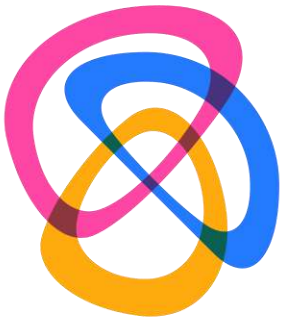

BioValue

D1.1 Current challenges and barriers to biodiversity inclusion in SP&MI

WP 1 Spatial Planning and Management Instruments (SP&MI)
T 1.1 Mapping the European spatial planning landscape and Benchmark policy directions for biodiversity-inclusive spatial planning

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v	Date	Beneficiary	Author

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Executive Summary

This deliverable explores spatial planning systems established in Europe, including comprehensive integral spatial planning, regional economic spatial planning, land use spatial planning and urban spatial planning, through the lens of transformative change to preserve and enhance biodiversity. It developed a conceptual framework to assess the transformative potential of these spatial planning systems, grounded on overarching policy frameworks, such as the United Nations 2030 Agenda for Sustainable Development, the EU Biodiversity Strategy 2030, the EU Territorial Agenda, and the New Leipzig Charter of European Planning.

The framework outlines characteristics of transformative change (i.e., restructuring, path-shifting, innovation, and multiscale) that can be attributed to different components of spatial planning instruments (i.e., visions, strategies, information baseline, and actions/regulations/instruments) with regard to four elements of analysis of spatial planning systems. These elements of analysis constitute different perspectives to interpret transformative change for, beyond and of biodiversity. They include (i) the governance of spatial planning systems, (ii) the mitigation hierarchy, (iii) the spatial planning provisions for different sectors, and (iv) biodiversity and ecosystem services (ES). Moreover, the framework considers those practices that should be phased out from the planning system for being old and unsustainable.

This framework was applied to 28 spatial planning instruments selected for countries clustered under the four spatial planning systems and with a good biodiversity performance against three biodiversity indicators: Italy, Denmark, Germany Portugal, Scotland, Spain, and Switzerland. The selected planning instruments for each country cover, as much as possible, diverse NUTS levels, from the national, to regional, and municipal scales. A content analysis of these instruments was carried out to identify 80 transformative elements built upon the proposed framework.

The findings illustrate the distribution and examples of transformative planning practices across the spatial planning systems and at diverse NUTS levels. They indicate an average lower presence of transformative elements in planning instruments related to comprehensive integral spatial planning systems compared to that found for land use and urban spatial planning systems. Moreover, planning practices with a restructuring character predominated over those with a higher transformative potential for being path-shifting and innovative. However, synergies and complementarities between transformative practices with diverse character emerged.

Finally, the deliverable highlights how these findings can contribute to the development of tasks of the project.

1. Introduction: towards a biodiversity-inclusive spatial planning

1.1.Introduction

The BioValue project is centered around spatial planning decision-making processes and their transformative potential to safeguard and enhance biodiversity. Such potential is explored through different complementary perspectives relevant for spatial planning. These include (i) policies to guide spatial transformations, (ii) assessment frameworks to anticipate their impacts, and (iii) investment instruments to implement them.

This deliverable focuses on the first one, which comprehends spatial planning and management instruments. It explores the spatial planning landscape in Europe through the lens of transformative change to inform projects' tasks on current enabling and hindering practices to transformative change. Moreover, it aims to suggest new directions to generate changes for mainstreaming biodiversity and ecosystem services (ES) in spatial planning decision-making processes.

According to Nadin et al. (2018) and EC (1997) , spatial planning is the broad spectrum of public policies and actions embracing citizen involvement that influence the spatial distribution of activities and the linkages between them at EU, national and local levels. Spatial planning mediates competition of land development over the protection of the environment and its resources, the use of land and property, the allocation of rights of development, and the promotion of preferred spatial and urban forms.

Different types of planning systems have been developed in Europe, including (i) comprehensive integral spatial planning, (ii) regional economic spatial planning, (iii) land use spatial planning, and (iv) urban spatial planning (EC 1997). These systems differ in terms of their legal context, the scope of policy topics covered, the extent of national and regional planning, power configuration across governance levels, roles of public and private sectors, completeness and maturity, and coherence between planning goals and outcomes (Nadin and Stead 2013; EC 1997). The comprehensive integral system seeks to coordinate spatial transformations from different public sectors through plans at several planning levels. This spatial planning system predominates in Germany, Denmark, and Switzerland. The regional economic system focuses on balancing economic and social development across regions, as occurs for Portugal. In the land use system, the local authorities control land uses within the municipal territory. However, supra-municipal planning levels can exert some influences through strategic plans and policies. This system is characteristic of the United Kingdom, Italy and Portugal, although the latter has features of the regional economic systems according to the (ESPON Project 2006). Finally, the urban planning system is established mainly in Spain, Sweden, Norway, Greece, and Cyprus and sets out a broad range of laws and regulations at the local level to determine land zoning.

Spatial planning can play a dual role in biodiversity and ES. On the one hand, it can negatively impact the conservation of ecosystems and the ES supply through spatial transformations of land uses. The last IPBES Global Assessment Report on Biodiversity and Ecosystem Services (2019) highlighted this issue as one of the main drivers of biodiversity loss. On the other hand, Target 11 and 14 of the Kunming-Montreal Global Biodiversity Framework (2022) emphasizes the potential of spatial planning to positively contribute to halting biodiversity loss. However, this requires systemic and radical changes in spatial planning to incorporate ecosystem knowledge and biodiversity values (Albert et al. 2020).

1.2.Goals and structure of this deliverable

This deliverable aims at assessing the potential of spatial planning to incorporate transformative change in order to boost the consideration of biodiversity and ES. It developed a conceptual framework that disentangles the concept of transformative change for biodiversity-inclusive spatial planning. This framework was tested in seven countries that are representatives of the four spatial planning systems developed in the European context. To this aim, the deliverable revised and analysed the content of a sample of spatial planning instruments covering different NUTS levels against the elements of the conceptual framework. This analysis supported the identification of current planning practices across spatial planning systems that can hold a transformative potential. It also unfolded barriers and bottlenecks that hinder the integration and implementation of goals for biodiversity preservation and ES enhancement.
The deliverable is structured into 7 sections. Section 2 describes the global and EU policy context around biodiversity and ES, highlighting the links with overarching frameworks such as the Sustainable Development Goals 2030, the EU Biodiversity Strategy 2030, the EU Territorial Agenda, and the New Leipzing Charter. Section 3 illustrates the conceptual framework to analyse transformative change in spatial planning and describes the methodological approach adopted for testing it in several spatial planning systems. The findings of the analysis are presented in Section 4 in the form of descriptive tables for each case study. Section 5 provides insights on the transformative potential of spatial planning systems through a cross-comparison of results between systems. Finally, Section 6 discusses the contribution of this deliverable to the BioValue project, and the specific activities conducted by other tasks.

2. Describing the overarching policy context

This deliverable aligns with the goals expressed in several policy frameworks adopted at the global and European scales, including the United Nations 2030 Agenda for Sustainable Development, the EU Biodiversity Strategy 2030, the EU Territorial Agenda, and the New Leipzig Charter of European Planning. These goals were used to define key elements of the conceptual framework in Section 3. The following sections delve into the different policy frameworks and specific indications for this deliverable.

2.1. The UN Sustainable Development Goals (SDGs) 2030

The SDGs 2030 guide spatial planning to manage and use environmental resources sustainably, balancing economic progress, human well-being, and biodiversity preservation. Figure 1 illustrates the goals and related targets akin to this deliverable and to the BioValue project and Table 1 provides a description of them. As expressed in Targets 11 and 16, transformations in spatial planning entail moving toward an inclusive, pluralist, and adaptive approach that supports stakeholders' participation and the use of different sources of knowledge while enabling iterative learning activities. Another important goal covered by Targets 11 and 15 is reducing environmental impacts and ecosystems degradation and ensuring the preservation and restoration of natural sites through adequate instruments, such as the mitigation hierarchy. The mitigation hierarchy is defined as an iterative decision-making tool to enhance, avoid, minimize, restore and offset impacts on ecosystem and biodiversity (The Biodiversity Consultancy 2015; IPBES-IPCC 2019). Finally, Target 13 pointed out to integrating climate adaptation and mitigation actions in spatial planning, to reinforce the nexus between climate change, societies, and biodiversity.

Figure 1: Sustainable Development Goals related to this deliverable

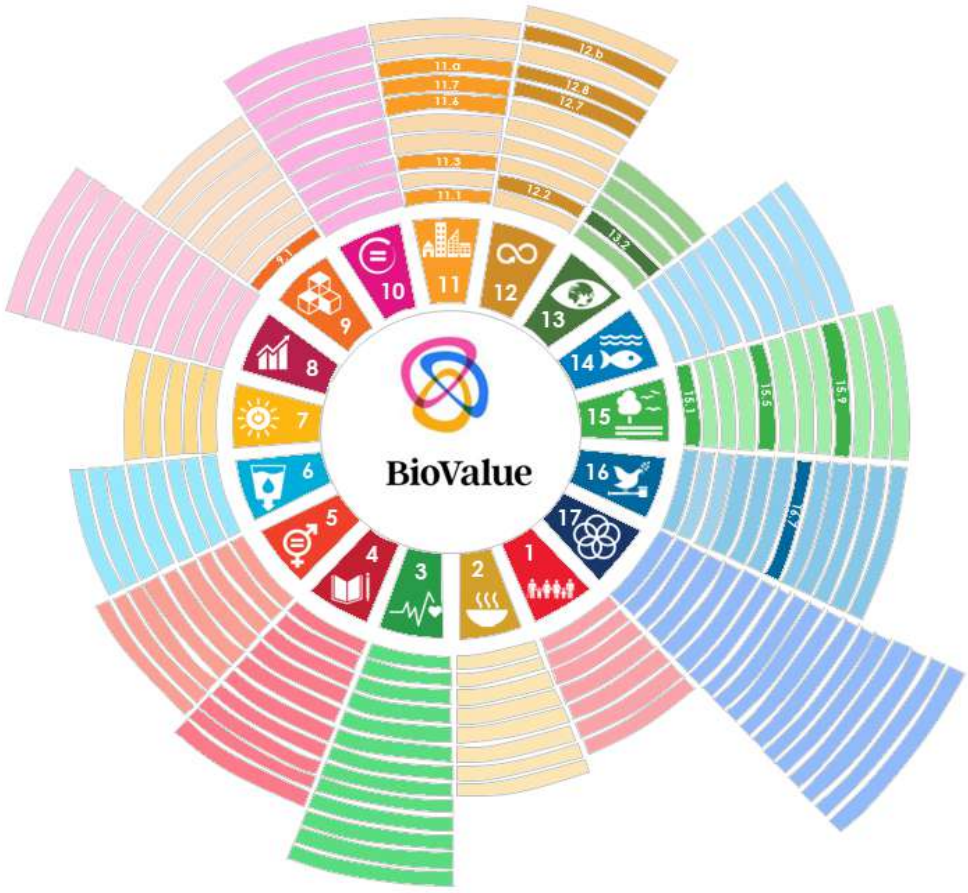


Table 1: Description of the SDG targets adopted in the Task 1.1.

Sustainable Development Goals	Targets
9. Industry, Innovation and infrastructure	9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all
11. Sustainable cities and communities	11.1 By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums. 11.3 By 2030, enhance inclusive and sustainable urbanisation and capacity for participatory, integrated and sustainable human settlement planning and management in all countries. 11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management. 11.7 By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for

	women and children, older persons and persons with disabilities. 11.a Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning.
12. Responsible consumption and production	12.2 By 2030, achieve the sustainable management and efficient use of natural resources. 12.8 By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature. 12.B Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products. 12.7 Promote public procurement practices that are sustainable, in accordance with national policies and priorities.
13. Climate Action	13.2 Integrate climate change measures into national policies, strategies and planning
15. Life on land	15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements. 15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species. 15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts.
16. Peace, justice and strong institutions	16.7 Ensure responsive, inclusive, participatory and representative decision-making at all levels.

2.2. The EU Biodiversity Strategy 2030

The EU Biodiversity Strategy sets out a wide range of qualitative and quantitative protection and restoration objectives to which spatial planning can substantially contribute. The strategy emphasizes the need to increase ecosystem extension and improve ecological connectivity and quality (EC 2021), which depend on spatial considerations. It calls for systematically integrating nature-based solutions into urban (spatial) planning to halt urban biodiversity loss and enhance ES provision. Moreover, it provides indications to the agricultural sector, which denotes the relevant role of sectoral policies for biodiversity.

2.3. The EU Territorial Agenda

The EU Territorial Agenda frames strategic spatial planning to balance development across regions. It develops around two visions, that of a Just Europe and a Green Europe. Concerning the first vision, the document emphasizes the need to build vertical and horizontal coordination and cooperation. The Agenda considers that taking actions to bridge neighborhoods, municipalities, counties, regions, and Member States and creating a polycentric network of cities contribute to faster and more efficient responses to societal challenges and issues raised by the disruptive urban-rural nexus. The second vision concerns biodiversity and the fundamental and multifunctional role in the existence and prosperity of societies. In this sense, the Agenda delineates strategies for the extensive implementation of nature-based solutions to connects ecosystems, such as creating urban green spaces, restoring degraded ecosystems, and preserving forested areas. This is also accompanied by the will to prevent urban sprawl.

2.4. The New Leipzig Charter

The New Leipzig Charter narrows down the EU Territorial Agenda's indications to guide its application in urban areas and unleash their transformative potential. Coordination and cooperation actions is a recurrent topic. The Charter emphasizes that these actions should operate across sectors and different spatial and temporal scales through innovative participatory process for co-creation and co-design of policies, instruments, and spatial transformations. This will help local authorities to strengthen dialogues and knowledge and expertise exchange between multiple actors, ultimately integrating principles of justice and transparency into spatial planning decision-making processes. The Charter shifts the attention to the cultural and political specificities of EU urban contexts and their roles in shaping urban development, hence promoting the adoption of a place-based approach to operate development strategies. Furthermore, it encourages the development of preventive plans based on predictive scenarios of environmental and climate impacts. Finally, this document reclaims the greening approach proposed by other policy frameworks, incentivizing nature-based solutions and the adoption of a new understanding of nature as a common good in cities. It goes a step forward, shedding light on the need to provide suitable design and management activities for green and blue areas to enhance urban biodiversity preservation.

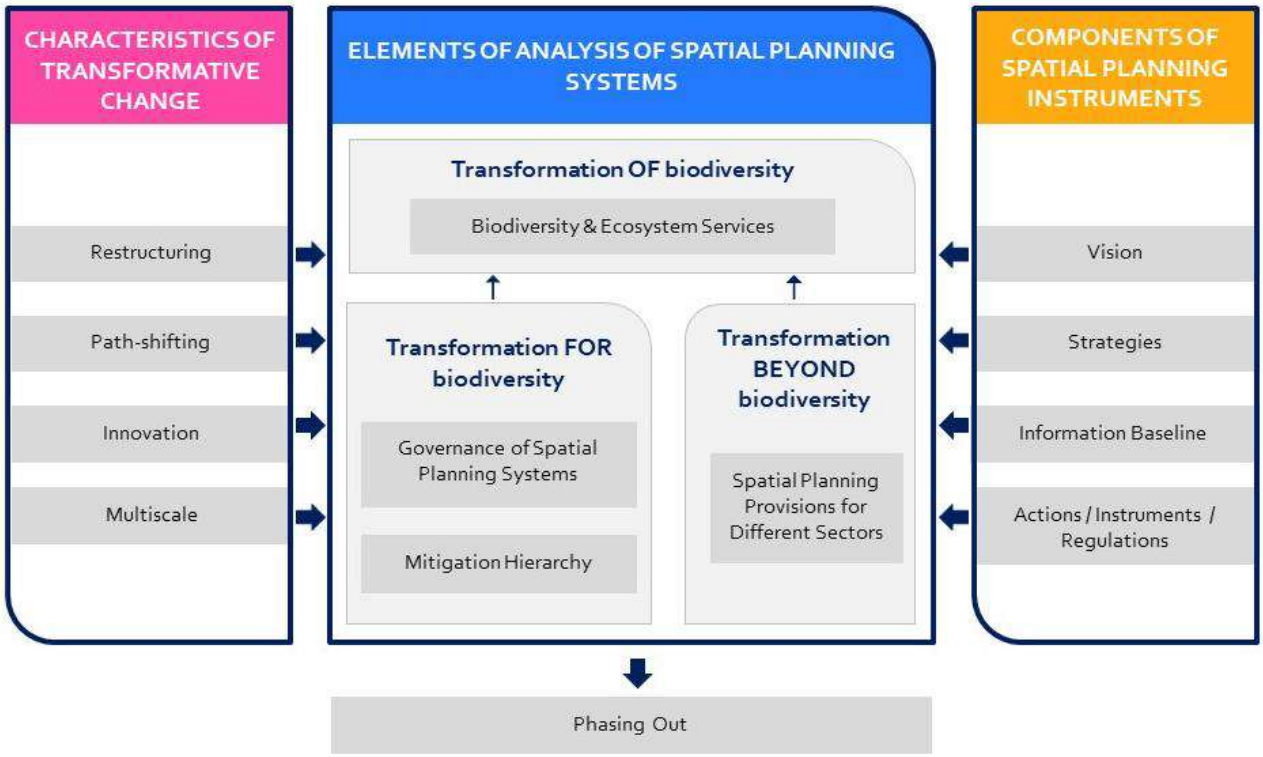
3. Developing and applying the conceptual framework to analyze the transformative potential of spatial planning systems

This section presents the conceptual framework for assessing the transformative potential of spatial planning systems developed by the BioValue Projects's Task 1.1. It details the rationale behind the framework's development and its different elements, including qualitative and regulatory criteria. To test the framework, the deliverable focuses on spatial planning instruments, including plans and programs, through which spatial planning systems operate. This section describes the criteria used to select the countries and related planning documents and the procedure adopted to conduct their content analysis.

3.1. Conceptual Framework

The conceptual framework, represented in Figure 2, comprehends three blocks: (i) the components of the spatial planning instruments which reflects the planning decisions, (ii) the characteristics of transformative change, and (iii) the elements of analysis of spatial planning systems, which define the main perspectives to interpret the concept of transformative change within spatial planning.

Figure 2: Conceptual framework to assess the transformative potential of spatial planning systems.



3.1.1. Components of spatial planning instruments

The components of the spatial planning instruments were clustered into four categories: visions, strategies, information baseline, and actions/regulations/instruments, based on the scientific literature on spatial planning and content analysis of plans as well as the expertise of the Task leaders. Generally, these categories are common to all spatial planning systems. The visions provide a common general view for the long-term future of an area, which derives from political choices, social desires, and/or linked to international and European policy frameworks (Ek and Santamaria 2018; Wittmer et al. 2021). The strategies are statements of specific qualitative and quantifiable objectives and targets the Plan set to implement the visions (Cortinovis and Geneletti 2018; Geneletti and Zardo 2015; Baker et al. 2012). The information baseline represents the knowledge background, built upon the analysis of current and future conditions, that supports planning decisions (Cortinovis and Geneletti 2018; Geneletti and Zardo 2015; Baker et al. 2012; Berke and Godschalk 2009). The actions/regulations/instruments/ are used to implement planning strategies in order to achieve the planning visions (Cortinovis and Geneletti 2018; Geneletti and Zardo 2015; Baker et al. 2012; Berke and Godschalk 2009). The framework provides the basis to analyse how the plans' visions, strategies, information baseline, and actions/regulations/instruments are transformative for biodiversity and ES.

3.1.2. Characteristics and theory of transformative change

The framework's second block aims to disentangle the concept of transformative change and what it implies for spatial planning. Following a scientific literature review in the context of climate

change, Fedele et al. (2019) identified several characteristics that define transformative adaptation in social, ecological, and socio-ecological systems. Some of these characteristics, relevant for spatial planning, include restructuring, path-shifting, innovative, and multiscale changes. In general terms, restructuring changes concern substantial variations of a system's components and interactions. Path-shifting changes entail a redirection of current trends and principles governing the system. Innovative changes are driven by new knowledge not implemented before. Multiscale changes involve several spatial, temporal, and governance scales and synergies between sectors. These characteristics were interpreted for the diverse elements of analysis of spatial planning systems (see the following section) based on other schoolars' considerations regarding the theory of transformative change.

To operationalize the concept, Bulkeley et al. (2020) proposed several principles, including addressing root causes, taking multiple paths, expanding the action arena, realizing diverse co-benefits, designing deliberative and inclusive processes, and adopting a proactive approach to resistance. They also proposed a set of specific biodiversity and climate-related actions for each principle. Following this study, Wittmer et al. (2021) developed a more comprehensive framework structured in five building blocks that navigate through desired trajectories and visions (transformative vision), actionable knowledge mainstreamed at strategic leverage points within the system to implement transformative visions (transformative knowledge), dynamics of building up and breaking down practices, values, and principles over time (transformative dynamics), active involvement of bottom-up agencies in the transformative debate to enhance legitimacy and acceptance of actions (emancipation and agency for transformation), and diverse modes of governance, involving agents of change, resistant agents, and affected actors, to create transformative instruments and actions.

Visseren-Hamakers et al. (2021) and Pascual et al. (2022) dived into the characteristics and principles that facilitate transformative governance. The first study promotes integrative (bridging different sectors, issues, and scales), inclusive (empowering underrepresented groups and interests), adaptive (iterative learning to improve proactive responses), and pluralist (integrating multiple knowledge) governance approaches. The second one focuses the attention on (i) implementing multifunctional interventions that improve multiple indicators, (ii) breaking ministerial silos and facilitating cooperation and innovation across scales, (iii) creating supportive coalitions of interests between companies, governments, and civil society, (iv) adopting equity-based approaches, and (v) triggering social tipping dynamics from grass-root initiatives. Similarly, Jacobs et al. (2022) and (Pascual et al. 2023) stressed the importance of a plural value perspective in decision-making processes as a key ingredient of transformative change to tackle the joint biodiversity and climate crisis.

3.1.3. Elements of analysis of spatial planning systems

The third block of the framework illustrates four main elements of analysis of spatial planning, including (i) the governance of spatial planning systems, (ii) the mitigation hierarchy, (iii) the spatial provisions of different sectors (e.g., mobility, energy, agrifood), and (iv) biodiversity and ES. These elements were selected because of their crucial role in influencing transformation "for" biodiversity, which is driven by the first and the second element, transformation "beyond" biodiversity, represented by the third element, and transformation "of" biodiversity and ecosystems, captured by the fourth element.

The governance looks at how spatial planning systems organize themselves to take and implement planning actions to protect and restore biodiversity (Nadin et al. 2018; Pascual et al. 2022). From this perspective, restructuring changes entail reorganizing planning procedures, instruments, and regulations used to implement the planning strategies and related actions, as well as the actors and stakeholders involved in the planning process (Fedele et al. 2019). For instance, it can occur by simplifying planning procedures to favor stakeholders' involvement and merging several regulations and instruments to provide more speedy and robust decisions (Nadin et al. 2018). Path-shifting changes regard a redirection on how decisions are taken towards a governance approach that embraces inclusive, adaptive, and pluralist principles (Fedele et al. 2019; Visseren-Hamakers et al. 2021; Michalski 2021). Innovative changes imply using new knowledge, policies, and technologies to define planning visions, strategies, actions, and instruments (Fedele et al. 2019). For instance, bottom-up (grassroots) initiatives can produce such knowledge for innovating and scaling up sustainable strategies toward biodiversity preservation and ES enhancement (Wittmer et al. 2021; Boyer 2015). Multiscale changes support the involvement of actors and stakeholders from the public and private realms and civil society. They also cover governance practices spanning several spatial and temporal scales.

The mitigation hierarchy represents the tool that guides planners to set visions, strategies, and actions for enhancing biodiversity and avoiding, minimizing, restoring, and offsetting impacts on ecosystems (The Biodiversity Consultancy 2015). In this sense, restructuring changes concern the application of the mitigation hierarchy's structure in current planning practices, respecting the complete and correct sequential implementation of all its hierarchical levels. Path-shifting changes promote the transition from a reactive planning approach to observed/foreseen changes to a proactive approach for biodiversity enhancement, including preparation for the unexpected. Innovative changes can occur using nature-based solutions and novel technical and procedural approaches for implementing mitigation hierarchy's goals, e.g., assessment methods and regulatory instruments to ensure that offsetting actions lead to Not Net Loss goals. Multiscale changes are oriented to support coordinating the mitigation hierarchy requirements and goals across spatial planning scales.

The spatial planning provisions for different sectors are aimed to capture the spatial planning actions taken in the realm of energy, mobility, agrifood, tourism, and other sectors potentially addressed by the Plan, with an indirect impact on biodiversity and ecosystems. In this case, the characteristics of transformative change follow the same rationale explained for the governance of spatial planning systems, contextualized to the specificities of each sector.

Finally, the element of biodiversity and ES describes the transformation of the structure and functioning of ecosystems, including size, diversity, conditions, and ES supply. Restructuring changes entail modifications of the spatial arrangement of ecosystems, precisely their size, diversity, and spatial distribution. Path-shifting changes describe a variation in species population trends and ES loss. Innovative changes consider using nature-based solutions to meet biodiversity goals and introducing native and new species, e.g., resilient to climate change effects. Multiscale changes seek to improve ecological connectivity and the supply of multiple ES.

Therefore, the proposed conceptual framework assesses the transformative potential of spatial planning systems as the ability to incorporate restructuring, path-shifting, innovative and multiscale changes into the governance of spatial planning systems, the mitigation hierarchy, the spatial planning provisions for different sectors, and biodiversity and ES, through the plans' visions, strategies, information baseline, and actions/regulations/instruments. It also considers the willingness to phase the old and unsustainable practices out of the system (Wittmer et al. 2021).

3.2. Applying the framework to selected spatial planning instruments

3.2.1. Criteria for selecting representative countries

The conceptual framework was applied to seven countries, including Italy, Spain, Portugal, Germany, Denmark, Switzerland, United Kingdom (Scotland). Italy, Portugal, Germany and Denmark were selected considering that the project's partners are based in these countries. Three criteria were used to select the rest of countries. The first one is that the analysis should cover the four spatial planning systems developed in Europe. Table 2 shows the distribution of countries across these systems following the indications of the Third Interim Report of the ESPON Project (ESPON Project 2006). The second criterion regards the performance of countries in terms of biodiversity preservation based on three indicators. The biodiversity habitat index describes the habitat loss, degradation, and fragmentation on a global scale (GEO BON 2014a). The biodiversity intactness index computes the average abundance of native terrestrial species compared with the abundance in the absence of human impacts (GEO BON 2014b). The biodiversity strategy index was self-developed to describe the country's achievement toward specific Biodiversity Strategy 2020 targets, such as target 1 of nature conservation, target 2 of restoration and green infrastructure, target 3 of agriculture and agroecosystems, target 4 of forest, and target 6 of contribution to global biodiversity. Of these indicators, more relevance was given to the latter during the selection process, selecting those countries that showed an above-average performance. In this sense, it is possible to discuss whether identified transformative practices could lead to satisfactory biodiversity outcomes. The last selection criterion addresses the analysis feasibility in terms of the language of planning documents and the availability of reviewers that know the language within the consortium.

Table 2: List of all countries distributed across the spatial planning systems based on the Third Interim Report of the ESPON Project, and the performance against the biodiversity indicators. Highlighted countries were selected for the assessment.

Countries	Biodiversity Habitat Index	Biodiversity Intactness Index	Biodiversity Strategy Index
Regional Economic Planning			
Portugal	0.46	0.68	0.81
Latvia	0.71	0.87	0.52
France	0.53	0.67	0.47
Lithuania	0.64	0.64	0.37
Comprehensive Integral Planning			
Bulgaria	0.54	0.67	0.6
Netherlands	0.47	0.54	0.54
Germany	0.55	0.59	0.53
Romania		0.64	0.47
Slovenia	0.61	0.9	0.46
Switzerland	0.64	0.8	0.41
Denmark	0.54	0.17	0.4
Austria	0.66	0.86	0.39
Poland	0.59	0.55	0.33
Czech Republic	0.59	0.64	0.3

Slovakia	0.57	0.74	0.27
Hungary	0.45	0.48	0.25
Urban Planning			
Norway	0.94	0	0.94
Spain	0.49	0.68	0.92
Sweden	0.86	1	0.84
Greece	0.45	0.64	0.7
Cyprus	0.44	0.38	0.65
Land Use Planning			
Estonia	0.73	0.86	0.68
Belgium		0.52	0.59
United Kingdom (Scotland)	0.54	0.61	0.55
Italy	0.47	0.64	0.53
Ireland	0.54	0.62	0.5
Malta	0.37	0.42	0.38
Portugal	0.46	0.68	0.81

3.2.2. Criteria to identify spatial planning instruments in the selected countries

The selection of spatial planning instruments in the selected countries was guided by specific criteria as well. Plans, programmes, procedures, laws, and legislations should address biodiversity and ES-related goals, explicitly. Also, they should cover several NUTS levels as much as possible to assess the transformative potential at different planning scales. Finally, they should be recent and/or innovative to increase the possibilities of embedding transformative characteristics. These criteria supported the work of Task 2.2 for selecting explorative cases study of spatial plans and projects. In total, 28 spatial planning instruments were revised. Table 3 shows the list of planning instruments selected for each country, their NUTS levels, and the year of development/adoption. During the course of the project, additional analysis could be potentially performed to further integrate the list of countries and planning documents.

Table 3: List of spatial planning instruments selected for the content analysis.

Countries	Spatial Planning Instruments	NUTS level	Year of development/ adoption	Reviewers
Italy	Regional Territorial Plan of Emiglia Romagna	NUTS -2	2010	UniTrento
	Territorial Metropolitan Plan of Bologna	NUTS - 3	2021	
	Urban Plan of Bologna Municipality	LAU	2021	
Denmark	Copenhagen Municipal	LAU	2022	AAU

	Biodiversity Strategy			
	Action Plan of the Copenhagen Municipal Biodiversity Strategy	LAU	2022	
	Municipal Spatial Plan for Skive Municipality	LAU	2016	
	Framework Local Plan for GreenLab Area in Skive Municipality	LAU	2016	
Germany	Berlin Strategy: Urban Development Concept Berlin 2030	LAU	2015	UFZ
	Land Use Plan Berlin		2015	
	City Development Plan Mobility and Transport Berlin 2030		2021	
	City Development Plan Housing 2030: New Houses for Berlin		2019	
	City Development Plan Climate: Securing Urban Quality of Life in Climate Change (Berlin)		2011	
Portugal	General Law of Public Policies for Soil, Territorial Development, and Urbanism	NUTS - 1	2014	IST-ID
	Portuguese Legal Framework of Territorial Management Instruments		2015	
	National Program of Territorial Planning Policy		2019	
	Regional Program of the Lisbon Metropolitan Area	NUTS - 2	2002	
	Management Plan of the Arrábida Natural Park		2005	
	Municipal Master Plan of Setúbal	LAU	2021	
Scotland	National Planning Framework	NUTS - 1	2023	UniTrento
	National Land Use Strategy		2021-2026	

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	Scottish Planning Policy		2014	
	Cairngorms National Park Local Development Plan 2020	LAU	2020	
Spain	Regional Planning Guidance of Basque Country	NUTS - 2	2019	
	Partial Territorial Plan of Central Álava	NUTS - 3	2022 – revision of the Plan of 2004	
	General Urban Development Plan of Vittoria-Gasteiz	LAU	2023 – revision of the Plan of 2001	
Switzerland	Territorial project Switzerland	NUTS - 1	2012	
	Cantonal-Ticino Master Plan Revision (explanatory Report)	NUTS - 3	2009	
	Municipal action program (city of Bellinzona)	LAU	2020	

3.2.3. Content analysis of selected planning documents

The content analysis of selected planning documents aimed at identifying, and codifying text fragments that provide insights concerning each element of the framework. The reviewers used the MAXQDA and Nvivo qualitative analysis softwares to facilitate the coding. The identification of relevant text fragments followed a deductive approach, meaning the full-text revision of planning documents supported by a list of guiding questions developed for each analysis element and reported in Table A1 of the Appendix. The text fragments were codified according to the components of spatial planning instruments (vision, strategies, information baseline, and actions/instruments/regulations), the element of analysis of spatial planning systems (governance, the mitigation hierarchy, spatial planning provisions for different sectors, and biodiversity and ES), and the transformative characteristics (restructuring, path-shifting, innovation, multiscale) or phasing-out. Table 4 shows the 80 codes that were developed by combining the different components of framework.

Table 4: List of codes developed for the framework. V: Vision, S: Strategy, IB: Information Baseline, AIR: Actions/Regulations/Instruments, G: Governance of spatial planning systems, MH: Mitigation Hierarchy, Se: Spatial planning provisions for different sectors, BES: Biodiversity & ES, R: Restructuring, P: Path-shifting, I: Innovation, M: Multiscale, and PO: Phasing out.

Elements of Analysis of Spatial Planning Systems	Restructuring	Path-shifting	Innovation	Multiscale	Phasing-out
Governance of spatial planning systems	[V-G-R] [S-G-R] [IB-G-R] [AIR-G-R]	[V-G-P] [S-G-P] [IB-G-P] [AIR-G-P]	[V-G-I] [S-G-I] [IB-G-I] [AIR-G-I]	[V-G-M] [S-G-M] [IB-G-M] [AIR-G-M]	[V-G-PO] [S-G-PO] [IB-G-PO] [AIR-G-PO]
Mitigation Hierarchy	[V-MH-R] [S-MH-R] [IB-MH-R] [AIR-MH-R]	[V-MH-P] [S-MH-P] [IB-MH-P] [AIR-MH-P]	[V-MH-I] [S-MH-I] [IB-MH-I] [AIR-MH-I]	[V-MH-M] [S-MH-M] [IB-MH-M] [AIR-MH-M]	[V-MH-PO] [S-MH-PO] [IB-MH-PO] [AIR-MH-PO]
Spatial planning provisions for different sectors	[V-Se-R] [S-Se-R] [IB-Se-R] [AIR-Se-R]	[V-Se-P] [S-Se-P] [IB-Se-P] [AIR-Se-P]	[V-Se-I] [S-Se-I] [IB-Se-I] [AIR-Se-I]	[V-Se-M] [S-Se-M] [IB-Se-M] [AIR-Se-M]	[V-Se-PO] [S-Se-PO] [IB-Se-PO] [AIR-Se-PO]
Biodiversity & ES	[V-BES-R] [S-BES-R] [IB-BES-R] [AIR-BES-R]	[V-BES-P] [S-BES-P] [IB-BES-P] [AIR-BES-P]	[V-BES-I] [S-BES-I] [IB-BES-I] [AIR-BES-I]	[V-BES-M] [S-BES-M] [IB-BES-M] [AIR-BES-M]	[V-BES-PO] [S-BES-PO] [IB-BES-PO] [AIR-BES-PO]

The rationale to assign code focuses first on understanding which Plan's component is described in the text fragment. The next step was identifying to which element of analysis the fragment contributes. The last step distinguished between the different transformative characteristics or determined whether the text fragment highlights something that should be phased out. For instance, the following text fragment extracted from the General Urban Development Plan of Vittoria-Gasteiz, Spain, *"An integrated approach for managing natural resources of the territory is fundamental."*, was codified as a vision (V) concerning the governance of spatial planning systems (G), characterized for being multiscale (M). The multiscale characteristic emerged from referring to an "integrated approach", which implicitly assumes the cooperation and coordination of several actors. Hence, the code assigned to this fragment was [V-G-M]. Another example, *"Plans should identify woodlands of high nature conservation value and include policies for protecting them and enhancing their condition and resilience to climate change."*, from the Scottish Planning Policy, was codified as a strategy (S) for biodiversity and ES (BES) impacting large-scale ecosystems' structure (R), reporting the code of [S-BES-R]. The following example was extracted from the Regional Planning Guidance of Basque Country, Spain, *"This section shows the maps of the current supply of ES in the Euskadi region….including, food supply, freshwater provision, wood production, carbon sequestration, flood mitigation, pollination, recreation…etc."*. The code assigned to it was [IB-G-P], which is an information baseline (IB) supporting the spatial planning system's governance (G) with a path-shifting character (P) due to the integration of ES knowledge and the use of different knowledge sources in the decision-making of spatial planning. The example of *"The plan develops*

mechanisms of transfer development rights to reduce the land urbanization…" from the Metropolitan Territorial Plan of Bologna, Italy, was codified as an innovative instrument of the Plan (AIR) to avoid negative impacts on ecosystems, considered the first level of the mitigation hierarchy (MH), hence using the code of AIR-MH-I.

The text fragments were extracted into several Excel spreadsheets, one for each spatial planning instrument, reporting the following information: name of the document, text fragment in the original language, pages containing the fragment, the assigned code, and the name of the Reviewer. They were processed by codes and translated into English to provide a summarized description of the Plan's contribution to each code of the framework.

The following partners carried out the analysis: the University of Trento, the University of Lisbon, the Helmholtz Centre for Environmental Research, and the Aalborg University. Specifically, the University of Trento was responsible for developing the conceptual framework, coordinating the content analysis and ensuring methodological consistency between the different working groups, and selecting and conducting the content analysis of the planning documents for Italy, Spain, Switzerland, and Scotland. The other partners were in charge of selecting the planning documents based on their expertise and knowledge of the spatial planning system of their country and conducting the analysis. Table 3 shows the distribution of work between partners.

