planning decision-making.

This process was conducted through structured working group discussions, using a Delphi-inspired approach – where participants assessed each instrument individually and iteratively refined classifications based on expert consensus. Strategic thinking played a central role, ensuring that the classifications were not only theoretically sound but also aligned with real-world planning challenges and decision-making processes. The research team utilised visual mapping techniques, constructing a spatial matrix on a physical layout to systematically categorise instruments and assess their relationships. The placement of instruments was evaluated against practical implementation considerations, allowing for iterative modifications to ensure internal coherence and logical consistency across classifications.

The refined classification underwent validation and practitioner assessment. Team members reviewed and approved the classification, while the project's three Arenas for Transformation

conducted a practitioner-oriented assessment, assessing the instruments' relevance in real-world contexts and analysing their political acceptability and feasibility.

4.1. Classification by Function

In the context of BioValue, instruments for biodiversity safeguard and enhancement in spatial planning are classified according to their function, based on their roles in implementing and shaping policies, influencing behaviour shifts, and ensuring effective implementation and outcomes. Each of these categories addresses biodiversity safeguard and enhancement from a different angle, helping practitioners select the most suitable instruments for specific challenges. Six functional categories are presented:

INFORMATION

Information-based instruments aim to improve awareness and knowledge related to biodiversity status, evolution, and safeguards. They empower stakeholders, including policymakers, developers, and communities, to make informed choices that support the enhancement of biodiversity, fostering a culture of biodiversity-conscious planning and behaviour.

1 **SP&MI:**

- Guidelines for Public Space Design and Management
- Best Practice Guidelines for Private Landowners

2 **EAI:**

- Assessment of Cumulative Impacts
- Scoping
- Information, Consultation, Engagement
- Baseline Assessment
- Monitoring and Evaluation

PLANNING & PROJECT DESIGN

Planning and design instruments integrate biodiversity considerations directly into spatial development processes. These tools ensure that projects and policies proactively address biodiversity challenges rather than responding to them reactively.

1 SP&MI:

- Protected and Conservation Areas
- Land use Zoning
- Design-Based Instruments
- Land Acquisition

2 EAI:

- Scoping
- Strategic Environmental Assessment (SEA)
- Environmental Impact Assessment (EIA)
- Formulation of Alternatives
- Mitigation Hierarchy
- Enhancement Measures
- Monitoring and Evaluation

INCENTIVE

Incentive-based instruments encourage biodiversity-friendly practices through financial or other benefits. These instruments aim to make conservation attractive by rewarding behaviours or compensating for the costs of biodiversity safeguard, aligning public and private interests in a broad sustainability context and making conservation a viable choice.

1 SP&MI:

- Density Bonuses
- Fast-Tracking Approval Process
- Interim Use Permits for Vacant Land

2 EAI:

- Mitigation Hierarchy
- Enhancement Measures

3 E&FI:

- User Fees and Surcharges
- Payments for Ecosystem Services and Direct Payments
- Environmental Taxes
- Tax Relief and Subsidies
- Ecological Fiscal Transfers
- Benefit and Revenue Sharing
- Awards and Recognitions
- Auctions and Tenders
- Habitat/Mitigation Banking
- Green Products and Eco-Labelling/Certification
- Green Credits and Investment Facilities
- Quotas and Licenses

Funded by the European Union

AGREEMENT

Agreements involve voluntary or negotiated commitments among stakeholders to achieve biodiversity goals. These can include public-private partnerships, conservation contracts, or land-use agreements that balance development and ecological safeguard. Different forms of agreements provide flexibility and encourage cooperation in biodiversity governance.

1 SP&MI:

- Land Rearrangements
- Contractualization and Stewardship Programs
- Transfer of Development Rights (TDR)

3 E&FI:

- Voluntary Donations and Sponsorships

REGULATION

Regulation-based instruments establish legal frameworks that set mandatory rules, control measures, or restrictions to safeguard and enhance biodiversity. Regulations ensure long-term biodiversity conservation, preserve critical habitats, and promote sustainable development.

1 SP&MI:

- Quantitative Targets and Standards
- Qualitative and Technological Requirements
- Compensation Measures
- Performance-Based Approaches (Point Systems)
- Land Use Zoning

2 EAI:

- Strategic Environmental Assessment (SEA)
- Environmental Impact Assessment (EIA)

3 E&FI:

- Fines, Penalties, and Legal Liabilities

Funded by the European Union

ENFORCEMENT

Enforcement instruments lead to observance and enable authorities to take direct action to protect biodiversity and ensure compliance with conservation and planning objectives. These instruments provide legal safeguards to uphold biodiversity commitments and prevent ecological degradation by securing land, enforcing conservation commitments, and guaranteeing that biodiversity measures are implemented effectively. Strong enforcement mechanisms help maintain the integrity of conservation efforts by ensuring that regulations are respected.

1 SP&MI:

- Expropriation of Land and Compulsory Easements
- Administrative Possession
- Pre-emption Rights

3 E&FI:

- Deposits and Performance Bonds

Taken together, the instruments within these categories provide a comprehensive toolkit for practitioners seeking biodiversity conservation within spatial planning. Information instruments empower stakeholders, planning and project design integrate biodiversity into planning processes, incentives encourage positive behaviours, agreements foster collaboration, regulations set the legal foundation, and enforcement ensures action.

4.2. Classification by Spatial Planning Objectives and Needs

The instruments are also classified based on the spatial planning objectives and implementation needs they can assist. This classification is designed to directly serve practitioners by helping them identify tools that best fit specific spatial planning challenges – whether related to, for example, land management, funding, regulatory compliance, or community engagement. Seven categories are presented, each addressing a distinct aspect of biodiversity integration in spatial planning:

LAND OWNERSHIP

These instruments define and manage property rights and access to land for biodiversity conservation. They help secure biodiversity valuable areas through measures such as expropriation, pre-emption rights, or compulsory easements. Planners can use these tools to regulate land use, ensure conservation, and safeguard critical ecological areas.

PLANNING & PROJECT DESIGN	Land Acquisition
AGREEMENT	Land Rearrangements
ENFORCEMENT	Expropriation of Land and Compulsory Easements; Administrative Possession; Pre-emption Rights

PERFORMANCE AND STANDARDS

These instruments set, or use, measurable criteria for environmental performance, such as emission limits, habitat restoration targets, and sustainable land-use standards. They guide development and conservation activities by enforcing ecological thresholds, ensuring biodiversity is maintained within urban planning and construction practices.