Considering the number of codes and the involvement of several reviewers, the leading team coordinated periodical consultations with each group to ensure that the coding process aligned with the framework's definitions. During these sessions of cross-checking results, several interpretation rules were defined common to all countries to codify specific text fragments. They aimed to clarify the distinction between codes, facilitating the work of the Reviewers and promoting its consistency. Moreover, two verification rounds conducted by different reviewers were established internally to each working group to address and discuss the codes characterized by ambiguity or differences in interpretation.

4. Results: Transformative elements of the selected spatial planning instruments & comparative analysis

This section provides an overview of the transformative elements that emerged from the content analysis of the selected 28 spatial planning instruments. Tables B1-B102 reported in Appendix B describe the transformative elements of each planning instrument. Specifically, they summarize the plans' visions, strategies, information baseline, and actions/instruments/regulations extracted from the revised planning instruments that hold a transformative potential related to the governance of spatial planning systems, the mitigation hierarchy, the spatial planning provisions for different sectors, and biodiversity and ES. The following sections discuss these results through a comparative analysis and representative examples extracted from Appendix B across spatial planning systems, countries, and the NUTS levels.

4.1. Land use planning system.

Tables 5-8 describe the distribution of transformative elements across the revised spatial planning instruments classified under the land use planning system. The results reveal similar patterns of transformative potential between Italy and Scotland, while the opposite was found for the Portugues spatial planning instruments. For the first group of countries, transformative elements were identified at all NUTS levels and all components of spatial planning instruments. Also, there are no remarkable differences in the extent to which these elements address the governance of spatial planning systems, the mitigation hierarchy, the spatial planning provisions for different sectors, and biodiversity and ES. Nonetheless, multiscale practices were the less proposed in the Scottish planning context, specifically concerning the mitigation hierarchy and the spatial planning provisions for different sectors. Several visions, strategies, and information baselines emerged for these analysis elements. At the same time, no planning action, instrument, or regulation was prescribed in plans to coordinate mitigation hierarchy goals and sectoral objectives across scales.
An interesting transformative element in the Italian context is the implementation of co-design processes to improve citizen engagement. This was classified as a restructuring action for the governance of planning systems. The co-design process was guided by the "Fondazione

Innovazione Urbana" at the metropolitan scale, a multidisciplinary research center promoting interaction between public authorities, universities, private companies, and citizens. Another example is from the Scottish National Planning Framework, which proposed an innovative action for implementing goals of the mitigation hierarchy through the development of the Central Scotland Green Network at the national level. This is one of Europe's largest and most ambitious green infrastructure projects, which plays a crucial role in tackling the interlinked climate change and biodiversity loss crisis.

The content analysis of the six spatial planning instruments in Portugal reveals relatively few transformative elements compared to those found in Italy and Scotland. It can be noticed that the presence of these elements increases as the NUTS levels decrease from the national scale to the municipal scale. Specifically, innovative proposals were the least common for all elements of analysis, including the governance of spatial planning instruments, the mitigation hierarchy, the spatial planning provisions for sectors, and biodiversity and ES.

Table 5: Distribution of transformative elements related to the governance of spatial planning systems across the spatial planning instruments of the countries with a land use planning system, including Italy, Scotland, and Portugal.

	Governance of spatial planning systems – Land Use Planning												
	Italy			Scotland				Portugal					
	Regional Territorial Plan of Emilia Romagna	Territorial Metropolitan Plan of Bologna	Urban Plan of Bologna Municipality	National Planning Framework	National Land Use Strategy	Scottish Planning Policy	Local Development Plan of National Park	General Law of Public Policies for Soil,	Portuguese Legal Framework of Territorial Management Instruments	National Program of Territorial Planning Policy	Regional Program of the Lisbon Metropolitan Area	Management Plan of the Arrábida Natural Park	Municipal Master Plan of Setúbal
	NUTS2	NUTS3	LAU	NUTS1	NUTS1	NUTS1	LAU	NUTS1	NUTS1	NUTS1	NUTS2	NUTS2	LAU
Restructuring													
[V-G-R]	■	■		■	■					■			■
[S-G-R]	■	■	■	■	■	■				■		■	
[IB-G-R]	■	■	■	■	■	■							■
[AIR-G-R]	■	■	■	■	■				■			■	
Path-shifting													
[V-G-P]	■	■	■	■	■					■			■
[S-G-P]	■	■	■	■	■	■	■		■	■		■	■
[IB-G-P]	■	■	■	■	■					■			
[AIR-G-P]		■	■	■									
Innovation													
[V-G-I]	■	■	■	■	■	■				■			
[S-G-I]	■	■	■	■	■	■	■			■			■
[IB-G-I]	■	■	■		■	■							■
[AIR-G-I]	■	■	■	■				■	■				
Multiscale													
[V-G-M]	■			■	■	■				■		■	■
[S-G-M]	■	■	■	■	■	■				■	■	■	■
[IB-G-M]	■	■	■		■	■	■						
[AIR-G-M]		■	■		■			■	■		■		■
Phasing-Out													
[V-G-PO]													■
[S-G-PO]										■			
[IB-G-PO]													
[AIR-G-PO]									■				

Table 6: Distribution of transformative elements related to the mitigation hierarchy across the spatial planning instruments of the countries with a land use planning system, including Italy, Scotland and Portugal.

	Mitigation Hierarchy – Land Use Planning												
	Italy			Scotland				Portugal					
	Regional Territorial Plan of Emilia Romagna	Territorial Metropolitan Plan of Bologna	Urban Plan of Bologna Municipality	National Planning Framework	National Land Use Strategy	Scottish Planning Policy	Local Development Plan of National Park	General Law of Public Policies for Soil,	Portuguese Legal Framework of Territorial Management Instruments	National Program of Territorial Planning Policy	Regional Program of the Lisbon Metropolitan Area	Management Plan of the Arrábida Natural Park	Municipal Master Plan of Setúbal
	NUTS2	NUTS3	LAU	NUTS1	NUTS1	NUTS1	LAU	NUTS1	NUTS1	NUTS1	NUTS2	NUTS2	LAU
Restructuring													
[V-MH-R]		■	■	■	■	■		■	■	■	■		
[S-MH-R]	■	■	■	■	■	■	■	■		■	■		
[IB-MH-R]	■	■	■		■	■	■			■	■		
[AIR-MH-R]	■	■	■	■			■	■	■		■	■	■
Path-shiftig													
[V-MH-P]	■	■		■	■	■	■		■				■
[S-MH-P]	■	■	■	■	■	■	■						
[IB-MH-P]	■	■	■		■		■				■		
[AIR-MH-P]		■	■	■			■						■
Innovation													
[V-MH-I]		■	■	■	■	■	■						
[S-MH-I]	■	■	■	■	■	■	■			■			
[IB-MH-I]	■	■	■			■							
[AIR-MH-I]		■	■	■			■						
Multiscale													
[V-MH-M]		■	■		■								
[S-MH-M]	■	■	■	■	■	■					■		
[IB-MH-M]		■	■		■					■			
[AIR-MH-M]	■							■			■		■
Phasing-Out													
[V-MH-PO]										■			
[S-MH-PO]			■							■			
[IB-MH-PO]													
[AIR-MH-PO]							■						■

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Table 7: Distribution of transformative elements related to the spatial planning provision for different sectors across the spatial planning instruments of the countries with a land use planning system, including Italy, Scotland and Portugal.

	Spatial planning provision for different sectors – Land Use Planning												
	Italy			Scotland				Portugal					
	Regional Territorial Plan of Emilia Romagna	Territorial Metropolitan Plan of Bologna	Urban Plan of Bologna Municipality	National Planning Framework	National Land Use Strategy	Scottish Planning Policy	Local Development Plan of National Park	General Law of Public Policies for Soil,	Portuguese Legal Framework of Territorial Management Instruments	National Program of Territorial Planning Policy	Regional Program of the Lisbon Metropolitan Area	Management Plan of the Arrábida Natural Park	Municipal Master Plan of Setúbal
	NUTS2	NUTS3	LAU	NUTS1	NUTS1	NUTS1	LAU	NUTS1	NUTS1	NUTS1	NUTS2	NUTS2	LAU
Restructuring													
[V-Se-R]	■	■	■	■	■	■	■		■	■	■	■	
[S-Se-R]	■	■	■	■	■	■	■	■		■	■	■	■
[IB-Se-R]	■	■	■		■			■	■	■	■		
[AIR-Se-R]			■	■	■		■	■	■		■	■	■
Path-shiftig													
[V-Se-P]	■	■	■	■	■	■					■		
[S-Se-P]	■	■	■	■	■	■	■			■	■		
[IB-Se-P]			■		■			■			■		
[AIR-Se-P]		■		■	■		■	■	■		■		■
Innovation													
[V-Se-I]	■	■	■			■							
[S-Se-I]	■	■	■	■	■	■	■			■			■
[IB-Se-I]		■	■		■								
[AIR-Se-I]	■	■	■	■	■		■		■				■
Multiscale													
[V-Se-M]	■		■					■	■		■		
[S-Se-M]		■	■	■	■	■				■	■	■	
[IB-Se-M]		■	■						■	■	■		
[AIR-Se-M]									■		■	■	
Phasing-Out													
[V-Se-PO]							■		■				
[S-Se-PO]		■					■						
[IB-Se-PO]													
[AIR-Se-PO]		■											■

Table 8: Distribution of transformative elements related to biodiversity and ES across the spatial planning instruments of the countries with a land use planning system, including Italy, Scotland and Portugal.

	Biodiversity and ES – Land Use Planning												
	Italy			Scotland				Portugal					
	Regional Territorial Plan of Emilia Romagna	Territorial Metropolitan Plan of Bologna	Urban Plan of Bologna Municipality	National Planning Framework	National Land Use Strategy	Scottish Planning Policy	Local Development Plan of National Park	General Law of Public Policies for Soil,	Portuguese Legal Framework of Territorial Management Instruments	National Program of Territorial Planning Policy	Regional Program of the Lisbon Metropolitan Area	Management Plan of the Arrábida Natural Park	Municipal Master Plan of Setúbal
	NUTS2	NUTS3	LAU	NUTS1	NUTS1	NUTS1	LAU	NUTS1	NUTS1	NUTS1	NUTS2	NUTS2	LAU
Restructuring													
[V-BES-R]	■	■	■	■	■	■	■	■		■	■	■	
[S-BES-R]	■	■	■	■	■	■	■				■		■
[IB-BES-R]	■	■	■	■	■		■			■	■		■
[AIR-Se-R]	■	■	■	■	■		■		■		■	■	■
Path-shiftig													
[V-BES-P]	■	■	■	■	■	■		■		■		■	
[S-BES-P]	■	■	■	■	■	■	■			■			■
[IB-BES-P]	■	■	■		■		■			■			■
[AIR-BES-P]		■	■	■	■		■	■	■				■
Innovation													
[V-BES-I]		■	■	■	■	■	■						
[S-BES-I]	■	■	■	■	■	■	■			■			■
[IB-BES-I]	■	■	■		■	■	■						■
[AIR-BES-I]	■	■	■			■	■			■			■
Multiscale													
[V-BES-M]	■	■	■	■	■		■						
[S-BES-M]	■	■	■	■	■	■	■			■		■	
[IB-BES-M]	■	■	■		■		■				■		
[AIR-BES-M]	■	■	■	■			■		■	■	■		■
Phasing-Out													
[V-BES-PO]													
[S-BES-PO]			■										
[IB-BES-PO]													
[AIR-BES-PO]													■

4.2. Comprehensive integral spatial planning system.

Tables 9-12 exhibit the distribution of transformative elements across the spatial planning instruments of Denmark, Germany, and Switzerland, which have a comprehensive integral spatial planning system. Overall, these findings highlight a notably lower presence of transformative elements than those observed for the land use planning system.

The revised spatial planning instruments were less transformative in integrating and implementing the mitigation hierarchy, while the opposite was found concerning the plan's indications impacting biodiversity and ES. Germany and Switzerland's instruments contributed more in terms of the mitigation hierarchy. Specifically, their spatial planning instruments set restructuring and path-shifting strategies of reducing land consumption for new developments, increasing settlement density, and new buildings within urbanized areas to avoid and minimize the impacts of infrastructure development on ecosystems. The Cantonal-Ticino Master Plan Revision states that containing undesirable developments was possible through the 1990 Master Plan. It also proposes a path-shifting action of increasing the number of preventive interventions to support the protective function of forests and the innovative strategy of developing management measures, creating buffer zones, and restoring biotopes and intensive agricultural areas to offset the adverse effects of human activities on flood dynamics. Specifically, innovative elements were less addressed by plans of this spatial planning system.

Like the trend found for the land use planning system, multiscale elements were predominant for the governance of spatial planning systems. For instance, the German plans emphasize strategies to implement cross-level and inter-agency collaborative processes to break the silos between different sectors and put in place mechanisms for citizens to decide on using their public spaces. Following a "shared planning" approach, these plans developed instruments, such as extensive workshops, that involve planning authorities from different administrative spatial bodies.

Concerning the coverage of transformative elements across the components of spatial planning instruments, the outcomes for the German case study indicate that path-shifting, innovative, and multiscale visions and strategies hardly materialize in planning actions with the same transformative characteristics. Unlike Germany, the revised planning instruments for Denmark, which also have a similar planning instrument structure that includes strategic and action plans, deviate from this trend. For instance, the path-shifting vision of biodiversity as central for development and growth narrows down into the restructuring strategy of integrating biodiversity protection and enhancement goals into the urban planning and development, conservation and maintenance of green areas and municipal construction projects. Several actions respond to this strategy, such as the protection of newly developed natural areas in the city and on municipal-owned land (path-shifting) and the implementation of an "idea-development project" in the transitioning area between land and water (innovation).

The planning instruments of Switzerland give insights into the transformative potential across NUTS level. As for Portugal (from the land use planning system), transformative elements were more popular as the NUTS levels decreased. However, the Cantonal-Ticino Master Plan Revision at the NUTS level 3 performs better.

Table 9: Distribution of transformative elements related to the governance of spatial planning systems across the spatial planning instruments of the countries with a comprehensive integral spatial planning system, including Denmark, Germany and Switzerland.

	Governance of spatial planning systems – Comprehensive Integral Spatial Planning System											
	Denmark				Germany					Switzerland		
	Copenhagen Municipal Biodiversity Strategy	Action Plan of the Copenhagen Municipal Biodiversity Strategy	Municipal Spatial Plan for Skive Municipality	Framework Local Plan for GreenLab Area in Skive Municipality	Berlin Strategy: Urban Development Concept	Land Use Plan Berlin	City Development Plan Mobility and Transport	City Development Plan Housing 2030: New	City Development Plan Climate: Securing Urban	Territorial project Switzerland	Cantonal-Ticino Master Plan Revision	Municipal action program (city of Bellinzona)
	LAU	LAU	LAU	LAU	LAU	LAU	LAU	LAU	LAU	NUTS 1	NUTS3	LAU
Restructuring												
[V-G-R]	■									■	■	
[S-G-R]	■			■		■	■			■	■	
[IB-G-R]											■	
[AIR-G-R]		■									■	
Path-shifting												
[V-G-P]	■										■	
[S-G-P]	■				■	■					■	■
[IB-G-P]												
[AIR-G-P]		■										
Innovation												
[V-G-I]												■
[S-G-I]	■										■	■
[IB-G-I]												
[AIR-G-I]		■									■	
Multiscale												
[V-G-M]	■		■		■						■	
[S-G-M]	■		■		■	■				■	■	■
[IB-G-M]										■	■	
[AIR-G-M]		■			■	■	■			■	■	
Phasing-out												
[V-G-PO]												
[S-G-PO]												
[IB-G-PO]												
[AIR-G-PO]												

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Table 10: Distribution of transformative elements related to the mitigation hierarchy across the spatial planning instruments of the countries with a comprehensive integral spatial planning system, including Denmark, Germany and Switzerland.

	Mitigation Hierarchy – Comprehensive Integral Spatial Planning System											
	Denmark				Germany					Switzerland		
	Copenhagen Municipal Biodiversity Strategy	Action Plan of the Copenhagen Municipal Biodiversity Strategy	Municipal Spatial Plan for Skive Municipality	Framework Local Plan for GreenLab Area in Skive Municipality	Berlin Strategy: Urban Development Concept	Land Use Plan Berlin	City Development Plan Mobility and Transport	City Development Plan Housing 2030: New	City Development Plan Climate: Securing Urban	Territorial project Switzerland	Cantonal-Ticino Master Plan Revision	Municipal action program (city of Bellinzona)
	LAU	LAU	LAU	LAU	LAU	LAU	LAU	LAU	LAU	NUTS 1	NUTS3	LAU
Restructuring												
[V-MH-R]					■					■	■	■
[S-MH-R]					■	■	■	■	■	■	■	■
[IB-MH-R]						■					■	
[AIR-MH-R]		■				■					■	■
Path-shifting												
[V-MH-P]					■						■	
[S-MH-P]	■							■	■		■	■
[IB-MH-P]							■					
[AIR-MH-P]				■							■	
Innovation												
[V-MH-I]												
[S-MH-I]											■	■
[IB-MH-I]												
[AIR-MH-I]												■
Multiscale												
[V-MH-M]												
[S-MH-M]						■					■	
[IB-MH-M]												
[AIR-MH-M]												
Phasing-out												
[V-MH-PO]												
[S-MH-PO]						■					■	■
[IB-MH-PO]												
[AIR-MH-PO]												

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Table 11: Distribution of transformative elements related to the spatial planning provisions for different sectors across the spatial planning instruments of the countries with a comprehensive integral spatial planning system, including Denmark, Germany and Switzerland.

	Spatial Planning Provisions for Different Sectors – Comprehensive Integral Spatial Planning System											
	Denmark				Germany					Switzerland		
	Copenhagen Municipal Biodiversity Strategy	Action Plan of the Copenhagen Municipal Biodiversity Strategy	Municipal Spatial Plan for Skive Municipality	Framework Local Plan for GreenLab Area in Skive Municipality	Berlin Strategy: Urban Development Concept	Land Use Plan Berlin	City Development Plan Mobility and Transport	City Development Plan Housing 2030: New	City Development Plan Climate: Securing Urban	Territorial project Switzerland	Cantonal-Ticino Master Plan Revision	Municipal action program (city of Bellinzona)
	LAU	LAU	LAU	LAU	LAU	LAU	LAU	LAU	LAU	NUTS 1	NUTS3	LAU
Restructuring												
[V-Se-R]					■			■	■	■		■
[S-Se-R]	■		■		■	■		■	■	■	■	■
[IB-Se-R]											■	
[AIR-Se-R]					■				■		■	■
Path-shifting												
[V-Se-P]									■	■	■	■
[S-Se-P]			■		■		■				■	■
[IB-Se-P]							■					
[AIR-Se-P]		■	■		■						■	
Innovation												
[V-Se-I]				■								
[S-Se-I]							■				■	■
[IB-Se-I]											■	
[AIR-Se-I]		■									■	■
Multiscale												
[V-Se-M]				■			■				■	
[S-Se-M]							■	■	■	■	■	
[IB-Se-M]									■			
[AIR-Se-M]											■	
Phasing-out												
[V-Se-PO]											■	■
[S-Se-PO]						■				■	■	■
[IB-Se-PO]												
[AIR-Se-PO]						■						

Table 12: Distribution of transformative elements related to biodiversity and ES across the spatial planning instruments of the countries with a comprehensive integral spatial planning system, including Denmark, Germany and Switzerland.

	Biodiversity & ES – Comprehensive Integral Spatial Planning System											
	Denmark				Germany					Switzerland		
	Copenhagen Municipal Biodiversity Strategy	Action Plan of the Copenhagen Municipal Biodiversity Strategy	Municipal Spatial Plan for Skive Municipality	Framework Local Plan for GreenLab Area in Skive Municipality	Berlin Strategy: Urban Development Concept	Land Use Plan Berlin	City Development Plan Mobility and Transport	City Development Plan Housing 2030: New	City Development Plan Climate: Securing Urban	Territorial project Switzerland	Cantonal-Ticino Master Plan Revision	Municipal action program (city of Bellinzona)
	LAU	LAU	LAU	LAU	LAU	LAU	LAU	LAU	LAU	NUTS 1	NUTS3	LAU
Restructuring												
[V-BES-R]					■		■	■		■	■	■
[S-BES-R]	■				■	■	■	■	■	■	■	■
[IB-BES-R]					■	■					■	
[AIR-BES-R]			■	■	■	■			■		■	■
Path-shifting												
[V-BES-P]	■				■	■					■	■
[S-BES-P]	■		■		■	■	■		■	■	■	■
[IB-BES-P]											■	
[AIR-BES-P]		■		■							■	■
Innovation												
[V-BES-I]											■	■
[S-BES-I]	■			■	■		■		■	■	■	■
[IB-BES-I]											■	■
[AIR-BES-I]		■		■							■	■
Multiscale												
[V-BES-M]			■							■	■	■
[S-BES-M]	■		■	■	■		■				■	■
[IB-BES-M]					■					■	■	
[AIR-BES-M]			■	■							■	
Phasing-out												
[V-BES-PO]												
[S-BES-PO]											■	
[IB-BES-PO]												
[AIR-BES-PO]											■	

4.3. Urban spatial planning system.

Tables 13-16 showcase the distribution of transformative elements that emerged from Spain's revised spatial planning instruments, which is the selected country within the urban spatial planning system cluster. Overall, the results highlight that transformative elements widely cover all NUTS levels and planning instruments' components concerning the governance of spatial planning systems, biodiversity, and ES. Conversely, the mitigation hierarchy and the spatial planning provisions for different sectors exhibited lesser transformative features. For all elements of analysis, restructuring changes predominates over the others, while innovation was the less addressed, aligning with the trends observed in other spatial planning systems (See Section 4.1 and 4.2).

A path-shifting element at the NUTS level 2 concerning the governance of spatial planning systems regards the integration of ES knowledge and the supportive role of the green infrastructure to the ES supply. All components of the plan addressed this aspect. The guideline outlines the mapping and assessment of ES as a tool to manage natural resources sustainably and identify critical areas for protection and restoration within the green infrastructure (i.e., strategy). To this end, the guideline's information baseline includes the maps of provisioning, regulating, and cultural ecosystem services (i.e., information baseline). Some assessed services include food supply, carbon sequestration, runoff mitigation, pollination, and recreation. Based on this, the guideline introduces the concept of green infrastructure and ES into all planning scales, indicating Partial Territorial Plans to develop suitable indicators for the mapping and assessing ES that can detect a decline or an improvement in the supply trend (i.e., action).

At the NUTS level 3, the Partial Territorial Plan of Alava Central underscores the need to shift the information baseline from a purely descriptive role into a dynamic tool that fosters active engagement in developing planning strategies and actions. Interestingly, the information baseline illustrates trade-offs that may arise between water reservoirs' recreational potential and their role as vital freshwater sources. It also describes how Alava Central performs according to the planetary boundaries' thresholds, which exceed them. Another relevant example from this plan is the efforts to ensure a participatory process adapted to the COVID-19 restrictions. The participation was organized using two approaches: one involving administrative and institutional actors and the other targeting civil society. It included five in-person workshops, 25 semi-structured interviews with strategic actors of diverse expertise and responsibilities, and two online roundtables for presenting planning documents and incorporating participants' inputs.

At the LAU NUTS level, the General Urban Development Plan of Vittoria-Gasteiz suggests rezoning specific areas to establish a non-developable regime in harmony with biodiversity protection objectives. It uses information on various ES to define non-developable areas' regulations. Moreover, the plan classifies diverse conditions within the non-developable land use category (553.79 ha) to incorporate mitigation hierarchy goals—conservation and enhancement. An interesting path-shifting and innovative strategy is the development of the green Infrastructure and the implementation of nature-based solutions to enhance biodiversity and ES, reimagining the green belt as a structural and cross-cutting element that links diverse city parts. Finally, the content analysis revealed a potential action to phase out. Given that the city surpasses the WHO's minimum green space availability per capita, the plan proposes transforming low-value ecological green spaces into built-up areas.

Table 13: Distribution of transformative elements related to the governance of spatial planning systems across the spatial planning instruments of Spain, the examined country with an urban planning system.

	Governance of spatial planning systems – Urban planning system		
	Spain		
	Regional Planning Guideline of the Basque Country	Partial Territorial Plan of Central Alava	General Urban Development Plan of Vittoria-Gasteiz
	NUTS2	NUTS3	LAU
Restructuring			
[V-G-R]			
[S-G-R]			
[IB-G-R]			
[AIR-G-R]			
Path-shifting			
[V-G-P]			
[S-G-P]			
[IB-G-P]			
[AIR-G-P]			
Innovation			
[V-G-I]			
[S-G-I]			
[IB-G-I]			
[AIR-G-I]			
Multiscale			
[V-G-M]			
[S-G-M]			
[IB-G-M]			
[AIR-G-M]			
Phasing-out			
[V-G-PO]			
[S-G-PO]			
[IB-G-PO]			
[AIR-G-PO]			

Table 14: Distribution of transformative elements related to the mitigation hierarchy across the spatial planning instruments of Spain, the examined country with an urban planning system.

	Mitigation hierarchy – Urban planning system		
	Spain		
	Regional Planning Guideline of the Basque Country	Partial Territorial Plan of Central Alava	General Urban Development Plan of Vittoria-Gasteiz
	NUTS2	NUTS3	LAU
Restructuring			
[V-MH-R]			
[S-MH-R]			
[IB-MH-R]			
[AIR-MH-R]			
Path-shifting			
[V-MH-P]			
[S-MH-P]			
[IB-MH-P]			
[AIR-MH-P]			
Innovation			
[V-MH-I]			
[S-MH-I]			
[IB-MH-I]			
[AIR-MH-I]			
Multiscale			
[V-MH-M]			
[S-MH-M]			
[IB-MH-M]			
[AIR-MH-M]			
Phasing-out			
[V-MH-PO]			
[S-MH-PO]			
[IB-MH-PO]			
[AIR-MH-PO]			

Table 15: Distribution of transformative elements related to the spatial planning provisions for different sectors across the spatial planning instruments of Spain, the examined country with an urban planning system.

	Spatial planning provisions for different sectors – Urban planning system		
	Spain		
	Regional Planning Guideline of the Basque Country	Partial Territorial Plan of Central Alava	General Urban Development Plan of Vittoria-Gasteiz
	NUTS2	NUTS3	LAU
Restructuring			
[V-Se-R]			
[S-Se-R]			
[IB-Se-R]			
[AIR-Se-R]			
Path-shifting			
[V-Se-P]			
[S-Se-P]			
[IB-Se-P]			
[AIR-Se-P]			
Innovation			
[V-Se-I]			
[S-Se-I]			
[IB-Se-I]			
[AIR-Se-I]			
Multiscale			
[V-Se-M]			
[S-Se-M]			
[IB-Se-M]			
[AIR-Se-M]			
Phasing-out			
[V-Se-PO]			
[S-Se-PO]			
[IB-Se-PO]			
[AIR-Se-PO]			

Table 16: Distribution of transformative elements related to biodiversity and ES across the spatial planning instruments of Spain, the examined country with an urban planning system.

	Biodiversity and ES – Urban planning system		
	Spain		
	Regional Planning Guideline of the Basque Country	Partial Territorial Plan of Central Alava	General Urban Development Plan of Vittoria-Gasteiz
	NUTS2	NUTS3	LAU
Restructuring			
[V-BES-R]			
[S-BES-R]			
[IB-BES-R]			
[AIR-BES-R]			
Path-shifting			
[V-BES-P]			
[S-BES-P]			
[IB-BES-P]			
[AIR-BES-P]			
Innovation			
[V-BES-I]			
[S-BES-I]			
[IB-BES-I]			
[AIR-BES-I]			
Multiscale			
[V-BES-M]			
[S-BES-M]			
[IB-BES-M]			
[AIR-BES-M]			
Phasing-out			
[V-BES-PO]			
[S-BES-PO]			
[IB-BES-PO]			
[AIR-BES-PO]			

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5. Conclusions and next steps

By analyzing 28 spatial planning instruments from various spatial planning systems, this deliverable shed light on opportunities and challenges in making spatial planning more biodiversity-inclusive. It presents a range of current planning practices with restructuring, path-shifting, innovative, and multiscale features while identifying practices that might need reconsideration or phasing out. A common transformative opportunity across spatial planning systems lies in multiscale changes that promote participatory approaches and collaboration between public and private actors and civil society's representatives. However, efforts are still required to strengthen the role of the mitigation hierarchy for effective biodiversity conservation and ecosystem services enhancement in spatial planning.

Furthermore, the findings suggest a potential hierarchy in the extent to which restructuring, path-shifting, innovative, and multiscale practices can induce varying degrees of transformation in spatial planning. Innovative practices anticipated to drive substantial changes were less frequently observed, whereas restructuring actions with a lower transformative potential were more prevalent in the revised planning instruments. Synergies and complementarity between transformative characteristics were evident, too. For instance, path-shifting strategies (e.g., managing natural resources sustainably) could be implemented through restructuring changes in regulations (e.g., assignment of the new non-developable land use class to developable areas), supported by innovative information baseline (e.g., high-resolution ES maps).

The results also highlight challenges in transformative elements consistently across various components of spatial planning instruments. This integration is pivotal for realizing the transformative potential of spatial planning systems for biodiversity and ecosystem services. Mainstreaming transformative practices within the visions, strategies, information baseline, and actions of planning instruments is essential for their long-term, ultimately becoming intrinsic to the spatial planning tradition.

During the course of the project, these conclusions could be potentially reinforced or reconsidered after integrating the findings obtained from the ongoing analysis of other spatial planning instruments of additional countries.

This deliverable contributes to several tasks of the project. The conceptual framework outlines how to assess the transformative potential of spatial planning systems. This can support Task 4.1 in specifying the overarching analytical framework of transformative change developed by (Wittmer et al. 2021) for the spatial planning and management instrument's perspective. It provides guidelines for Task 4.2 of transformative elements that can be tested in the three arenas for transformation and Task 4.3 and 4.4 on the strengths, weaknesses, and potential pathways to boost the transformative potential of spatial planning. Moreover, the results reinforce the importance of integrating biodiversity values and ecosystem knowledge into different stages of the planning process, linking with Task 1.3, which explores approaches and assessment methods for this purpose. Lastly, it can contribute to the activities of Task 1.4, specifically unveiling the role of the mitigation hierarchy in current planning practices.

6. References

Albert, Christian, Christine Fürst, Irene Ring, and Camilla Sandström. 2020. "Research Note: Spatial Planning in Europe and Central Asia – Enhancing the Consideration of Biodiversity and Ecosystem Services." *Landscape and Urban Planning* 196 (January): 103741. https://doi.org/10.1016/j.landurbplan.2019.103741.

Baker, Ingrid, Ann Peterson, Greg Brown, and Clive McAlpine. 2012. "Local Government Response to the Impacts of Climate Change: An Evaluation of Local Climate Adaptation Plans." *Landscape and Urban Planning* 107 (2): 127–36. https://doi.org/10.1016/j.landurbplan.2012.05.009.

Berke, Philip, and David Godschalk. 2009. "Searching for the Good Plan: A Meta-Analysis of Plan Quality Studies." *Journal of Planning Literature* 23 (3): 227–40. https://doi.org/10.1177/0885412208327014.

Boyer, Robert H.W. 2015. "Grassroots Innovation for Urban Sustainability: Comparing the Diffusion Pathways of Three Ecovillage Projects." *Environment and Planning A* 47 (2): 320–37. https://doi.org/10.1068/a140250p.

Cortinovis, Chiara, and Davide Geneletti. 2018. "Ecosystem Services in Urban Plans : What Is There , and What Is Still Needed for Better Decisions." *Land Use Policy* 70 (March 2017): 298–312. https://doi.org/10.1016/j.landusepol.2017.10.017.

EC. 1997. "The Compendium of European Spatial Planning Systems." *European Planning Studies* 3 (3): 390–95. https://doi.org/10.1080/09654319508720313.

Ek, Richard, and Frédéric Santamaria. 2018. "Meanings for Spatial / Geographical Visions To Cite This Version : HAL Id : Halshs-01021609 Meanings for Spatial / Geographical Visions."

ESPON Project. 2006. "Governance of Territorial and Urban Policies from EU to Local Level: Third Interim Report." www.espon.lu.

Fedele, Giacomo, Camila I. Donatti, Celia A. Harvey, Lee Hannah, and David G. Hole. 2019. "Transformative Adaptation to Climate Change for Sustainable Social-Ecological Systems." *Environmental Science and Policy* 101 (July): 116–25. https://doi.org/10.1016/j.envsci.2019.07.001.

Geneletti, Davide, and Linda Zardo. 2015. "Ecosystem-Based Adaptation in Cities : An Analysis of European Urban Climate Adaptation Plans." *Land Use Policy* 50: 38–47. https://doi.org/10.1016/j.landusepol.2015.09.003.

GEO BON. 2014a. "Biodiversity Habitat Index." 2014. https://geobon.org/ebvs/indicators/biodiversity-habitat-index/.

———. 2014b. "Local Biodiversity Intactness Index." 2014. https://geobon.org/ebvs/indicators/local-biodiversity-intactness-index/.

IPBES-IPCC. 2019. "IPBES-IPCC Co-Sponsored Workshop Report on Biodiversity and Climate Change." https://doi.org/10.5281/zenodo.4659158.IPBES.

Jacobs, Sander, Fernando Santos-Martín, Eeva Primmer, Fanny Boeraeve, Alejandra Morán-Ordóñez, Vânia Proença, Martin Schlaepfer, et al. 2022. "Transformative Change Needs Direction." *Sustainability* 14 (22): 14844. https://doi.org/10.3390/su142214844.

Jones, Kendall R., Amrei von Hase, Hugo M. Costa, Hugo Rainey, Naseeba Sidat, Benjamin Jobson, Thomas B. White, and Hedley S. Grantham. 2022. "Spatial Analysis to Inform the Mitigation

Hierarchy." *Conservation Science and Practice* 4 (6): 1–17. https://doi.org/10.1111/csp2.12686.
Michalski, Rajmund. 2021. *Towards a Sustainable Future: Transformative Change and Post-COVID-19 Priorities*. *Quarterly NAUKA*. Vol. 1. https://easac.eu/publications/details/towards-a-sustainable-future-transformative-change-and-post-covid-19-priorities/.
Nadin, Vincent, Maria Fernández, Ana Maldonado, Wil Zonneveld, Dominic Stead, Marcin Dąbrowski, Kasia Piskorek, et al. 2018. "COMPASS Final Report - Comparative Analysis of Territorial Governance and Spatial Planning Systems in Europe." www.espon.eu.
Nadin, Vincent, and Dominic Stead. 2013. "Opening up the Compendium: An Evaluation of International Comparative Planning Research Methodologies." *European Planning Studies* 21 (10): 1542–61. https://doi.org/10.1080/09654313.2012.722958.
Pascual, Unai, Patricia Balvanera, Christopher B. Anderson, Rebecca Chaplin-Kramer, Michael Christie, David González-Jiménez, Adrian Martin, et al. 2023. "Diverse Values of Nature for Sustainability." *Nature*, no. July 2022. https://doi.org/10.1038/s41586-023-06406-9.
Pascual, Unai, Pamela D. McElwee, Sarah E. Diamond, Hien T. Ngo, Xuemei Bai, William W.L. Cheung, Michelle Lim, et al. 2022. "Governing for Transformative Change across the Biodiversity-Climate-Society Nexus." *BioScience* 72 (7): 684–704. https://doi.org/10.1093/biosci/biac031.
The Biodiversity Consultancy. 2015. "Mining Mitigation Hierarchy."
Visseren-Hamakers, Ingrid J., Jona Razzaque, Pamela McElwee, Esther Turnhout, Eszter Kelemen, Graciela M. Rusch, Álvaro Fernández-Llamazares, et al. 2021. "Transformative Governance of Biodiversity: Insights for Sustainable Development." *Current Opinion in Environmental Sustainability* 53: 20–28. https://doi.org/10.1016/j.cosust.2021.06.002.
Wittmer, Heidi, A Berghöfer, Büttner L, R Chakrabarty, J Förster, S Khan, C König, et al. 2021. "Transformative Change for a Sustainable Management of Global Commons – Biodiversity, Forests and the Ocean . Recommendations for International Coopera Tion Based on a Review of Global Assessment Reports and Project Experience." https://doi.org/10.57699/7s83-7z35.

7. Appendix A: Guiding questions supporting the content analysis of spatial planning instruments

Table A 1: Examples of guiding questions to identify transformative characteristics in spatial planning instruments

Elements of Analysis of Spatial Planning Systems	Guiding questions
Governance of spatial planning systems	1. How were knowledge co-production and co-learning ensured to integrate the views and values of different stakeholder groups such as experts, indigenous, youth, women, socially and economically marginalized groups, and actors with vested interests in the status quo? 2. Which participatory approaches were used to target, e.g., private stakeholders at levels, regional environmental agency, forest agency, watershed protection agency, gardens, and green areas department, etc.? 3. Which practices supported the involvement of stakeholders and interaction between different actors, e.g., laws' reformation, establishing cooperative structures between departments, and building public-private partnerships? 4. How have plans and regulations been changed to speed the planning process, e.g., reduction of instruments and adoption of statutory time limits? 5. How do plans consider nature's intrinsic, instrumental, and relational values? 6. How were ES assessment methods (i.e., biophysical, social, and economic) used to support decision-making? 7. How was ES information integrated into plans, e.g., through qualitative and quantitative ES analysis, including measurements of functions and processes for ES supply, identification of demand and beneficiaries, and trade-off assessments?

Mitigation hierarchy	1. How (and at which planning stage) were biodiversity conservation goals and avoidance/minimization/restoration/offsetting programs considered? 2. Which instruments support the implementation of the MH requirements? e.g., incentive-based/financial instruments. 3. How frequent are preventive measures of the MH (e.g., avoidance and minimization) proposed over remediative measures (e.g., rehabilitation and offsetting) in plans? In case remediative measures prevail over preventive ones, which remediative measures are proposed to halt biodiversity loss and enhance ecosystem conditions? 4. What procedures were implemented to use broad-scale spatial data and analysis to set requirements for avoidance and offsetting measures, e.g., areas of high conservation concern and potential offset sites? (Jones et al. 2022). 5. What kind of technical innovation (e.g., genetic tools, remote sensing, metapopulation models, science-based biodiversity and ES management practices, and collaborative spatial decision support system) were used to assess biodiversity offsetting that ensures the achievement of the No Net Loss objectives? 6. What types of nature-based solutions were proposed to avoid, restore and offset biodiversity impact?
Spatial planning provisions for different sectors	1. What approaches are adopted for managing agroecosystems, e.g., forest harvesting and agroecology practices? Were specific targets defined, e.g., maximum agricultural land consumption rate? 2. Were community gardens proposed to incentivize the self-production of fresh food, reducing agricultural intensification? Which instruments were developed to support their implementation? 3. Which practices/instruments/targets for urban mobility were proposed to enhance accessibility to green spaces, including community gardens? 4. How were spatial priorities identified for biodiversity goals, e.g., applying the ELSA methodology to identify conservation areas between agricultural units and transport infrastructures? And natural areas vital to ES provision that should be preserved from the land occupation of renewable energy practices?

Biodiversity and ES	1. How did spatial planning instruments consider biodiversity goals? Did they refer to national and international biodiversity goals/frameworks? 2. Are nature-based solutions systematically considered as a planning action to tackle biodiversity? Are nature-based solutions proposed as an alternative to conventional engineering solutions? 3. Which assessment methods, indicators, and planning actions were proposed to (i) enhance ecosystem heterogeneity and ecological connectivity locally and at the landscape scale, ensuring that populations support each other, recolonization is possible, and animal movement, (ii) ensure that the total area under protection is enough to ensure the persistence of biodiversity features, (iii) support a full range of species, ecosystems, and ecosystem services, not just iconic ones? 4. Which methods were implemented to assess the spatial cross-scale impacts on ES supply? 5. Which approaches were proposed to monitor the six biodiversity classes and related variables? 6. Was open source information from, e.g., ex GBIF, UN biodiversity Lab, European Bird Census Council, Corine Land Cover, Butterfly Conservation Europe data, used in lack of national data?

8. Appendix B: Transformative elements of the selected spatial planning instruments

8.1. Italy

8.1.1. Regional Territorial Plan of Emilia Romagna

The following tables illustrate the summarized results obtained from analyzing the Regional Territorial Plan of Emilia Romagna. Specifically, Table B1 shows the transformative elements related to the governance of spatial planning systems, Table B2 those related to the mitigation hierarchy, Table B3 those related to the spatial planning provision for different sectors, and Table B4 those related to biodiversity and ES.

Table B 1: Transformative elements related to the governance of spatial planning systems for the Regional Territorial Plan of Emilia Romagna.

Framework' Codes	Summarized Results
[V-G-R] Vision – Governance - Restructuring	• The Plan' vision seeks to enhance women's representation in institutions, emphasizing the need for a gender perspective in regional policy planning. • It seeks to streamline governance systems, enhance decision-making, and innovate institutional mechanisms, particularly in collaboration with local governments. • The Plan also proposes simplifying planning processes while emphasizing cooperation with stakeholders to prioritize public interests and citizen involvement. • It advocates for a new balance between 'development' and 'protection,' where 'protection' takes precedence while accommodating compatible 'development'
[S-G-R] Strategy – Governance - Restructuring	• The Plan' strategy enhances territorial resources via partnerships with local governments, businesses, and unions. • It prioritizes citizen participation, aiming for a new participatory decision-making model. It coordinates sector planning with general planning to shape urban and territorial development rules. • The Regional Government guides provinces and municipalities, participating in planning updates and

	signing Territorial Agreements for multi-level spatial development. • The Plan aligns public efforts for environmental heritage preservation and enhancement. It fosters eco-restoration using public and private funds, creating economic opportunities, involving research institutions, and cultivating environmental awareness. • The Plan focuses on integrated protection and enhancement, employing landscape units for subregional plans, allocating resources for landscape heritage enjoyment, and reducing future costs.
[IB-G-R] Information baseline – Governance - Restructuring	• The Plan's development and implementation involves a public participation process that makes the Environmental and Territorial Sustainability Assessment an open process for stakeholders to express their views on strategies, objectives, and measures to mitigate negative impacts of territorial development policies.
[AIR-G-R] Actions /Instruments /Regulations – Governance - Restructuring	• The Plan proposes using spatial objects like compelling city and complex area systems for proactive adaptation to change. This necessitates improved policy coordination across regional sectors and administrative levels, aiming to foster innovation that sustains territorial capital and benefits future generations.
[V-G-P] Vision – Governance – Path-shifting	• The vision of the Plan advocates involving citizens and businesses in governance, emphasizing youth and women's participation. • It addresses governance challenges due to fragmented decision-making and proposes "ecosystem knowledge" integration for environment-friendly planning. • It urges modern, participatory governance, enhancing decision quality. Environmental sustainability is promoted via policy integration, innovation, and multi-stakeholder engagement. • The Plan also prioritizes environment in transformations, influencing planning processes. • It seeks a new 'development'-'protection' balance with protection as a priority but enabling compatible development.
[S-G-P] Strategy – Governance – Path-shifting	• The Plan' strategy advances beyond sectoral policies, emphasizing ecosystems in development reform. • It fosters awareness, accountability, investment, and resource enhancement. • The Regional Government collaborates with local stakeholders to enrich resources, ensuring effective governance through citizen engagement.

	• Multiple actors are involved in participatory tool reform for shared perspectives. • The Plan guides land transformations, focusing on protection, restoration, and enhancement. • It aids ecological planning, demonstrating investment value. • It prioritizes ecological projects, involving public and private entities for constrained asset utilization, addressing urban planning and economic considerations.
[IB-G-P] Information Baseline – Governance – Path-shifting	• The Plan fosters collaboration among regional sectors to enhance sectoral policies. Public participation during the Plan's formation and upcoming implementation contributes to an open Environmental and Territorial Sustainability Assessment. Actors can voice opinions on strategies, objectives, and measures to mitigate land development policy impacts.
[V-G-I] Vision – Governance – Innovation	• The Plan should use cross-sectoral systems to assess regional well-being using environmental, social, and economic indicators. • Creating the new Metropolitan City can involve municipal governments, neighbourhoods, and city associations in defining strategic goals and institutional dimensions in accordance with laws.
[S-G-I] Strategy – Governance – Innovation	• The Plan addresses territorial fragmentation, integrates it into regional and national frameworks, emphasizes community participation for practical solutions, develops participatory tools for a new decision-making model, relies on ecological networks for success, and emphasizes knowledge for effective ecosystem approaches.
[IB-G-I] Information Baseline – Governance – Innovation	• The Plan optimizes analyses, normalizes indicators, balances detail and synthesis, fostering sectoral policy integration. • Descriptive ecological studies highlight settlement growth and habitat fragmentation. • Provincial and municipal ecological networks are emphasized. • The Plan verifies provincial spatial coherence using mathematical models and landscape ecology concepts, proposing changes for plan consistency and sustainability.
[AIR-G-I] Actions /Instruments /Regulations – Governance - Innovation	• A participatory planning processes was developed to enhance coherence between performance assessment and activity planning via Inter-Directorate General Integration Areas.

	• The Plan proposes innovative use of spatial objects like compelling city and complex area systems for proactive adaptation, necessitating improved policy coordination across regional sectors and administrative levels to sustain territorial capital and public goods for future generations.
[V-G-M] Vision – Governance – Multiscale	• The Plan addresses governance challenges due to fragmented decision-making, emphasizing integration across administrative levels. • It promotes city-mountain ecosystem management, highlights public administration qualification as crucial, and prioritizes community-centred policies. • Applying subsidiarity ensures regional strategies align with local autonomy and rules.
[S-G-M] Strategy – Governance – Multiscale	• The Plan seeks effective solutions for local transformation, including land use compatibility within the territorial ecosystem, overcoming administrative limits. • It guides provincial and municipal modernization efforts, develops inter-municipal planning tools, and ensures cost-benefit sharing. • The Plan determines optimal governance levels, integrating natural areas and artificial systems. It promotes an integrated approach to regional landscape and cultural heritage.
[IB-G-M] Information Baseline – Governance – Multiscale	• In line with the recent proposal from the European Commission for a geographic information infrastructure of the EU, the plan believes that spatial information should play a key role in the governance and planning approach, integrating data across various disciplines and sectors.

Table B 2: Transformative elements related to the mitigation hierarchy for the Regional Territorial Plan of Emilia Romagna.

Framework' Codes	Summarized Results
[S-MH-R] Strategy – Mitigation Hierarchy- Restructuring	• The Plan' strategy addresses locating settlements and infrastructure with minimal environmental impact, prioritizing non-renewable land as a resource providing ecosystem services. • It combats land consumption, mitigates disasters, and adapts to climate change. • The Plan integrates land management with biodiversity conservation, ecological networks, and microclimate improvement.

	• Its objectives include limiting land consumption, urban redevelopment, and hill/mountain area enhancement. The Plan promotes sustainable land development, considering environmental, social, and economic factors, and restricts transformation in specific areas.
[IB-MH-R] Information baseline – Mitigation Hierarchy-Restructuring	• The Plan independently maps indicators like artificial surfaces, demographics, land use, foreign residents, and commuting. Then, multicriteria spatial analysis correlates them. This method synthesizes demographic and urbanized data at the municipal scale (1991-2005 for residents, 1994-2003 for urbanization). • The use of GIS tools enables cross-representation of these indicators, which were previously analysed separately. • The Plan highlights the need for unique indicators translating numerical values into descriptors. It also includes a map of environmental quality, hazards, and land use capacity.
[AIR-MH-R] Actions /Instruments /Regulations – Mitigation Hierarchy-Restructuring	• The Plan's planning dispositions are aimed at conserving soil, subsoil, water, flora and fauna.
[V-MH-P] Vision – Mitigation Hierarchy– Path-shifting	• The Plan' vision underscores the importance of greenhouse gas mitigation and climate adaptation for minimizing harm and leveraging opportunities. • It advocates restricting land consumption due to soil's role as a non-renewable, common resource critical for preserving ecosystems, averting hydrogeological issues, and addressing climate change.
[S-MH-P] Strategy – Mitigation Hierarchy– Path-shifting	• The Plan targets zero land consumption by 2050. It seeks this through urban land reuse, resource management, and pollutant reduction. • The Plan prioritizes landscape and ecosystem restoration, city redevelopment, reduced land use conflicts, and local strategies to curb land consumption. • Reuse and urban regeneration aim for higher environmental and architectural quality, reduced resource use, pollution remediation, increased green spaces, waste sorting, and sustainable mobility.
[IB-MH-P] Information Baseline – Mitigation Hierarchy– Path-shifting	• The Plan represents the change in the urbanized land index at the municipal level between 1994 and 2003. • The table means the greater or lesser demand expressed in the latest years by the different land areas regarding land transformation and land use.

[S-MH-I] Strategy – Mitigation Hierarchy– Innovation	• The Plan adopts an ecosystem concept that varies from 'matrix' in natural areas to 'greenway' in urbanized settings, supporting ecological networks, mitigating urban impacts, managing hazards, and connecting diverse environments. It identifies interferences between settlement and ecosystems, guiding development scenarios and addressing spatial fragmentation.
[IB-MH-I] Information Baseline – Mitigation Hierarchy– Innovation	• The Plan defines a summary indicator for Urbanized Territory. • It also performs multi-criteria analysis, combining resident density and urbanized territory index from different periods for a graphical overview. • It assesses the 'Sprawl Index' to understand environmental fragmentation due to urbanized land consumption.
[S-MH-M] Strategy – Mitigation Hierarchy– Multiscale	• The Plan aims to counter urban sprawl and the resulting fragmentation of infrastructure by designing a mosaic of landscapes.
[AIR-MH-M] Actions /Instruments /Regulations – Mitigation Hierarchy- Multiscale	• The Plan promotes the limitation of land consumption as soil is a renewable resource that produces ecosystem services, including functions of climate change mitigation and adaptation strategies.

Table B 3: Transformative elements related to spatial planning provisions for different sectors for the Regional Territorial Plan of Emilia Romagna.

Framework' Codes	Summarized Results
[V-Se-R] Vision – Spatial provision of different sectors - Restructuring	• The region aspires to achieve new environmental and energy targets by 2020, emphasizing improved quality of life and the integration of advanced technologies in sustainable construction. • The Plan actively engages stakeholders across the sustainable energy supply chain, encompassing builders, material and energy research firms, professionals, as well as micro and small enterprises. Agriculture assumes a pivotal role in driving sustainable progress. • The Plan's objective is to bolster multifunctional farms, which, in addition to generating agricultural income, contribute to wholesome nutrition, the production and promotion of distinctive goods, biodiversity safeguarding, and self-reliant renewable energy generation. • The Plan advocates for "eco-functional intensification" of agricultural output, emphasizing low resource input and high environmental compatibility to enhance overall

	environmental and safety performance within the primary sector. • Strategic dialogue between local authorities and agricultural stakeholders is actively promoted to bolster agricultural multifunctionality, encouraging eco-functional practices and the reestablishment of ecosystem networks. • The Plan envisions fostering local mobility networks and collective transportation systems to advance sustainable travel options and diminish environmental impact. • The Plan underscores the significance of reinforcing functions in rural peri-urban zones, encompassing the establishment of open, cultivated, and wooded spaces to counterbalance urban influences, safeguard biodiversity, and facilitate localized food distribution through farmer markets. • The Plan prioritizes eco-functional enhancement in food production, striving to amplify the favourable effects of ecosystem functions, including biodiversity, soil fertility, and stability. • The Plan is dedicated to safeguarding rural and agricultural land by mitigating hydrogeological risks and ensuring the effective operation of hydraulic systems that underpin agricultural activities.
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• The Plan targets an environmentally sustainable energy shift by 2020, aligned with Kyoto Protocol and EU directives. • The strategy prioritizes sustainable urban mobility networks, including dedicated lanes for public transport, seated collective urban transit, and bike pathways. • Emphasizing integrated wide-area systems bridging urban and natural spaces, the Plan advocates heightened strategic collaboration among local authorities and agricultural stakeholders. This advances agriculture's multifunctionality and strengthens ecosystem networks. • The Regional Landscape Plan mandates municipal or inter-municipal planning for vacant spaces, envisioning park and forest areas for leisure, barring soil sealing. Concerning agriculture, the Plan halts further agricultural land loss. • The Zonal Agricultural Development Plan will prescribe methods to preserve soil productivity and safeguard resources. • Encouraging water and land routes, the Regional Landscape Plan seeks alternatives to roads that restore land, link landscape assets, and enhance landscape experiences.

[IB-Se-R] Information baseline – Spatial provision of different sectors - Restructuring	• The Plan features a biological resource map that identifies five categories, spotlighting prime agricultural, wildlife, and floristic zones of the region.
[V-Se-P] Vision – Spatial provision of different sectors – Path-shifting	• The Plan embraces "territorial capital," emerging from cognitive, social, settlement-infrastructure, and ecosystem-landscape synergy. Emilia-Romagna stands as Italy's green economy hub, spanning manufacturing, construction, services, and agriculture. • The Plan's new energy policies urge industry to lead in energy conservation and renewable. • It interconnects social, economic, environmental, institutional, and gender dimensions for sustainable regional development. • Managed natural resources, like forests and water, alongside new peri-urban and intra-urban agriculture, harmonize environmental, social, and productive aspects. • Multifunctionality links sustainable agriculture, food security, landscape equilibrium, ecological preservation, risk management, tourism, and culture. • To boost tourism, intramodal and public transport-enhancing systems are key. Strategic research targets eco-functional food production, interdependent regional integration, and rural peri-urban diversification.
[S-Se-P] Strategy – Spatial provision of different sectors – Path-shifting	• Planning for redesigning landscapes and ecosystems must seize multi-functional agriculture prospects in mountains, rural, and urban zones. • Effective city governance prioritizes sustainable mobility networks, tying new residential and productive zones to rail and road transport, while enhancing bicycles, pedestrians, and public transit. • Economic diversification in rural and mountainous areas fosters territorial growth, sustaining farms, and enhancing ecosystemic and agro-energy functions, vital for regional supply chains. • The Plan asserts that water and land routes can reclaim otherwise unused land areas.
[V-Se-I] Vision – Spatial provision of different sectors – Innovation	• The Plan centres on territorial capital, formed through cognitive, social, settlement-infrastructure, and ecosystem-landscape interactions. • Research focuses on enhancing food production's eco-functional intensity, bolstering ecosystem functions, and biodiversity. • Additionally, integrated policies are proposed for fostering sustainable, high-quality agriculture.

[S-Se-I] Strategy – Spatial provision of different sectors – Innovation	• The Plan highlights productive rural landscapes' role in crafting a mosaic of cultural landscapes, blending high-productivity agriculture with historical-environmental facets. • Economic diversification in rural and mountainous regions is crucial for territorial development, preserving farms. • Multifunctionality enhances eco-systemic, agro-energy, and productive functions. • Urban regeneration improves cities' environmental and architectural quality through reduced water and energy use, polluted land reclamation, increased urban greenery, and sustainable mobility and waste management promotion.
[AIR-Se-I] Actions /Instruments /Regulations – Spatial provision of different sectors - Innovation	• Opportunities for ecological network reconstruction are inherent in the "Guidelines for Rural Land Transformation Governance" by the Province of Bologna. This resource holds significance for the entire regional system.
[V-Se-M] Vision – Spatial provision of different sectors – Multiscale	• Emilia-Romagna commits to a national role in propelling innovation and ecological economic transformation, ensuring social cohesion, justice, and territorial equality between the country's north and south. To manage these intricate systems, strategic dialogue among local authorities and agricultural stakeholders is pivotal. This advances agriculture's multifunctionality and bolsters ecosystem networks. • The Plan advocates incentivizing farmers for eco-functional practices, seamlessly integrated into ecosystem network restoration across various scales, from regional to local levels.

Table B 4: Transformative elements related to biodiversity and ES for the Regional Territorial Plan of Emilia Romagna.

Framework' Codes	Summarized Results
[V-BES-R] Vision – Biodiversity & ES - Restructuring	• The Plan underscores connecting and enhancing ecosystem networks to counter habitat fragmentation and biotic isolation. • It proposes integrating "ecosystem knowledge" into spatial planning for better environmental and landscape compatibility during land changes. • Strategic areas of the valley are pivotal for ensuring continuity from mountains to Adriatic. • Bolognese mountains serve as a green belt for a vital metropolitan region, with suggested enhancement

	strategies. In rural peri-urban zones, diverse open, cultivated, wooded, and equipped spaces offer urban impact offset, biodiversity support, ecological trails, and local food production. • The Plan envisions bolstering regional ecosystem and landscape capital, improving territory integrity, ecosystem network continuity, regional security, natural resource regeneration, landscape richness, and biodiversity. • The Regional Landscape Plan fosters an environment culture based on a unified "environment-territory" concept, treating territory as a 'complex environmental system' to restore, rehabilitate, recover, and enhance.
[S-BES-R] Strategy – Biodiversity & ES - Restructuring	• Planning transitions from "where to locate settlements and infrastructure networks" to "how to limit private mobility-based settlement patterns." • Addressing spatial fragmentation, planning guides ecological network reconstruction. Criteria ensure resource quality, waterways enhancement, compromised area restoration, and sustainability measures. • Plan interventions elevate environmental/architectural standards, cut water/energy use, restore polluted soils, boost urban greenery, support waste separation, and sustainable mobility. • The Regional Landscape Plan halts further agricultural land consumption, protecting productivity and heritage. • It encourages regional, provincial, municipal initiatives for cultural, natural interest protection, and restoring disintegrated areas. • Special areas, "marine colonies," "river parks," undergo targeted interventions. A recovery/enhancement program and environmental preservation/restoration are planned for "nature reserves."
[IB-BES-R] Information baseline – Biodiversity & ES - Restructuring	• The Plan introduces an index of Infrastructural Fragmentation of Land and Urban Settlements Fragmentation Index. These tools analyze eco-mosaic disruptions and spotlight the importance of comprehending settlement-induced fragmentation in diverse contexts. • Furthermore, the Plan employs multiple environmental quality indices. These include an urban ecosystem quality indicator, particulate matter concentration assessment, reversibility coefficient for land use transformations, and landscape attractiveness evaluation across provinces. • The Regional Landscape Plan features the "Biological Resources Map" and "Environmental Quality Map." The

	former identifies top-value regional biological resources, while the latter pinpoints pollution areas and types.
[AIR-BES-R] Actions /Instruments /Regulations – Biodiversity & ES - Restructuring	• Within the Plan, the LIFE Econet project significantly contributes to local ecological network development. To nurture spontaneous vegetation and ecological corridors, a 10-meter buffer is established, forbidding new construction in floodable and reservoir areas. • Specific protection and enhancement projects, alongside regional integration and financial support, delineate intervention zones. • The Plan's tools prioritize conserving soil, subsoil, water, flora, and fauna.
[V-BES-P] Vision – Biodiversity & ES – Path-shifting	• The Plan prioritizes economic recovery via green economy, commons protection, reduced resource consumption, and sustainable social-environmental development. • It addresses soil's CO_2 absorption, combatting land consumption, and advancing ecosystem-landscape capital for integrity, network continuity, land security, resource regeneration, landscape richness, and biodiversity. • A dynamic ecosystem protection model is highlighted, securing adaptive functions. • The ecosystem network guides city and territory design, preserving valuable habitats and minimizing fragmentation. • The Plan envisions unified ecological-landscape problem-solving, redefining settlement-ecological ties. • The Regional Landscape Plan champions environment as defence, recovery, and development catalyst. • A unified environment-territory concept drives an environment culture, treating territory as a 'complex environmental system' for restoration, rehabilitation, enhancement. Region qualities shape transformation, underpinning planning.
[S-BES-P] Strategy – Biodiversity & ES – Path-shifting	• The Plan advocates integrating ecological networks into land-use processes, aiming to counter hydrogeological disruptions and climate change adaptation. • The new law treats land as a shared, finite resource offering ecosystem services. • This spurs proactive planning for structural enhancement, new ecosystems, and quality landscapes. • Transformation of undeveloped land for urban use is irreversible, urging vulnerability-focused preservation. Planning prioritizes low land consumption and reduced function conflicts.

	• The "ecological networks" strategy gauges conservation efficacy. • Adapting transformation amid territorial degradation becomes strategic. • The Regional Landscape Plan shifts from defence to active preservation, nurturing a novel land-environment culture. • It highlights bolstered environmental projects and policies for enhancement and restoration.
[IB-BES-P] Information Baseline – Biodiversity & ES – Path-shifting	• The Plan underscores safeguarding land resources, tackling gradual natural resource "consumption" risking quality of life and ecosystem deterioration. • Spatial fragmentation forms "eco-mosaics" with human-made spaces, causing harm. • It highlights ecological value against climate change, hazards, urban quality. • Goals target emission cut, air/water cleanup, water cycle management, noise/electromagnetic reduction, soil permeability, addressing environmental issues. • Strategic vision tackles ecological concerns, spatial fragmentation via resource defence, proactive anti-impact interventions, and spatial sustainability promotion.
[V-BES-I] Vision – Biodiversity & ES – Innovation	• The Plan strategy integrates ecological networks via habitat restoration, biodiversity, and urban-periurban connectivity through green areas and afforestation. • Landscape design merges ecological corridors with forested strips, enhancing public spaces. • Environmental network strategy's evolution-based governance leverages ecological characterization. Urban-ecological networks manage territorial reversibility. • Local planning reconstructs habitats, fosters connected ecological networks. Interference quantification shapes spatial scenarios, mitigates land fragmentation. • Coastal challenges prompt diverse protection, habitat growth, sustainable fish resource management in the Plan.
[S-BES-I] Strategy – Biodiversity & ES – Innovation	• The Plan champions ecological and environmental assets, spanning spaces, actions, and strategies countering climate change, enhancing urban quality, and curbing hazards. • Goals encompass emission cuts, water cycle management, pollution control, soil preservation, heat mitigation, waste separation, and hazard reduction. • The Plan introduces an environmental reversibility index gauging reversible land percentage through coefficients assigned to various land uses.

[IB-BES-I] Information Baseline – Biodiversity & ES – Innovation	• The Plan highlights substantial contributions from Bologna and Modena provinces to establish the regional ecological network, aligning with pertinent EU directives.
[AIR-BES-I] Actions /Instruments /Regulations – Biodiversity & ES - Innovation	• The Plan strategy integrates ecological networks via habitat restoration, biodiversity, and urban-periurban connectivity through green areas and afforestation. • Landscape design merges ecological corridors with forested strips, enhancing public spaces. • Environmental network strategy's evolution-based governance leverages ecological characterization. Urban-ecological networks manage territorial reversibility. • Local planning reconstructs habitats, fosters connected ecological networks. Interference quantification shapes spatial scenarios, mitigates land fragmentation. • Coastal challenges prompt diverse protection, habitat growth, sustainable fish resource management in the Plan.
[V-BES-M] Vision – Biodiversity & ES – Multiscale	• The Plan aims for territorial quality (ecosystem network continuity), efficiency (natural resource regeneration), and identity (biodiversity richness). • It underscores the need for coherent ecosystem networks to counter habitat fragmentation, enhance urban environments, and connect valuable habitats. • Ecosystem networks guide urban and territorial design, safeguarding vulnerable habitats, bridging environmental gaps, and structuring agriculture and suburban landscapes. • It regulates urban forms and dispersion, promoting integrated designs for ecosystem networks and landscapes.
[S-BES-M] Strategy – Biodiversity & ES – Multiscale	• The Plan initiates a proactive design process, enhancing land structure and fostering new ecosystems. • Redesigning landscapes and ecosystems involve enhancing waterways, connecting coasts, valleys, and mountains for community well-being. • Considering settlement reorganization, the Plan sees the ecosystem network as key to urban-rural interface, guiding unified urban-rural planning with green space focus. • North-south and east-west connections prevent unplanned urban sprawl. • Hydrographic axes become identity markers, shaping urban spaces. • Strategies include river parks, accessible public spaces, forests, and glades for recreation, excluding soil sealing.

	• The Plan supports public enjoyment while prioritizing nature protection, research, climate mitigation, and tourism in the forest system.
[IB-BES-M] Information Baseline – Biodiversity & ES – Multiscale	• The Plan introduces a connectivity index, gauging links between landscape elements (patches, corridors, ecotones) to assess functional exchanges. • Understanding current and potential fragmentation from settlements guides strategies for cohesive ecological mosaics and sustainable creation of natural spaces.
[AIR-BES-M] Actions /Instruments /Regulations – Biodiversity & ES - Multiscale	• The regional ecological network's construction was aided by Bologna and Modena provinces, following EU directives for lowland territories. • The LIFE Econet project played a pivotal role in local ecological network development. • Flood-prone zones and a 10-meter buffer from water bodies prohibit construction, fostering spontaneous vegetation and ecological corridor formation.

8.1.2. Territorial Metropolitan Plan of Bologna

Tables B5, B6, B7, and B8 present the transformative elements that emerged from the analysis of the Territorial Metropolitan Plan of Bologna, related to the governance of spatial planning systems, the mitigation hierarchy, the spatial planning provision for different sectors, and biodiversity and ES, respectively.

Table B 5: Transformative elements related to the governance of spatial planning systems for the Territorial Metropolitan Plan of Bologna.

Framework' Codes	Summarized Results
[V-G-R] Vision – Governance - Restructuring	• The plan is a flexible, comprehensive tool prioritizing environmental sustainability. It integrates inputs from metropolitan city administrations, experts, and stakeholders to synthesize diverse territorial needs, fostering a metropolitan mindset.
[S-G-R] Strategy – Governance - Restructuring	• The plan strategy dynamically enhances urban redevelopment through streamlined processes and cross-sectoral alignment. • It prioritizes accessible green spaces, public engagement, and enforces urban planning rules for biodiversity and environmental quality, fostering a holistic approach.

[IB-G-R] Information baseline – Governance - Restructuring	• The plan emphasizes the initial consultation by the Urban Innovation Foundation, involving stakeholders, including environmental experts, to grasp expectations and challenges. This stage gathered insights, identified goals, critical concerns, and plan strengths. It compiled a community database to aid its development and outreach.
[AIR-G-R] Actions /Instruments /Regulations – Governance - Restructuring	• The plan facilitates administrative simplification through standardized language and rules while enhancing citizen engagement via co-design processes.
[V-G-P] Vision – Governance – Path-shifting	• The plan prioritizes environmental sustainability as a central planning goal and strives to bolster peripheral areas through political discussions and consultations. • Mayors' engagement has established a control hub led by the metropolitan city, fostering collaboration among municipalities to achieve planning objectives. • Mayors view the plan as a chance for cohesive territory building, transcending individualism for a holistic vision. It seeks to enhance territorial cohesion by jointly managing land consumption and economic resources. • The plan targets mobility, energy efficiency, and waste management improvements.
[S-G-P] Strategy – Governance – Path-shifting	• The plan strategy aims to transition from a downtown-centric model that has depleted the Apennines over time. • It promotes tourism, bicycle mobility, and regeneration, fostering sectoral and governmental integration for enhanced effectiveness.
[IB-G-P] Information Baseline – Governance – Path-shifting	• The plan employed two exploratory paths for land survey: functional systems and place-based methods. • It underscores knowledge's role and stakeholder involvement through meetings and workshops. • The Sustainable Mobility Urban Plan (PUMS) process engaged institutions, stakeholders, and citizens in defining goals. • The Airport Structure Plan aims to optimize existing infrastructure and limit land use. • The Urban Innovation Foundation's efforts to identify strengths and challenges are also highlighted.
[AIR-G-P] Actions /Instruments /Regulations – Governance - Path-shifting	• The plan employs an economic fund and equalization process. • It aligns municipal jurisdiction regulations with ecosystem-based planning guidelines and legally defines plan ecosystems.

[V-G-I] Vision – Governance – Innovation	• The plan takes a holistic future-oriented perspective, avoiding narrow focus, and considers broad strategic choices across a wider area for meaningful impact.
[S-G-I] Strategy – Governance – Innovation	• The plan establishes a shared terminology for rural ecosystems and services, sets specific guidelines for sustainable regeneration, promotes ecological network restoration, especially green and blue infrastructure, and supports urban reforestation and local trade initiatives.
[IB-G-I] Information Baseline – Governance – Innovation	• The plan is a strategic urban tool that integrates sustainability, mobility, and energy. • It involves consultative stages using interviews and questionnaires to gather concerns and strengths. • The Urban Innovation Foundation coordinates the process, establishing a "database of communities" for stakeholder involvement.
[AIR-G-I] Actions /Instruments /Regulations – Governance - Innovation	• The plan employs "fondo metropolitano" and "programmi di rigenerazione" for its goals. • It sets rules for ecosystems and offers guidelines for planning and regeneration. • The structural component adheres to plan rules, nurturing ecosystems through participatory workshops for land projects.
[S-G-M] Strategy – Governance – Multiscale	• The plan boosts metropolitan regeneration and ecosystem services through corridor connections. • It encourages collaboration among private, associations, and public sectors, interpreting competency principles.
[IB-G-M] Information Baseline – Governance – Multiscale	• The plan tasked the "Fondazione Innovazione Urbana" with managing the consultation process for drafting the urban planning document. • The foundation interviewed mayors of union cities' municipalities. • During plan preparation, the administration initiated preliminary consultation with ARPAE and the environmental assessment authority.
[AIR-G-M] Actions /Instruments /Regulations – Governance - Multiscale	• The plan promotes environmental education through guided tours to enhance awareness of local biodiversity and SDGs. • It incorporates regeneration projects and establishes a fund to empower municipalities for collective welfare.

Table B 6: Transformative elements related to the mitigation hierarchy for the Territorial Metropolitan Plan of Bologna.

Framework' Codes	Summarized Results
[V-MH-R] Vision – Mitigation Hierarchy- Restructuring	• The plan emphasizes combating land consumption growth, endorsing land reuse per new urban planning law. • Addressing land security, it enhances climate adaptation, mitigation, and preserves natural ecosystem functions.
[S-MH-R] Strategy – Mitigation Hierarchy- Restructuring	• The plan's primary objective is informed territory management to mitigate risks and enhance land use planning. • It aims to balance natural dynamics, minimize climate change effects, and optimize resource management. • The plan advances urban renewal, reviving degraded areas and preserving heritage to minimize ecosystem impacts and land use. • Planning must align with urban rejuvenation and zero-net land consumption, prioritizing sustainable transit. • High-pressure settlements facing climate impacts merit resilience-boosting strategies across planning sectors for environmental sustainability.
[IB-MH-R] Information baseline – Mitigation Hierarchy- Restructuring	• The plan, in conjunction with the Urban Sustainable Mobility Plan, outlines measures to offset negative impacts and evaluates local vulnerability and resilience for balanced implementation.
[AIR-MH-R] Actions /Instruments /Regulations – Mitigation Hierarchy- Restructuring	• The plan prohibits new urbanization in protected and conservation zones as per regional and provincial regulations. Its urban-ecological quality strategy addresses the loss of soil-based ecosystem services.
[V-MH-P] Vision – Mitigation Hierarchy– Path-shifting	• The plan prioritizes engaging all municipalities and fostering a collaborative approach for sustainable mobility and environmental preservation. • It underscores reducing traffic-related air and noise pollution, targeting a 40% cut in traffic emissions by 2030, aligning with the Paris Climate Accords. • The plan commits to curbing land consumption, promoting existing asset reuse, and revitalizing areas both public and private for improved urban quality. • It focuses on safeguarding soil and ecosystems for wholesome food, clean air, and water, while jointly managing resources. • The plan enhances green spaces to mitigate urban heat islands in deficient areas.

[S-MH-P] Strategy – Mitigation Hierarchy– Path-shifting	• The plan embraces novel responsibilities, encompassing ecosystem services, climate change response, and cross-sectoral coordination for synergistic impact. • It advocates urban rejuvenation, sustainable land use, and progressive consumption management. • Goals encompass curbing land use, enhancing urban quality, pedestrian-cycling infrastructure, and green amenities. • Land consumption reduction employs regeneration and redevelopment measures. • Nature-based solutions are encouraged for ecosystem benefits climate resilience and pollution abatement.
[IB-MH-P] Information Baseline – Mitigation Hierarchy– Path-shifting	• The plan conducts a land consumption analysis in the metropolitan area, assessing urbanization between 2010-2020. • To combat this, diverse scenarios were evaluated, overlaying georeferenced data with ISPRA's report. • These analyses inform strategies aligning with Regional Law 24/2017 to curb and ultimately eliminate land consumption by 2050.
[AIR-MH-P] Actions /Instruments /Regulations – Mitigation Hierarchy- Path-shifting	• The plan advocates for transforming abandoned urban spaces, repurposing roads and parking areas to boost regulating ecosystem services like fostering biodiversity, refining air and water quality, managing stormwater, infiltrating, and mitigating heat island effects.
[V-MH-I] Vision – Mitigation Hierarchy– Innovation	• The plan incorporates measures that interlink environmental and demographic aspects to curtail land usage, influencing mobility and allowable construction interventions.
[S-MH-I] Strategy – Mitigation Hierarchy– Innovation	• The plan underscores the necessity of prioritizing land use planning centered on revitalizing and renewing brownfields and structures to mitigate effects on ecosystems. • It promotes the integration of nature-based solutions like permeable and vegetated zones, tree-lined corridors with cycling lanes, verdant areas for emission reduction, enhanced microclimate regulation to counter urban heat island effects, and effective urban drainage management.
[IB-MH-I] Information Baseline – Mitigation Hierarchy– Innovation	• To combat soil consumption, the plan encompasses: soil typology overview, soil ecosystem services evaluation with targeted indicators, cross-referencing geo-referenced data from ISPRA (Superior Institute for Environmental Protection and Research) report on soil consumption with existing plans, and retrospective analysis of land use

	dynamics from 2000 to 2010 to align with soil containment objectives.
[AIR-MH-I] Actions /Instruments /Regulations – Mitigation Hierarchy- Innovation	• The plan enacts laws for curbing land consumption, urban rejuvenation, sets sustainability criteria for new developments, and creates the "Fondo Perequativo Metropolitano" and "Programmi Metropolitani di Rigenerazione." The Urban Sustainable Mobility Plan incorporates "green" adaptation measures.
[V-MH-M] Vision – Mitigation Hierarchy– Multiscale	• The plan strives for environmental sustainability encompassing climate, health, and air quality protection. It also anticipates the integration of climate change mitigation and adaptation within planning strategies.
[S-MH-M] Strategy – Mitigation Hierarchy– Multiscale	• The plan underscores the imperative of incorporating climate change mitigation and adaptation strategies across comprehensive planning, fostering unity among various sectoral plans for integrated territorial actions. • It emphasizes curbing land consumption, rejuvenating urban areas, and establishing new urban spaces to address the climate crisis, amplify ecosystem services, and encourage sustainable mobility. • The plan seeks to establish a holistic network of interventions along Via Emilia and in lowland zones near Bologna, bolstering resilience, expanding the bicycle network, and developing green and blue infrastructure.
[IB-MH-M] Information Baseline – Mitigation Hierarchy– Multiscale	• The plan conducted a land-use analysis to enhance comprehension of evolutionary dynamics.