INFORMATION	Baseline Assessment; Monitoring and Evaluation
PLANNING & PROJECT DESIGN	Design-Based Instruments; Monitoring and Evaluation
INCENTIVE	Habitat/Mitigation Banking; Quotas and Licenses
REGULATION	Quantitative Targets and Standards; Qualitative and Technological Requirements; Compensation Measures; Performance-Based Approaches (Point Systems)

FUNDS FOR CONSERVATION

Instruments in this category have the potential to raise funds or provide broader funding options, including from private sources, or facilitate the allocation of public funds for biodiversity conservation. These include environmental taxes, green bonds, and compensation schemes that support conservation initiatives and fund ecological restoration projects.

INCENTIVE	User Fees and Surcharges; Payments for Ecosystem Services and Direct Payments; Environmental Taxes; Tax Reliefs and Subsidies; Ecological Fiscal Transfers; Benefit and Revenue Sharing; Auctions and Tenders; Quotas and Licenses
AGREEMENT	Voluntary Donations and Sponsorships

Funded by the European Union

PUBLIC SERVICES AND ADMINISTRATION

These instruments focus on integrating biodiversity considerations into public administration and service provision. They involve strategic planning, public land management, and administrative incentives to embed biodiversity into governance frameworks and promote nature-positive urban development.

INFORMATION	Guidelines for Public Space Design and Management
PLANNING & PROJECT DESIGN	Enhancement Measures; Strategic Environmental Assessment (SEA); Environmental Impact Assessment (EIA)
INCENTIVE	Fast-Tracking Approval Process; Enhancement Measures
REGULATION	Strategic Environmental Assessment (SEA); Environmental Impact Assessment (EIA)

PRACTICES

This category includes instruments of good practices at different levels that establish rules and guide land use and construction activities to ensure they align with biodiversity conservation objectives. These instruments help manage development impacts, regulate land use changes, and enforce environmental safeguards to support ecological sustainability.

INFORMATION	Best Practice Guidelines for Private Landowners; Assessment of Cumulative Impacts; Scoping
PLANNING & PROJECT DESIGN	Protected and Conservation Areas; Land Use Zoning; Scoping; Strategic Environmental Assessment (SEA); Environmental Impact Assessment (EIA); Mitigation Hierarchy
INCENTIVE	Density Bonuses; Interim Use Permits for Vacant Land; Mitigation Hierarchy
AGREEMENT	Contractualization and Stewardship Programs; Transfer of Development Rights (TDR)
REGULATION	Land Use Zoning; Strategic Environmental Assessment (SEA); Environmental Impact Assessment (EIA); Fines, Penalties, and Legal Liabilities
ENFORCEMENT	Deposits and Performance Bonds

Funded by the European Union

AWARENESS AND ENGAGEMENT

These instruments promote knowledge-sharing and public engagement in biodiversity conservation. They include educational campaigns and participatory planning, fostering community involvement and ensuring biodiversity is a shared priority in urban and spatial planning.

INFORMATION	Information, Consultation, Engagement
PLANNING & PROJECT DESIGN	Formulation of Alternatives; Strategic Environmental Assessment (SEA); Environmental Impact Assessment (EIA)
INCENTIVE	Awards and Recognitions
REGULATION	Strategic Environmental Assessment (SEA); Environmental Impact Assessment (EIA)

SUSTAINABLE BUSINESS & FINANCE

Instruments in this category support market-driven conservation approaches, encouraging businesses to integrate biodiversity-friendly practices. They include certification schemes, green procurement policies, and incentives for eco-friendly products and services.

INCENTIVE	Green Products and Eco-Labelling/Certification; Green Credits and Investment Facilities

4.3. Political Acceptability and Implementation Feasibility

Beyond their function/role and spatial planning objectives, the instruments in this catalogue are also assessed based on their political acceptability and feasibility of implementation within real-world planning and governance contexts. This classification was conducted by the WP4's Arenas for Transformation – the BioValue project's case studies in Trento (T), Meck-Pomm (MV), and Mafra (M) – to evaluate how different instruments align with local political realities, administrative capacities, and institutional frameworks.

Political acceptability reflects the likelihood of an instrument gaining support from decision-makers, stakeholders, and the general public, considering political priorities, economic interests, and social perceptions. Implementation feasibility assesses the practical challenges of putting an instrument into practice, including administrative complexity, financial costs, and required institutional capacity.

The classification uses a four-tier scale that combines these two dimensions:

1. **High probability of political acceptability – Easy implementation**: Instruments that have the potential to be widely supported by policymakers and stakeholders and can be readily implemented with existing resources and governance structures. These tools offer quick wins for biodiversity integration.

2. **High probability of political acceptability – Difficult implementation**: Instruments that will likely receive strong political and stakeholder support but require significant administrative, financial, or technical efforts to implement. Their adoption may depend on long-term planning and capacity-building efforts.
3. **Low probability of political acceptability – Easy implementation:** Instruments that are relatively simple to implement from a technical or administrative standpoint but may lack political support. These tools often require strong advocacy efforts or incentives to gain acceptance among decision-makers.
4. **Low probability of political acceptability – Difficult implementation**: Instruments that face political resistance and require substantial efforts to be implemented. These tools may challenge prevailing policies, economic interests, or administrative traditions, requiring advocacy, negotiation, and institutional change.

This classification provides practitioners with insights into the political and administrative realities surrounding biodiversity conservation instruments in the contexts of BioValue's Arenas for Transformation – which might or might not be transferable to different settings. This is offered here merely as indicative, since this classification is obviously quite subjective and dependent on the context and political moment, as well as on the public acceptance, the economic capacity, and the legislative structures. Those classified by the three arenas as 1 are quite likely to be easy to be used, while those classified as 4 will most likely face greater needs of diplomacy. This helps identify strategic entry points for implementation and potential barriers that may require negotiation, adaptation, or additional supporting measures.

4.4. Synergies Between Instruments and Strategies for Transformative Change

The listed instruments have been grouped into SP&MI, EAI, and E&FI, as these represent the main areas of knowledge involved in the BioValue project. It is worth noting that the EIA and SEA methodologies are already embedded in the spatial planning process, as they are mandatory at the European level for Plans and Projects. Some E&FI correspond to tools exclusive to SP&MI (such as Impact Fees or Urban Charges), while others are common to economic-financial governance and are often also employed by the planning process itself. The listed SP&MI are more specific to spatial planning, with their usage frequency varying according to context.

All the instruments can be applied individually or in combination, depending largely on the context, the specific problems at hand, the type of plans involved, and the spatial planning culture of each country (Nadin and Fernández-Maldonado, 2023). It is advisable to design effective strategies based on a suitable combination of instruments, potentially involving the metaphorical triad of "Carrots", "Sticks", and "Sermons" (as referenced in D1.2), originally introduced by Vedung (1998) and later supported by Purkarthofer (2018) and David et al. (2024).