Table B 7: Transformative elements related to spatial planning provision for different sectors for the Territorial Metropolitan Plan of Bologna.

Framework' Codes	Summarized Results
[V-Se-R] Vision – Spatial provision of different sectors - Restructuring	• The plan enhances the efficiency and advancement of sustainable mobility systems (bicycle-pedestrian mobility and public transport), fosters the gradual decarbonization of the vehicle fleet, and facilitates the shift to net-zero-emission engines. • Furthermore, it promotes energy upgrades by providing funds for apartment buildings.
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• The plan emphasizes the crucial role of municipalities in adopting a proactive stance to implement sustainable mobility and accessibility policies, including the

	establishment of bicycle lanes, pedestrian connections, and bus stop enhancements. • The plan provides incentives for enhancing energy efficiency in public buildings through renewable energy adoption and supports the adoption of electric cars to minimize environmental impact.
[IB-Se-R] Information baseline – Spatial provision of different sectors - Restructuring	• The Sustainable Mobility Plan aligns with sectoral and urban plans at both higher and municipal scales. • It outlines 21 distinct objectives that underwent discussion and evaluation with stakeholders in a participatory manner. This process identified the overarching priority objective of ensuring excellent accessibility, followed by climate protection and air quality preservation. • The plan also targets the seismic and energy enhancement of public facilities.
[V-Se-P] Vision – Spatial provision of different sectors – Path-shifting	• The plan underscores the urgency of embracing a novel mobility paradigm that centres on enhancing public transportation, integrating safer pedestrian and bicycle networks, and optimizing sustainable mobility systems for the decarbonization of the vehicle fleet. • It is dedicated to crafting a transportation infrastructure that contributes to sustainable development by significantly curbing pollutant emissions and prioritizing environmental, social, and economic ramifications. • The plan also emphasizes the vital role of all municipalities in planning and executing sustainable mobility policies. • A focal point is to transition a substantial portion of current car travel to sustainable transportation modes to realize the plan's ambitions. • The plan underscores the significance of sustainable agricultural and food production for national and global equilibrium and advocates for energy upgrades in both public and private buildings to enhance energy efficiency and minimize environmental impact.
[S-Se-P] Strategy – Spatial provision of different sectors – Path-shifting	• Within the plan, policies are centred on bolstering the provision of sustainable mobility services, encompassing public transportation and pedestrian as well as bicycle pathways. • The key objective is to amplify accessibility and mobility while prioritizing individual well-being, enhancing urban microclimates, and mitigating pollution. • A core aspiration is to curtail the reliance on private vehicles in favour of more sustainable travel alternatives, coupled with an endeavour to expand restricted traffic

	zones and limited parking zones within historical urban centres. • Moreover, the plan emphasizes the revitalization of rural areas, with a strong focus on encouraging organic farming to foster sustainable agricultural practices. • Additionally, the plan facilitates the enhancement of energy efficiency in public buildings, including schools and various facilities, through energy upgrades, thereby reducing environmental impact.
[AIR-Se-P] Actions /Instruments /Regulations – Spatial provision of different sectors - Path-shifting	• The plan advocates for a comprehensive evaluation of environmental limitations to engage in sustainable mobility initiatives, including the restoration of bicycles to establish seamless connections between bus stops and commercial establishments, as well as implementing measures for traffic calming. • Simultaneously, the plan underscores the imperative of energy efficiency across all public spaces and facilities. • It promotes the creation of horticultural gardens and the augmentation of local food production efforts.
[V-Se-I] Vision – Spatial provision of different sectors – Innovation	• The central objective of the Urban Plan for Sustainable Mobility is to bequeath future generations a sustainable transportation system, achieved through the enhancement of public transportation and bicycle/pedestrian pathways. • The plan serves as a mechanism to enhance the sustainable growth of the agricultural sector, particularly in the establishment of a "BIO agricultural district."
[S-Se-I] Strategy – Spatial provision of different sectors – Innovation	• The plan focuses on urban regeneration through green and blue infrastructure, promoting sustainable mobility, and preserving peri-urban agriculture. • It emphasizes initiatives such as bicycle lanes, nature-based stormwater management, and Mobility Centers for intermodal transportation. • The plan also integrates biodiversity conservation, historical river revitalization, and reconnection between urban and agricultural spaces. It envisions a sustainable urban environment with enhanced accessibility, reduced environmental impact, and alternative energy use.
[IB-Se-I] Information Baseline – Spatial provision of different sectors – Innovation	• The plan establishes sustainable mobility objectives, assessed through stakeholder collaboration, and implements seismic and energy upgrades for schools and gyms. • It acknowledges environmental networks as essential infrastructures linking city zones and integrating Nature-Based Solutions (NBS) for climate adaptation.

[AIR-Se-I] Actions /Instruments /Regulations – Spatial provision of different sectors - Innovation	• The plan strategically upgrades street amenities and prioritizes cycling through repurposing former railways and establishing new bike routes. • Urban renewal involves expanding pedestrian and bike paths, integrating green infrastructure for microclimate and stormwater benefits. • The Sustainable Mobility Plan (PTM) encourages new bike paths and connections to public transit. • It also entails constructing an energy-efficient elementary school and initiatives to promote the organic district and local product consumption.
[S-Se-M] Strategy – Spatial provision of different sectors – Multiscale	• In late 2019, the Metropolitan City approved the Sustainable Urban Mobility Plan (PUMS), prioritizing sustainable mobility through improved Metropolitan Public Transport and an expanded network of bicycle paths for daily and leisure travel. • The plan's main goal is to create a comprehensive spatial strategy that integrates economic, environmental, and social factors, aligning the PUMS with other city policies. • Regional focus on compact urban centers and social unity via the Metropolitan Railway Service. • Metropolis-wide, the plan enhances Metropolitan Public Transportation to curb urban sprawl. • Locally, public spaces become shared domains, accommodating pedestrians and cyclists for urban quality and safety. • The PUMS advocates cycling as eco-friendly transport, fostering a cohesive bicycle network within cities and suburban areas.
[IB-Se-M] Information Baseline – Spatial provision of different sectors – Multiscale	• The plan identifies environmental, metropolitan public transport, and cycling networks as cross-cutting "infrastructures" that reconnect spatial zones, creating links and shaping interactions between urban and other spheres in the metropolitan city, including social services, mobility, conservation, and nature-based solutions for climate adaptation.
[S-Se-PO] Strategy – Spatial provision of different sectors – Phasing out	• The plan has a dual focus on mobility: firstly, to decrease the reliance on private motorized transport; and secondly, to restrain the expansion of road infrastructure.
[AIR-Se-PO] Actions /Instruments /Regulations – Spatial provision of different sectors – Phasing out	• The plan incorporates measures to decrease public parking in highly accessible zones for sustainable mobility, with the requirement to allocate generated funds to support non-motorized transportation.

Table B 8: Transformative elements related to biodiversity and ES for the Territorial Metropolitan Plan of Bologna.

Framework' Codes	Summarized Results
[V-BES-R] Vision – Biodiversity & ES - Restructuring	The plan's objectives encompass soil protection, securing resources for well-being and ecosystem preservation. It strives to enhance climate adaptation, mitigate change, and safeguard ecosystem roles via resilient land development, especially against heat islands, with a focus on strategic tree planting.
[S-BES-R] Strategy – Biodiversity & ES - Restructuring	• The plan establishes strategic land management choices for holistic urban growth, prioritizing social, economic, and environmental aspects. • It emphasizes biodiversity and ecosystem service protection. • The plan advocates urban green expansion for microclimate control, green and blue infrastructure enhancement, urban regeneration, sustainable mobility promotion, reduced land consumption, hillside environmental system improvement, brownfield redevelopment, and ecological network enhancement.
[IB-BES-R] Information baseline – Biodiversity & ES - Restructuring	• The plan categorizes land structuring according to diverse ecosystem contexts to preserve environmental assets, recognizing natural ecosystems as sources of regulation and provisioning services. • Monitoring targets include impaired groundwater bodies, forested and semi-natural areas, specific forest dominance, newly afforested sites, community gardens, de-paved and renaturalized zones.
[AIR-BES-R] Actions /Instruments /Regulations – Biodiversity & ES - Restructuring	• The plan encompasses urban rejuvenation initiatives, including the establishment of ecological equilibrium zones, wooded corridors, and the reclamation of brownfield sites for naturalizing and restoring ecosystem functions, promoting biodiversity and enhancing air and water quality. • It advocates for nature-based strategies in water management like permeable surfaces, vegetated channels, and bioretention zones. • Furthermore, the plan suggests resilient planting interventions and ecological network reinforcement, with assessments of surface water quality. • It closely monitors land consumption and its proportional impact on available land and classifies the total land into vegetation categories.
[V-BES-P] Vision – Biodiversity & ES – Path-shifting	• The plan regards ecosystems as integral to human-environment interactions, crucial for sustainable

	development and essential for providing fundamental services derived from natural processes. • It acknowledges ecological, recreational, and tourism networks as interconnected and integrated components.
[S-BES-P] Strategy – Biodiversity & ES – Path-shifting	• The plan encompasses regenerating parking areas, expanding urban green spaces, enhancing forests, and utilizing permeable pavements for biodiversity, ecosystem services, and climate mitigation. • It strives to safeguard water and aquatic ecosystems for optimal environmental status and biodiversity preservation. • The plan incorporates ecosystem services, urban regeneration, and land management to ensure quality resources for human well-being, including healthy food and clean air.
[IB-BES-P] Information Baseline – Biodiversity & ES – Path-shifting	• The plan underscores how rural environmental processes shape land structure and guide "sustainable development" planning. • It emphasizes the pivotal role of natural ecosystem knowledge in land use planning and ecosystem service provision. • The plan features cartographic analyses of these ecosystems in the metropolitan area, depicting their influence and ecological network connections between hill and plain environments, alongside bicycle networks. • Future climate projections (2021-2050), encompassing extreme temperature, precipitation events, and heatwave durations, are depicted. • The plan utilizes SOS4LIFE project data on soil-provided ecosystem services and functions.
[AIR-BES-P] Actions /Instruments /Regulations – Biodiversity & ES - Path-shifting	• The plan mandates enhancing pedestrian pathways with green elements in urban redevelopment and emphasizes de-paving brownfield urban zones to amplify ecosystem services. • It encompasses regulatory measures for forest, shrub, gully, and stagnant water ecosystems. • These systems' ecosystem services are identified, new urbanization is restricted, and building interventions outside urbanized regions are curtailed. • The plan mandates water management systems for all building projects to enhance water quality and biodiversity via nature-based solutions. • For mitigating heat islands, the plan necessitates nature-based actions like urban green development, space

	revitalization, green and blue infrastructure enhancement, and higher albedo material use. • Multi-objective development, including social considerations, is emphasized.
[V-BES-I] Vision – Biodiversity & ES – Innovation	• The plan adopts ecosystems as the foundational structure for conservation initiatives and open space enhancement. • It recognizes the area's agricultural potential as a primary asset and strives to boost the transition to organic farming to mitigate hydrogeological disturbances.
[S-BES-I] Strategy – Biodiversity & ES – Innovation	• The plan strives to enhance environmental quality, sustainability, and climate change mitigation in urban areas. • It emphasizes soil, water, and ecosystem preservation for food security and urban regeneration, including green and blue infrastructure development. • The plan advocates for more trees, shrubs, specialized paving, and brownfield renaturalization to improve urban microclimate. It also bolsters ecological and tourism networks through bicycle and pedestrian pathways.
[IB-BES-I] Information Baseline – Biodiversity & ES – Innovation	• The plan presents three approaches. The first employs quantitative variables to allocate funds directly to municipalities for environmental protection and ecosystem conservation. The second focuses on qualitative variables to enhance ecosystem services and intervention quality. The third combines both to support vulnerable municipalities providing significant ecosystem services. • The plan employs maps to identify ecosystem service-rich mountainous areas and describes the ecological network map, it forecasts extreme events (2021-2050) and heat wave trends. • Analyses of soil and ecosystem services, from the SOS4LIFE project data, assess urban planning's impact on soil consumption and environmental quality.
[AIR-BES-I] Actions /Instruments /Regulations – Biodiversity & ES - Innovation	• The metropolitan city prioritizes ecosystem preservation and functionality, outlining guidelines for "Ecosystem-Oriented Planning." • The plan advances metropolitan afforestation using high-carbon-absorbing species, enhances pedestrian and bicycle pathways with urban greenery for microclimate and stormwater management, and expands green and blue infrastructure to promote tourism. • Ecosystem maintenance leverages a metropolitan equalization fund. Development restrictions exist outside protected zones, complemented by specific ecosystem management provisions.

	• Nature-based water management solutions employ permeable pavements and vegetated channels, while countering heat islands integrates green elements in buildings, high albedo materials, and increased shading via tree rows.
[V-BES-M] Vision – Biodiversity & ES – Multiscale	• The plan aims to safeguard soil and its resources for living beings' well-being. • It acknowledges ecological networks as an interconnected system, uniting environmental preservation with cultural ecosystem service enhancement, emphasizing agricultural and natural ecosystems.
[S-BES-M] Strategy – Biodiversity & ES – Multiscale	• The plan prioritizes expanding green spaces, urban forests, tree-lined pathways, green parking areas, and soil preservation. • It enhances ecological networks for climate adaptation and biodiversity preservation. • Enhancing urban greenery is a cohesive strategy for fostering biodiversity and ecosystem services. T • he plan facilitates the establishment of green and blue infrastructure to link hills and valleys, maintaining ecological network continuity. • It strives to combat urban sprawl, protect ecosystems, and ensure nourishing food, clean air, ample water, and valuable soil resources.
[IB-BES-M] Information Baseline – Biodiversity & ES – Multiscale	• The plan recognizes ecosystems as integral and operational components delivering vital terrestrial and human health benefits. • Forest ecosystems contribute climate control and timber resources. • Aquatic ecosystems offer life-sustaining and climate regulatory services. • Agricultural systems provide fundamental functions such as sustenance and food production. • Ecosystem services, encompassing carbon sequestration, aquifer replenishment, and biodiversity safeguarding, enhance the region's environment and landscape quality. • The Ecological Networks Map integrates protective strips, connectivity corridors, gateways, and cycling routes. • The plan incorporates climate forecasts for 2021-2050 in lowlands, along with an analysis of extreme events (temperature and precipitation) and future patterns of extended summer heatwaves.

[AIR-BES-M] Actions /Instruments /Regulations – Biodiversity & ES - Multiscale	• The plan encompasses regulations for forest, shrub, and gully ecosystems, identifying their services, excluding new urbanization, and constraining construction interventions. • It incorporates CO_2-absorbing tree planting to reinforce ecological, cycling, and pedestrian networks, alongside agricultural zones. • The plan designates natural and agricultural ecosystems, outlining their management. • It mandates water management systems for all construction projects to enhance water quality and biodiversity via nature-based approaches. • To mitigate heat island effects, the plan mandates nature-based measures for new buildings, including urban greenery, space redevelopments, improved green and blue infrastructure, and high-albedo materials. This holistic approach encompasses social considerations in multi-objective development.

8.1.3. Urban Plan of Bologna Municipality

The following tables show the summarized results of the analysis of the Urban Plan of Bologna Municipality. Specifically, Table B9 reports the transformative elements related to the governance of spatial planning systems, Table B10 does this for the mitigation hierarchy, Table B11 for the spatial planning provisions for different sectors, and Table B12 for biodiversity and ES.

Table B 9: Transformative elements related to the governance of spatial planning systems for the Urban Plan of Bologna Municipality.

Framework' Codes	Summarized Results
[S-G-R] Strategy – Governance - Restructuring	• The Plan requires prior resident participation for urban densification or replacement proposals through initiatives like the 'Neighbourhood Workshops'. • It focuses on city regeneration to reshape city-environment, space-society, and network-economy dynamics. It integrates the Municipal Green Regulation aligned with the Green Plan.
[IB-G-R] Information baseline – Governance - Restructuring	• Recent planning instruments and participatory processes address environmental issues, including climate change, shaping the city's future. • The plan incorporates the Municipal Green Plan and integrates Metropolitan Agenda for Sustainable

	Development themes for sustainability assessment in the 'Valsat' (strategic environmental assessment).
[AIR-G-R] Actions /Instruments /Regulations – Governance - Restructuring	• The Plan has defined the urban and ecological-environmental quality goals through negotiation between municipality and private parties.
[V-G-P] Vision – Governance – Path-shifting	• The Plan believes that sustainable conditions are necessary for implementing or regenerating urban interventions and considers people's contribution as crucial to increase the quality of transformations. • The plan integrates the "Greening Plan" to strengthen strategies related to urban green spaces within the urban planning discipline.
[S-G-P] Strategy – Governance – Path-shifting	• The Plan aligns with 2030 and Metropolitan Agenda targets, advocating reduced consumption and emissions. • Local strategies involve listening paths and 'Neighbourhood Workshops'. • It reorganizes city-environment relationships, emphasizes ecosystem services, and revitalizes public spaces through diverse actors. • Urban proposals require prior resident participation and provide private green space openings.
[IB-G-P] Information Baseline – Governance – Path-shifting	• The Plan innovatively drew from old municipal plans, the Adaptation Plan, and sector expertise. Sustainability goals align with the Metropolitan Agenda and 2030 Agenda. • It used quantitative data, participatory processes like 'Neighbourhood Workshops' and various engagement methods throughout planning. Indicators were defined to monitor the plan's environmental impact.
[AIR-G-P] Actions /Instruments /Regulations – Governance - Path-shifting	• The Plan empowers citizens for individual and collective initiatives, fostering co-design and active city engagement. • It prioritizes urban commons' care and regeneration, following the subsidiarity principle. Participatory processes involve the implementing party, the plan office, and the concerned neighbourhood during project development.
[V-G-I] Vision – Governance – Innovation	• The Plan envisions a more sustainable, inclusive city and emphasizes measuring the impact of urban regeneration processes. • It promotes participatory urban transformation for higher quality and recognizes the ecological value of watersheds, soil, and multifunctional green spaces for a more resilient territory.

[S-G-I] Strategy – Governance – Innovation	• The Plan aligns with regional, national, and international guidelines, notably the 2030 Agenda and the Metropolitan Agenda on climate change and nature-based solutions. • It engaged citizens and stakeholders for local strategies and a long-term vision, including bottom-up experiments like the 'Bicycle Plan'. • It aims to open private green spaces through agreements with private parties and establishes a monitoring plan to assess governance and environmental outcomes.
[IB-G-I] Information Baseline – Governance – Innovation	• The Plan follows supra-municipal climate and nature-based guidelines, using insights from European projects for plant species selection. • It employs innovative co-design, involving citizens through workshops, walks, and online questionnaires to describe their everyday places. • Plan objectives, aligned with sustainability, emerged from discussions among sector experts. • The main goal is a circular model for urban quality assessment based on data and constant citizen engagement, facilitated digitally through focus groups and meetings.
[AIR-G-I] Actions /Instruments /Regulations – Governance - Innovation	• The Plan enhances engagement via 'Neighbourhood Workshops' and public agreements for river management. This foster resilience, align public and private interests, and promote water resource protection.
[S-G-M] Strategy – Governance – Multiscale	• The Plan' strategy promotes urban regeneration processes to reclaim soils and increase public spaces to provide ecosystem services. • The Plan also support the engagement of multiple stakeholders, requires participation for urban interventions, and enables agreements for private green space accessibility to the public.
[IB-G-M] Information Baseline – Governance – Multiscale	• The Plan was collaboratively developed, involving associations, institutions, communities, and citizens across various spatial scales. • Sustainability goals are aligned with the 2030 Agenda and local community environmental policies. • Strategies were developed through consultations with the metropolitan city, environmental authorities, and the region. • Various indicators for plan monitoring were identified, and the plan's capacity to address ecological issues was assessed.

[AIR-G-M] Actions /Instruments /Regulations – Governance - Multiscale	• The plan facilitates the dialogue between the Plan Office and the coordinator of the 'Neighbourhood Workshops' to assess the suitability of the workshop participation program.

Table B 10: Transformative elements related to the mitigation hierarchy for the Urban Plan of Bologna Municipality.

Framework' Codes	Summarized Results
[V-MH-R] Vision – Mitigation Hierarchy- Restructuring	• The Plan assumes the goal of reducing global warming gas emissions by at least 60% of those measured in 2005 and encourages the regeneration of anthropized soils by fighting land consumption.
[S-MH-R] Strategy – Mitigation Hierarchy- Restructuring	• The Plan' strategy mandates limiting impermeable surface expansion through urban regeneration and land reuse to reduce soil consumption. • Parks and green spaces mitigate intervention impacts. • It promotes soil de-sealing for hydraulic and ecological benefits, incentivizes wetland restoration, and safeguards biodiversity. • New constructions must meet energy efficiency standards and use renewables.
[IB-MH-R] Information baseline – Mitigation Hierarchy- Restructuring	• The Plan monitors emissions and land use, aiming to boost urban greenery, soil rehabilitation, and temperature control. • It maps out barriers in water runoff, identifies areas for reuse and regeneration, and promotes existing building stock rehabilitation and efficiency.
[AIR-MH-R] Actions /Instruments /Regulations – Mitigation Hierarchy- Restructuring	• The Plan identifies flood-prone areas and proposes mitigation and offset measures, including green systems, stormwater management, and water storage.
[S-MH-P] Strategy – Mitigation Hierarchy– Path-shifting	• The Plan' strategy promotes soil reuse to limit land consumption and offsets impacts with green zones like parks and tree lines. • New construction must reduce pollutant emissions and adhere to environmental compensation measures. • The Plan prohibits hillside stream burial and requires urban interventions to improve soil permeability. • It also mandates the preservation of intact soils and considers the 'heat island' effect and wastewater management.

[IB-MH-P] Information Baseline – Mitigation Hierarchy– Path-shifting	• The municipality joined European projects to combat climate change, influencing its adaptation plan. • Results informed techniques like identifying effective plant species. • The Plan monitors energy transition, CO_2 reduction in construction, and electric charging stations.
[AIR-MH-P] Actions /Instruments /Regulations – Mitigation Hierarchy- Path-shifting	• The Plan safeguards flood-prone areas to reduce hydraulic risk and riverbanks to prevent pollution and slope instability. • It also promotes permeable materials for improved drainage.
[V-MH-I] Vision – Mitigation Hierarchy– Innovation	• The Plan' vision promotes urban regeneration and open space projects to reduce soil sealing, aligning with sustainable development goals. • It also helps mitigate urban heat islands and supports climate change adaptation.
[S-MH-I] Strategy – Mitigation Hierarchy– Innovation	• The plan proposes strategies for reducing land consumption through soil regeneration and de-sealing. • Building interventions aim to offset vehicular traffic and enhance permeability with green roofs, walls, and permeable materials. • The plan promotes biodiversity, green infrastructure, and CO_2 reduction.
[IB-MH-I] Information Baseline – Mitigation Hierarchy– Innovation	• The Plan defines a surface temperature map, elaborated using multispectral and thermal satellite imagery. • It also identifies areas for soil regeneration, and assesses microclimate fragility. • The Plan includes a monitoring system to limit soil consumption and enhance permeability.
[AIR-MH-I] Actions /Instruments /Regulations – Mitigation Hierarchy- Innovation	• The Plan recommend the implementation of nature-based solutions like reforestation, permeable pavements, and green roofs to reduce the heat island effect, runoff, and air pollution.
[V-MH-M] Vision – Mitigation Hierarchy– Multiscale	• The Plan' vision wants to cut global warming gas emissions by 60% from 2005 levels and believes increased urban green space will counter rising temperatures from climate scenarios.
[S-MH-M] Strategy – Mitigation Hierarchy– Multiscale	• The Plan' strategy aims at reducing emissions from city services and creating parks and green areas to offset construction impacts.

	• It limits land consumption and enhances regulatory ecosystem services through renovation and densification only in existing artificial soil areas.
[IB-MH-M] Information Baseline – Mitigation Hierarchy– Multiscale	• The plan collects data to monitor and mitigate environmental risks, mapping current risks and containment and mitigation policies.
[S-MH-PO] Strategy – Mitigation Hierarchy– Phasing out	• The Plan excludes new tombing of hillside streams.

Table B 11: Transformative elements related to spatial planning provisions for different sectors for the Urban Plan of Bologna Municipality.

Framework' Codes	Summarized Results
[V-Se-R] Vision – Spatial provision of different sectors - Restructuring	• The Plan promotes using energy-efficient air conditioning and lighting systems, emphasizing the importance of reducing energy consumption and the need to transition from fossil fuels to renewable energy.
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• The Plan' strategy aims at improving biking infrastructure with new routes, enhancing public transportation, and creating safe pathways for better city-wide connectivity, including parks and rural areas. • It includes a zone-30 trial project, values urban gardens for their social and environmental roles, and boosts renewable energy while enhancing building efficiency.
[IB-Se-R] Information baseline – Spatial provision of different sectors - Restructuring	• The Plan has defined a specific plan dedicated to bicycle mobility called 'Bicycle Plan' developed with input from participatory meetings and workshops. • It emphasizes bicycles' role in sustainability and reducing emissions while mapping accessible greenways for cyclists and pedestrians.
[AIR-Se-R] Actions /Instruments /Regulations – Spatial provision of different sectors - Restructuring	• The Plan improves path connections to neighbouring green areas, enhancing usability and permeability. • It also prioritizes pedestrian and bicycle connections, accessibility, and park liveability.
[V-Se-P] Vision – Spatial provision of different sectors – Path-shifting	• The Plan integrates the 'Bicycle Plan' to prioritize cycling in mobility policies. • It also addresses water conservation, storage, and recycling to maintain water flows in natural resources.
[S-Se-P] Strategy – Spatial provision of different sectors – Path-shifting	• The Plan' strategy promotes the reduction of car transportation modes proposing Zone 30 and new bicycle routes.

	• It also seeks to restore natural water bodies, reduce energy consumption through efficiency, and boost renewables. • Additionally, it aims to limit land use, protect urban agriculture, and foster multifaceted environmental farming.
[IB-Se-P] Information Baseline – Spatial provision of different sectors – Path-shifting	• Recently, there's been a paradigm shift, viewing cycling as integral to the 'new city', facilitated by the implementation in the municipality of the 'bicycle consultation', an entity formed by local associations.
[V-Se-I] Vision – Spatial provision of different sectors – Innovation	• The Plan envisions the city's future mobility focusing on enhancing public transit and promoting eco-friendly urban transportation, including bicycles and electric car-sharing. • Additionally, it aims to establish an improved rural accessibility system to enhance usability and support sustainable tourism within broader national and European networks.
[S-Se-I] Strategy – Spatial provision of different sectors – Innovation	• The Plan advances bicycle and pedestrian tourism routes of European, national, and regional significance, enhances electric vehicle mobility and public transport incentives, improves connectivity among public stops, and fosters better linkages to reduce energy vulnerability and pollution. It establishes 30 km/h zones for safer pedestrian and bicycle usage. • The Plan also encourages sustainable agriculture, local supply chains, rural accessibility, green river routes, and energy efficiency measures.
[IB-Se-I] Information Baseline – Spatial provision of different sectors – Innovation	• The plan maps a local bicycle network connecting to national and European routes, improving urban-suburban connections and travel time. • It also monitors energy transition, lowers CO_2 emissions from construction, and increases the number of electric charging stations.
[AIR-Se-I] Actions /Instruments /Regulations – Spatial provision of different sectors - Innovation	• The Plan suggests improving the connectivity and quality of bicycle and pedestrian routes. • New buildings must achieve energy class A with photovoltaic installations in selected areas for self-sufficiency. • The Plan also combats the heat island effect by defining various measures like shading, natural ventilation, and natural lighting.

[V-Se-M] Vision – Spatial provision of different sectors – Multiscale	• The plan aims to develop a new rural accessibility system to support sustainable tourism and integrate the city into a wider network of national and European routes.
[S-Se-M] Strategy – Spatial provision of different sectors – Multiscale	• The plan preserves and enhances peri-urban landscapes, improves urban accessibility, and creates tourist routes for pedestrians and cyclists. • It includes a pilot project for 30 km/h zones in a congested residential neighbourhood.
[IB-Se-M] Information Baseline – Spatial provision of different sectors – Multiscale	• The plan identifies and maps the bicycle-pedestrian network and hiking trails that cross the municipal territory and connect paths at different spatial scales (supranational, regional and municipal).

Table B 12: Transformative elements related to biodiversity and ES for the Urban Plan of Bologna Municipality.

Framework' Codes	Summarized Results
[V-BES-R] Vision – Biodiversity & ES - Restructuring	• The Plan believes that is crucial to take action on critical hydraulic issues to improve ecological aspects and safety.
[S-BES-R] Strategy – Biodiversity & ES - Restructuring	• The Plan improves water quality by separating hydrographic networks from sewage systems, reducing water withdrawals, and preserving watercourse ecosystems. • It also reduces hydraulic risk by conserving soil, restoring wetlands, and enhancing hydraulic functionality. • The plan enhances green spaces by increasing tree cover, upgrading connections, improving parks, and creating new public green areas. • It promotes the urban eco-network for ecosystem services and ecological corridor preservation. • The plan monitors habitat restoration and non-native species spread, and includes urban regeneration for brownfields and soil reclamation.
[IB-BES-R] Information baseline – Biodiversity & ES - Restructuring	• The Plan identifies and maps canals for restoration in the minor and tombed catchment network to improve surface water quality.
[AIR-BES-R] Actions /Instruments /Regulations – Biodiversity & ES - Restructuring	• The Plan establishes green provisions for new structures and the conservation of phytomass in requalification projects, with added protection for monumental trees and river environments to preserve and enhance their ecological functions.

[V-BES-P] Vision – Biodiversity & ES – Path-shifting	• The vision of the Plan focuses on regenerating the city and its connection with the environment, emphasizing green spaces' multifunctionality and soils' ecological role in providing ecosystem services and preserving biodiversity.
[S-BES-P] Strategy – Biodiversity & ES – Path-shifting	• The Plan' strategy aims to improve water quality by separating hydrographic networks from sewage systems, reduce water withdrawals, control surface water pollutants, and enhance the blue infrastructure. • It also protects natural features and greenery, increases ecosystem services, and promotes biodiversity. • The plan encourages soil regeneration, limits land consumption, and addresses the heat island effect through measures like tree planting and green roofs. • It controls the impact of invasive species and supports the conservation of endangered species and habitats.
[IB-BES-P] Information Baseline – Biodiversity & ES – Path-shifting	• The Plan offers a qualitative analysis of ecosystem services in urban and rural areas to identify the right strategies, actions and rules to conserve and implement citizens' benefits. • It aligns with the Municipal Green Plan to guide green initiatives in the city.
[AIR-BES-P] Actions /Instruments /Regulations – Biodiversity & ES - Path-shifting	• The Plan recognizes the importance of public greenery like trees and permeable pavements for public spaces, supporting ecological benefits such as increasing phytomass, shade provision, and urban drainage. • It also safeguards flora and fauna with restrictions on activities near protected trees.
[V-BES-I] Vision – Biodiversity & ES – Innovation	• The Plan acknowledges the significance of rivers, natural or restored, protected, permeable soils, and vegetated areas for enhancing ecosystem services, biodiversity conservation, risk mitigation, and climate adaptation. • It also emphasizes green spaces as vital for ecological and social connections.
[S-BES-I] Strategy – Biodiversity & ES – Innovation	• The Plan' strategy aims to increase urban greenery, protect existing water reservoirs, defend the urban eco-network, enhance the urban green and blue infrastructure, improve ecosystem services through de-sealing and new green areas, protect and increase biodiversity, upgrade existing urban gardens and create new ones, promote naturalization of the territory, manage wetland habitats optimally, limit non-renewable resource consumption, rehabilitate urban soils, reduce surface water pollutants, and safeguard public and private green spaces.

	• It sets compensatory measures like green roofs and walls in building projects to ensure minimum urban and ecological quality standards.
[IB-BES-I] Information Baseline – Biodiversity & ES – Innovation	• The Plan has assessed urban green cover, both public and private, using satellite imagery and spectral index analysis. • Qualitative, quantitative, and land performance analyses were conducted, including mapping ecosystem services from the urban eco-network. • Microclimatic analyses identified urban heat islands, guiding climate adaptation actions. Indicators were developed to monitor the urban eco-network's development, anthropized soil restoration, and land consumption reduction.
[AIR-BES-I] Actions /Instruments /Regulations – Biodiversity & ES - Innovation	• The Plan include nature-based solutions into urban planning, such as tree planting, green roofs and walls, and the creation of public green spaces in development projects. • It also focuses on restoring private tree areas after demolition, installing permeable pavements with grass cover, de-paving areas, and promoting the use of native species. • Standards for public greenery were introduced to enhance phytomass and urban drainage in public buildings.
[V-BES-M] Vision – Biodiversity & ES – Multiscale	• The Plan considers that the increase in greenery offsets the expected rise in temperature.
[S-BES-M] Strategy – Biodiversity & ES – Multiscale	• The Plan' strategy encourages urban forestation, creating new green spaces, improving public areas, and developing the urban eco-network. • It focuses on connecting central areas with tree-lined paths, enhancing ecological corridors, and building fish passages to overcome artificial dams. • Rural areas are also enhanced through the creation of a system of connections and nodes. • The Plan safeguards public and private greenery and tree species to improve local environmental conditions, microclimate, and biodiversity.
[IB-BES-M] Information Baseline – Biodiversity & ES – Multiscale	• The Plan mapped peri-urban parks and conducted a qualitative analysis of soil ecosystem services. • It established indicators to support the urban eco-network, regenerate anthropized soils, combat land consumption, and assess climate vulnerability at neighbourhood and urban level.

[AIR-BES-M] Actions /Instruments /Regulations – Biodiversity & ES - Multiscale	• The Plan implements various measures to enhance ecological connectivity and ecosystem services. • It protects groundwater areas, forests, natural heritage sites, and Natura 2000 network sites, integrating ecosystems concepts with economic and social aspects. • The Plan also safeguards wetlands, shrub meadows, and gullies at the metropolitan level. • Furthermore, it includes actions to create a new connected public green system, extending urban green corridors to hillside areas, and providing shaded pathways through increased greenery.
[S-BES-PO] Strategy – Biodiversity & ES – Phasing out	• The Plan removes sewage-water interference to enhance surface water quality and combats invasive alien species across all habitats.

8.2. Denmark

8.2.1. Copenhagen Municipal Biodiversity Strategy

Tables B13 and B14 summarize the content analysis results of the Copenhagen Municipal Biodiversity Strategy at the Local Administrative Unit, related to the governance of spatial planning systems, biodiversity, and ES. Only one transformative strategy was identified concerning the mitigation hierarchy and the spatial planning provision for different sectors. For the first one, the plan's strategy, considered path-shifting, includes restoring and mitigating the loss of important habitats when it is impossible to avoid impact, increasing nature maintenance, and creating more space for natural spaces. For the second one, a restructuring strategy is that nature and biodiversity should be included in initiatives related to the coast and harbour, e.g., constructing new canals or quays.

Table B 13: Transformative elements identified related to the governance of spatial planning systems for the Copenhagen Municipal Biodiversity Strategy.

Framework' Codes	Summarized Results
[V-G-R] Vision – Governance - Restructuring	• The vision is to implement a focus - long term and constant - on improving conditions for nature and implementing this in, e.g., existing plans, tools, and procedures.
[S-G-R] Strategy – Governance - Restructuring	• The strategy launches a new planning process, where an action plan is made following the strategy. The action plan is revised every four years based on an inventory/status for the themes and goals and is approved by the council. Whenever the action plan is revised, a strategy update will be considered. • The strategy emphasizes that biodiversity concerns, protection, and improvement should be integrated into municipal planning and management. This includes, e.g.,

	urban planning and development, conservation, maintenance of green and natural areas, and municipal construction projects.
[V-G-P] Vision – Governance – Path-shifting	• The vision of the strategy includes creating a greener Copenhagen - setting a new direction for the development of biodiversity in Copenhagen, one where biodiversity is central for development and growth and where nature is a meeting place for social and learning communities.
[S-G-P] Strategy – Governance – Path-shifting	• The strategy stresses that in the municipal planning processes, a clear direction is set for new biodiversity in urban development areas and for securing connections between green and blue area.
[S-G-I] Strategy – Governance – Innovation	• The plan promotes using an integrated participatory system beyond traditional consultative approaches to actively feed each planning stage with new planning proposals and suggestions from various actors. Some methods include in-depth interviews, focused meetings, workshops, surveys, and launching events.
[V-G-M] Vision – Governance – Multiscale	• The strategy generally has visions of collaboration within the municipality between different areas of administration and outside the municipality with citizens, institutions, etc. • Part of the vision is also that biodiversity should be integrated with other agendas, such as urban development and climate adaptation, and across landowners.
[S-G-M] Strategy – Governance – Multiscale	• The strategy aims to include schools and institutions (e.g., nursing homes) in terms of improving biodiversity in their physical spaces and perhaps even more as partners in improving the knowledge and learning of the users on biodiversity. Fostering learning and dissemination through and about biodiversity is a recurring theme in the strategy aimed at Copenhageners, tourists, and visitors. The strategy is that experiencing and learning about biodiversity is the basis for taking care of and supporting its development. • Another element of the strategy is to create local social communities and activities around biodiversity initiatives, e.g., anchored in local associations and cultural institutions. This dual purpose is to improve biodiversity and social relations/issues. Social community efforts are seen as a way of motivating Copenhageners to engage in biodiversity efforts. • Part of the strategy is also to create cooperation and partnerships with municipal, private actors, and citizens around biodiversity initiatives, for example, in connection

	to cultural activities and to create new habits among participants.

Table B 14: Transformative elements related to biodiversity and ES for the Copenhagen Municipal Biodiversity Strategy.

Framework' Codes	Summarized Results
[S-BES-R] Strategy – Biodiversity & ES - Restructuring	• The strategy aims to create and restore biodiversity, habitats, and food sources for species. This includes creating space for biodiversity in the municipality, e.g., more and better connected green areas, private and communal gardens, green facades, and green roofs.
[V-BES-P] Vision – Biodiversity & ES – Path-shifting	• Part of the strategy's vision is to halt species' decline.
[S-BES-P] Strategy – Biodiversity & ES – Path-shifting	• Overall, the strategy aims to protect and improve Copenhagen's biodiversity and halt and reverse the decline in biodiversity. • The strategy has goals for higher biodiversity in Copenhagen in 2050, including more space for biodiversity, with goals of 30% of the area in the municipality to be designated public green spaces and 10% of the area protected by the Danish nature protection legislation.
[S-BES-I] Strategy – Biodiversity & ES – Innovation	• The strategy states that nature and biodiversity should be part of the solution to flood protection/climate change adaptation using nature-based solutions. • The strategy encourages planting native species (plants) in urban development areas.
[S-BES-M] Strategy – Biodiversity & ES – Multiscale	• The strategy states a need to improve and expand the green network in the urban landscape to create more and better-connected spaces for biodiversity and easier access to nature and green areas for people.

8.2.2. Copenhagen Municipal Biodiversity Action Plan

Table B15 summarizes the content analysis results of the Copenhagen Municipal Biodiversity Action Plan, developed at the Local Administrative Unit, related to the governance of spatial planning systems. No transformative elements related to the mitigation hierarchy were identified for this action plan. In terms of spatial planning provision for different sectors, two actions emerged: one is path-shifting, considering biodiversity in the renewal and restructuring of the city; the other one is innovative, and indicating the action plan should be implemented through integration in, e.g., construction, climate change adaptation, etc. (see also G-M). Considering

biodiversity and ES, a path-shifting action is that new natural areas should be protected and developed in the city and on municipally owned land, e.g., via nature management and restoration. Moreover, an innovative action is to promote biodiversity through an 'idea-development project' in the transitioning area between land and water.

Table B 15: Transformative elements related to the governance of spatial planning systems for the Copenhagen Municipal Biodiversity Action Plan.

Framework' Codes	Summarized Results
[AIR-G-R] Actions /Instruments /Regulations – Governance - Restructuring	• The municipal council will produce and discuss the status and overview of next year's activities. • A revised action plan will be presented and decided on every four years in the council.
[AIR-G-P] Actions /Instruments /Regulations – Governance - Path-shifting	• The action plan should be implemented through the coming municipal spatial and local plans, and biodiversity programs should be produced for selected areas.
[AIR-G-I] Actions /Instruments /Regulations – Governance - Innovation	• The plan states that biodiversity coordinators who should coordinate and prioritize efforts will be hired. • Also, knowledge and understanding should be built about how biodiversity can be integrated into the procedures and work of the municipality. • The plan states different knowledge/data that should be gathered: mapping biodiversity and state of nature areas plus monitoring.
[AIR-G-M] Actions /Instruments /Regulations – Governance - Multiscale	• The strategy has been prepared in cooperation with the Danish Nature Conservation Society, and the municipality wishes to continue the close collaboration. • The plan states that it should be implemented through cooperation between all departments in the municipality, citizens, associations, business communities, developers, land owners, and others. It is emphasized that biodiversity considerations should be implemented through all operations, construction, and management in the municipality, and this should be supported by education and courses for employees as well as new machinery. • The plan also states that knowledge of biodiversity should be communicated to children and young people, associations, and volunteer groups. This includes developing new teaching materials and capacity building with school teachers and nursery staff. Also, activities related to biodiversity and nature should be offered to citizens with physical, social, or psychological problems.

	• The plan states that considerations of biodiversity should be implemented through the cultural and recreational activities and communities in Copenhagen.

8.2.3. Skive Municipal Spatial Plan

Table B16, B17, and B18 summarize the results of the content analysis of the Skive Municipal Spatial Plan for the governance of spatial planning systems, the spatial provisions for different sector, and biodiversity and ES, respectively. Concerning the mitigation hierarchy, an action presents a restructuring character: creating a new pond when impacts on ponds in the GreenLab area cannot be avoided.

Table B 16: Transformative elements related to the governance of spatial planning systems for the Skive Municipal Spatial Plan.

Framework' Codes	Summarized Results
[V-G-M] Vision – Governance – Multiscale	• A goal of the plan is that the recreational use of nature (e.g., hiking and biking) shall happen based on increased knowledge of nature and biodiversity.
[S-G-M] Strategy – Governance – Multiscale	• The plan states that work with nature restoration in former raw materials pits will cooperate with the regional authorities, land owners, and raw material enterprises. Generally, when restoring nature, the area's cultural character should be considered.

Table B 17: Transformative elements related to spatial planning provision for different sectors for the Skive Municipal Spatial Plan.

Framework' Codes	Summarized Results
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• The plan designates very few new areas for urban development to protect nature areas. Instead, strategies of densification and reuse of areas are used.
[S-Se-P] Strategy – Spatial provision of different sectors – Path-shifting	• The goal is that wind turbines, biogas facilities, PV facilities, large recreational facilities, and water extraction should be located and run under the consideration of nature. • A goal is also that streams should be used under the largest possible consideration for nature. • Also, the plan aims for former raw material pits to be used primarily for nature purposes to increase biodiversity.
[AIR-Se-P] Actions /Instruments /Regulations – Spatial provision of different sectors - Path-shifting	• The plan states that agriculture, wind turbines, recreational areas, and PV facilities should be placed and run under

	consideration of nature, natural values, and ecological connections. • Also, rainwater should, where possible, be used to increase nature values.

Table B 18: Transformative elements related to biodiversity and ES for the Skive Municipal Spatial Plan.

Framework' Codes	Summarized Results
[AIR-BES-R] Actions /Instruments /Regulations – Biodiversity & ES - Restructuring	• The plan states that the design of hotels, inns, and camping areas should consider nature's interests and protection. • Low-lying areas are selected for restoration or creation of wetlands. In these areas, building and construction cannot hinder nature restoration. • The plan also states that intervention in nature areas of low quality can be permitted if the means improved living conditions for natural animals and plants.
[S-BES-P] Strategy – Biodiversity & ES – Path-shifting	• The plan states in several places that there will be active work to develop and protect biodiversity and nature areas, e.g., in former raw material extraction areas.
[V-BES-M] Vision – Biodiversity & ES – Multiscale	
[S-BES-M] Strategy – Biodiversity & ES – Multiscale	• The plan sets goals to achieve good connection between nature areas and protect and improve ecological connections. Part of this is that the plan strives to distribute forest areas, strengthening the ecological connections.
[AIR-BES-M] Actions /Instruments /Regulations – Biodiversity & ES - Multiscale	• The plan establishes ecological networks or corridors in protected areas, potential nature areas, ecological connections, potential ecological connections, rivers and streams. Construction and building cannot be allowed in these networks if it deteriorates the nature values, including the possibilities for new or extended ecological connections.

8.2.4. Local Framework Plan for GreenLab Area in Skive Municipality

Tables B18 and B20 present the summarized results of the content analysis regarding the spatial planning provisions of different sectors and biodiversity and ES, for the GreenLab Local Framework in Skive Municipality. A restructuring strategy emerged for the governance of spatial planning systems; specifically, the framework local plan should set the overall frames for developing the area and secure a coherent area, including the landscaping and nature improvements. A path-shifting action for the mitigation hierarchy considers setting in place a new refuge for otters in the area.

Table B 19: Transformative elements related to spatial planning provision for different sectors for the Framework Local Plan for GreenLab Area in Skive Municipality.

Framework' Codes	Summarized Results
[V-Se-I] Vision – Spatial provision of different sectors – Innovation	• The GreenLab area shall provide possibilities for working across the environmental, nature, and energy sectors to develop and test future solutions. The landscape should reflect this mix of nature and knowledge experience.
[V-Se-M] Vision – Spatial provision of different sectors – Multiscale	• The area should have a triple profile: a) Innovation and research-park; b) Sciencepark for tourists, students etc; c) Leisure-landscape for locals, tourists etc.

Table B 20: Transformative elements related to biodiversity and ES for the Framework Local Plan for GreenLab Area in Skive Municipality.

Framework' Codes	Summarized Results
[AIR-BES-R] Actions /Instruments /Regulations – Biodiversity & ES - Restructuring	• Encroachment on nature of limited value can generally only be allowed if it results in improved conditions for nature. As part of the landscaping, nature protection and nature improvement is incorporated. Specifically, if waterholes/ponds are destroyed, replacements in the form of ponds or lakes should be created in the local area.
[AIR-BES-P] Actions /Instruments /Regulations – Biodiversity & ES - Path-shifting	• The plan should secure improvements for nature in the area, including securing space for nature in interaction with the new activities and a new refuge for otters.
[S-BES-I] Strategy – Biodiversity & ES – Innovation	• Intelligent solutions - including local drainage solutions - for handling surface water should secure improved nature qualities.
[AIR-BES-I] Actions /Instruments /Regulations – Biodiversity & ES - Innovation	• To the extent possible, the landscaping in a 'green galaxy' should consist of plants that are a wide variety of native species.
[S-BES-M] Strategy – Biodiversity & ES – Multiscale	• The nature development parts of the plan should create unique quality before and after enterprises start up in the area.
[AIR-BES-M] Actions /Instruments /Regulations – Biodiversity & ES - Multiscale	• The plan states that the results of the SEA of the overall municipal spatial plan pertaining to the GreenLab area should be taken into account in the local planning and EIA process. • Construction and building are not allowed in areas that make up ecological connections - or could be used in the future for ecological connections.

	• Surface water should be handled in open ditches and basins, focusing on creating ecological connections.

8.3. Germany

8.3.1. Berlin Strategy: Urban Development Concept Berlin 2030

The following tables show the summary of the Berlin Strategy 2030 results. Specifically, Table B21, B22, B23, and B24 address the transformative elements identified for the governance of spatial planning systems, the mitigation hierarchy, the spatial planning provisions of different sectors, and biodiversity and ES, respectively.

Table B 21: Transformative elements related to the governance of spatial planning systems for the Berlin Strategy 2030.

Framework' Codes	Summarized Results
[S-G-P] Strategy – Governance – Path-shifting	• The strategy has clear goals in supporting neighborhood development by integrating the different actors in the discussion, preserving opportunities, and creating spaces for development. It also emphasizes a planning culture that is transparent and inclusive, oriented to participatory and cooperative processes. • Furthermore reinforces the opportunities and the duties of private sector stakeholders, while established neighbourhood and regional management services take on particular importance when mobilizing local knowledge and broad-based opportunities for participation.
[V-G-M] Vision – Governance – Multiscale	• The strategy considers an efficient governance that includes different actors, seekings an integrated urban development.
[S-G-M] Strategy – Governance – Multiscale	• The strategy considers that collaborative processes are needed to break the silos between different sectors seeking a cross-level, inter-agency collaboration. • Also, the strategy refers to the mechanisms in place for citizens to decide on the use of their public spaces in a participatory way.
[AIR-G-M] Actions /Instruments /Regulations – Governance - Multiscale	• The strategy considers an efficient land use management program that includes different stakeholders and is based on principles of transparency.

Table B 22: Transformative elements related to the mitigation hierarchy for the Berlin Strategy 2030.

Framework' Codes	Summarized Results
[V-MH-R] Vision – Mitigation Hierarchy- Restructuring	• The strategy has a vision of a city with balanced growth considering reclaiming underused areas. • It also refers to the different elements of urban planning to minimize the impact (again, in a very general way). • The strategy refers to eliminating pollution as a central part of its vision for a healthy city.
[S-MH-R] Strategy – Mitigation Hierarchy- Restructuring	• The strategy emphasized the potential of potential development sites to develop the urban city structure, shaping growth and harnessing its positive effects for the Berlin metropolitan region. • The strategy promotes the careful development of the urban environment considering history and identity but also minimizes the impacts of the development of infrastructures. For example, visible architectural features are emphasized using innovative and experimental approaches and high-quality architecture based on Berlin's building typology, the history of the city, and its identity. Furthermore, it integrates the concept of a compact city, seeking to balance spatial development, avoiding/minimizing the impacts of infrastructure development (transport, other settlement structures). The strategy includes policies to maintain a compact city, balancing internal development and densification. This will contribute to limiting land intake and avoid/minimize the impact on other ecosystems.
[S-MH-P] Strategy – Mitigation Hierarchy– Path-shifting	• The strategy considers densification as an alternative to minimize risks, advancing the high-quality development of the city through the reuse and conversion of existing structures.

Table B 23: Transformative elements related to spatial planning provision for different sectors for the Berlin Strategy 2030.

Framework' Codes	Summarized Results
[V-Se-R] Vision – Spatial provision of different sectors - Restructuring	• The strategy's vision considers urban planning as a key element for the success of the provision for other sectors (housing, mobility). • It promotes the vision of being climate neutral. • The strategy integrates the concept of eco-mobility, which could be relevant for Biodiversity and spatial planning.

[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• The strategy also mentioned in a very general way that urban spatial planning will contribute to the tourism sector. • The strategy considered laying the groundwork for a climate-friendly city, including different policies focused on the provisioning from the energy sector (related to spatial planning). • It highlights the shift to eco-mobility by using different transport options but also in connection to urban planning.
[AIR-Se-R] Actions /Instruments /Regulations – Spatial provision of different sectors - Restructuring	• The strategy provides information about a construction and planning law toolkit as well as property policy to safeguard and develop new infrastructure in the city.
[S-Se-P] Strategy – Spatial provision of different sectors – Path-shifting	• The strategy considers integrating sustainable water supply management by considering innovative solutions. • It seeks to make public transport in Berlin more attractive and give its citizens equal opportunities. This includes expanding the development of infrastructures but considering the concepts of smart city and intelligent mobility within its traffic management plans. The mobility in Berlin is post-fossil fuel.
[AIR-Se-P] Actions /Instruments /Regulations – Spatial provision of different sectors - Path-shifting	• The strategy focuses on climate change and has developed a portfolio of tools to measure and forecast the influence/ impact of urban development. It includes the launching and promoting neighborhood-based climate protection and adaptation initiatives aimed at targeting climate-related health risks and removing multiple sources of pollution.

Table B 24: Transformative elements related to biodiversity and ES for the Berlin Strategy 2030.

Framework' Codes	Summarized Results
[V-BES-R] Vision – Biodiversity & ES - Restructuring	• The main vision for Berlin is in terms of green areas. The document highlights the importance of large green spaces for the population. It emphasizes the importance of protecting the environment and preserving climate and other resources.
[S-BES-R] Strategy – Biodiversity & ES - Restructuring	• The strategy considers creating green public spaces to improve its citizens' health and quality of life. It emphasizes the importance of developing green areas for the well-being of the citizens and to fulfill climate neutrality. It also highlights the safeguarding and strengthening of out-of-school educational venues, including different multifunctional green areas.

	• The strategy emphasizes the development, connection, and accessibility of green areas for all its citizens. • Furthermore, it considers actions oriented to developing green spaces, planting trees to create a healthier (preserving biodiversity and for its citizen's well-being), and a climate-neutral city.
[IB-BES-R] Information baseline – Biodiversity & ES - Restructuring	• The strategy provides information about the current state of the green areas in Berlin. It also highlights the connectivity, accessibility, and multifunctionality of these areas. • It also emphasized why Berlin can be considered a city that guarantees its citizens a sustainable living.
[AIR-BES-R] Actions /Instruments /Regulations – Biodiversity & ES - Restructuring	• The strategy emphasizes the aim of safeguarding and improving ecological qualities, mentioning the policies related to protecting Berlin's natural resources. This seeks to the reduction of land consumption and minimizes pollution.
[V-BES-P] Vision – Biodiversity & ES – Path-shifting	• The strategy considers urban and green spaces equally important, highlighting that their development should go side by side.
[S-BES-P] Strategy – Biodiversity & ES – Path-shifting	• The strategy emphasizes the safeguarding and strengthening of out-of-school educational venues, including different types of multifunctional green areas.
[S-BES-I] Strategy – Biodiversity & ES – Innovation	• The strategy explicitly mentions the preservation of biodiversity. Biodiversity and the city's development should go hand in hand, with the mention of safeguarding natural resources (soil, air, water) for the long term.
[S-BES-M] Strategy – Biodiversity & ES – Multiscale	• The strategy incentivizes the development of green connectivity networks between residential centers and open spaces. The aim is to build 20 main greenways developed across the city's edge to connect better and enhance open spaces.
[IB-BES-M] Information Baseline – Biodiversity & ES – Multiscale	• The strategy provides information about the current state of the green areas in Berlin. It also highlights the connectivity, accessibility, and multifunctionality of these areas. It also emphasized why Berlin can be considered a city that guarantees its citizens a sustainable living.

8.3.2. Land Use Plan of Berlin

Tables B25, B26, B27, and B28 summarized the results for the governance of spatial planning systems, the mitigation hierarchy, the spatial planning provision for different sectors, and biodiversity and ES, respectively, obtained for the Land Use Plan of Berlin (LAU level).

Table B 25: Transformative elements related to the governance of spatial planning systems for the Land Use Plan of Berlin.

Framework' Codes	Summarized Results
[S-G-R] Strategy – Governance - Restructuring	• The formal planning process considers the Berlin-specific environmental legislation (Landscape Programme and Local Landscape Plans).
[S-G-P] Strategy – Governance – Path-shifting	• The plan is subject to a continuous program of monitoring and review. Since 1994, the Land Use Plan's modifications have been made to safeguard and improve green open spaces. Also, the amount of land zoned for open spaces has substantially increased.
[S-G-M] Strategy – Governance – Multiscale	• The plan encourages and ensures transparent opportunities for public participation in all aspects of society for various matters, including environmental issues.
[AIR-G-M] Actions /Instruments /Regulations – Governance - Multiscale	• A master plan, which proposes the development of an innovation park for research and industry and housing and mixed-use areas next to existing urban quarters with large areas of open space for the Tegel airfield, was agreed upon following an extensive workshop and participation process.

Table B 26: Transformative elements related to the mitigation hierarchy for the Land Use Plan of Berlin.

Framework' Codes	Summarized Results
[S-MH-R] Strategy – Mitigation Hierarchy- Restructuring	• The plan sets up priority for internal development over external expansion by, e.g., 1) strengthening the character and functional variety of existing urban areas, 2) infill development and moderate increases of densities, 3) new uses for vacant plots, recycling of derelict or underused land, and 4) small-scale rounding-off. This helps avoid potential negative impacts of urban development on biodiversity. • It also adopts a city-wide mitigation concept to compensate for environmental adverse impacts formulated by the Landscape Programme. When environmental impacts cannot be compensated locally within the areas zoned for development, compensation measures are to be concentrated in the priority areas defined by the strategy. Priority is given to compensation measures in the inner city

	to assist the concept of internal development and improve the quality of open spaces. • Other measures are targeted to upgrade the citywide system of open spaces, including large peripheral landscapes like the Barnim Regional Park in the North-East.
[IB-MH-R] Information baseline – Mitigation Hierarchy-Restructuring	• Preparing a report on the environment is legally required for all but the most uncontroversial modifications to the Land Use Plan. It brings together information on all aspects relevant to nature and landscape conservation to give due weight to environmental concerns in the decision-making process. The Landscape Programme, the Berlin Environmental Atlas, and other plans and strategies relating to the environment provide the information basis for the report. In some cases, additional research will have to be consulted or undertaken. • The environmental impact assessment is prepared early to be available as a basis for subsequent planning decisions.
[AIR-MH-R] Actions /Instruments /Regulations – Mitigation Hierarchy-Restructuring	• Landscape parks are built for compensating adverse impacts of development on the environment. E.g., 1) new landscape parks in the Barnim area will provide room for outdoor leisure and ecological mitigation; 2) the Gleisdreieck park was realized as a compensation measure and provides green open spaces. • Local Development Plans, including landscape projects intended as compensation for new development, will be commented on by the Department of Urban Development regarding their compatibility with the Land Use Plan.
[S-MH-M] Strategy – Mitigation Hierarchy– Multiscale	• Preparing a report on the environment is legally required for all but the most uncontroversial modifications to the Land Use Plan. The environmental impact assessment reports for changes to the Land Use Plan take part in the public and public bodies' formal consultation process.
[S-MH-PO] Strategy – Mitigation Hierarchy– Phasing out	• Although priority is given to internal development, the Land Use Plan keeps strategic options open for outward expansion and mentions that, in the event of development pressures building up due to favorable economic and other circumstances, it may become necessary to make additional land available at short notice.

Table B 27: Transformative elements related to spatial planning provision for different sectors for the Land Use Plan of Berlin.

Framework' Codes	Summarized Results
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• The Plan sets up priorities, including promoting pedestrian and bicycle traffic and public transport, which requires corresponding infrastructure and area planning, to promote an efficient transport network compatible with social and environmental objectives.
[S-Se-PO] Strategy – Spatial provision of different sectors – Phasing out	• The Plan to aims at recycling abandoned or underused industrial sites for new intensive uses. • It also sees the waterside as a prime location for new housing and river corridors providing great attractions for investment proposals.
[AIR-Se-PO] Actions /Instruments /Regulations – Spatial provision of different sectors – Phasing out	• Since 1994, the industrial land allocations are increased due to major projects such as the 'Business Park' development near the new international airport BER and the new developments proposed for the site of the present airport at Tegel. • The Land Use Plan provides a small number of new road and rail links. • The Plan proposes the development in the south-eastern parts of Berlin along the river Spree, the emerging Europacity to the quarters around the nearby canal port Humboldthafen, and the envisaged projects for new housing along the upper reaches of the rivers Havel and Spree.

Table B 28: Transformative elements related to biodiversity and ES for the Land Use Plan of Berlin.

Framework' Codes	Summarized Results
[S-BES-R] Strategy – Biodiversity & ES - Restructuring	• The plan considers planning concepts directed to the protection of the environment, such as the Sectoral Development Plan on Climatic Change, Noise Protection Action Plan, Air Quality Protection Plan, Urban Landscape Strategy, and Biological Diversity. • It also considers and evaluates the land requirements for different development purposes as well as economic and ecological considerations, weighs their respective importance, and strives for a just compromise.

[IB-BES-R] Information baseline – Biodiversity & ES - Restructuring	• Based on the Berlin Nature Protection Act, the Landscape Programme (LaPro) provides the major basis for ecological considerations relevant to the Land Use Plan and the environmental evaluation of proposed modifications to the plan. It encompasses four component maps relating to the ecosystem, the protection of biotopes and species, landscape issues, recreation, and open spaces. These contain information and objectives dealing with the protection of natural resources, the enlargement and enhancement of open spaces, nature, and landscape conservation, the improvement of living conditions for the inhabitants, and the preservation of characteristic urban landscapes.
[AIR-BES-R] Actions /Instruments /Regulations – Biodiversity & ES - Restructuring	• The plan indicates that attractive green and urban open spaces will complement the development: o The master plan for the Tegel airfield proposes the development of an innovation park for research and industry and of housing and mixed-use areas next to existing urban quarters with large open space areas. o One of the lead projects of city planning addresses the section of the river Spree between Jannowitzbrücke and Elsenbrücke, for attractive open spaces and recreation areas as well as for housing, offices, and other urban uses; o Several new landscape parks in the Barnim area were proposed. o The Gleisdreieck Park will provide open green spaces for recreational purposes and ecological mitigation. o New open spaces, such as the Landscape Park Rudow-Altglienicke were proposed.
[V-BES-P] Vision – Biodiversity & ES – Path-shifting	• The Plan has the vision to build Berlin as a green city through an environmentally sensible and sustainable form of development.
[S-BES-P] Strategy – Biodiversity & ES – Path-shifting	• To achieve an environmentally-sensible and sustainable development, the plan seeks to: o Upgrade existing large parklands. o Provide sufficient open spaces in the densely built-up inner city. o Provide green linkages between new and existing open spaces. • The plan introduces concrete open space strategies through: o Building upon the existing pattern of open spaces;

	○ Upgrading the recreational areas on the outer periphery and around the inner city; ○ Using green corridors for connecting the major open spaces and improving the accessibility of large recreational landscapes on the city's outskirts from major housing areas. The green corridors also run alongside most of the water courses throughout the city. Forests, lakes, fields, parks, and other open spaces account for more than 40% of the area of the city. • The plan also contributes to preserving natural resources by making economical use of land for development, safeguarding ecologically and climatically important areas, and avoiding unnecessary traffic.

8.3.3. City Development Mobility and Transport Plan of Berlin 2030

The following tables show the transformative elements identified for the City Development Mobility and Transport Plan of Berlin 2030. Specifically, Table B29 illustrates the summarized results for the governance of spatial planning systems, Table B30 for the mitigation hierarchy, Table B31 for the spatial planning provisions of different sectors, and Table B32 for biodiversity and ES.

Table B 29: Transformative elements related to the governance of spatial planning systems for the City Development Mobility and Transport Plan of Berlin 2030.

Framework' Codes	Summarized Results
[S-G-R] Strategy – Governance - Restructuring	• The transformation strategy towards a 'clean' transport system includes a mix of measures that comprise environmental standards, infrastructural amendments, designated non-emission areas and prioritizing environmentally friendly means of transport.
[AIR-G-M] Actions /Instruments /Regulations – Governance - Multiscale	• For different topics, the plan wants to use a 'shared planning' approach, an instrument that involves planning authorities from other administrative spatial bodies.

Table B 30: Transformative elements related to the mitigation hierarchy for the City Development Mobility and Transport Plan of Berlin 2030.

Framework' Codes	Summarized Results
[S-MH-R] Strategy – Mitigation Hierarchy- Restructuring	• Commercial traffic is to be avoided, and if necessary, its impact on the urban environment is minimized. IMC is supposed to be prevented and transferred to more environmentally friendly means of traffic, although the prioritization in this regard is not made clear. Traffic-

	related land use and energy consumption are supposed to be minimized as well. • Greening and nature-based solutions are supported regarding climate change adaptation and general improvement of urban infrastructure.
[IB-MH-P] Information Baseline – Mitigation Hierarchy– Path-shifting	• Recent data shows that the mobility sector is moving to environmental sustainability, which is seen from shrinking IMC shares.

Table B 31: Transformative elements related to spatial planning provision for different sectors for the City Development Mobility and Transport Plan of Berlin 2030.

Framework' Codes	Summarized Results
[S-Se-P] Strategy – Spatial provision of different sectors – Path-shifting	• To meet the objectives in the mobility sector, business as usual is no longer suitable. Instead, consistent action toward a (fundamental) industry transformation is required. Regarding spatial planning provisions, the modeling results are interpreted as imperative to focus on the 'outer city', as population growth is strongest here.
[IB-Se-P] Information Baseline – Spatial provision of different sectors – Path-shifting	• The model uses spatial planning data, e.g., measures and plans on public transport and bike infrastructure expansion, to quantify the potential success of different action scenarios and draw strategic conclusions.
[S-Se-I] Strategy – Spatial provision of different sectors – Innovation	• The plan supports innovative approaches that can have a spatial impact on managing general and specifically commercial traffic flows. For example, developing new logistic concepts for the city center, including 'micro-depots' and 'city hubs' is encouraged.
[V-Se-M] Vision – Spatial provision of different sectors – Multiscale	• Restructuring of traffic areas in a sustainable way includes green spaces. Environmentally friendly means of traffic are supposed to become more interconnected within the region. The catalog of measures suggests this is to be done through cooperative planning.
[S-Se-M] Strategy – Spatial provision of different sectors – Multiscale	• Cooperation between Berlin and its neighboring state Brandenburg and a highly developed participatory planning practice can help to reach the city's goals, especially in the transport and housing sectors.

Table B 32: Transformative elements related to biodiversity and ES for the City Development Mobility and Transport Plan of Berlin 2030.

Framework' Codes	Summarized Results
[V-BES-R] Vision – Biodiversity & ES - Restructuring	• Berlin is envisioned to meet environmental demands.
[S-BES-R] Strategy – Biodiversity & ES - Restructuring	• Urban ecosystems benefit from increasing the quantity and quality of green spaces to make urban spaces more attractive and protect the city from climate change impacts.
[S-BES-P] Strategy – Biodiversity & ES – Path-shifting	• Meeting the environmental goals and relieving the urban area and global environment from traffic-induced stress requires mitigation of car use and a shift to more environmentally friendly means of transport.
[S-BES-I] Strategy – Biodiversity & ES – Innovation	• Greening and innovations, such as nature-based solutions, are encouraged in order to strengthen resilience in the face of climate change impacts.
[S-BES-M] Strategy – Biodiversity & ES – Multiscale	• The plan embeds environmental goals in its vision for 2030, namely societal consensus on the importance of environmental issues and good air quality.

8.3.4. City Development Plan Housing 2030: New Houses for Berlin

The following tables present the transformative elements identified for the City Development Housing Plan of Berlin 2030. Tables B33, B34, and B35 show the summarized results related to the mitigation hierarchy, spatial planning provisions for different sectors, and biodiversity and ES, respectively. No transformative elements were found related to the governance of spatial planning systems.

Table B 33: Transformative elements related to the mitigation hierarchy for the City Development Plan Housing 2030.

Framework' Codes	Summarized Results
[S-MH-R] Strategy – Mitigation Hierarchy- Restructuring	• Open and green spaces should be preserved and ameliorated to mitigate climate change impact and enhance biodiversity. • Strategies follow the principle of inner-city development over outer-city development, agreed upon in the Leipzig Chapter, thus avoiding additional land consumption. • Other strategies involve the connection of habitats and the general minimization of interventions in nature and landscape. At last, space for compensatory measures is to be secured.

[S-MH-P] Strategy – Mitigation Hierarchy– Path-shifting	• The Plan mentioned that at the level of cooperative planning involving Berlin and Brandenburg, current strategic documents (namely "Landesentwicklungsplan" 2019) take open spaces and their protection as well as their functional embeddedness into account. This is important as it secures open spaces early in planning, avoiding potential negative environmental impact through sealing and building.

Table B 34: Transformative elements related to spatial planning provision for different sectors for the City Development Plan Housing 2030.

Framework' Codes	Summarized Results
[V-Se-R] Vision – Spatial provision of different sectors - Restructuring	• Involving different sectors of spatial planning, the vision for Berlin 2030 aims at environmental sustainability.
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• Environmental aspects are supposed to be taken into account in the process of designing new neighborhoods and in urban spatial development in general. This refers especially to integrating and enhancing green spaces to create attractive residential areas.
[S-Se-M] Strategy – Spatial provision of different sectors – Multiscale	• Participatory planning and the involvement of relevant stakeholders is promoted. As the housing strategy follows an integrated approach, multi-level and multi-sector stakeholder participation is promoted.

Table B 35: Transformative elements related to biodiversity and ES for the City Development Plan Housing 2030.

Framework' Codes	Summarized Results
[V-BES-R] Vision – Biodiversity & ES - Restructuring	• Green space is envisioned to be an essential and integral part of the city in Berlin's vision for 2030.
[S-BES-R] Strategy – Biodiversity & ES - Restructuring	• The importance of preserving and enhancing green spaces is repeatedly mentioned throughout the document. These actions are supposed to serve climate adaptation goals primarily but have implications for biodiversity and ecosystem services. The plan highlights ecological, climate-related, and environmental aspects as relevant on all spatial levels, especially in the planning process of new neighborhoods. • Strategies to enhance biodiversity and ecosystem services at the neighborhood scale comprises measures that deal with unsealing, greening, and improved evapotranspiration.

8.3.5. City Development Plan Climate: Securing Urban Quality of Life in Climate Change (Berlin)

Table B36, B37, and B38 present the summarized results extracted from the City Development Plan Climate of Berlin, related to the mitigation hierarchy, the spatial planning provisions for different sectors, and biodiversity and ES, respectively. No transformative element emerged during the content analysis concerning the governance of spatial planning systems.

Table B 36: Transformative elements related to the mitigation hierarchy for the City Development Plan Climate.

Framework' Codes	Summarized Results
[S-MH-R] Strategy – Mitigation Hierarchy- Restructuring	• The Plan aims at developing tools for the city to become resilient against climate change impacts and implement its vision of a 'city of short distances'. This includes spatial planning for different, if not all, sectors and aims primarily at traffic prevention and avoiding urban sprawl, which both impact biodiversity and ecosystems negatively in several different ways.
[S-MH-P] Strategy – Mitigation Hierarchy– Path-shifting	• In contrast to the loss of urban ecosystems, their preservation and spatial extension are stimulated. This should happen to minimize heat stress and improve the citie's or neighborhood's 'bioclimate'. • In addition to this strategy, climate-damaging development should be avoided, e.g., by preserving natural GHD sinks.

Table B 37: Transformative elements related to spatial planning provision for different sectors for the City Development Plan Climate.

Framework' Codes	Summarized Results
[V-Se-R] Vision – Spatial provision of different sectors - Restructuring	• The Plan aims at developing tools for the city to become resilient against climate change impacts and implement its vision of a 'city of short distances'. This includes spatial planning for different, if not all, sectors and aims primarily at traffic prevention and avoiding urban sprawl, which both impact biodiversity and ecosystems negatively in several different ways.
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• There are strategies combining actions from different sectors to make the city resilient in the face of climate change impacts. These include reconciling green and 'grey' (built) infrastructure, preserving and creating green spaces, examining where unsealing surfaces and creating 'cold air production areas' can be implemented.

	• In order to implement the citie's vision of "Stadt der kurzen Wege" ('city of short distances'), existing infrastructure should be rearranged, including green spaces.
[AIR-Se-R] Actions /Instruments /Regulations – Spatial provision of different sectors - Restructuring	• Restructuring whole areas with implications for different sectors is an action that, in StEP Klima, often goes along with the expansion and/or connection of green spaces. Preferably, climate adaptation actions should be included in ongoing tasks and measures that are 'required anyway' in construction, maintenance, and modernization works.
[V-Se-P] Vision – Spatial provision of different sectors – Path-shifting	• Creating a 'city of short distances' is the guideline for the different spatial planning sectors. It plans on meeting people's demands in a short distance to their residency. This includes the need for green, recreational areas.
[S-Se-M] Strategy – Spatial provision of different sectors – Multiscale	• The plan sets up the strategy to include climate action in an integrative, cross-departmental way into the existing governance system and altering it by more consistently involving 'all actors' (administrative bodies, academia, property owners, housing companies, communal enterprises, business representatives, associations, civil society) into the planning process and associated discussions. It acknowledges that some implementing actors are yet to be won over. • Local strategies need to be synchronized with supra-national and even global goals and strategies. • For different planning sectors, civil society as well as all administrative levels, should be included in the planning process and its contentwise discussions.
[IB-Se-M] Information Baseline – Spatial provision of different sectors – Multiscale	• Different environmental data are combined in modeling to get baseline information and projections. Like the plan itself, this multi-level analysis which combines socio-structural and environmental data is unprecedented in climate change-adaptation-related urban planning in Berlin.

Table B 38: Transformative elements related to biodiversity and ES for the City Development Plan Climate.

Framework' Codes	Summarized Results
[S-BES-R] Strategy – Biodiversity & ES - Restructuring	• The climate change adaptation strategy includes redesigning, preserving, and connecting green spaces that serve biodiversity, ecosystem services, and connection. Green spaces are acknowledged to be refuges for urban flora and fauna.

	• New habitats can be created through practices like unsealing surfaces and redesigning river banks in a natural way.
[AIR-BES-R] Actions /Instruments /Regulations – Biodiversity & ES - Restructuring	• Proposed actions that have implications for biodiversity and urban ecosystems include preserving and creating green spaces and trees, mainly for cold air production and health reasons. Explicitly mentioned: preservation of flora and fauna of urban meadows (Tempelhofer Feld). • The city wants to create deciduous forests on 50 % of the urban forest area by the end of the next 50 years.
[S-BES-P] Strategy – Biodiversity & ES – Path-shifting	• At several scales, the creation, extension (and preservation) of green spaces is part of the strategy to cool down neighborhoods and set up retreat spaces for the inhabitants. It is also acknowledged to help against ongoing biodiversity loss.
[S-BES-I] Strategy – Biodiversity & ES – Innovation	• The introduction of climate-change-adapted species and new forms of greening in small areas (e.g. 'pocket parks') is viewed as a strategy to strengthen and enhance urban ecosystems and biodiversity.

8.4. Portugal

8.4.1. General Law of Public Policies for Soil, Territorial Development, and Urbanism

The following Tables show the transformative elements identified in the General Law of Public Policies for Soil, Territorial Development and Urbanism. Specifically, Tables B39, B40, B41, and B42 contain the results related to the governance of spatial planning systems, the mitigation hierarchy, the spatial planning provision for different sectors, and biodiversity and ES, respectively.