For transformative change to take place in terms of biodiversity safeguard and enhancement through spatial planning, several additional factors can significantly influence the success of outcomes. These include: clear political will; the agility of local authority technical staff in selecting and applying instruments – including those that may be novel or innovative; the presence of a

society with a proactive civic conscience, capable of putting pressure on the administration and cooperating on solutions; and the availability of financial and economic resources.

Thus, the spatial planning process must harness an appropriate combination of instruments that generate synergies. These should be integrated with key enabling factors, which act as triggers – such as those mentioned above. These triggers can activate positive feedback dynamics which, if successful, result in transformative change. In doing so, the spatial planning process learns to operate with new tools, manage expectations and interests based on tangible biodiversity and ecosystem outcomes, and progressively phase out outdated procedures and reform legacy thinking – fostering a new relationship between humans and nature.

4.5. Catalogue of Instruments

Table 1 synthesises the various instruments according to their **Type** (SP&MI, EAI, and E&FI – see Section 1.4), **Function** (information, planning & project design, incentive, agreement, regulation, and enforcement – see Section 4.1), spatial planning **Objectives and Needs** (land ownership, performance and standards, funds for conservation, public services and administration, practices, awareness and engagement, and sustainable business & finance – see Section 4.2), and **Political Acceptability and Implementation Feasibility** (low/high probability of political acceptability, and easy/difficult implementation – see Section 4.3).

Table 1: Catalogue of instruments for biodiversity value safeguard and enhancement according to their Type, Function, spatial planning Objectives and Needs, and Political Acceptability and Feasibility of implementation.

Type	Instrument	OBJECTIVE / NEED / FUNCTION	Acceptability & Feasibility	
1 01	**Guidelines for Public Space Design and Management** Frameworks for integrating biodiversity into planning and upkeep of public spaces. This can support biodiversity by guiding ecological design in public spaces and favouring integration with green networks.	PUBLIC SERVICES AND ADMINISTRATION / INFORMATION	T MV M	1 2 1
1 02	**Best Practice Guidelines for Private Landowners** Recommendations for biodiversity-friendly land management on private properties. This can enhance biodiversity by encouraging more sustainable land management and ecologically friendly practices.	PRACTICES / INFORMATION	T MV M	1 2 2
1 03	**Protected and Conservation Areas** Legally designated sites where ecological preservation is prioritised through restrictions on land use and activities. These areas preserve biodiversity by safeguarding habitats, halting land-use change and connecting green spaces.	PRACTICES / PLANNING & PROJECT DESIGN	T MV M	2 3 2
1 04	**Land Use Zoning** A tool that allocates land (at different scales) for specific uses, balancing development and conservation goals. It supports biodiversity by organising land use to protect habitats and potentially linking natural habitats to increase connectivity.	PRACTICES / PLANNING & PROJECT DESIGN / REGULATION	T MV M	2 4 2
1 05	**Design-Based Instruments** Design approaches incorporating nature-based solutions to support biodiversity. This can enhance biodiversity by prioritising green design and potentially connecting natural habitats.	PERFORMANCE AND STANDARDS / PLANNING & PROJECT DESIGN	T MV M	3 4 4

106	**Land Acquisition** The purchase of land by public authorities to protect or restore habitats. It supports biodiversity by preserving natural habitats and improving management for conservation. It can also be used to create green networks.	LAND OWNERSHIP PLANNING & PROJECT DESIGN	T MV M	3 2 1
107	**Density Bonuses** Incentives allowing increased building capacity in exchange for biodiversity enhancements, promoting natural elements, habitat preservation, and creation. This can support biodiversity by incentivising habitat safeguard and enhancement.	PRACTICES INCENTIVE	T MV M	2 1 4
108	**Fast-Tracking Approval Process** A streamlined approval process for developments that incorporate biodiversity enhancements. This promotes biodiversity by aligning development with ecological goals and reducing delays in projects with positive effects for habitat quality or connectivity.	PUBLIC SERVICES AND ADMINISTRATION INCENTIVE	T MV M	1 2 1
109	**Interim Use Permits for Vacant Land** Temporary land-use permits that allow ecological functions on underutilised land. This can improve biodiversity by activating spaces for nature-based solutions and increasing ecological value.	PRACTICES INCENTIVE	T MV M	1 2 4
110	**Land Rearrangements** The reorganisation of land parcel ownership to create larger, ecologically viable habitat patches. This can support biodiversity by creating cohesive, connected habitats. Needs to be paired with conservation areas or zoning for effective biodiversity conservation.	LAND OWNERSHIP AGREEMENT	T MV M	3 4 4
111	**Contractualization and Stewardship Programs** Voluntary or contractual arrangements where landowners commit to maintaining ecological conditions, ensuring that conservation practices are upheld over time. Habitat quality and connectivity can be enhanced through such collaborative stewardship.	PRACTICES AGREEMENT	T MV M	3 4 4
112	**Transfer of Development Rights (TDR)** Mechanisms that transfer development potential from ecologically sensitive areas to designated growth zones. TDRs can preserve biodiversity by protecting habitats and guiding sustainable development.	PRACTICES AGREEMENT	T MV M	2 2 4
113	**Performance-Based Approaches (Point Systems)** A scoring mechanism that rewards development projects integrating biodiversity-friendly features. They can improve biodiversity by promoting habitat creation and ecological alignment.	PERFORMANCE AND STANDARDS REGULATION	T MV M	3 3 1
114	**Quantitative Targets and Standards** This regulatory tool sets specific and quantifiable targets for biodiversity conservation in development projects or in land-use planning. They can enhance biodiversity by increasing natural areas and can also improve habitat quality and ecological connectivity.	PERFORMANCE AND STANDARDS REGULATION	T MV M	1 3 1
115	**Qualitative and Technological Requirements** Regulations setting qualitative ecological and/or technological elements for land use management or infrastructure development projects. They enhance biodiversity by integrating green infrastructure, improving resource management, and promoting good ecological conditions.	PERFORMANCE AND STANDARDS REGULATION	T MV M	3 3 2
116	**Compensation Measures** Obligations imposed on developers to offset environmental damage through habitat restoration or conservation efforts. These measures can support biodiversity by offsetting impacts and restoring ecosystems.	PERFORMANCE AND STANDARDS REGULATION	T MV M	3 4 3
117	**Expropriation of Land and Compulsory Easements** A legal tool that allows public authorities to acquire private land or impose usage restrictions for conservation purposes. It helps protect biodiversity by securing land, expanding habitats and/or ensuring better land management.	LAND OWNERSHIP ENFORCEMENT	T MV M	4 2 4
1	**Administrative Possession** This tool allows public authorities to temporarily manage land to address neglect or ecological threats. It can	LAND OWNERSHIP	T MV	4 1