Table B 39: Transformative elements related to the governance of spatial planning systems for the General Law of Public Policies for Soil, Territorial Development and Urbanism.

Framework' Codes	Summarized Results
[AIR-G-R] Actions /Instruments /Regulations – Governance - Restructuring	• The ratification of municipal or inter-municipal plans is now exceptional, i.e., municipalities have acquired greater autonomy and greater responsibility to approve their plans in the Municipal Assembly, even though they need the favorable opinions of public entities with interests and responsibilities in that municipality. • Moreover, The programming of the execution of plans and programs has acquired much more importance and more instruments than those that existed in the previous basic law, to promote the effective implementation by the State and Local Authorities of programmes and plans. These

	innovations play in favor of greater efficiency in public action.
[AIR-G-M] Actions /Instruments /Regulations – Governance - Multiscale	• The regional planning institution, called Coordination Comission and Regional Development (CCDR), coordinates different entities to ensure the inclusion of natural values in the plans. There are 5 CCDR in the country operating under the direct dependence of the central government (except for the Islands - Azores and Madeira), but each one operates in its geographic area (with decentralized functions). Despite the Portuguese Constitution foreseeing the creation process of regions (regionalization), the two previous referendums always rejected regionalization (creation of regions with democratically elected power). Even so, on the initiative of the central government, what many consider a "covert regionalization" is underway, based on the transfer of increased competencies to the CCDR (deconcentration) and also transfers of competencies from the Central government to the Municipalities (decentralization). This includes an important role for the CCDR in coordinating and concertation the various planning instruments in the sense that the Municipal Plans integrate the different policies between levels and sectors. This institution has the role of bringing together and following the plan's governance process with entities of different scales and sectors.

Table B 40: Transformative elements related to the mitigation hierarchy for the General Law of Public Policies for Soil, Territorial Development and Urbanism.

Framework' Codes	Summarized Results
[V-MH-R] Vision – Mitigation Hierarchy- Restructuring	• The legislation's objectives state the avoidance of soil contamination and the minimization of polluted substances.
[S-MH-R] Strategy – Mitigation Hierarchy- Restructuring	• There are three principles of the legislation that relate to the MH approach: o Prevention and precaution, leading to the adoption of anticipatory measures to diminish the negative effects on nature; o Responsibility, which includes the idea of paying the costs of polluted activities from the side of the user and the side of the producer; o Restoration, which forces the responsible for any environmental damage to restore the initial environmental state.

[AIR-MH-R] Actions /Instruments /Regulations – Mitigation Hierarchy- Restructuring	• The building rights could be transferred to other plots to safeguard natural heritage, biodiversity conservation, or environmental risks.
[AIR-MH-M] Actions /Instruments /Regulations – Mitigation Hierarchy- Multiscale	• The Law requires the coordination and integration of sectoral policies, European orientations, and objectives of different plans.

Table B 41: Transformative elements related to spatial planning provision for different sectors for the General Law of Public Policies for Soil, Territorial Development and Urbanism.

Framework' Codes	Summarized Results
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• The Territorial Management System divides instruments into Programmes and Plans. Programmes set the strategic framework and policies for territorial development. Plans focus on defining specific options and actions in territorial planning and land use. Programs are initiated by Regional and Central Administration, while Plans are municipal or inter-municipal planning instruments. • Numerous programs have been created for environmental protection, nature conservation, and coastal, estuary, and reservoir protection. • These programs play a vital role in preserving biodiversity by binding public bodies to their objectives. • Legislation sets goals for land management, agricultural and forestry area development, efficient natural resource use, environmental sustainability, and soil preservation for agriculture and environmental protection.
[IB-Se-R] Information baseline – Spatial provision of different sectors - Restructuring	• When there are procedures for creating, correcting, or modifying plans, information is available from local and national authorities about the territorial features. This aspect is fundamental concerning Biodiversity and environmental values.
[AIR-Se-R] Actions /Instruments /Regulations – Spatial provision of different sectors - Restructuring	• The cession of areas ("Areas de cedência" or Dedication or Development Exaction for public space or other collective uses and the possibility to incorporate rural plot without known owner, nor use, to the national land repository. This action provides non-built areas for implementing actions that directly or indirectly improve biodiversity. It also creates an obligation for the State, Autonomous Regions and Local Authorities to make available the administrative information relating to the pursuit of their attributions in matters of soil, land use and town and country planning, without prejudice to the exercise of the general right to information by citizens.

[S-Se-P] Strategy – Spatial provision of different sectors – Path-shifting	• The law reinforces and promotes the need for monitoring and evaluation of plans and programs, creating the need for planning instruments to evaluate the performance of those plans and programmes continuously, and creating the obligation to produce regular (4 years for municipalities) Implementation Reports on Plans and Programmes and also Evaluation Reports on the State of Spatial Planning and Urbanism (REOT).
[AIR-Se-P] Actions /Instruments /Regulations – Spatial provision of different sectors - Path-shifting	• The possibility of transferring development rights (TDR) attributed to a lot or plot of land to other lots or parcels was created in this law, namely for purposes related to the Conservation of Nature and Biodiversity". • The law reinforces and promote the need for monitoring and evaluation of plans and programmes, creating the need for planning instruments to evaluate the performance of those plans and programmes continuously, and creating the obligation to produce regular (4 years for municipalities) Implementation Reports on Plans and Programmes and also Evaluation Reports on the State of Spatial Planning and Urbanism (REOT).
[V-Se-M] Vision – Spatial provision of different sectors – Multiscale	• There is also a hierarchical organization of the planning system in which the vision of the plans must include any modification of a wider level plan. The quantity of codes in this category shows the relevance of multiscale in this legislation.

Table B 42: Transformative elements related to biodiversity and ES for the General Law of Public Policies for Soil, Territorial Development and Urbanism.

Framework' Codes	Summarized Results
[V-BES-R] Vision – Biodiversity & ES - Restructuring	• In the objectives of the legislation, it is stated to increase the resilience of the territory for minimizing the effects of extreme climate events, the rational use of the land valuing the biodiversity.
[V-BES-P] Vision – Biodiversity & ES – Path-shifting	• There are pluralist environmental principles that any measure from the land planning system needs to accomplish, mainly related to actions explained in the MH section.
[AIR-BES-P] Actions /Instruments /Regulations – Biodiversity & ES - Path-shifting	• It sets the redistribution of benefits and costs to uphold principles of equity (equal treatment within the scope of inter-municipal or municipal plans). • This instrument has been used to distribute infrastructure and building costs in Detailed Plans and has enormous

	potential for integrating Biodiversity issues in private properties.

8.4.2. Portuguese Legal Framework of Territorial Management Instruments

The summarized results of the content analysis of the Portuguese Legal Framework of Territorial Management Instruments are presented in the tables below. Specifically, Table B43, B44, B45, and B46 contain the transformative elements related to the governance of spatial planning systems, the mitigation hierarchy, the spatial planning provisions for different sectors, and biodiversity and ES, respectively.

Table B 43: Transformative elements related to the governance of spatial planning systems for the Portuguese Legal Framework of Territorial Management Instruments.

Framework' Codes	Summarized Results
[AIR-G-R] Actions /Instruments /Regulations – Governance - Restructuring	• The new legislation creates a National Commission of the Territory, which aim is to coordinate the execution of the national policy of land management. The creation of the National Commission of the Territory has the opportunity to gather different actors, indirectly impacting biodiversity due to its influence on the governance process of the instruments. It also creates the Advisory Commission for coordinating the different entities influencing the several scale plans, including environmental entities.
[S-G-P] Strategy – Governance – Path-shifting	• The National Commission of the Territory must provide and update the strategic guidelines for the National Ecological Reserve. The role of the new actor in the decision-making process could influence the orientations for these areas with biodiversity values.
[AIR-G-I] Actions /Instruments /Regulations – Governance - Innovation	• In different sections of the plans' principles and obligations, there is the need to coordinate with plans from different scales and other sectoral requirements.
[AIR-G-M] Actions /Instruments /Regulations – Governance - Multiscale	• Creating new actors and procedures for decision-making in the approval and revision of the instruments shapes the multiscale coordination with possible effects in areas with biodiversity values. On the one hand, the National Commission of the Territory has different functions related to the coordination, consolidation, information management, and communication in the decision-making process of the Ecological National Reserve among entities of different levels and scales. On the other hand, the creation of the Advisory Commission strengthened the coordination among all entities in the approval and revision process of the different scale instruments. Moreover, it

	ensures that all the competent entities know the environmental consequences of the plan implementation. This commission also follows the assessment processes, including environmental assessment.

Table B 44: Transformative elements related to the mitigation hierarchy for the Portuguese Legal Framework of Territorial Management Instruments.

Framework' Codes	Summarized Results
[V-MH-R] Vision – Mitigation Hierarchy- Restructuring	• Regional, sectoral, and special plans must include ways for down-scaling environmental protection policies and ecosystem validation in their principles.
[AIR-MH-R] Actions /Instruments /Regulations – Mitigation Hierarchy- Restructuring	• It is required for the areas for energetic and geological exploration to assess the minimization of environmental impacts. • In the case of other plans, environmental assessment is required in the circumstances in which the plan has significant effects on the natural environment.
[V-MH-P] Vision – Mitigation Hierarchy– Path-shifting	• Creating special and Sectorial plans justified by the need to protect and value areas of environmental interest could contribute to the first levels of the mitigation hierarchy.

Table B 45: Transformative elements related to spatial planning provision for different sectors for the Portuguese Legal Framework of Territorial Management Instruments.

Framework' Codes	Summarized Results
[V-Se-R] Vision – Spatial provision of different sectors - Restructuring	• The local plans (inter-municipal, municipal, urbanization, and detail plans) aim to regulate the land use and organize the activities in the territory. Among the classification, the rural soil includes land-use types of agroforestry, agrarian, energetic and geological exploration, and natural areas with cultural and landscape values.
[IB-Se-R] Information baseline – Spatial provision of different sectors - Restructuring	• The plans must include identifying and localizing areas of agricultural and forestry uses; agricultural reserve, ecological reserve; energetic exploration; industrial areas aligned with economic needs and environmental quality; and commercial and touristic areas aligned with labor needs and environmental quality. • Moreover, there is also a national system of information in which there is information about the planning process and results of all different scales.
[AIR-Se-R] Actions /Instruments /Regulations – Spatial provision of different sectors - Restructuring	• It created the possibility for more inter-municipal planning instruments, which is relevant for the problems of infrastructures, equipment, and urban areas that go

	beyond the limits of a municipality. This is also relevant for the management in rural areas such as agricultural areas, forests, natural areas, and areas of ecological value, among others. • Moreover, the Right to Participation in all stages of the planning process has strengthened issues of transparency and citizen involvement. • The plans must include information about land uses and restricted areas. • When it is required, the plan involves an environmental assessment and always uses a support document called the environmental report.
[AIR-Se-P] Actions /Instruments /Regulations – Spatial provision of different sectors - Path-shifting	• The preparation of State of Spatial Planning Reports by municipalities will now be mandatory every four years, to inform municipal decisions on plan revision and encourage organizations to monitor their policies and actions actively. This periodic monitoring is a new procedure that is more adaptative and enforces the governance process.
[AIR-Se-I] Actions /Instruments /Regulations – Spatial provision of different sectors - Innovation	• The figure of the "Plano de Pormenor de intervenção no espaço rústico" is created, which may be relevant for various types of interventions, including operations for the protection, enhancement, and requalification of the natural and cultural landscape. • It also develops new tools, such as land readjustment, to meet the Basic Law's design to address equity in the redistribution of benefits and burdens, which can potentially be used in favor of promoting Biodiversity.
[V-Se-M] Vision – Spatial provision of different sectors – Multiscale	• In different sections of the plans' principles and obligations, coordinating with plans from different scales and other sectoral requirements is necessary. There is also a hierarchical organization of the planning system in which the vision of the plans must include any modification of a wider-level plan. Therefore, the vision of the different plans incorporates the articulation with other plans and sectors. The quantity of codes in this category shows the relevance of multiscale in this legislation.
[IB-Se-M] Information Baseline – Spatial provision of different sectors – Multiscale	• The different plans must include a report showing the relation with different scale plans to ensure coherence in the territorial model of urban development and the valorization of environmental values. In this sense, the entities influencing the plan must create permanent information procedures to improve articulation.
[AIR-Se-M] Actions /Instruments	• The legislation provides different norms and procedures for each plan to ensure accurate coordination among all scales

/Regulations – Spatial provision of different sectors - Multiscale	and sectors. Any change affecting other scale plans must be updated in a restricted period.
[AIR-Se-PO] Actions /Instruments /Regulations – Spatial provision of different sectors – Phasing out	• In this legislation it was eliminated the old type of land-use noun as "urbanizable" that should be now replaced by "urban areas". This classification was previously used for classifying areas that were not urban, but could be susceptible to be reclassified as urban and it allowed easily building rights in the surroundings of the city, where this land-use type was present, causing the emergence of large urban growth boundaries and favouring urban sprawl. This alteration was also accompanied by the Municipalities' obligation to undertake, in future reviews of municipal plans, the programming of their investments in general infrastructures in these "Urban Areas". The result was the shrinking of many of these "Urban Areas" (now classified as such) to more reasonable urban perimeters (urban growth boundaries). The result was somewhat successful in controlling real estate speculation and, above all, in reducing urban dispersion within these areas of urban growth, with indirect effects on the conservation of Biodiversity and ecological values of those areas.

Table B 46: Transformative elements related to biodiversity and ES for the Portuguese Legal Framework of Territorial Management Instruments.

Framework' Codes	Summarized Results
[AIR-BES-R] Actions /Instruments /Regulations – Biodiversity & ES - Restructuring	• Regional environmental studies and environmental assessment studies are required to be used and included.
[AIR-BES-P] Actions /Instruments /Regulations – Biodiversity & ES - Path-shifting	• The inter-municipal and municipal plans must provide incentive mechanisms to pursue the conservation of nature and biodiversity, safeguarding the natural, cultural, and landscape heritage, and efficiency in the use of resources and energy efficiency.
[AIR-BES-M] Actions /Instruments /Regulations – Biodiversity & ES - Multiscale	• The National Commission of the Territory produces the guidelines for the National Ecological Reserve delimitation in coordination with different entities.

8.4.3. National Program of Territorial Planning Policy

The following tables illustrate the summarized results obtained from analyzing the National Program of Territorial Planning Policy. Specifically, Table B47 shows the transformative elements related to the governance of spatial planning systems, Table B48 those related to the mitigation hierarchy, Table B49 those related to the spatial planning provision for different sectors, and Table B50 those related to biodiversity and ES.

Table B 47: Transformative elements related to the governance of spatial planning systems for the National Program of Territorial Planning Policy.

Framework' Codes	Summarized Results
[V-G-R] Vision – Governance - Restructuring	• The Program advocates a multisectoral and multiscale governance system. • It encourages public-private partnerships in bottom-up governance processes. • The Program emphasizes the importance of decentralizing public decisions. • It underscores the need for locally and regionally-based solutions to address challenges related to cohesion, competitiveness, and sustainable development.
[S-G-R] Strategy – Governance - Restructuring	• The Program highlights the importance of understanding the social and economic benefits of ecosystems. • It emphasizes the role of spatial planning in promoting technical and scientific knowledge. • The Program encourages greater collective awareness of the social and economic value of ecosystems and their services.
[V-G-P] Vision – Governance – Path-shifting	• The Program highlights the importance of incorporating a territorial dimension into public policies. • It emphasizes the need to align strategies and operational programming with the post-2020 funding cycle. • The Program is grounded in regional policy (Cohesion Policy) and aligns with global policy frameworks like the Paris Agreement and Agenda 2030. • It develops the principle of territorial cohesion, suggesting the idea of combining soft and hard planning within a framework of partnerships and instruments, that are not necessarily dependent on the historical approach within the planning system.
[S-G-P] Strategy – Governance – Path-shifting	• The Program underscores the significance of new technologies in enhancing cities. • It aims to raise ecological awareness among citizens and promote innovative governance structures. • The Program suggests the implementation of policy measures to train and engage spatial planning institutions.

	• It calls for the establishment of cooperation platforms and communication with public administration. • A territorial-based approach is advocated as a catalyst for transformative change. This approach aims to foster synergies and cultivate a new territorial culture involving both public and private entities.
[IB-G-P] Information Baseline – Governance – Path-shifting	• The Program is founded on the principle of enhancing polycentrism nationally. • It emphasizes the need to foster inter-urban and rural-urban partnerships. • The Program encourages the development of new forms of territorial governance. • It stimulates new formats of territorial governance aiming to strengthen environmental, economic and social complementarities towards sustainable development.
[V-G-I] Vision – Governance – Innovation	• The Program underlines the importance of new functional and proactive alliances with flexible governance geographies between public actors and civil society, particularly in the case of river basins, classified areas, green and blue infrastructures and functional urban regions.
[S-G-I] Strategy – Governance – Innovation	• The Program proposes the adoption of more experimental methodologies, based on "learning by doing" processes, new tools and methodologies (design thinking, pro-totyping, scenarization, service design, among others). • The Program advocates for the creation of spaces and opportunities for dialogue and the co-creation of new approaches.
[V-G-M] Vision – Governance – Multiscale	• Responsibility for implementing policy measures lies with the government, autonomous regions, inter-municipal entities, and local authorities. It serves as a reference framework for other programs and territorial plans and guides strategies with territorial impact. • The Program emphasizes that biodiversity, the ecosystems that support it, and the soil and water resources are crucial strategic assets for territorial cohesion at national and regional levels. • To achieve effective, efficient and transparent territorial governance, it encourages intersectoral and multilevel cooperation, collaboration through territorially based networks, and increasing territorial culture.
[S-G-M] Strategy – Governance – Multiscale	• Regarding the planning system, the Program constitutes the national territorial reference for all regional and municipal spatial planning instruments and for defining

	sectorial strategies and socioeconomic development with expression in the territory. • It defends the creation of partnerships, networks and regional and sub-regional alliances, both at institutional, community and business levels, to reach consensus on strategies and monitor their implementation.
[S-G-PO] Strategy – Governance – Phasing out	• The Program recognizes the need for a new approach to governance processes. • Its goal is to improve territorial and spatial planning cultures by promoting education, information, values, and behaviours through awareness campaigns. • It intends to phase out the outdated approach that relied on strict institutional channels and limited levels of administration involvement.

Table B 48: Transformative elements related to the mitigation hierarchy for the National Program of Territorial Planning Policy.

Framework' Codes	Summarized Results
[V-MH-R] Vision – Mitigation Hierarchy- Restructuring	• The Program considers that Portugal should be more prepared for extreme events, where the risks could be increased and costly both in urban areas (heat waves, floods, coastal erosion) and the rural regions (forest fires, loss of biodiversity, reduced agricultural productivity). • It claims for solutions to increase the resilience of natural, agricultural and forestry systems under the principles of sustainability and safeguarding landscape connectivity and food sovereignty.
[S-MH-R] Strategy – Mitigation Hierarchy- Restructuring	• The Program identifies a set of Critical Changes from trend scenarios in four major domains: environmental and climate; sociodemographic, technological, economic, and social. • It uses strategic foresight to anticipate the critical issues to be considered in designing the Territorial Challenges and the Territorial Model.
[IB-MH-R] Information baseline – Mitigation Hierarchy-Restructuring	• The Program considers knowledge about the environment, habitats, ecosystems and landscapes. • It recognizes that the contrasts between wet and dry regions will increase, as well as the frequency and intensity of extreme climate events with different impacts and consequences on biodiversity and its management.

[S-MH-I] Strategy – Mitigation Hierarchy– Innovation	• The plan was designed considering trend scenarios (i.e., without strong policy influence), an uncommon methodology in Portuguese spatial planning processes
[IB-MH-M] Information Baseline – Mitigation Hierarchy– Multiscale	• The spatialization of Natural Capital is a key aspect of the Program Territorial Model. It seeks to identify and map the primary occurrences of natural resources such as water, soil, and biodiversity on a national scale. This is done to highlight the critical natural resources necessary for ecosystem function, service quality, sustainability, and intergenerational equity. • By including this spatial data in the territorial model, the program aims to streamline the integration of biodiversity-related policies across different levels and sectors.
[S-MH-PO] Strategy – Mitigation Hierarchy– Phasing out	• Recognising that global warming and awareness of the importance of protecting the environment and biodiversity are creating a new ecological awareness, the plan discusses current socio-economic models, welfare standards, social injustice and insufficient environmental and economic resilience

Table B 49: Transformative elements related to spatial planning provision for different sectors for the National Program of Territorial Planning Policy.

Framework' Codes	Summarized Results
[V-Se-R] Vision – Spatial provision of different sectors - Restructuring	• The Program aims to enhance spatial planning to mitigate risks and enhance adaptive capacity, especially in the face of ongoing trends. Examples cited include urbanization along coastlines and floodplains, economic forces favouring monoculture land use, and developments that devalue territorial assets and lead to population abandonment. • It also refers to the intense use of water resources and conflicts in natural areas relevant to conservation and biodiversity to envisage policy measures and strategies.
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• The Program defines a Territorial Model that is assumed as a commitment to the organisation of the territory by subsystems, proposing, in this context, a Natural System which reflects the key natural resources and territorial diversity
[IB-Se-R] Information baseline – Spatial provision of different sectors - Restructuring	• The Program identifies and spatialises, on a national scale, the significant occurrences of natural resources — water, soil and biodiversity — as key for the proper functioning of

	ecosystems and as the ground for developing the territorial model (Natural System).
[S-Se-P] Strategy – Spatial provision of different sectors – Path-shifting	• The Program defines strategies and measures with a direct implication for biodiversity, such as preserving soils of high ecological value, counteracting and reversing situations of soil degradation, halting its artificialisation, promoting agricultural, forestry and pastoral use, increasing carbon sink, etc. • It also defines as strategic goals the recovery of environmental liabilities (e.g., former industrial or mining areas), reuse or (re)naturalisation and mitigating their ecological effects. • It presents policy measures to curb the fragmentation of property, especially in territories where small property predominates. • It points out the need for the phased implementation of a cadastral information system to fill in the deficits in real estate knowledge in rural areas. • It considers that territories of forest land use are to be valued as assets that - in addition to the production function - can perform other structuring functions, such as habitats and carbon sinks.
[S-Se-I] Strategy – Spatial provision of different sectors – Innovation	• The Program highlights that green infrastructures would be critical elements in the organisation of the territory, promoting economic activities that generate jobs around the protection of biodiversity and sustainable use. • The Program proposes a framework for enhancing socioeconomic development by integrating ecosystem services into economic value chains and a system for redistributing wealth between territories favouring those that provide more services. • The Program suggests incorporating eligibility and priority criteria into financing mechanisms for agriculture, forestry, nature conservation, and infrastructure projects that enhance landscape quality. To this end, it highlights the need for further research and development of economic valuation methods for ecosystem services.
[S-Se-M] Strategy – Spatial provision of different sectors – Multiscale	• The Program defines an ecological connectivity scheme that is the macro basis of the national green infrastructure. • It points out that this connectivity network must be developed and detailed in the most appropriate planning and policy instruments, allowing articulation with the "Regional Structures for Environmental Protection and Enhancement" (at the regional level) and with the" Municipal Ecological Structures" (at the municipal level).

	• It also states such adaptations must be sensitive to the aims of the National Ecological Reserve (REN) and the national network of classified areas regarding their nature and biodiversity conservation goals.
[IB-Se-M] Information Baseline – Spatial provision of different sectors – Multiscale	• The Program considers the soil as an essential component of ecosystems, assuming functions supporting biodiversity and producing primary goods. • It identifies the connectivity networks established through the hydrographic network, national and international rivers, the primary headwaters of water lines, the coastal system and the network of protected areas as fundamental ecological corridors for biodiversity and national competitiveness. • It highlights the need for more knowledge and assessment of ecosystem status along planning scales.

Table B 50: Transformative elements related to biodiversity and ES for the National Program of Territorial Planning Policy.

Framework' Codes	Summarized Results
[V-BES-R] Vision – Biodiversity & ES - Restructuring	• The Program assumes that in a global and systemic view, social well-being and economic growth depend on natural capital, in its various forms, from abiotic resources, species and habitats, ecosystems and landscapes, and their services (i.e., support, provisioning, regulatory and cultural). • It points to the maintenance and recovery of the functionality of ecosystems through the sustainable and efficient use of resources by society and the economy.
[V-BES-P] Vision – Biodiversity & ES – Path-shifting	• The Program states that natural capital should be seen as a differentiating factor that enhances territories and, consequently, as a balancing factor in Portugal's wealth distribution. • It states that the conservation and enhancement of biodiversity are not restricted to natural conservation areas (which are already classified) but are thus extended to the entire territory.
[S-BES-P] Strategy – Biodiversity & ES – Path-shifting	• The Program thinks that conservation and enhancement of biodiversity are not restricted to natural conservation areas (which are already classified) but are thus extended to the entire territory. • It proposes that such a vision can be carried out using existing regimes and concepts such as the Fundamental

	Nature Conservation Network, the National Ecological Reserve, the National Agricultural Reserve and the Water Domain. These are consolidated and structured regimes that provide numerous ecosystem services (i.e., regulation and maintenance, provisioning and cultural) that must be considered
[IB-BES-P] Information Baseline – Biodiversity & ES – Path-shifting	• The Program assumes the "soil" as a critical factor both in its pedological valences and in the primary productive potential regarding the ecological processes that support biodiversity, the biogeochemical cycles such as those of water, carbon, nitrogen and organic matter. • It makes a spatial representation of high and very high-value soils as a basis for developing the territorial model. • It also refers to the hydrographic network and the national system of areas classified as "essential elements for the circulation and interconnection of flows of materials, energy and the provision of ecosystem services that benefit people and biodiversity"
[S-BES-I] Strategy – Biodiversity & ES – Innovation	• The Program claims for more and better articulation between urban and rural areas, explicitly acting in value chains taking into account the demand and supply of ecosystem services, namely within the food system, the labour market, the flows of people and goods, networks information and investment services, water, energy and waste networks, as well as services in the areas of tourism, leisure and well-being.
[AIR-BES-I] Actions /Instruments /Regulations – Biodiversity & ES - Innovation	• Some operational goals among policy measures include fostering partnerships and contracts to supply agricultural and forestry ecosystem services. • One of the expected effects for future monitoring of the Program implementation is the "integration of ecosystems and ecosystem services in planning and management instruments territorial.
[S-BES-M] Strategy – Biodiversity & ES – Multiscale	• One policy measure proposed by the Program is for the central administration to anticipate factors that favour territories with more significant natural capital and to reflect this in money transfers from the state budget to municipalities.
[AIR-BES-M] Actions /Instruments /Regulations – Biodiversity & ES - Multiscale	• The Program offers guidelines for implementing policy measures through the planning system. • One of the guidelines at the municipal scale (Municipal Master Plan) is to develop approaches to assess the sustainability of projects in order to guarantee the safeguarding and enhancement of natural resources and

	values (water, soil and biodiversity), the creation of ecological structures and green infrastructure, nature conservation and landscape enhancement, and in particular, mechanisms for valuing ecosystem services.

8.4.4. Regional Program of the Lisbon Metropolitan Area

The following tables illustrate the summarized results obtained from analyzing the Regional Program of the Lisbon Metropolitan Area. Specifically, Table B51 shows the transformative elements related to the governance of spatial planning systems, Table B52 those related to the mitigation hierarchy, Table B53 those related to the spatial planning provision for different sectors, and Table B54 those related to biodiversity and ES.

Table B 51: Transformative elements related to the governance of spatial planning systems for the Regional Program of the Lisbon Metropolitan Area.

Framework' Codes	Summarized Results
[S-G-M] Strategy – Governance – Multiscale	• The Regional Program of the Lisbon Metropolitan Area operates within a multilevel governance framework. It integrates options from the National Spatial Planning Policy Program and sector-specific plans. • The program provides guidelines that direct central and local administration services and influence municipal-level planning instruments. • Since 2002, the presence of the Regional Program has compelled municipalities within its influence area to revise their spatial plans. This revision ensures alignment with the strategic options, guidelines, and determinations of the regional planning scale.
[IB-G-M] Information Baseline – Governance – Multiscale	• The plan underwent a multi-year discussion involving public and private stakeholders. • Regular meetings were conducted with local authorities and accompanying entities. • Presentation sessions were held for municipalities and professional associations. • Recommendations from these discussions were integrated into the plan and a public discussion period was included as required by law. • The plan was made available for online consultation, receiving contributions from citizens. It serves as an informative guide for territorial planning decisions at both metropolitan and local levels.

Table B 52: Transformative elements related to the mitigation hierarchy for the Regional Program of the Lisbon Metropolitan Area.

Framework' Codes	Summarized Results
[V-MH-R] Vision – Mitigation Hierarchy- Restructuring	• The Program considers water as a central factor in the development of the metropolitan area, especially due to the size of the Tagus and Sado estuaries, but also the extension of the coastline, and the set of streams and underground resources. • Because he considers that these are strategic values that must be protected, it mentions that the interventions must preserve and maintain the streams in their natural state.
[S-MH-R] Strategy – Mitigation Hierarchy- Restructuring	• The territorial model explicitly refers to the Metropolitan Ecological System as a central goal in implementing its vision, where ecological corridors are a core feature. • This implies reorienting urban development, promoting environmental sanitation, and ensuring sustainability through protection measures and valuing natural spaces (including agricultural and forest areas). • It also implies stabilizing and modernizing the environmental sanitation systems and promoting the dynamics of natural spaces while ensuring environmental sustainability, which impacts on biodiversity.
[IB-MH-R] Information baseline – Mitigation Hierarchy- Restructuring	• The Program refers to some critical areas for maintaining biological diversity and the soil's water purification capacity, identifying and diagnosing problems and their origin. • The Program highlights environmental and landscape degradation due to unplanned land occupation. • Baseline information is derived from recognizing the agricultural and ecological significance of specific areas. • Examples include the northern and southern regions of Lisbon, the marginal lands of the Sado River, the Arrábida Natural Park, and the Sado Estuary Nature Reserve.
[AIR-MH-R] Actions /Instruments /Regulations – Mitigation Hierarchy- Restructuring	• The normative guidelines of the Program adopt as a principle that the Metropolitan Area of Lisbon coastal zone is an area subjected to integrated management through a dynamic, continuous and interactive process that harmonizes environmental values with economic and social ones
[S-MH-M] Strategy – Mitigation Hierarchy– Multiscale	• The Program provides guidelines for reducing environmental liabilities through the continued and

	coherent implementation of policies, measures, and actions that favour sustainable development. • Municipal planning instruments must implement these guidelines. • Such regional guidelines aim to ensure that local administration execute them or take part in their implementation.
[AIR-MH-M] Actions /Instruments /Regulations – Mitigation Hierarchy- Multiscale	• The Program states that the central administration services must map the risk areas to be subject to specific measures within the scope of the municipal plans and projects so that they determine the prohibition of construction in these areas. • The plan's guidelines for municipal management of environmental assets cover various topics. These topics include safeguarding peri-urban land for agriculture and forestry, managing water resources, and ensuring the relief and decompression of the urban system. • Specific attention is given to preserving the metropolitan ecological structure (REM) and avoiding uses that disrupt natural systems.

Table B 53: Transformative elements related to spatial planning provision for different sectors for the Regional Program of the Lisbon Metropolitan Area.

Framework' Codes	Summarized Results
[V-Se-R] Vision – Spatial provision of different sectors - Restructuring	• The Regional Program of the Lisbon Metropolitan Area aims for harmonious and sustainable development. It integrates social, environmental, and cultural factors to improve citizens' quality of life. • Strategic goals include affirming Lisbon as an excellent region for living, working, and visiting. • There is an emphasis on investing in social, territorial, urban, and environmental quality. • Enhancing environmental conditions in the area is a priority, utilizing classified areas, agricultural and forestry areas, and natural conditions for development and competitiveness.
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• About the metropolitan ecological system, the Program highlights as fundamental elements the "primary structuring areas" and the "primary structuring corridors and connections" in articulation and complements with the "structuring agroforestry areas".

	• The Program emphasizes the importance of maintaining agriculture and forestry for landscape preservation and tourism attraction. • It proposes a polynuclear structure with urban area discontinuity to safeguard the metropolitan ecological structure and improve the overall landscape and environmental sustainability of the Lisbon Metropolitan Area.
[AIR-Se-R] Actions /Instruments /Regulations – Spatial provision of different sectors - Restructuring	• The Program refers that Implementing the Metropolitan Ecologic Structure must be carried out in municipal spatial planning, urban regeneration and urbanisation processes and be supported by support for projects, actions and works that fulfil and materialise their objectives. • To this end, the Program refers that the Administration needs to intervene in the land market, whenever necessary, to prevent allocation errors to uses incompatible or unsuited to the characteristics of vital areas or areas and structuring ecological corridors.
[V-Se-P] Vision – Spatial provision of different sectors – Path-shifting	• The Program signals that more significant investment is needed to improve the quality of life of populations, with a particular focus on creating public spaces, and urban green spaces, particularly in suburban areas or less-qualified areas in the region.
[S-Se-P] Strategy – Spatial provision of different sectors – Path-shifting	• The program aims to safeguard and enhance the region's ecological system. This involves reorienting urban development away from the centre, coastlines, and estuaries, the modernization of environmental sanitation systems and promoting the stability and dynamics of natural and agroforestry spaces. • Ensuring ecological sustainability is a key goal. • Several measures are defined to protect and enhance these areas.
[AIR-Se-P] Actions /Instruments /Regulations – Spatial provision of different sectors - Path-shifting	• The plan encourages municipalities to acquire areas required for the Metropolitan Ecologic Structure. These areas can become part of municipal heritage. • The aim is to ensure their public use through acquisition or agreements with owners. These actions should help address border and termination issues between urban areas and facilities for structural coherence.
[V-Se-M] Vision – Spatial provision of different sectors – Multiscale	• The Program signals that municipal spatial planning instruments must change towards searching and creating opportunities for more qualified, environmentally more effective, and sustainable urban spaces.

[S-Se-M] Strategy – Spatial provision of different sectors – Multiscale	• The Program outlines strategic options for developing the Lisbon Metropolitan Area. It creates a territorial model with regional-level systems, networks, and connections. • The Plan defines guiding norms for central and municipal administration decisions and planning instruments. • It serves as a reference for Municipal Master Plans, including a macro program for implementation through action identification and investments.
[IB-Se-M] Information Baseline – Spatial provision of different sectors – Multiscale	• The Program addresses municipal-level ecological network treatment. Examples include conflicts from unregulated occupation in Setúbal peninsula affecting aquifer preservation. It highlights preserving Azeitão's agricultural area with its heritage and unique landscape. • The Program emphasizes conserving the North Interior with its distinct agricultural and forestry configuration. It recognizes Tapada de Mafra as a key part of the metropolitan ecological system. • The Program underscores the importance of ecological connectivity between estuaries through municipal green structures.
[AIR-Se-M] Actions /Instruments /Regulations – Spatial provision of different sectors - Multiscale	• The Program established a set of "General Norms", "General principles", "Criteria for application of the plan", and "guiding norms" to which public entities are bound to. • By defining specific norms, the Program linked the municipalities to the defined strategy, referring that this must be pursued by the municipalities covered by the Plan through a land policy that enables to control of urban fragmentation and supports the prioritization of its expansion. • The Program also states that municipalities must safeguard soils with greater productive capacity for agriculture, production, and protection forests, and critical soils for recharging underground aquifers, controlling floods, and maintaining wetlands."

Table B 54: Transformative elements related to biodiversity and ES for the Regional Program of the Lisbon Metropolitan Area.

Framework' Codes	Summarized Results
[V-BES-R] Vision – Biodiversity & ES - Restructuring	• The Program explains that it aims to safeguard the metropolitan ecological structure to integrate this area's most significant natural values that perform essential

	ecological functions for the balanced functioning of the metropolitan urban system.
[S-BES-R] Strategy – Biodiversity & ES - Restructuring	• The Program emphasizes the importance of the metropolitan structure for environmental protection and enhancement. • This structure comprises natural, agricultural, and forestry areas, as well as the metropolitan ecological structure. • Its purpose is to maintain the region's biophysical balance, preserve and enhance natural ecosystems, and frame and enhance urban areas.
[IB-BES-R] Information baseline – Biodiversity & ES - Restructuring	• The program acknowledges the ecological importance of Arrábida/Espichel/Matas de Sesimbra units in the Setúbal peninsulas' southwest. These units encompass diverse natural elements such as cliffs, marine areas, beaches, maquis, garrigues, pastures, forests, and agricultural zones. The Serra de Sintra unit, a natural park, is recognized for its geological, geomorphological, floristic, and faunistic values. • The Program identifies and highlights areas with protection status, including protected areas, SPAs, RAMSAR sites, CORINE Biotope, and other classified areas, adhering to both national legislation and community directives.
[AIR-BES-R] Actions /Instruments /Regulations – Biodiversity & ES - Restructuring	• The Program identifies primary structuring corridors within the Metropolitan Ecologic Structure as key areas for ecosystem exchanges. These corridors also serve as spaces for relieving and decompressing the urban system, facilitating the development of natural processes. • The Program emphasizes the importance of preserving the capacity of these areas to host migratory fauna, including endemic or endangered species, in accordance with the Birds and Habitats Directive.
[IB-BES-M] Information Baseline – Biodiversity & ES – Multiscale	• The Program acknowledges the significance of the Tagus and Sado estuaries at the metropolitan and national levels due to their substantial size, diverse ecosystems, and rich flora and fauna. These estuaries are particularly important in the metropolitan context, housing various classified ecosystems, including nature reserves and special protection zones for avifauna.
[AIR-BES-M] Actions /Instruments /Regulations – Biodiversity & ES - Multiscale	• The plan designates primary structuring corridors within the Metropolitan Ecologic Structure as essential for facilitating exchanges between ecosystems. These corridors play a crucial role in ensuring connectivity between ecological systems, particularly for fauna and the

	transfer of energy across various environmental systems, promoting overall consistency and sustainability.