18	support biodiversity by restoring neglected areas and improving habitat connectivity.	ENFORCEMENT	M	4
1 19	**Pre-emption Rights** A legal right that allows authorities to purchase land before private buyers to prevent environmentally harmful developments. They help protect ecologically valuable land from development and can support green networks.	LAND OWNERSHIP ENFORCEMENT	T MV M	1 3 1
2 01	**Assessment of Cumulative Impacts** An evaluation of the aggregated impacts from different planning activities within the same area. Cumulative impact assessments can be an instrument on its own, but assessing cumulative impacts can also be an integrated part of SEAs and EIAs. They capture the broader, systemic interactions that contribute to biodiversity loss or gain, which is essential for understanding how individual impacts can accumulate in time and space.	PRACTICES INFORMATION	T MV M	1 4 2
2 02	**Scoping** The process of identifying the relevant and significant impacts associated with a given planning activity and which are important to decision making. The issues identified in the scoping process are to be addressed and assessed in the coming SEA and/or EIA. Scoping is conducted early in the EA process and is a crucial step in ensuring that relevant biodiversity impacts are included and assessed.	PRACTICES INFORMATION PLANNING & PROJECT DESIGN	T MV M	1 3 2
2 03	**Information, Consultation, Engagement** Methods for involving stakeholders in biodiversity-related planning decisions. Sharing information and engaging communities collaboratively empowers decision-making, ensuring diverse perspectives are integrated, fostering a more sustainable, biodiversity-focused approach.	AWARENESS AND ENGAGEMENT INFORMATION	T MV M	1 4 1
2 04	**Baseline Assessment** Evaluations of biodiversity conditions, challenges, and transformative opportunities to inform land-use decisions. SEA uses existing data to map biodiversity, land use, and ecosystem conditions, guiding strategies for habitat restoration and ecosystem connectivity.	PERFORMANCE AND STANDARDS INFORMATION	T MV M	3 3 2
2 05	**Monitoring and Evaluation** Systematic tracking of environmental conditions to assess biodiversity outcomes, refine mitigation measures, and inform future planning cycles and SP&MI through condition indicators, including biodiversity metrics. SEA tracks broader systemic outcomes, like ecosystem health, while EIA focuses on project-specific issues.	PERFORMANCE AND STANDARDS INFORMATION PLANNING & PROJECT DESIGN	T MV M	2 4 2
2 06	**Strategic Environmental Assessment (SEA)** Horizontal instrument and regulation within the EU's environmental policy framework. SEA integrates biodiversity considerations, along with other critical environmental factors like climatic factors, land and population, at the strategic level of policies, plans and programs.	PUBLIC SERVICES AND ADMINISTRATION PRACTICES AWARENESS AND ENGAGEMENT PLANNING & PROJECT DESIGN REGULATION	T MV M	1 3 1
2 07	**Environmental Impact Assessment (EIA)** A horizontal and mandatory instrument aligned with SEA but applied to specific project-levels of planning. EIAs provide a process for the early identification and mitigation of potential impacts to ensure compliance with environmental standards and protect local biodiversity.	PUBLIC SERVICES AND ADMINISTRATION PRACTICES AWARENESS AND ENGAGEMENT PLANNING & PROJECT DESIGN REGULATION	T MV M	1 3 1
2 08	**Formulation of Alternatives** Development of different planning scenarios to evaluate impact on biodiversity, ecosystem services, and human well-being. It clarifies trade-offs, supports informed decisions, and prioritises interventions like green infrastructure and habitat connectivity.	AWARENESS AND ENGAGEMENT PLANNING & PROJECT DESIGN	T MV M	2 3 2
2 09	**Mitigation Hierarchy** A structured approach to minimising environmental damage. It prioritises avoidance, minimisation, reparation, or offsetting through a framework that emphasises harm prevention before considering	PRACTICES PLANNING & PROJECT DESIGN	T MV	2 3

	corrective actions. See Ravn Boess & Kørnøv (2024) for a catalogue of mitigation measures.	INCENTIVE	M	4
2 10	**Enhancement Measures** Proactive efforts to improve current baseline biodiversity conditions beyond mitigation. These measures aim for net-positive environmental outcomes and alignment with biodiversity goals. See Kørnøv et al. (2024b) for a catalogue of enhancement measures.	PUBLIC SERVICES AND ADMINISTRATION PLANNING & PROJECT DESIGN INCENTIVE	T MV M	2 3 4
3 01	**User Fees and Surcharges** Fees or charges for using or consuming goods and services or activities associated with natural areas. They can be used to generate revenue for conservation, recover costs and/or manage demand of land and/or resource use.	FUNDS FOR CONSERVATION INCENTIVE	T MV M	1 1 3
3 02	**Payments for Ecosystem Services and Direct Payments** Voluntary payments (in cash or in kind, including carbon payments) or performance-based compensation for undertaking agreed conservation actions to enhance ecosystem services provision or biodiversity conservation.	FUNDS FOR CONSERVATION INCENTIVE	T MV M	2 4 4
3 03	**Environmental Taxes** Levies applied to activities that use ecosystem services or may harm biodiversity and ecosystem services. Success depends on whether relevant authorities have the political power to influence fiscal measures, which are often decided at the state or national level.	FUNDS FOR CONSERVATION INCENTIVE	T MV M	3 2 3
3 04	**Tax Reliefs and Subsidies**: Tax reductions, exemptions, or subsidy payments by the government to support products, technologies, and practices that minimise or prevent environmental degradation or contribute to conservation goals. They are often decided at state or national level.	FUNDS FOR CONSERVATION INCENTIVE	T MV M	1 2 1
3 05	**Ecological Fiscal Transfers** Redistribution of revenues within or between public sector agencies to help lower-tier governments cover costs for providing nature-related public goods and services. Redistribution occurs according to certain environmental criteria, including conservation measures.	FUNDS FOR CONSERVATION INCENTIVE	T MV M	3 2 3
3 06	**Benefit and Revenue Sharing** A flat fee or percentage of public revenues or private income generated from conservation products and services that is shared with local communities to recognise their essential role in conservation and provide incentives and tangible benefits.	FUNDS FOR CONSERVATION INCENTIVE	T MV M	2 1 3
3 07	**Awards and Recognitions** Recognition of individuals, groups, or communities demonstrating good environmental practices to motivate the continuation or improvement of conservation activities. These measures are often combined with other incentives or awareness campaigns.	AWARENESS AND ENGAGEMENT INCENTIVE	T MV M	1 3 1
3 08	**Auctions and Tenders** Auctions are a mechanism to decide which landowners receive a contract that pays them to change land use and implement conservation measures on their land. Multiple landowners make competing propositions or bids for the price they ask to implement conservation measures, and a buyer – either government or a private entity – selects the best offer.	FUNDS FOR CONSERVATION INCENTIVE	T MV M	4 1 4
3 09	**Habitat/Mitigation Banking** When such a bank is established, a landowner who acts to conserve the natural habitat is seen as making a deposit in the bank and receives credits. Others who want to develop the habitat or otherwise impact on it must purchase a credit from the bank. These instruments are often determined by national law and require high transaction costs for setting up and management.	PERFORMANCE AND STANDARDS INCENTIVE	T MV M	3 3 1
3 10	**Green Products and Eco-Labelling/Certification** These initiatives promote income streams from products based on sustainable land and resource use, or provide voluntary trademarks to environmentally sustainable products,	SUSTAINABLE BUSINESS & FINANCE INCENTIVE	T MV	1 4

	services, processes or financial products for reaching new markets or generating additional revenues. They aim to provide incentives for businesses to operate in a way compatible with biodiversity conservation.		M	1
3 11	**Green Credits and Investment Facilities** Credit and loans or preferential terms and conditions are granted to green products and enterprises or may stipulate certain environmental requirements in their terms of agreement, including both small-scale loans and large-scale sources of credits and investment for green or biodiversity-based enterprises.		T MV M	2 1 2
3 12	**Quotas and Licenses** Quotas that restrict the extraction or use of natural resources can limit environmental damage to sustainable levels. They can be sold or auctioned to generate additional revenue for conservation efforts. Revenues from licenses can also generate additional income for environmental purposes and conservation projects.		T MV M	2 3 2
3 13	**Voluntary Donations and Sponsorships** Financial contributions from individuals or companies interested in conservation, or who benefit from ecosystem services, or recognise their role in ecosystem degradation. This also includes voluntarily sponsoring activities that enhance biodiversity or channel funds to local communities.		T MV M	1 2 2
3 14	**Fines, Penalties, and Legal Liabilities** Punishments and financial consequences applied to individuals or companies that overuse, harm or pollute the environment. The goal is to avoid or minimise negative environmental impacts or, for damage incurred, to oblige the responsible party legally and financially to compensate for it.		T MV M	2 2 3
3 15	**Deposits and Performance Bonds** Individuals or companies undertaking activities which threaten the environment or require some form of mitigation, remediation or management plan are required to make a (usually refundable) deposit of funds against the expenditure involved. This money is earmarked for mitigating or compensating damage.		T MV M	4 1 4

5. Recommendations on the Combined Action of SP&M, EA and E&F Instruments Within the Planning Process

Agents: Local policymakers, planning authorities, environmental practitioners, other relevant authorities

Various spatial planning instruments can be put into practice to achieve planning goals and visions in the implementation stage of the planning process. The selection of instruments is often influenced by factors such as path dependence and know-how, where planners tend to prioritise familiar solutions and incremental changes over innovative approaches due to limited resources, perceived risks or simple resistance to change. On the one hand, planning authorities must be able to identify and adapt appropriate instruments to enhance biodiversity according to their specific planning need(s). On the other hand, to maximise transformative outcomes, these planning instruments must be combined strategically to avoid trade-offs, such as shifting environmental costs to other landscapes or imposing social costs on vulnerable stakeholders.

Spatial planning instruments alone cannot fully address these challenges, and they highly benefit from the combined action with other instruments (EAI, E&FI). We provide in this section specific recommendations for the identification, adaptation, and combination of these instruments according to different planning needs, towards a more transformative implementation in the spatial planning process. By integrating and implementing (or preparing the implementation) these instruments in earlier stages of the planning process, both their effectiveness, efficiency, and impact can be improved, and potential challenges can be addressed proactively rather than reactively.

Early-stage implementation creates a more resilient, efficient, and adaptable planning process, which ultimately leads to better outcomes for both biodiversity and urban development. A good example is land acquisition. Early implementation through various tools, such as LVC, expropriation, or negotiation mechanisms, allows the municipality to secure strategic land parcels, prevent speculative price increases, and align land use with long-term biodiversity goals. By acting proactively, municipalities can ensure that land acquisition supports sustainable development and facilitates the effective implementation of spatial plans.

This section addresses specific operational recommendations – organised according to instruments' function, i.e., based on their role in shaping policies, influencing behaviour, and ensuring effective outcomes – centred in the perspective of the spatial planning instruments, considering their combination with environmental assessment and economic and financial instruments. We reference instruments following their catalogue code (X/YY) (from Section 4.5). Many of these recommendations directly stem from the 14 recommendations presented in Section 3, which establish the enabling conditions needed for implementation. We reference them accordingly.

INFORMATION

- When producing *Guidelines for Public Space Design and Management (1/01)* and *Best Practice Guidelines for Private Landowners (1/02)*, ensure they are adaptable to different planning contexts. In this regard, use *baseline assessments (2/04)* including biodiversity and ecosystem services, and engage with local actors (*e.g., information, consultation and engagement (2/03)*), to tailor guidelines and criteria to consider local practices and ecological conditions **(R12)**.
- Institutionalise long-term biodiversity monitoring programs to adjust guidelines and recommendations and track improvements across temporal and spatial scales **(R14)**. In this regard, strengthen inter-agency cooperation and provide local authorities with access to technical expertise and funding (e.g., *ecological fiscal transfers (3/05)*) for continuous monitoring **(R4)**.
- Enhance public accessibility to environmental information – including monitoring results – to increase transparency, accountability, and learning. Make use of non-technical summaries of EA results for non-specialist audiences (e.g., *2/06* and *2/07*).
- Promote participatory planning processes to align guidelines with community needs.
- Raise public awareness on biodiversity-friendly land management practices through *information, consultation and engagement (2/03)*. Ensure technical support is available for private landowners willing to adopt *Best Practice Guidelines for Private Landowners* (1/02).
- Improve interdepartmental coordination to align biodiversity data collection with planning policies **(R6)**.
- Leverage citizen science to engage communities in biodiversity conservation while promoting systematic, locally relevant data collection to inform planning decisions **(R6)**.
- When conducting *Baseline assessments (2/04)*, biodiversity and ecosystem service assessments should be included. These need to be conducted integrating diverse knowledge and conflicting perspectives, which can be done by promoting meaningful and early stakeholder engagement. Feasible assessment methods and integration approaches should be privileged to identify synergies, trade-offs, and power dynamics among stakeholders. Formative interactions among relevant actors are key to fostering mutual understanding and collaboration **(R6)**.
- Ensure effective use of information and knowledge generated by these instruments to inform the design of potential E&FI to encourage broader participation and engagement **(R12)**. For example, to provide financial or regulatory positive incentives for stewards (i.e., landowners and managers) willing to incorporate *Best Practice Guidelines (1/02)*, in line with the benefits provided (e.g., *tax reliefs (3/03)*, *fast-tracking approval processes (1/08)*).