8.4.5. Management Plan of the Arrábida Natural Park

The following tables show the summarized results of the analysis of the Management Plan of the Arrábida Natural Park. Specifically, Table B55 reports the transformative elements related to the governance of spatial planning systems, Table B56 does this for the mitigation hierarchy, Table B57 for the spatial planning provisions for different sectors, and Table B58 for biodiversity and ES.

Table B 55: Transformative elements related to the governance of spatial planning systems for the Management Plan of the Arrábida Natural Park.

Framework' Codes	Summarized Results
[S-G-R] Strategy – Governance - Restructuring	• The plan delineates its approach to public discourse concerning its goals and initiatives. • It underscores its commitment to disseminating information, promoting awareness and education, and fostering engagement from civil society to conserve natural heritage.
[AIR-G-R] Actions /Instruments /Regulations – Governance - Restructuring	• As per POPNA, the Arrábida Natural Park is collaborating with local farmers to establish agreements aimed at revitalizing traditional agricultural practices. • Efforts include endorsing product certification and spreading awareness about sustainable practices that safeguard the natural environment. • The park management assumes the responsibility of imparting information to farmers about alternative production methods, like organic farming and integrated pest management. • The objective is to minimize the reliance on chemical products and conserve the area's natural values.
[S-G-P] Strategy – Governance – Path-shifting	• After conducting the prescribed public discussion on its aims and measures, the plan asserts that it has effectively facilitated information dissemination, awareness-building, training, and active participation. • It emphasizes the mobilization of civil society to contribute to the preservation of the natural heritage.
[V-G-M] Vision – Governance – Multiscale	• The Plan's vision encompassed the active involvement of municipalities within the area (Palmela, Setúbal, and Sesimbra).

	• Other institutions of Central Administration, with both direct and indirect responsibilities in the intervention area, were included.
[S-G-M] Strategy – Governance – Multiscale	• The plan took into account input from various State bodies, including regional authorities CCDR LVT. • The aim was to ensure alignment of this plan with the objectives, principles, and regulations set forth by other territorial management instruments, notably municipal plans.

Table B 56: Transformative elements related to the mitigation hierarchy for the Management Plan of the Arrábida Natural Park

Framework' Codes	Summarized Results
[AIR-MH-R] Actions /Instruments /Regulations – Mitigation Hierarchy-Restructuring	• The plan designates different areas with distinct protection levels, determined by the significance of the existing biophysical values and their ecological vulnerability. • "Total protection" zones encompass spaces dominated by remarkable natural and landscape systems and values, including geological, landscape, and ecological formations. • These areas maintain a high level of naturalness and exhibit exceptional qualities, along with notable ecological sensitivity. • They encompass unique arboreal carrascal plant formations, regions with local and national floral endemism, and avifauna of special conservation importance. • Illustrative instances include Mata do Vidal, Mata do Solitário, Mata Coberta Nascente, Mata Coberta Poente, and the southern cliff of Cape Espichel.

Table B 57: Transformative elements related to spatial planning provision for different sectors for the Management Plan of the Arrábida Natural Park.

Framework' Codes	Summarized Results
[V-Se-R] Vision – Spatial provision of different sectors - Restructuring	• The plan's overarching vision aims to facilitate the organization and regulation of diverse activities, such as agro-forestry, fishing, urban development, industrial operations, recreation, and tourism. • This vision seeks to prevent the deterioration of the region's natural, semi-natural, and landscape attributes, along with aesthetic and cultural values.

	• The plan strives to enable the practice of compatible activities, including nature tourism, environmental education, and scientific research.
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• The plan articulates specific objectives with a positive impact on biodiversity. • These objectives encompass promoting the conservation of natural resources, safeguarding flora, fauna, marine and geological assets, and landscapes. • The plan seeks sustainable management and enhancement of natural resources, including marine resources, to uphold ecological systems, sustain life, and conserve biodiversity. • The preservation of the region's archaeological and historical heritage is prioritized. • The plan advocates for integrated architecture harmonizing with the landscape. • The plan contributes to regulating urban, industrial, recreational, and tourist activities to avert degradation of natural and cultural values, while fostering sustainable development and community well-being.
[AIR-Se-R] Actions /Instruments /Regulations – Spatial provision of different sectors - Restructuring	• The plan introduces protective measures for resources and natural assets. • It formulates usage and management regulations to ensure the preservation and improvement of natural and semi-natural landscapes, along with the biodiversity within the natural park region. • Within this framework, the plan outlines actionable initiatives to be promoted, specifies activities necessitating authorization, designates zones of total and partial protection, and establishes overarching principles for agricultural, pasture, and forest land use endeavors.
[AIR-Se-M] Actions /Instruments /Regulations – Spatial provision of different sectors - Multiscale	• The plan enforces various public utility restrictions, notably including the National Agricultural Reserve (RAN), National Ecological Reserve (REN), forestry regulations, fire-affected forest zones, extractive industry limitations, safeguarding of lighthouses, military servitude zones, protection of classified properties, preservation of archaeological heritage, trees of public interest, cork and holm oak protection, olive tree conservation, defence of the telecommunications network, water control, electricity network preservation, water catchment and distribution safeguarding, wastewater drainage network protection, National Road Plan 2000 adherence, and protection of geodesic landmarks.

Table B 58: Transformative elements related to biodiversity and ES for the Management Plan of the Arrábida Natural Park.

Framework' Codes	Summarized Results
[V-BES-R] Vision – Biodiversity & ES - Restructuring	• The plan's purpose is to protect and conserve the Arrábida mountain range. • The objective of the plan is the prevention of degradation from various factors. • The plan's goal is to utilise all available resources and potential.
[AIR-BES-R] Actions /Instruments /Regulations – Biodiversity & ES - Restructuring	• The plan maintains natural values and processes in Four 'Total protected areas'. • The plan conserves exceptional ecological examples in Four 'Total protected areas'. • The plan restricts human intervention to Four 'Total protected areas'. • Two areas are in the mountain, two at the mountain-ocean interface. • The plan considers contractual arrangements with private owners for nature conservation. • Restoration is required if values are lost to maintain protected status.
[S-BES-M] Strategy – Biodiversity & ES – Multiscale	• The plan provides the use of native hardwoods preferred for forest afforestation. • The plan promotes the conservation or creation of ecological corridors along water lines. Corridors consist of characteristic native vegetation. • The plan provides the creation or maintenance of discontinuity strips in composition, density, and forest structure. • The plan aims to boost biodiversity and prevent forest fires.

8.4.6. Municipal Master Plan of Setúbal

The summarized results of the content analysis of the Municipal Master Plan of Setúbal are presented in the tables below. Specifically, Table B59, B60, B61, and B62 contain the transformative elements related to the governance of spatial planning systems, the mitigation hierarchy, the spatial planning provisions for different sectors, and biodiversity and ES, respectively.

Table B 59: Transformative elements related to the governance of spatial planning systems for the Municipal Master Plan of Setúbal.

Framework' Codes	Summarized Results
[V-G-R] Vision – Governance - Restructuring	• Apart from established knowledge, two additional types of potential are emerging: environmental potential, comprising both active and potential resources, encompassing nearly two-thirds of the territory. This environmental potential represents an asset for the future requiring proper preservation. • Another facet of potential lies within primary activities, notably: agricultural pursuits, especially those stemming from viticulture; grazing livestock and associated by-products; fishing and aquaculture.
[IB-G-R] Information baseline – Governance - Restructuring	• The territorial management system is characterized by rigidity and sluggishness. This hampers the ability to promptly address territorial changes and dynamics.
[V-G-P] Vision – Governance – Path-shifting	• SETÚBAL serves as both a significant city in the Lisbon Metropolitan Area and the corresponding Municipality, extending beyond the city limits. • The overarching VISION entails transforming the Municipality into an advocate for Environmental Enhancement, capable of influencing the trajectory of tourism development. • The Municipality needs to position itself with a central focus primarily on the realm of entertainment, encompassing: sports activities such as nautical, diving, fishing, extreme sports, and equestrian pursuits; urban attractions including cultural events, thematic experiences, and nightlife offerings; environmental engagements like beach and water promenades, birdwatching, and pedestrian activities.
[S-G-P] Strategy – Governance – Path-shifting	• "Embrace the river" exemplifies a significant shift in approach. • This change is aimed at revitalizing port areas that had previously restricted the city's connection to the estuary. • The goal is to leverage the potential of the water plan and associated activities to benefit the local population
[S-G-I] Strategy – Governance – Innovation	• Setúbal historically thrived as a significant industrial and port city due to the Sado estuary. • The objective of "Ensuring a sustainable basis for conciliation between economic development and the

	preservation of the Municipality's natural/environmental values" represents an innovative strategy. • This strategy is a notable aspect of the planning process, explicitly outlined in General Objective OG5 of both the city planning process and the municipality.
[IB-G-I] Information Baseline – Governance – Innovation	• The developed methodology encompasses Risk Analysis. It entails diverse measures for risk prevention and mitigation. The outcome includes a multi-risk zoning map. This map identifies the most hazardous areas within each considered theme. An exception is the seismic hazard, which covers the entire emerged municipality territory.
[V-G-M] Vision – Governance – Multiscale	• The multi-scale approach leads to: increased stakeholder engagement and motivation; coordination with instruments at regional and national scales. The latter involves recognizing the Metropolitan Ecological Structure present in the AML regional PROT plan. The approach extends to implementing this structure within the municipality at a more detailed scale.
[S-G-M] Strategy – Governance – Multiscale	• PDM-Setúbal aligns with PROTAML guidelines, specifically those outlined in the Strategy for Environmental Sustainability and the EMPVA guidelines. • The implementation of the primary Network occurs within the municipality's territory. This implementation is achieved through the utilization of Classified Areas within the National Network of Protected Areas.
[AIR-G-M] Actions /Instruments /Regulations – Governance - Multiscale	• PDM-Setúbal aligns with PROTAML guidelines. • PDM-Setúbal adheres to the Strategy for Environmental Sustainability guidelines. • PDM-Setúbal follows the EMPVA (Environmental Monitoring and Assessment Strategy) guidelines. • The primary Network implementation occurs within the municipal territory. Implementation is achieved through the Classified Areas of the National Network of Protected Areas.
[V-G-PO] Vision – Governance – Phasing out	• The historical industrial focus, centered on heavy metalworking, fishing, and port industries, is transitioning. The new vision centers on "Valuing the cultural and environmental heritage of the Municipality." This shift aims to establish the heritage as a driver of local identity and engagement, fostering citizen participation and social inclusion. • The goal is to achieve a harmonious blend of tradition and modernity (General Objective 7).

	• The significant change isn't the abandonment of economic development, but its integration with the protection of environmental and cultural assets. • A governance model emphasizing involvement and motivation signals a desire to usher in a new era in the region's history.

Table B 60: Transformative elements related to the mitigation hierarchy for the Municipal Master Plan of Setúbal.

Framework' Codes	Summarized Results
[AIR-MH-R] Actions /Instruments /Regulations – Mitigation Hierarchy- Restructuring	• Amend the Setúbal Edification and Urban Development Regulation (REUMS) to set out minimum dimensions for sidewalks and cycle paths. • This aims to prevent inadequate sizing of public areas frequented by pedestrians. • This implements a program to enhance county beaches. • The program reconfigures access roads. • It organizes parking facilities. • It enhances conditions for adopting sustainable modes of transportation. • It establishes essential infrastructure. • It upgrades public spaces. • It provides necessary equipment and beach amenities. • It safeguards the existing elevated environmental values. • It fosters the establishment of the Sapadores de Setúbal Fire Company.
[V-MH-P] Vision – Mitigation Hierarchy– Path-shifting	• To realize the vision of an environmentally enhanced Municipality, a strategic axis is planned. • This axis focuses on: enhancing connectivity among natural systems, strengthening their integration with urban systems, decreasing natural, mixed, and technological risks, facilitating the rejuvenation of environmentally degraded areas, implementing a comprehensive strategy for climate change mitigation and adaptation. This aspiration signifies a notable shift in direction.
[AIR-MH-P] Actions /Instruments /Regulations – Mitigation Hierarchy- Path-shifting	• The EEM serves as a green infrastructure vital for territorial equilibrium, in conjunction with other networks and infrastructures. • New construction is conditioned to interstitial areas primarily earmarked for agricultural or forestry use. This strategy aims to curtail dispersed building phenomena. • Numerous mitigation measures are employed across various zones within the municipality: minimizing impacts

	on neighboring areas of higher ecological significance; enhancing the quality of built-up regions and potentially legalizing constructions with conditions that enhance the natural and scenic qualities of the region. • Specific studies are developed to structure and enhance areas with urban sprawl. The emphasis is placed on enhancing quality of life and the environment.
[AIR-MH-M] Actions /Instruments /Regulations – Mitigation Hierarchy- Multiscale	• The Municipal Plan was made for Adaptation to Climate Change. • This plan is aligned with the Metropolitan Plan for Adaptation to Climate Change. • It informs the municipal land use plans and introduces mechanisms to enhance territorial resilience. • The Setúbal EEM collaborates with the Metropolitan Ecological Network. This involves enhancing corridors and structuring primary and secondary areas. This collaboration is crucial on a municipal level to bolster ecological vitality.
[AIR-MH-PO] Actions /Instruments /Regulations – Mitigation Hierarchy– Phasing out	• The plan restores degraded or vacant spaces through renaturalization efforts. • The plan targets specific areas within the municipality for this restoration process.

Table B 61: Transformative elements related to spatial planning provision for different sectors f for the Municipal Master Plan of Setúbal.

Framework' Codes	Summarized Results
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• A distinct strategy is in place for the ecological restoration of the region. • This strategy centers on establishing: infrastructure like pathways and traditional moorings; facilities such as ecological shelters, picnic areas, lunch spots, traditional game spaces, and bird-watching spots; public amenities including informative signs and signals; activities like horseback riding and mountain biking to encourage nature exploration and leisure while adhering to specific boundaries. • This strategy aims to cultivate societal appreciation for nature and the environment, fostering a collective commitment to their preservation and safeguarding biodiversity.
[AIR-Se-R] Actions /Instruments	• Formulation of urban land use plans is planned for key urban and industrial clusters in alignment with the aim of greening these agglomerations. This approach presents an

/Regulations – Spatial provision of different sectors - Restructuring	avenue to create open spaces and integrate fresh urban initiatives like gardens and green parks. • Municipality's infrastructure investment recommendations encompass water supply, sanitation, and rainwater drainage areas. These initiatives involve multiple projects with indirect impacts on biodiversity. • Initiatives are scheduled to develop a "Pedestrian Action Plan," "Cycling Action Plan," and "Public Transport Action Plan" (sustainable mobility). • The anticipated outcome is an enhanced environmental quality, yielding indirect benefits for biodiversity. • Further measures entail reclassifying public spaces and enhancing road safety. • This includes decreasing traffic volumes and/or speeds, prioritizing active/light modes, enhancing road user experience, regulating parking, and implementing traffic calming measures like "zones 30." • This includes setting standards for sidewalks and cycle paths to counteract undersized public spaces, leading to environmental enhancement. • Regarding built-up areas, the PDMS aims to mitigate dispersed building (urban sprawl) and enhance the concentration and improvement of these zones through detailed studies and plans. • These efforts are envisioned to yield positive effects on promoting less artificialized spaces and biodiversity.
[AIR-Se-P] Actions /Instruments /Regulations – Spatial provision of different sectors - Path-shifting	• In Setúbal, the focus centers on revitalizing the city through several key strategies. • This encompasses the "requalification of the riverfront and the revitalization of the historic center." • It efforts also extend to improving buildings and public spaces. • The intention is to boost tourism, recreation, and leisure by harnessing natural resources, including Arrábida and the Sado Estuary. Additionally, cultural heritage will play a pivotal role. • A series of actions have been devised to achieve this: establishing the "Wake" green urban park, designed for sports activities like wakeboarding. • The park includes a designated area for preserving Nature and Biodiversity. • In rural areas, regulations are slated to limit construction in zones primarily used for agriculture or forestry.
[S-Se-I] Strategy – Spatial provision of different sectors – Innovation	• Policies concerning cultural and natural heritage have undergone a transformative progression.

	• This evolution encompasses a more comprehensive notion of heritage. Presently, the significance of protecting not only monumental heritage is acknowledged. • The recognition extends to encompass other essential facets for memory and collective identity preservation. This encompassing approach includes realms as varied as natural and landscape heritage, urban heritage, movable heritage, and even intangible heritage. • This innovation marks a notable shift in the planning process.
[AIR-Se-I] Actions /Instruments /Regulations – Spatial provision of different sectors - Innovation	• Introduction of innovative tools: municipal Emergency Plan, Tsunami Warning System. • The objective is to employ Environmental Management Plans in heavily industrialized zones like Mitrena. • This approach aims to foster comprehensive action within environmentally delicate regions.
[AIR-Se-PO] Actions /Instruments /Regulations – Spatial provision of different sectors – Phasing out	• Renaturalization of degraded or vacant spaces is embraced in certain Plan Execution units (UNOP).

Table B 62: Transformative elements related to biodiversity and ES for the Municipal Master Plan of Setúbal.

Framework' Codes	Summarized Results
[S-BES-R] Strategy – Biodiversity & ES - Restructuring	• Regarding Setúbal city, Strategic Axis 3 (EE3) explicitly outlines a strategy for the advancement of Cultural and Nature Tourism. • The goal of this axis is to stimulate tourism, recreation, and leisure activities. • This involves enriching the inherent natural and ecological assets, namely the Serra da Arrábida and Estuário do Sado. • It also involves safeguarding the coastline in collaboration with neighboring jurisdictions. • The strategy aims to remediate environmental liabilities and assure harmonious land use. • In rural areas, emphasis is placed on enhancing landscapes and existing agroforestry systems. • Special attention is given to areas populated by cork oak trees and the preservation of hydrographic networks and associated ecosystems. • Measures include the establishment of new nature spots or the regeneration of existing ones across multiple locations.
[IB-BES-R] Information baseline – Biodiversity & ES - Restructuring	• An extensive and satisfactory recognition and understanding of the quality and extent of natural and landscape resources is evident.

	• This recognition extends to the potential for primary sector growth, particularly in agriculture and winemaking, in collaboration with neighboring regions. • The proposal for a "Wake Park" in Setúbal city, designed for sports activities, including a designated space for nature and biodiversity conservation. • Establishment of Casa Verde - an Environmental Interpretation Center aimed at enriching the region. • Creation of the "Water Route," linking Setúbal city through a pedestrian pathway establish a route enriched with open green spaces, seating, and recreational zones. • The plan provides the expansion of the Municipal Network of Urban Gardens. • The plan provides the progression of the Municipal Afforestation Plan.
[AIR-BES-R] Actions /Instruments /Regulations – Biodiversity & ES - Restructuring	• In alignment with the objective of Environmental Enhancement, addressing areas lacking wastewater treatment and resolving issues in existing systems with positive environmental impacts is necessary. • The EEM comprises spatial systems with recreational, productive, and protective functions. • It recognizes territorial ecological systems, guiding sustainable land use and transformation to promote biodiversity, counteract climate change effects, minimize territorial risks, and ensure the enjoyment of natural, cultural, heritage, and scenic spaces through ecosystem services. • The EEM functions as a vital green infrastructure in harmony with other networks and infrastructures like roads, water supply, and electricity. • It collaborates with the REM, delineating corridors, structuring areas (primary and secondary), and crucial zones at the municipal scale. • Investment in green spaces encompassing recreation, leisure, and production includes various new green infrastructures to implement the EEM and enhance ecosystem services, such as Urban Green Parks and gardens like Varzea, Quinta da Amizade, Xaraz, and Forte Velho/Viso. • A dedicated Action Program for the Environment is in place, along with numerous projects to improve urban public spaces and create reference green zones for recreation and leisure. • Initiatives involve tree planting on urban lands and implementing the EEM, as well as defining a UEE - Urban Ecological Structure for the city.

	• The PDMS proposes novel structures and mechanisms for optimizing waste collection and treatment: including new waste reception centers, recovering green waste, introducing door-to-door selective collection of biodegradable urban waste, establishing home composting systems for green waste, expanding areas served by deep urban waste disposal systems (buried or semi-buried). • These initiatives will indirectly impact Biodiversity and ecosystem preservation.
[S-BES-P] Strategy – Biodiversity & ES – Path-shifting	• The plan introduces the EEM - Municipal Ecological Structure, and UEE - Urban Ecological Structure. • These structures aim to preserve existing natural values, including cork tree areas and watercourses. • They involve establishing public green spaces for communal use. • A key element is the inclusion of tree buffers along the current railway network. • The purpose of these buffers is to reduce noise levels in established built-up areas and present new concepts.
[IB-BES-P] Information Baseline – Biodiversity & ES – Path-shifting	• Environmental liabilities, particularly concerning aquifer pollution, are acknowledged, with a goal of rectification. • The land use occupation and transformation are subject to administrative easements or public utility restrictions. • This culminates in producing a "plan (or map) of constraints" explicitly showcasing the various concerns linked to environmental value and Biodiversity preservation.
[AIR-BES-P] Actions /Instruments /Regulations – Biodiversity & ES - Path-shifting	• The EEM (Municipal Ecologic Structure) holds strong importance due to ecosystem services from green and blue areas. These areas offer benefits like thermal comfort, CO_2 reduction, and water reserve maintenance. • The plan acknowledges EEM's role in preserving ecological corridors. EEM's ecological nature aids in mitigating urban climate change impacts by conserving ecosystems and biodiversity. • These areas value ecosystems and biodiversity by providing multiple benefits. • The new EEM facilitates Green Spaces for Recreation and Leisure, enhancing natural values and creating relief zones in urban areas. • In non-urban rural zones, zoning includes "Natural and Landscape Spaces" usage category. • These areas are of high natural value or transposed from the "Natura 2000" Plan, with stringent usage restrictions.

	• This category is essential for nature, biodiversity, and landscape conservation, excluding agricultural, forestry, or geological exploitation.
[S-BES-I] Strategy – Biodiversity & ES – Innovation	• For Setúbal city, both a Strategic Plan and a Master Plan were formulated. • These plans aim to establish a development model that incorporates principles of sustainable urbanism. • This approach seeks to actualize a strategic vision by encompassing its form, land use and functions model, and a series of pivotal guiding principles. These principles include multifunctional density, proximity, flexibility, adaptability, and sustainable mobility.
[IB-BES-I] Information Baseline – Biodiversity & ES – Innovation	• An upcoming addition is the introduction of a Municipal Plan of Tree Planting. • Similar to many municipalities in Portugal, the execution of the Municipal Plan for Adaptation to Climate Change is underway. • Additionally, there are intentions to establish an Environmental Interpretation Center dedicated to Cork Oak and MONTADO ecosystems.
[AIR-BES-I] Actions /Instruments /Regulations – Biodiversity & ES - Innovation	• The initiative is expanding the Municipal Network of Urban Green Parks and Gardens. • The initiative is constructing a Green Viaduct / Ecological Overpass across A12 highway (Setúbal city entrance). • The initiative is implementing roofs and green walls on municipal public buildings. • The upcoming Green Urban Park of Várzea ("Parque Urbano da Várzea") is anticipated to be the country's largest urban park (about 19 hectares). • It will offer diverse recreational and leisure amenities, along with rainwater retention basins to mitigate urban flooding in Setúbal city. • If necessary, the restoration of dunes and degraded vegetation areas is planned. • In specific instances, the classification of "Sensitive Zone" is assigned to Natural and Landscape Spaces within the POPNA and PORNES Area. • This approach appears to signify a gradual transition from the old to a new system. • It establishes rigorous rules to constrain land use transformation while introducing explicit recovery measures. • Ambitious actions, such as the Várzea Urban Green Park, exemplify the energetic direction of these efforts.

[AIR-BES-M] Actions /Instruments /Regulations – Biodiversity & ES - Multiscale	• During the formulation of the PDMS proposal, a crucial aspect was the seamless integration and technical correlation between municipal planning and special regulations emanating from central administrative special plans. • The following special plans are currently in effect: POPNA (Plan for the Arrábida Natural Park) (RCM n.º 141/2005, of 23 August), PORNES (Plan for the Natural Reserve of the Sado Estuary) (RCM 182/2008, of 24 November), POOCSS (Sintra-Sado Coastal Plan) (RCM n.º 86/2003 of June 25). • A comprehensive analysis conducted during the PDMS revision disclosed the need for minor adjustments to the existing special regulations at the municipal level. • Consequently, the CMS intends to request the PDMS's endorsement following procedures outlined in the RJIGT. • This indicates a productive synergy between national/regional interests and municipal interests. • It exemplifies the capacity to find common ground in matters concerning natural areas, environmental values, and Biodiversity, as addressed in these special plans - POOCSS, PORNES, POPNA.
[AIR-BES-PO] Actions /Instruments /Regulations – Biodiversity & ES – Phasing out	• Restoration of dunes and degraded vegetation areas is planned when required. • Efforts include addressing illegal deposits of various materials on the surface and subsurface, along with scrap removal. • The objective is to mitigate risks and minimize soil and aquifer contamination.

8.5. Scotland

8.5.1. National Planning Framework

This section reports the transformative elements identified for the National Planning Framework of Scotland in the following tables. Specifically, Tables B63, B64, B65, and B66 illustrated the summarized results related to the governance of spatial planning systems, the mitigation hierarchy, the spatial planning provision for different sectors, and biodiversity and ES, respectively.

Table B 63: Transformative elements related to the governance of spatial planning systems for the National Planning Framework.

Framework' Codes	Summarized Results
[V-G-R] Vision – Governance - Restructuring	• Scotland can make a significant contribution to achieving its net zero and nature-positive goals by effectively managing its natural assets.

	• A coherent strategy prioritizing climate change and addressing pandemic challenges will lead to positive changes, reducing inequalities and promoting a greener future. Embracing radical change is crucial to address climate change, restore biodiversity, enhance health and wellbeing, and foster a well-being economy. • The vision for Scotland includes a prosperous country with opportunities for all through sustainable economic growth, emphasizing kindness, dignity, and compassion. • The goal is to build a globally competitive, inclusive, and sustainable economy, addressing poverty by sharing opportunities and power equally. • The focus is on empowered, resilient, and safe communities with quality jobs and fair work, while valuing and protecting the environment. • Scotland also celebrates its creativity and diverse cultures, making positive contributions internationally.
[S-G-R] Strategy – Governance - Restructuring	• Public participation is essential, and everyone should have the opportunity to contribute to shaping their local neighbourhoods through the planning system. • Local Development Plans (LDPs) must have a spatial strategy to reduce, minimise, or avoid greenhouse gas emissions. The six spatial principles serve as the foundation of this strategy, guiding development towards sustainable locations. • The spatial strategy should consider the potential impacts of proposed projects on greenhouse gas emissions. • LDPs should also support adaptation to climate change's current and future effects; it includes assessing climate risks, avoiding development in vulnerable areas, and facilitating measures for adapting to climate-related challenges.
[IB-G-R] Information baseline – Governance - Restructuring	• For the first time, the plan has integrated a long-term spatial strategy and a comprehensive set of national planning policies to create a statutory development plan.
[AIR-G-R] Actions /Instruments /Regulations – Governance - Restructuring	• The plan defines the Clyde Mission: a comprehensive initiative that unites significant public and private funding to rehabilitate and revitalize brownfield areas along the River Clyde. The aim is to transform these lands, with a focus on fostering economic growth, enhancing social well-being, and promoting environmental sustainability.
[V-G-P] Vision – Governance – Path-shifting	• The strategy aims to improve people's lives by creating sustainable, liveable, and productive places. It aligns with the United Nations Sustainable Development Goals and national outcomes.

	• The planning system will be fairer and more inclusive, allowing everyone to shape their future. • The commitment to a just transition ensures that the journey to net zero and nature recovery includes and benefits everyone. This part of the plan Scotland aims to contribute significantly to the country's net zero and nature-positive goals by managing natural assets sustainably. • The policy intends to promote development that addresses the global climate emergency and nature crisis. • Radical change is necessary to tackle climate change, restore biodiversity, improve health, reduce inequalities, and create thriving communities.
[S-G-P] Strategy – Governance – Path-shifting	• Local communities will be allowed to participate and shape their neighbourhoods through the planning system. • Local Development Plans (LDPs) should have a spatial strategy to reduce, minimize, or avoid greenhouse gas emissions based on the six spatial principles for sustainable locations. • LDPs should consider and support adaptation to climate change, identifying climate risks and guiding development away from vulnerable areas while enabling adaptation measures. • Development proposals for national or significant projects should demonstrate conservation, restoration, and enhancement of biodiversity, including nature networks, with unacceptable impacts on the natural environment will not be supported and enhance, expand, and improve woodland and tree cover will be supported. • Proposals likely to affect existing or proposed European sites (Special Areas of Conservation or Special Protection Areas) must undergo an "appropriate assessment" of their implications for conservation objectives. • The biodiversity value of naturalized brownfield land should be considered when determining the sustainability of its reuse.
[IB-G-P] Information Baseline – Governance – Path-shifting	• The plan has brought together a long-term spatial strategy with a comprehensive set of national planning policies to form part of the statutory development plan for the first time.
[AIR-G-P] Actions /Instruments /Regulations – Governance - Path-shifting	• In the plan is defined the Clyde Mission, that brings together substantial public and private investment to remediate and regenerate brownfield land along the River Clyde for economic, social and environmental uses.

[V-G-I] Vision – Governance – Innovation	• The strategy sets out how we will work together in the coming years to improve people's lives by making sustainable, liveable and productive places; this will play a key role in delivering on the United Nations Sustainable Development Goals and national outcomes.
[S-G-I] Strategy – Governance – Innovation	• Development proposals for new commercial peat extraction, including extensions to existing sites, will only be supported if the extracted peat supports the Scottish whisky industry. • Green belts should be identified or reviewed during Local Development Plans (LDPs) preparation. • Changes to the green belt boundary may accommodate planned growth, extend, or alter the area covered as green belt, but such changes should be based on evidence and identified in plans. There is Scotland's Climate Change Plan.
[AIR-G-I] Actions /Instruments /Regulations – Governance - Innovation	• Eighteen national developments support the plan's strategy, including single large-scale projects and networks of several smaller-scale, nationally significant proposals.
[V-G-M] Vision – Governance – Multiscale	• The plan's commitment to a just transition means that journey to a net zero society and nature recovery must involve and be fair to everyone.
[S-G-M] Strategy – Governance – Multiscale	• The plan will also work together to ensure that development onshore aligns with national, sectoral and regional marine plans.

Table B 64: Transformative elements related to the mitigation hierarchy for the National Planning Framework.

Framework' Codes	Summarized Results
[V-MH-R] Vision – Mitigation Hierarchy- Restructuring	• Scotland aims to conserve and recycle assets by utilizing existing buildings, infrastructure, and services, promoting a circular economy and minimizing waste. • The plan aims to create net zero, nature-positive places that address climate change impacts while preserving and restoring the environment. • The policy intends to encourage development that addresses the global climate emergency and nature crisis. The focus is on minimizing emissions and adapting to climate change impacts through sustainable development. • There is an emphasis on protecting carbon-rich soils, restoring peatlands, and minimizing soil disturbance during development.

	• The plan to reuse brownfield, vacant, and derelict land is encouraged to reduce the need for greenfield development. • The policy aims to protect coastal communities and assets and build resilience to climate change impacts. • The promotion of development supporting decarbonized solutions for heating and cooling and adaptation to extreme temperatures is a priority.
[S-MH-R] Strategy – Mitigation Hierarchy- Restructuring	• The plan for compact urban growth will optimize land use for services like carbon storage, flood risk management, and biodiversity. To limit new land development, the plan proposes to reuse vacant and derelict land will be emphasized. • Local Development Plans must address the climate emergency and promote nature recovery. The spatial strategy should reduce greenhouse gas emissions and support adaptation to climate change. Development proposals should minimize emissions, adapt to climate risks, and retrofit existing developments for climate resilience. Mitigation measures should be applied to mitigate adverse impacts on biodiversity, nature networks, and the environment. • Peatland protection and restoration are prioritized, and development on peatland should be assessed for environmental impacts. • Development proposals should avoid loss and adverse effects on woodlands and trees of high biodiversity value. • Green belts should be protected to maintain environmental quality. • Brownfield land reuse will be supported for sustainable development. • Coastal areas need adaptation to climate change impacts like rising sea levels and floods. • The development of renewable and low-carbon technologies will be supported. • Priority should be given to locations accessible by sustainable transportation modes. For living, working, and recreation, sustainability will be promoted, integrating nature-positive biodiversity solutions.
[AIR-MH-R] Actions /Instruments /Regulations – Mitigation Hierarchy- Restructuring	• The Six National Developments for Liveable Places are the following: the Central Scotland Green Network restores nature at scale and exemplifies green infrastructure, benefiting communities and supporting a wellbeing economy; it contributes to health, biodiversity, and climate change mitigation and adaptation, and it focuses on areas helping community wellbeing and resilience.

	• Developing a Lifecycle Greenhouse Gas Emissions Assessment will likely positively impact achieving national greenhouse gas emissions of reduction targets. • The Policy Impacts are rebalanced development, conserving and recycling assets, rural revitalization, and just transition.
[V-MH-P] Vision – Mitigation Hierarchy– Path-shifting	• Scotland aims to create net zero, nature-positive places that combat climate change impacts and preserve the environment. • The plan's policy intends to promote development that addresses the global climate emergency and nature crisis. The focus is on minimizing emissions and adapting to climate change impacts through sustainable development. There is an emphasis on protecting carbon-rich soils, restoring peatlands, and minimizing soil disturbance during development. • Compact urban growth is encouraged to use land around towns and cities efficiently. • The plan's policy aims to prioritize sustainable modes of transportation such as walking, cycling, and public transport to reduce unsustainable travel.
[S-MH-P] Strategy – Mitigation Hierarchy– Path-shifting	• The plan for compact urban growth will limit urban expansion, optimizing land use for services like carbon storage, flood risk management, blue and green infrastructure, and biodiversity. • The national spatial strategy aims to create sustainable places that reduce emissions, restore biodiversity, and enhance connections. • The plan will prioritize reusing vacant and derelict land to minimize new land development, aligning with net-zero and nature recovery goals. • The plan supports coastal and island communities to become carbon neutral and combat fuel poverty. • Infrastructure planning and investment will aid the transition to net zero while protecting and enhancing blue and green infrastructure and decarbonizing connectivity. • Local Development Plans must address climate emergencies and nature crises by promoting nature recovery and reducing emissions. • Development proposals should minimize lifecycle greenhouse gas emissions, adapt to climate change risks, and include measures to reduce emissions and support adaptation. • The plan promotes the reuse of brownfield, vacant, and derelict land to minimize greenfield development.

	• The plan encourages development that supports decarbonized solutions for heat and cooling demand and adaptation to extreme temperatures.
[AIR-MH-P] Actions /Instruments /Regulations – Mitigation Hierarchy- Path-shifting	• The Circular Economy Materials Management Facilities supports zero waste objectives by reducing the need for new materials, resource use, and emissions. • The Dundee Waterfront aims to create a resilient waterfront regeneration, providing a high-quality, mixed-use, and locally liveable place that addresses climate impacts. • Pumped Hydro Storage is a national development that plays a crucial role in balancing and optimizing electricity generation, ensuring the operability of the electricity system during the transition to net zero. • The Central Scotland Green Network is one of Europe's most significant green infrastructure projects, addressing climate change and biodiversity loss by building and strengthening nature networks. • It promotes greener development, contributes to 20-minute neighbourhoods, and benefits biodiversity connectivity, especially in urban areas requiring regeneration and brownfield land repurposing.
[V-MH-I] Vision – Mitigation Hierarchy– Innovation	• The policy intent is to encourage, promote and facilitate development that minimises emissions and adapts to the current and future impacts of climate change.
[S-MH-I] Strategy – Mitigation Hierarchy– Innovation	• Urban Sustainable, Blue and Green Surface Water Management Solutions exemplify a nature-based, infrastructure-oriented approach to managing surface water flood risk across catchment areas, helping major cities adapt to climate change impacts. • Local Development Plans (LDPs) should consider incorporating green belts as a settlement management tool to limit development around towns and cities. • Spatial strategies for coastal areas should consider the diversity of coastal regions and explore nature-based solutions to enhance the resilience of coastal communities and assets. • Nature-based solutions should be utilized wherever possible to manage future coastal changes and build strength to climate change effects, incorporating blue and green infrastructure and nature-rich habitats.
[AIR-MH-I] Actions /Instruments /Regulations – Mitigation Hierarchy- Innovation	• The Central Scotland Green Network, national development, is one of Europe's largest and most ambitious green infrastructure projects. It will play a key role in tackling climate change and biodiversity loss

	challenges, including building and strengthening nature networks. • A greener approach to development will improve placemaking, contribute to the roll-out of 20-minute neighbourhoods, and benefit biodiversity connectivity. This project has particular relevance in the more urban parts of Scotland, where there is pressure for development and significant areas requiring regeneration to address past decline and disadvantages. • Regeneration, repurposing and reuse of brownfield land should be a priority.
[S-MH-M] Strategy – Mitigation Hierarchy– Multiscale	• Local Development Plans must address the global climate emergency and nature crisis by ensuring the spatial strategy will reduce emissions and adapt to current and future risks of climate change by promoting nature recovery and restoration in the area.