PLANNING & PROJECT DESIGN

- Align *Design-based instruments (1/05)* with strategic ecological plans to ensure habitat and connectivity benefits **(R8)**.
- Define clear social and ecological objectives for any public space projects including *Design-based instruments (1/05)*, leveraging outputs from *Scoping (2/02)* and *Information, consultation, and engagement (2/03).*
- Integrate biodiversity and ecosystem service assessments (e.g., *Baseline assessments (2/04)*) early into project design to guide prioritisation of areas in which to intervene **(R9),** including using

landscape fragmentation indicators (to support habitat connectivity and assess cumulative impacts).

- Ensure that post-implementation maintenance includes dedicated biodiversity *monitoring and evaluation (2/05)* **(R14)**.
- Allocate dedicated municipal personnel and financial support for long-term success of design-based instruments **(R4)**. This may be coupled with E&FI – e.g., providing positive incentives such as increased access to municipal funding redistribution to public entities engaging in *Design-based instruments (1/05)* – e.g., through *Ecological Fiscal Transfers (3/05)*. *Voluntary donations and Sponsorships (3/13)* can also play a role in supporting design-based instruments, in which case potential private patterns should be scoped from the onset of the planning process.
- Engage stakeholders early in design-based projects to balance ecological and development interests, anticipating trade-offs and leveraging synergies **(R1, R6)**.
- Couple *Design-based instruments (1/05)* with *Qualitative requirements (1/14)* or *Quantitative targets (1/15)* to determine different thresholds for accessing more (or less) municipal funding (i.e., municipalities implementing certain types of design-based instruments and/or covering a specific % of targeted habitats through these instruments can be eligible to additional funding).

INCENTIVE

- Provide *Best Practice Guidelines for Private Landowners (1/02)*, specifying the temporary uses and activities that will be allowed in the land parcel (including them in the auction call if there is one), when implementing incentives such as *Interim Use Permits for Vacant Land (1/09).*
- Use *Baseline assessments* (2/04), including biodiversity condition and ecosystem service assessments to prioritise site selection for *Interim Use Permits for Vacant Land (1/09)* **(R12)**.
- Ensure clear legal and administrative frameworks for the temporary land-uses allowed in *Interim Permits (1/09)*. In this regard, prioritise biodiversity-compatible uses with relevant social functions (e.g., urban parks, community gardens) **(R1)**.
- Provide adequate financial and technical support to communities managing *Interim Permits (1/09)* projects, when applicable.
- Monitor ecological benefits when providing *Interim Permits (1/09)* to guide long-term land use decisions **(R14)**.
- Link *Density bonuses (1/07)* to biodiversity-enhancing measures that go beyond an increase in natural areas (e.g., more than just maintaining undeveloped land or unsealing surfaces). In this regard, integrate information instruments (e.g., *Best Practice Guidelines for Private Landowners (1/02)*, *Baseline assessments in EA (2/04)*) to ensure an increase in habitat quality and connectivity can also be achieved through density bonuses.
- Use *Quantitative targets (1/14)* targeting if applicable to ensure net ecological benefits when implementing *Density bonuses (1/07)*. Employ the mitigation hierarchy in EA to ensure that developments qualifying for density bonuses follow a clear logic: avoid -> minimise -> restore -> compensate.
- Provide local authorities with technical capacity to evaluate the quality of projects when determining *Density bonuses (1/07)* **(R6)**.
- Strengthen legal frameworks to prevent misuse of *Density bonuses (1/07)* incentives **(R3)**.

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- Pair *Fast-tracking approval processes (1/08)* with monitoring programs to track ecological outcomes **(R14)**.
- Provide technical support to municipalities for evaluating projects subjected to *Fast-tracking approval processes (1/08)*, or strengthen inter-agency cooperation in this regard **(R6)**.
- Ensure transparency in decision-making to prevent environmental trade-offs when implementing *Fast-tracking approval processes (1/08)*.
- Balance *Fast-tracking approval processes (1/08)* with thorough environmental impact assessments. In this regard, revise the biodiversity criteria for eligibility to facilitate screening process by local authorities, and ensure net ecological benefit of projects. The *Mitigation hierarchy* (2/10) can also provide support in this regard.
- *Density bonuses (1/07)* could be further supported by E&FI such as incentives to establish access to credit (e.g., *Green credits (3/11)*) for developers striving to meet the required criteria for bonuses.
- *Interim Use Permits for Vacant Land (1/09)* can be coupled with additional E&FI to encourage promoters/managers to comply with foreseen *Best Practice Guidelines for Private Landowners* (1/02).
- Account for biological principles such as area-species relationship and the source-sink dynamics when designing objectives and measures in E&FI, in particular, in *Payments for ecosystem services and direct payments (3/02)*, *Auctions and tenders (3/08)*, and *Tax reliefs and subsidies (3/04)*, to ensure positive contributions to biodiversity **(R7)**. Ensure phasing-out of unsustainable practices is addressed within the design of measures in E&FI **(R13)**. Include adequate *Monitoring and evaluation (2/05)* to ensure instrument achievement in terms of its objectives **(R14)**.
- Identify opportunities to promote changes to consumption and production patterns in other sectors (e.g., mobility and energy sectors) when designing E&FI with support from spatial planning actions such as infrastructure planning and zoning **(R11)**.
- Actively consider empowerment and innovation opportunities during scoping and when designing E&FI. In particular, combine SP&MIs that adjust or reallocate land-use rights in spatial planning (*Land acquisition (1/06)* and *Land rearrangements (1/10)*) with E&FI that support the establishment of new markets or provide access to credits for communities to participate in these markets **(R6)**.
- Ensure effective stakeholder engagement through thorough stakeholder analysis at the design stage and by involving affected stakeholders in a co-design and co-development process of E&FI (integrating *Information, Consultation and Engagement (2/03)*). Identify synergies with the stakeholder participation and public consultation processes embedded within the planning and related processes **(R6)**.
- Establish reflective follow-up after the implementation of E&FI to explore opportunities for improvements, or the need for modifications. Collaborate with others for wider application in terms of governance levels, spatial extensions, and sectors **(R14)**.
- Clear landownership is often the precondition for implementing E&FI such as *User fees and surcharges (3/01)*, *Payments for ecosystem services and direct payments (3/02)*, and *Auctions and tenders (3/08)*. Consider SP&MI on ownership agreements (e.g., *Land rearrangements (1/10)*), regulations, and/or enforcement (e.g., *Expropriation (1/17)*, and *Administrative possession (1/18)*) dealing with property rights before E&FI if issues on landownership are identified.
- E&FI such as *Environmental taxes (3/03)*, and *Tax reliefs and subsidies (3/04)* are often decided at state or national level. Success of such instruments depends on whether relevant authorities have the political power to influence fiscal measures. Higher level of governance intervention might be needed **(R4)**.

AGREEMENT

- Integrate S*coping (2/02)* and *Baseline Assessments (2/03)* in early planning to identify key biodiversity values, stakeholder interests, and legal constraints, informing the design of contractual agreements (e.g., *Stewardship programs (1/11)*, *TDRs (1/12)*).
- Ensure any contractual agreements include clear biodiversity enhancement and conservation commitments.
- Anticipate potential collaborations as early as possible in the planning process by engaging relevant actors and stakeholder through *Information, Consultation and Engagement (2/03)* **(R6)**.
- Use M*onitoring and Evaluation (2/05)* to track compliance and ecological outcomes after contractual agreements **(R7)**.
- Provide financial and technical assistance to local authorities for handling long-term *Stewardship programs (1/11)* **(R6)**.
- Support partnerships with NGOs and private landowners to expand conservation opportunities through *Contractualizations and Stewardship programs (1/11)*.
- Prioritise *TDRs (1/12)* that enhance ecological connectivity and conservation outcomes. To this end, use adequate *Baseline Assessments (2/04)* including biodiversity condition and ecosystem service assessments to identify suitable sending and receiving areas **(R12)**.
- Provide financial and legal mechanisms to support *TDRs (1/12)* implementation.
- Monitor and evaluate (2/05) long-term ecological impacts after *TDRs (1/12)* agreements to ensure conservation goals are met **(R7)**.
- Address socio-economic disparities to prevent unintended negative consequences in receiving areas when implementing *TDRs (1/12)*.
- Address legal and administrative barriers to facilitate land exchanges in land ownership rearrangements (*Land rearrangements (1/10)*).
- Engage stakeholders early on to reduce conflicts over land ownership changes in *Land rearrangements (1/10)* **(R6)**.
- Prioritise ecological restoration and connectivity goals when restructuring land parcels through *Land rearrangements* (1/10).
- Use *Baseline Assessments* (2/04), prioritising *Cumulative* assessments *(2/01)* with biodiversity indicators to understand impacts of *Land rearrangements (1/10)* and respective management changes post-implementation **(R9, R12)**.
- Ensure adequate financial support to compensate landowners for conservation-based transitions in *Land rearrangements (1/10).*
- Potentially provide financial incentives (e.g., *Tax reliefs (3/04)*) for stewards (i.e., landowners and managers) willing to engage in *Land rearrangements (1/10)*. Stewards should be compensated at least for the opportunity costs of the restrictions imposed to their activity(ies) because of the readjustment but ideally should be rewarded in line with the benefits provided by the beneficiaries (e.g., *Green subsidies (3/04)* when the beneficiaries are public, user-side *Payments for ecosystem services (3/02)*).
- Unlock new potentials to benefit from conservation by establishing new markets or supporting the establishment of new value chains (e.g., *Credits trading (3/11)*, *certifications and green label initiatives (3/10)*), if applicable **(R6)**.

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- *Fast-tracking processes (1/09)* for access to sectoral funds that support compliance with best practices (forestry, agriculture), for stewards engaging in *Land rearrangements (1/10)*, if applicable **(R4)**.

REGULATION

- Ensure that *Quantitative targets (1/14)*, *Qualitative requirements (1/15)* or scoring criteria for *Performance-based approaches (1/13)* align with ecological quality metrics and are not just limited to the expansion of green areas, unsealed surfaces or non-productive areas.
- Define clear biodiversity-focused criteria in development regulations in line with provisions and recommendations from urban green plans (e.g., type of green roofs and vegetation, permeable surfaces) **(R8)**.
- When designing *Quantitative targets (1/14)* and *Qualitative requirements (1/15)*, integrate biodiversity assessments to set location-specific targets where appropriate **(R12)**.
- Combine regulatory instruments with zoning schemes (e.g., *Land use zoning (1/04)*) to strategically enhance habitat connectivity.
- Provide clear enforcement mechanisms to ensure compliance of regulatory instruments. Provide local authorities with the necessary tools to monitor and evaluate compliance if applicable (*Monitoring and Evaluation (2/05)*). Address financial constraints by creating incentive mechanisms for compliance, if possible **(R4, R6)**.
- In the case of *Qualitative and Technological Requirements* (1/15), develop supportive legal frameworks to ease regulatory adoption **(R3)**.
- Ensure appropriate monitoring of long-term outcomes and ecological performance of such regulations using biodiversity indicators. In this regard, adjust quantitative targets or qualitative requirements as needed when applicable **(R14)**.
- In the case of *Performance-based approaches (1/13)*, ensure financial accessibility to prevent exclusion of smaller developers over larger ones.
- Integrate *Protected Areas* (1/03) with monitoring programs to assess long-term ecological conditions and combine with additional regulations and incentives to expand and improve conservation zones **(R14)**.
- Ensure strong legal backing for *Land use zoning (1/04)* to prevent encroachment or policy rollback **(R3)**.
- Strengthen enforcement mechanisms for *Land use zoning (1/04)* to prevent regulatory bypasses. To this end, increase capacity in local authorities to monitor compliance by focusing on key indicators for quick check-ups **(R6)**.
- Facilitate cross-sector coordination within local authorities to align zoning schemes with local or regional conservation goals. In this regard, link conservation areas (e.g., *Protected areas (1/03)*) into regional green infrastructure networks **(R8)**.
- Foster public engagement to increase local support for *Protected areas (1/03)* and to reduce conflicts over *zoning restrictions (1/04)* **(R6)**.
- Ensure *Compensation measures (1/16)* results in net habitat gains given the project's footprint and prioritise compensatory actions that enhance habitat connectivity **(R10)**.
- Use quantitative and qualitative targets to set clear benchmarks for habitat restoration.
- Monitor compliance and long-term ecological impacts using biodiversity indicators **(R14)**.

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- Ensure compensation sites provide local benefits to avoid social inequities.
- Provide incentives (e.g., *Tax reliefs (3/04)*) for stewards complying with any new targets or requirements introduced through regulation, whenever externalities are identified. Negative incentives should be considered to penalise polluters – not complying with targets or standards (e.g., *Fines, penalties, and legal liabilities (3/14)*).
- Provide incentives to establish access to credit for stewards to comply with any new technological requirements introduced (e.g., *Green credits and loans (3/11)*) **(R6)**.
- Provide positive incentives (e.g., *Tax reliefs (3/04)*) for stewards (i.e., landowners and managers) inside conservation areas, to cover at least the opportunity costs of the restrictions imposed to their activity(ies) but ideally rewarding them in line with the benefits provided by their compliant management (e.g., *Green subsidies (3/04)*, user side *Payments for ecosystem services (3/02)*). Seek for opportunities that unlock new potential to benefit from conservation by establishing new markets (e.g., *Carbon/biodiversity credits (3/11)*, *certifications and green labels (3/10)*), if applicable **(R6)**. Potentially provide funding via direct contributions from private beneficiaries (e.g., *User fees and surcharges (3/01)*) or from corporate *sponsorship (3/13)*, if applicable.
- Compensation measures should be integrated with E&FI to ensure effective implementation and long-term sustainability, such as with habitat/mitigation banking, ecological tax, etc.

ENFORCEMENT

- *Land acquisition (1/06)* works efficiently through a municipal policy that uses various tools, such as LVC, expropriation, or negotiation mechanisms. Therefore, a municipal land acquisition policy should be implemented in the earlier stages of the planning process. Early implementation allows the municipality to secure strategic land parcels, prevent speculative price increases, and align land use with long-term planning goals. By acting proactively, municipalities can ensure that this tool supports sustainable development and facilitates the effective implementation of spatial plans.
- Control instruments place financial and operational burden on local authorities and public budgets. Only resort to control instruments when other options for intervention are unfeasible or unsuccessful.
- Only resort to enforcement measures when *Land acquisition (1/06)* is unfitting or is proving unsuccessful. Prioritise direct acquisitions, pre-emption purchases or administrative possession for controlling critical land parcels to enhance ecological connectivity and biodiversity.
- Whenever possible, integrate enforcement or acquisition interventions with conservation zoning schemes and land-use regulation (e.g., *Protected Areas (1/03)*, and *Land Use Zoning (1/04)*) for long-term connectivity at larger scales. In this regard, strengthen inter-agency coordination to align expropriation or acquisition with regional conservation goals, for example **(R8)**.
- Ensure post-implementation management prioritises biodiversity by integrating ecological restoration and monitoring (*Monitoring and Evaluation (2/05)*). To this end, strengthen coordination between local authorities and conservation organisations to support management and monitoring interventions post-implementation **(R5, R14).**
- Use *Baseline Assessments (2/05)* (including biodiversity and ecosystem service assessments) to justify public interest claims. Prioritise condition assessment and connectivity indicators to identify key areas in which to intervene through these instruments for conservation purposes **(R12)**.

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- In case enforcement measures are used, address social resistance by ensuring transparent decision-making and fair compensation to affected parties (look into incentive tools).
- In case enforcement measures are used, establish clear governance frameworks to prevent misuse of expropriated land for non-conservation purposes **(R3).**
- Ensure local authorities are endowed with sufficient financial mechanisms to support adequate implementation of control instruments, especially *Land Acquisition (1/06)* **(R4).**
- Public funding for *environmental targets (1/14, 1/15)*, *sponsorships with private agents (3/13)*, and instruments such as conservation *Auctions and tenders (3/08)* and *Payments for ecosystem services (3/02)* can be used for collecting and efficient allocation of the (potentially limited) financial resources for management post-implementation. This can be coupled with performance-based SP&MI to determine different thresholds for accessing more (or less) municipal funding and be further supported by SP&MI such as fast-tracking approval process to reduce the administrative barriers for public entities engaging in such programs regarding access to municipal funding redistribution.

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6. BioValue core findings

BioValue project core findings can be summarized as follows:

Spatial planning can act as a key leverage for biodiversity transformation, if instruments are coherently combined, socially legitimate, and adapted to local institutional contexts; transformative outcomes emerge from coherent policy mixes in spatial planning, embedded in participatory and institutionally grounded processes;

Transformation is not driven by instruments alone, but by their social, cultural and institutional embedding, legitimacy, and alignment with local development trajectories;

The empirical outcomes of BioValue reveal that co-creation with municipalities and local actors proved decisive for transformative change; Biodiversity can act as a structuring principle and driver of resilience in spatial planning;

Various spatial planning instruments can be employed to support and enhance biodiversity at different scales, but their implementation is challenging due to critical deficiencies in institutional design, data integration, and administrative capacity

Spatial planning systems often treat biodiversity as a constraint, with implementation frequently stalled by conflicting sectoral interests (e.g., agriculture vs. conservation), hindered by "siloed" governance, a lack of cross-departmental coordination and of binding regulatory power.

Key messages from BioValue:

- Pathways to transformation are context-dependent but structurally similar.
- The strength of the instrumental perspectives lies in combination and through process alignment and not in isolation.
- There is a need for a strategic connector between spatial planning visions, regulatory instruments, and economic/financial measures.
- Transformative potential is strongly conditioned by social and institutional factors, rather than by technical instrument design alone.
- Learning-oriented and experimental formats were instrumental in activating transformation.
- Transferability across EU contexts depends less on copying instruments and more on replicating conditions

7. Conclusions

BioValue offers actionable and adaptable recommendations and a catalogue of instruments for designing biodiversity-positive spatial planning strategies for decision-makers and practitioners across governance levels and national contexts to enhance biodiversity through transformative change in spatial planning.

As seen in this deliverable, BioValue recognises that biodiversity must no longer be treated as an external constraint but integrated as a core value and driver within the spatial planning process. The catalogue of instruments presented here supports this shift by offering planners, policymakers, and practitioners a toolbox to embed biodiversity into spatial decision-making in all stages of the planning process – from early vision-setting and strategic planning to implementation and monitoring.

The 14 overarching recommendations from Section 3 outlined in this deliverable provide a roadmap for enabling transformative planning practices for biodiversity. They range from strengthening planning capacity and regulatory frameworks (e.g., shifting from no-net-loss to net-gain mindsets), to ensuring participatory governance, early integration of biodiversity objectives, and adaptive, action-oriented monitoring. Most importantly, many of these recommendations require institutional coordination across levels and sectors, reinforcing the need for enhanced governance, policy cohesion, and fiscal alignment to achieve meaningful change.

The 44 Spatial Planning and Management, Environmental Assessment and Economic and Financial instruments act as a toolbox with a potential to, acting individually or in combination, enable the enhancement of biodiversity value in spatial planning. Having been categorised in relation to its function but also in relation to the spatial planning objectives and needs, they are prepared to be used on demand driven approaches. One of the concerns with BioValue was to ensure that our learning could be context-specific and therefore we avoided too standardised solutions.

The operational recommendations from Section 5 emphasise that the integration of Spatial Planning and Management Instruments, Environmental Assessment Instruments, and Economic and Financial Instruments is not only feasible but essential for catalysing transformative change in spatial planning. When strategically aligned, these instruments can act synergistically to shift planning practice from a reactive – e.g., focused on mitigating harm and biodiversity loss – to a proactive mode that enhances biodiversity value. Their combined application enables more coherent decision-making, supports systemic approaches to land-use change, and leverages cross-sectoral coordination. By identifying shared entry points across instruments and planning stages, we illustrate how the implementation and combination of tools can unlock greater transformative potential than isolated actions, towards more resilient and biodiversity-inclusive planning.

Ultimately, the recommendations patent in this deliverable highlight that transformative change for biodiversity is not only a technical or regulatory task but a cultural and political endeavour.

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