Table B 65: Transformative elements related to spatial planning provision for different sectors for the National Planning Framework.

Framework' Codes	Summarized Results
[V-Se-R] Vision – Spatial provision of different sectors - Restructuring	• Scotland aims to conserve and recycle assets by using existing buildings, infrastructure, and services while minimizing waste and promoting a circular economy. • Every decision on future development must contribute to a more sustainable Scotland. • The focus is on encouraging low and zero-carbon design, energy efficiency, and development accessible by sustainable travel. The plan's policy intends to prioritize walking, cycling, and public transport for everyday travel, reducing the need for unsustainable travel.
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• The policy of the plan aims to transition from oil and gas to net zero while preserving and enhancing blue and green infrastructure and decarbonizing connectivity, encouraging and facilitating all forms of renewable energy development, including generation, storage, and distribution infrastructure, as well as emerging low-carbon and zero-emission technologies like hydrogen and CCUS. • Development proposals for renewable, low-carbon, and zero-emission technologies are supported. • Local Development Plans should prioritize locations accessible by sustainable modes of transport and follow sustainable travel and investment hierarchies. The plan will support proposals for improving active travel and public

	transport infrastructure, including electric vehicle charging points fueled by renewable energy. Developments should have safe and direct links to local facilities via walking, wheeling, and cycling networks. The plan emphasizes supporting well-connected networks to reduce car dependency.
[AIR-Se-R] Actions /Instruments /Regulations – Spatial provision of different sectors - Restructuring	• Urban Mass/Rapid Transit Networks incentives sustainable transport in Glasgow, Edinburgh, and Aberdeen, reducing emissions and enhancing accessibility. • The National Walking, Cycling, and Wheeling Network expands the active travel network to reduce transport emissions, focusing on areas with accessibility improvements needed. • The strategic Renewable Electricity Generation and Transmission Infrastructure supports renewable electricity generation, repowering, and grid expansion. • The National Walking, Cycling, and Wheeling Network encourages walking, cycling, and wheeling for daily travel, contributing to emission reduction and promoting well-being.
[V-Se-P] Vision – Spatial provision of different sectors – Path-shifting	• Scotland aims to use its natural assets sustainably, benefiting communities and contributing to decarbonization efforts. • Every decision on future development should contribute to a more sustainable Scotland. The focus is on encouraging low and zero-carbon design, energy efficiency, and sustainable travel options for accessibility. • High-Speed Rail is planned to improve connectivity with the UK and beyond, reduce long-distance transport emissions, and maximize benefits. • The policy intends to prioritize walking, cycling, and public transport for everyday travel to reduce unsustainable travel.
[S-Se-P] Strategy – Spatial provision of different sectors – Path-shifting	• The strategy aims to maximize renewable energy benefits while enhancing blue and green infrastructure, decarbonizing transport, and building resilient connections, to protect environmental assets and investing in natural and engineered climate change and nature restoration solutions while also decarbonizing transportation, to provide net-zero energy solutions, including extended heat networks, improved energy efficiency, urban greening, and improved low-carbon transport, to promote low-carbon, resilient urban living by implementing networks of 20-minute neighbourhoods, future-proofing city and town centres, accelerating urban greening, investing in net-zero

	homes, and managing development on the edge of settlements and to encourage and facilitate the development of renewable energy onshore and offshore, including energy generation, storage, transmission, and distribution infrastructure, as well as emerging low-carbon technologies like hydrogen and CCUS. • The strategy emphasizes the promotion of sustainable transport options, including active travel and public transport, to reduce car dominance and support a mode shift from road freight to more sustainable alternatives. It aims to create connected and compact neighbourhoods where daily needs can be met within a reasonable distance by walking, wheeling, cycling, or using sustainable transport options.
[AIR-Se-P] Actions /Instruments /Regulations – Spatial provision of different sectors - Path-shifting	• Circular Economy, Materials Management Facilities reduce waste, resource use, and emissions by promoting the reuse and recycling of materials. • National Walking, Cycling, and Wheeling Network extend the active travel network to reduce emissions from transportation, focusing on areas needing improved accessibility and encouraging walking, cycling, and wheeling for everyday travel, reducing greenhouse gas emissions and promoting health and well-being. • The energy Innovation Development on the Islands supports renewable energy generation, hydrogen production, and associated opportunities in the Outer Hebrides, Shetland, and Orkney Islands. • The pumped Hydro Storage balances and optimizes electricity generation in the transition to net zero, compensating for the variable output of renewable energy. • The Strategic Renewable Electricity Generation and Transmission Infrastructure supports renewable electricity generation and grid expansion.
[S-Se-I] Strategy – Spatial provision of different sectors – Innovation	• The strategy aims to maximize renewable energy benefits while enhancing blue and green infrastructure and decarbonizing transport, to protect environmental assets and invest in natural and engineered climate change and nature restoration solutions, to provide net-zero energy solutions, including extended heat networks, to improve energy efficiency, and low-carbon transport, to support renewable energy development onshore and offshore, including emerging low-carbon technologies like hydrogen and CCUS.
[AIR-Se-I] Actions /Instruments	• The spatial strategy is to strengthen and expand the National Walking, Cycling, and Wheeling Network to

/Regulations – Spatial provision of different sectors - Innovation	promote active travel and reduce transport emissions, particularly in areas that require improved accessibility. • High-Speed Rail aims to enhance connectivity with the UK and beyond, reducing long-distance transport emissions and maximizing overall benefits.
[S-Se-M] Strategy – Spatial provision of different sectors – Multiscale	• The policy Intent is to encourage, promote and facilitate the application of the Place Principle and create connected and compact neighbourhoods where people can meet the majority of their daily needs within a reasonable distance of their homes, preferably by walking, wheeling or cycling or using sustainable transport options.

Table B 66: Transformative elements related to biodiversity and ES for the National Planning Framework.

Framework' Codes	Summarized Results
[V-BES-R] Vision – Biodiversity & ES - Restructuring	• The plan of Scotland aims to create net-zero, nature-positive places that reduce emissions and adapt to climate change while safeguarding and restoring the environment. • Policy intent 1 is to protect biodiversity, reverse biodiversity loss, promote positive effects from development, and strengthen nature networks. • Policy intent 2 is to safeguard, restore, and enhance natural assets using nature-based solutions. • Policy intent 3 is to preserve carbon-rich soils, restore peatlands, and minimize soil disturbance from development. • Policy intent 4 is to protect and improve blue and green infrastructure and interconnected networks.
[S-BES-R] Strategy – Biodiversity & ES - Restructuring	• The plan compacts urban growth limiting urban expansion to optimize land use for services, resources, carbon storage, flood risk management, blue and green infrastructure, and biodiversity. • The plan promotes sustainable places reducing emissions, restoring biodiversity, and improving connectivity in urban areas. • The plan incentive nature recovery securing positive effects for biodiversity, creating and strengthening nature networks, and investing in nature-based solutions for net-zero contributions and cleaner, safer, and greener places improving open spaces to build resilience and provide benefits for people, health, and biodiversity. • The plan improves green infrastructure connecting people with nature, helping biodiversity recover and protect environmental assets, and promoting investment in natural and engineered climate change solutions while

	transitioning to net zero and enhancing blue and green infrastructure. • Local development plans ensure the conservation, restoration, and enhancement of biodiversity, nature networks, and natural habitats through careful planning and design to minimize adverse impacts and build resilience. • The plan establishes and grows nature networks in spatial strategies to protect and restore biodiversity and natural processes, enhance and expand blue and green infrastructure, and prioritize connectivity to address cross-boundary needs and opportunities.
[IB-BES-R] Information baseline – Biodiversity & ES - Restructuring	• The policy impact of the plan is transition, conserving and recycling assets, local living, compact urban growth, rebalanced development and rural revitalization.
[AIR-BES-R] Actions /Instruments /Regulations – Biodiversity & ES - Restructuring	• Six national developments aim to create liveable places with multiple benefits. The benefits are: focusing on restoring nature at scale and exemplifying green infrastructure to support community wellbeing, biodiversity, and climate change mitigation and adaptation in Central Scotland Green Network; aiming to create a resilient waterfront regeneration that addresses climate impacts and offers high-quality mixed-use spaces in Dundee Waterfront; bringing together public and private investments to remediate and regenerate brownfield land along the River Clyde for economic, social, and environmental purposes in Clyde Mission. • Local Development Plans (LDPs) must address the global climate emergency and nature crisis by reducing emissions, adapting to climate change risks, and promoting nature recovery and restoration within their areas.
[V-BES-P] Vision – Biodiversity & ES – Path-shifting	• The policy Intent is to protect biodiversity, reverse biodiversity loss, deliver positive effects from development and strengthen nature networks.
[S-BES-P] Strategy – Biodiversity & ES – Path-shifting	• The plan will support local liveability and improve community health and well-being by ensuring people can access services, greenspace, learning, work and leisure locally.
[AIR-BES-P] Actions /Instruments /Regulations – Biodiversity & ES - Path-shifting	• The Central Scotland Green Network, national development, is one of Europe's largest and most ambitious green infrastructure projects. It will play a key role in tackling climate change and biodiversity loss challenges, including building and strengthening nature networks. A greener approach to development will improve

	placemaking, contribute to the roll-out of 20-minute neighbourhoods, and benefit biodiversity connectivity. This project has particular relevance in the more urban parts of Scotland, where there is pressure for development and significant areas requiring regeneration to address past decline and disadvantages. • Regeneration, repurposing and reuse of brownfield land should be a priority.
[V-BES-I] Vision – Biodiversity & ES – Innovation	• The primary policy intends to safeguard and improve natural assets through nature-based solutions and the protection and expansion of forests, woodland, and trees.
[S-BES-I] Strategy – Biodiversity & ES – Innovation	• Urban Sustainable, Blue, and Green Water Management Solutions prioritize infrastructure to manage flood risk in major cities due to climate change. • Nature Recovery focuses on nature-based solutions to combat the global biodiversity crisis, fostering biodiversity and establishing nature networks. • The plan enhances Green Infrastructure, promoting green spaces in urban areas for nature connection and resilience. • It protects Environmental Assets by investing in climate and nature restoration while decarbonizing transport. • Local Development Plans emphasize biodiversity conservation, habitat connections, and nature-based solutions. • Woodlands and trees are identified, protected, and expanded for multiple benefits and climate resilience. • Green belts limit development around towns and cities, with specific criteria for supporting development within these areas. • Coastal resilience is improved through nature-based solutions in spatial strategies. • Sustainable Spatial Strategies prioritize efficient resource use, climate resilience, and nature-friendly solutions, considering blue and green infrastructure audits.
[V-BES-M] Vision – Biodiversity & ES – Multiscale	• The core objective of this policy is to ensure the preservation and enhancement of our natural resources using nature-based approaches, focusing on the safeguarding and growth of forests, woodlands, and trees.
[S-BES-M] Strategy – Biodiversity & ES – Multiscale	• The plan supports community health and well-being by ensuring easy access to services, greenspace, learning, work, and leisure locally. • Sustainable places reduce emissions, restore biodiversity, and improve connectivity in urban areas.

	• Nature recovery secures positive effects for biodiversity, creates and strengthens nature networks, and invests in nature-based solutions for net-zero contributions. • The plan enhances green spaces in urban areas to connect people with nature and help biodiversity recover. • Local development plans should protect and enhance biodiversity, nature networks, and ecological connectivity, considering potential impacts and promoting restoration. • Spatial strategies should establish and grow nature networks to protect and restore biodiversity, ecosystems, and natural processes. • The plan identifies and proposes forestry and woodlands to provide multiple benefits and enhance climate resilience. • Local development plans should be informed by relevant audits and strategies, identifying and protecting blue and green infrastructure assets and networks and prioritizing connectivity between them. • The plan design blue and green infrastructure to be multi-functional, well-integrated, and accessible based on existing provision, new requirements, and network connections.
[AIR-BES-M] Actions /Instruments /Regulations – Biodiversity & ES - Multiscale	• The Central Scotland Green Network, national development, is one of Europe's largest and most ambitious green infrastructure projects. It will play a key role in tackling climate change and biodiversity loss challenges, including building and strengthening nature networks. A greener approach to development will improve placemaking, contribute to the roll-out of 20-minute neighbourhoods, and benefit biodiversity connectivity. This project has particular relevance in the more urban parts of Scotland, where there is pressure for development and significant areas requiring regeneration to address past decline and disadvantages. • Regeneration, repurposing and reuse of brownfield land should be a priority.

8.5.2. National Land Use Framework

This section illustrates the transformative elements that emerged from the content analysis of the National Land Use Framework of Scotland. Table B67 shows the summarized results related to the

governance of spatial planning systems. Table B68 did so for the mitigation hierarchy, Table B69 for the spatial planning provisions for different sectors, and Table B70 for biodiversity and ES.

Table B 67: Transformative elements related to the governance of spatial planning systems for the National Land Use Framework.

Framework' Codes	Summarized Results
[V-G-R] Vision – Governance - Restructuring	• The plan discusses the importance of nature-based solutions in combating climate change and restoring nature. It emphasizes the need for innovative financing methods to maximize the potential of these solutions and addresses the challenges of balancing different demands on land. • A holistic systems approach to land use and management is advocated, recognizing its role in supporting biodiversity and ecosystems. • Transparency in land ownership is seen as crucial for effective planning and decision-making. • Scotland's sustainable future depends on addressing the climate and nature crises through responsible land use. • The development of Regional Spatial Strategies and Placemaking principles, with a focus on nature-based solutions, is proposed to create a cleaner and healthier environment. • Coastal planning is also highlighted for sustainable coastal management. • The plan also aims to align policies related to various land use aspects, supporting Scotland's vision for sustainable land use and wellbeing economy priorities.
[S-G-R] Strategy – Governance - Restructuring	• The plan discusses various initiatives and policies implemented by the Scottish government to promote positive interactions between landowners and communities. • It highlights the landscape approach taken by the government to address key objectives, including increasing tree canopy cover in cities, improving green spaces in urban areas, and supporting community-led local place plans. • Scottish Forestry is working to enhance urban forestry and collaborate with communities to improve woodlands, while the Crofting National Development Plan focuses on supporting productive systems and thriving communities in rural areas. • The text also mentions a forthcoming biodiversity strategy and the involvement of National Parks and local partnerships in climate change and sustainable development efforts. It emphasizes six principles for land rights, including promoting public interest, community

	ownership opportunities, responsible land use, and transparency. • The text underlines the importance of involving local communities in decisions related to land use, particularly in areas with significant changes.
[IB-G-R] Information baseline – Governance - Restructuring	• The Scotland's Environment Strategy, published in February 2020, aims to address global climate change and nature crises while benefiting well-being, communities, economy, and global citizenship. • It includes policies for sustainable land use, increasing tree canopy cover in cities, and improving air quality. • The strategy emphasizes an ecosystem approach for marine environment health and resilience. • Public engagement is sought to create an accessible Land Use Strategy with subheadings on Climate Change, Biodiversity, and Communities. The Act requires a new Land Use Strategy every five years to combat climate change and includes an indicator for community inclusion in land use decisions.
[AIR-G-R] Actions /Instruments /Regulations – Governance - Restructuring	• The Scottish Government is promoting low carbon farming and land use through various measures. • They have set up farmer-led groups like the Suckler Beef Climate Group to advise and transition the beef farming sector to low carbon practices. • An Open Space Strategy is being developed in collaboration with stakeholders to guide green infrastructure and open space policies. • Pilot projects with NatureScot, Architecture & Design Scotland, and the Scottish Federation of Housing Associations aim to integrate green infrastructure into social housing developments for climate change mitigation. • The Scottish National Marine Plan outlines a vision for managing seas in a clean, healthy, safe, productive, and diverse manner, emphasizing alignment with terrestrial policies for long-term well-being.
[V-G-P] Vision – Governance – Path-shifting	• The plan discusses the importance of effective land use management through negotiation and compromise among stakeholders. • It advocates for transparency and inclusivity in land use decisions, emphasizing a holistic systems approach that considers the interconnectedness of the environment and human impact.

	• The Scottish Government follows a "four capitals" approach, considering natural capital as important as social, economic, and human capital. • The vision for Scotland in 2050 is to value land resources, delivering lasting benefits and enhancing wellbeing. • Land use choices impact various aspects of life, requiring careful consideration of ecosystems, agriculture, energy, housing, infrastructure, health, and heritage. • Regional Spatial Strategies inform the National Planning Framework to align priorities and opportunities at a regional scale. • The plan promotes an ecosystem approach to land use and planning, recognizing the significance of natural capital. • Nature-based solutions and innovative financing are highlighted as crucial tools to address climate change and restore nature.
[S-G-P] Strategy – Governance – Path-shifting	• The Scottish Government is adopting a landscape-based approach to land use, integrating different uses while minimizing conflicts. • Local Place Plans empower communities to influence land development. • Urban communities are involved in decisions about nearby forests for community benefits. • Efforts to enhance forest use for well-being and cover are underway. • The Crofting National Development Plan supports crofting and emphasizes the environment. Initiatives like the Woodland Carbon Capture Investment Programme and Biodiversity Challenge Fund attract private investment for conservation. • National Parks' management prioritizes conservation and community involvement. • Marine and terrestrial planning align through Marine Planning Partnerships. • Islanders' voices and benefits are ensured in the transition to a net-zero economy. • Public involvement in land use debates is encouraged, especially in areas with significant changes planned.
[IB-G-P] Information Baseline – Governance – Path-shifting	• Scotland established a public register of controlled interests in land to enhance transparency in land use decisions. They implemented two Land Use Strategies since 2009, focusing on sustainable land use in agriculture, forestry, and land reform. • The government aims to strengthen the relationship between people and the land, incorporating human rights principles. A

	• task force's recommendations led to a £50 million program for transforming vacant land as part of a green recovery plan. Efforts include protecting and improving farm soils, promoting biodiversity, and reducing carbon emissions. • The Strategy addresses climate change, biodiversity, and communities, with ongoing efforts to make it accessible and informative to a wider audience. • A new Land Use Strategy is required every five years to combat climate change, with considerations for equality issues through consultations and high-level assessments.
[V-G-I] Vision – Governance – Innovation	• The Scottish Government is adopting a "Four Capitals" that recognizes the critical importance of natural capital alongside people, social, and economic capital. The new approach emphasizes the integration of placemaking principles, which focus on creating attractive and sustainable environments. The Scottish Government also aims to promote an Ecosystem Approach to land use and planning. This approach recognizes the interlinkages between natural capital and society and seeks to manage resources and ecosystems sustainably. • Nature-based solutions will play a significant role in achieving these goals. To maximize the potential impact of nature-based solutions, new approaches to financing the work are necessary. This includes optimizing the use of both public and private investment. • The plan also highlights the significance of a healthy water environment in supporting the well-being of local communities.
[S-G-I] Strategy – Governance – Innovation	• The Scottish Land Commission encourages collaboration between landowners and communities, providing guidance for decision-making on land use. • The forestry sector is supported to attract private investment through the Woodland Carbon Code. • Scotland plans to publish a biodiversity strategy after the Convention on Biological Diversity Conference, with the Biodiversity Challenge Fund supporting projects focused on priority habitats and species. • To address coastal erosion and sea-level rise, Scotland is investing £12 million to protect natural defenses. • Initiatives like the sustainable communities fund and Community Capacity Grants aim to support green recovery and just transitions in coastal communities. • Furthermore, Scotland aims to work with island communities, farmers, and landowners to promote sustainable land use, including agriculture, forestry,

	peatland restoration, and nature-based tourism for economic and social growth.
[IB-G-I] Information Baseline – Governance – Innovation	• Scotland passed regulations in February 2021 to create a public register of controlled interests in land, promoting transparency and better land use decision-making. • The Pollinator Strategy for Scotland 2017-2027 aims to support wild pollinators and bees, incorporating sustainable land use efforts. • Some survey respondents expressed concerns about the lack of detail in the strategy, leading the government to include illustrative examples and related actions in the Climate Change Plan update. • Stakeholder engagement and an EQIA were conducted for this strategic document, which also briefly mentions other policy statements on onshore wind, biodiversity, local food, and community initiatives.
[V-G-M] Vision – Governance – Multiscale	• The plan aims to foster discussions about the future use of land in the country. • The strategy takes a holistic approach to sustainable land use, considering climate change and biodiversity targets while acknowledging current actions. • Land in Scotland serves various essential purposes, including supporting ecosystems, agriculture, carbon absorption, water storage, renewable energy, housing, and recreation. • The strategy advocates for an ecosystems approach, recognizing the interdependence of all environmental aspects, including human activities. • Achieving balanced land use requires collaboration and compromise among stakeholders, including land managers, owners, and local communities. • The Scottish Government seeks input and action from people across the country to achieve the strategy's goals. • The development of new Regional Spatial Strategies will inform the National Planning Framework, aligning regional priorities with national objectives. • The ultimate vision is for a strong and dynamic relationship between land and people, contributing to a modern and successful Scotland while recognizing rights and responsibilities related to land.
[S-G-M] Strategy – Governance – Multiscale	• The Climate Change Plan update focuses on increasing agroforestry to sequester carbon by working with farming and forestry industries. • Local Authorities will lead Marine Planning Partnerships to align marine and terrestrial planning policies.

	• The Outer Hebrides Community Planning Partnership safeguards communities from climate change impacts. • Collaborating with island partners, nature-based solutions like peatland and salt marsh protection are designed. • Principles for land rights and public policies promote sustainability and community engagement. • Regional land use partnerships aim for a collaborative approach to address climate change, environmental targets, and economic recovery, supporting Scotland's ambitions for natural capital and inclusive growth.
[IB-G-M] Information Baseline – Governance – Multiscale	• In September 2020, the Scottish Government received suggestions from the Vacant and Derelict Land Taskforce and plans to collaborate with the Scottish Land Commission and stakeholders for a cultural change in handling such land. • In December 2020, a £50 million program was announced to transform Scotland's vacant and derelict land over the next five years as part of the green recovery strategy, ensuring a just transition for all communities. • The Government engaged with various stakeholders, including RSPB, National Farmers Union Scotland, Scottish Wildlife Trust, Scottish Land and Estates, National Trust for Scotland, and Trees for Life, to gather perspectives on sustainable land use. Efforts were made to involve groups interested in Equality issues who had not previously participated in the Land Use Strategy consultation process.
[AIR-G-M] Actions /Instruments /Regulations – Governance - Multiscale	• The Government is working with planning authorities and stakeholders to support the implementation of the new duty from the Planning (Scotland) Act 2019. This new duty requires authorities to produce an Open Space Strategy, outlining policies and proposals for the development, maintenance, and use of green infrastructure in their district, including open spaces and green networks. • The planning authorities are collaborating with various stakeholders, including NatureScot, Architecture & Design Scotland, and the Scottish Federation of Housing Associations, to support the implementation of the strategy. • Moreover, Pilot projects are being carried out to explore the integration of green infrastructure within social housing developments. This includes implementing features like green roofs and rain gardens, using a placemaking approach.

Table B 68: Transformative elements related to the mitigation hierarchy for the National Land Use Framework.

Framework' Codes	Summarized Results
[V-MH-R] Vision – Mitigation Hierarchy- Restructuring	• The plan highlights the importance of not only reducing greenhouse gas emissions but also adapting to the impacts of climate change. It discusses the Scottish Climate Change Adaptation Programme (SCCAP) and its goal to increase Scotland's capacity to cope with climate change through policies and proposals. • The plan envisions sustainable land use in Scotland, incorporating urban forestry, renewable energy, flood risk management, greener housing, and biodiversity initiatives. It emphasizes that severe weather events are already affecting Scotland's communities, necessitating climate resilience measures alongside emissions reduction. • To address climate action in small towns, the proposal includes establishing a network of Climate Action Towns. • Restoring degraded peatlands is identified as critical for carbon storage and flood management. • Additionally, careful land management is recommended to protect water environments from pollution. • The text underscores the significance of preparing for the inevitable impacts of past and ongoing emissions despite striving for net-zero emissions.
[S-MH-R] Strategy – Mitigation Hierarchy- Restructuring	• The plan discusses a comprehensive Climate Change Plan for Scotland, focusing on increasing the role of agroforestry, collaborating with farming and forestry industries for carbon sequestration. It also includes a Bioenergy Update with a Bioenergy Expert Working Group to explore carbon dioxide removal solutions through bioenergy production. • The plan aims to maintain sustainable food production while reducing greenhouse gas emissions, particularly addressing the impact of livestock grazing. • Scotland is experiencing climate change effects, leading the government to invest in flood risk management and a coordinated approach to address rising sea levels and extreme weather events. • Additionally, the plan allocates funds to support low-carbon projects on islands, creating green jobs and contributing to net-zero and green recovery objectives. • In the Outer Hebrides, a Community Planning Partnership approach is used for climate change adaptation, fostering collaboration and development of adaptation actions.

	• Lastly, the plan provides a framework for sustainable development and use of Scotland's marine area, prioritizing marine environment protection, and promoting various industries, including offshore wind energy, to achieve net-zero goals.
[IB-MH-R] Information baseline – Mitigation Hierarchy-Restructuring	• The plan outlines national strategies and projects. Scotland's Environment Strategy aims to address environmental and climate change issues with the vision of 'One Earth. One home. One shared future.' • It emphasizes restoring nature, tackling climate change, and benefiting people, communities, and the economy. • The Scottish Forestry Strategy 2019 – 2029 aims to increase urban tree canopy cover. • Planning authorities must prepare Forestry and Woodland Strategies for protection. • The 'Valuing Your Soils' project improves farm soils and carbon sequestration. SEPA's Framework for Water aims for 87% of water bodies to reach 'good' status by 2027. • The Dynamic Coast project investigates coastal resilience to sea-level rise. The plan includes a greenhouse gas emissions indicator for land use and forestry.
[V-MH-P] Vision – Mitigation Hierarchy– Path-shifting	• The plan underscores the significance of the Scottish Climate Change Adaptation Programme (SCCAP) 2019-2024 in conjunction with mitigation efforts. SCCAP focuses on policies and proposals to bolster Scotland's ability to adapt to climate change, benefiting communities and landscapes. • Land reform and the Land Rights and Responsibilities Statement are highlighted as crucial to ensure fair distribution of benefits from Scotland's valuable land resource. • Sustainable land use is emphasized for combating climate change and biodiversity loss, protecting the environment, and supporting communities. • Strengthening climate resilience in cities, towns, and villages, particularly through initiatives like Climate Action Towns, is deemed necessary to address the impacts of severe weather events. Restoring degraded peatlands is crucial for carbon storage and flood management. • Additionally, careful land management, particularly concerning soils, nutrients, and organic matter, is stressed to reduce waste and protect water quality through collaboration with farmers and industries.
[S-MH-P] Strategy – Mitigation Hierarchy– Path-shifting	• The plan highlights Scotland's efforts and progress in addressing climate change and reducing emissions. Despite

	making advancements since 1990, Scotland acknowledges the need for further action. The country has implemented strict climate change policies, experiencing climate change impacts such as extreme weather events and rising sea levels. • To adapt, Scotland is investing in flood risk management and supporting low-carbon projects, especially in vulnerable communities. The Community and Renewable Energy Scheme (CARES) encourages innovative approaches to harness renewable resources and achieve net-zero targets. P • roper land management, including green networks and natural flood management areas, is emphasized to reduce greenhouse gas emissions. • Scotland also focuses on supporting technological development and research in marine industries to combat climate change. • Offshore wind plays a crucial role in their plans to decarbonize the power sector.
[IB-MH-P] Information Baseline – Mitigation Hierarchy– Path-shifting	• Scotland's Climate Change Plan Update sets ambitious actions for emissions reduction until 2032. They focus on creating water-resilient areas using blue and green infrastructure. • The government published a policy framework in 2021 to guide Scottish Water in managing surface water. • Legislation governs agricultural activity to minimize environmental impact. SEPA oversees and enforces regulations, including fertiliser spreading and pesticide application. • Initiatives like Farm Advisory Service and NatureScot promote low carbon farming practices.
[V-MH-I] Vision – Mitigation Hierarchy– Innovation	• The plan aims to implement nature-based solutions to combat the effects of climate change. Instead of relying solely on traditional engineering approaches, it proposes using natural systems to address environmental challenges. For this reason, it aims to increase green spaces in urban areas, such as urban woodlands, rooftop gardens, and rain gardens. These additions can help to green cities and towns, providing various benefits like improved air quality, temperature regulation and protection against flooding. • Moreover, natural shoreline habitats, beaches, and dunes are highlighted as vital components in combating the effects of climate change, especially related to rising sea levels and coastal erosion.

	• The plan proposes moving coastal flood defences back to allow shifting sand dunes to replenish shorelines and support the development of new coastal habitats, which can help absorb wave energy.
[S-MH-I] Strategy – Mitigation Hierarchy– Innovation	• The plan discusses Scotland's progress in reducing emissions since 1990, although it acknowledges the need for further action against climate change. Scotland has implemented stringent statutory frameworks for climate change action and recognizes the importance of increasing tree planting to achieve net-zero emissions. To support this goal, the Scottish government has allocated £100 million to Scottish Forestry for new planting and forestry land and an additional £20 million for boosting nursery stocks. • The Woodland Carbon Capture Investment Programme aims to attract private sector investment in forestry, while the Woodland Carbon Code promotes consistency and transparency in woodland carbon projects. • The plan also highlights the potential benefits of flood risk management measures, such as creating wet woodlands for carbon sequestration. • Scotland aims to achieve net-zero emissions by 2045, with its land assets recognized as a significant factor that could enable it to reach this target five years earlier than the rest of the UK.
[V-MH-M] Vision – Mitigation Hierarchy– Multiscale	• The plan believes it is crucial to reduce greenhouse gas emissions to net-zero in order to address climate change effectively but also it is essential to prepare for the existing and future impacts of climate change that are already affecting us and are expected to continue in the future. For this reason, the plan discusses the concept of sustainable land use, which involves managing and utilizing land in a way that actively contributes to the fight against climate change and biodiversity loss: it not only helps combat climate change and preserve biodiversity but also has broader positive impacts on the natural environment, supports communities socially and economically, and contributes to the overall health and well-being of the population.
[S-MH-M] Strategy – Mitigation Hierarchy– Multiscale	• Adaptation Scotland in the Outer Hebrides uses a Community Planning Partnership approach to climate change adaptation. The project aims to improve understanding of climate change in the Outer Hebrides, build collaboration across organisations and communities, and develop adaptation actions for inclusion in the Local Outcomes Improvement Plan.

[IB-MH-M] Information Baseline – Mitigation Hierarchy–Multiscale	• The plan identifies climate change as a primary pressure on many SEA topic areas (i.e. soil, water, biodiversity, cultural heritage and the historic environment). These pressures and predicted impacts have been discussed further under the individual SEA topics. • The complex interaction between air quality and climate change has also been considered under the SEA "Air Quality" topic.

Table B 69: Transformative elements related to spatial planning provision for different sectors for the National Land Use Framework.

Framework' Codes	Summarized Results
[V-Se-R] Vision – Spatial provision of different sectors - Restructuring	• The plan highlights the importance of adopting sustainable land use practices in Scotland to address various challenges, including climate change, biodiversity loss, and sustainable economic growth. • It advocates for a balanced approach that considers activities such as food production, renewable energy generation, and natural flood risk management while protecting habitats and biodiversity. • The potential of bioenergy production and carbon capture as a means to achieve negative emissions is discussed. • Converting vacant land into green infrastructure is seen as a way to promote climate change mitigation and inclusive growth. • Healthy soils are recognized for their role in carbon storage, climate resilience, and food security. • Sustainable land use actions are shown to have multiple benefits, including improving air and water quality, public health, and supporting rural economies. • The concept of the Third Land Use Strategy is introduced, aiming to align existing policies with the Scottish Government's vision for sustainable land use and promoting positive impacts on land use that benefit both urban and rural communities.
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• The Scotland's Government has outlined a comprehensive plan to promote sustainable transportation, invest in town centers' revitalization, and create active freeways for walking and cycling. • They also aim to support farmers and crofters in producing high-quality food while reducing greenhouse gas emissions. • Additionally, there are plans to explore bioenergy solutions and increase the consumption of locally produced food.

	• Efforts are being made to ensure sustainable food production, particularly in livestock grazing. • Communities have benefitted from funding to buy and manage land, leading to thriving communities and improved infrastructure. • Offshore wind plays a crucial role in Scotland's efforts to achieve net-zero emissions, and recent policies aim to decarbonize the power sector and utilize offshore wind energy effectively.
[IB-Se-R] Information baseline – Spatial provision of different sectors - Restructuring	• The plan focuses on various key themes, including the impacts of food production on the environment, promoting sustainable practices, on-farm woodlands and agroforestry, valuing soils through Soil Regenerative Agriculture, and the importance of wild and managed pollinators and pollinator-friendly pest control measures. It also defines indices to assess the Gross Value Added (GVA) in agriculture and forestry and the high nature value of farming and forestry.
[AIR-Se-R] Actions /Instruments /Regulations – Spatial provision of different sectors - Restructuring	• The plan has established five sector-specific farmer-led groups to develop advice and proposals to allow the Scottish Government to effect rapid, transformative change to meet the plan's climate change and biodiversity goals. • The Groups will advise on what key farming sectors can do to shift to low-carbon farming, land management, and use. • The Suckler Beef Climate Group has already published recommendations, and a separate Programme Board has now been set up to take these forward. The other Groups are in the early stages of developing their advice and will report to the Scottish Government in the Spring of 2021.
[V-Se-P] Vision – Spatial provision of different sectors – Path-shifting	• The plan aims to enhance biodiversity, natural capital, and ecosystem services while supporting the Scottish Government's sustainable land use vision and objectives. • The plan is expected to support key priorities of environmental, economic, and social sustainability, contributing to the overall wellbeing of Scotland's population and environment. For this reason, it emphasizes the importance of managing land use in a way that not only addresses climate change and greenhouse gas emissions but also ensures adequate space for other essential activities like food production and onshore wind generation. • It suggests several measures to reduce greenhouse gas emissions in urban areas, such as: promoting active travel (walking, cycling), improving domestic energy efficiency

	through retrofitting and in new buildings, and adopting greener construction alternatives like wood products; developing sustainable construction practices and increasing tree planting to meet future construction needs in an environmentally friendly manner. • The plan also emphasizes that the capacity of Scotland to generate renewable energy will need to be increased to achieve net-zero targets.
[S-Se-P] Strategy – Spatial provision of different sectors – Path-shifting	• The plan for Scotland's sustainability covers multiple areas: urban and rural. It promotes active travel, energy efficiency, and greener construction in cities. • Tree planting addresses sustainable construction needs. • A Local Food Strategy aims to boost locally produced food consumption. • Scotland relies on diverse renewables like onshore wind and supports marine industries through a Blue Economy Action Plan. • Successful community funding and buy-outs on islands have led to thriving communities with housing and renewable investments. • Land-use decisions consider climate change opportunities and reducing emissions. • Outdoor recreation and accessible green spaces are prioritized for well-being. Sustainable farming practices focusing on soil conservation and biodiversity are encouraged in the countryside.
[IB-Se-P] Information Baseline – Spatial provision of different sectors – Path-shifting	• Scotland's agricultural activity is governed by legislation and regulations aimed at minimizing environmental impact and promoting best practices. • Cross Compliance includes rules covering areas like environment, climate change, land condition, and public health. • The Scottish Environment Protection Agency (SEPA) oversees and enforces environmental protection regulations. • Initiatives like Farm Advisory Service and Farming For a Better Climate promote low carbon and sustainable farming practices, including on-farm woodlands, Soil Regenerative Agriculture, and pollinator-friendly pest control measures.
[AIR-Se-P] Actions /Instruments /Regulations – Spatial provision of different sectors - Path-shifting	• Scotland's islands are at the forefront of pioneering innovation in renewable energy. A prime example of this is the "Surf 'n' Turf" project led by Orkney's Community Energy Scotland. This groundbreaking initiative harnesses surplus electricity generated from Orkney's abundant tidal

	and onshore wind sources and converts it into hydrogen. The produced hydrogen is then efficiently stored and transported by road and sea, making it readily available for use in Orkney whenever needed. This remarkable endeavor showcases Scotland's commitment to sustainable energy solutions and sets a remarkable precedent for other regions to follow.
[S-Se-I] Strategy – Spatial provision of different sectors – Innovation	• The Scottish Government has invested £500 million in promoting active travel methods, such as walking and cycling, to encourage sustainable and eco-friendly transportation options; £275 million to support community-led initiatives aimed at revitalizing town centres and improving the overall well-being of communities; £50 million for the development of Active Freeways, which are sustainable transportation links connecting towns, cities, and national landmarks, to encourage greener travel options. • The Government also developed a Community and Renewable Energy Scheme (CARES) that supports innovative actions to leverage Scotland's renewable resources working towards reaching net-zero targets and promoting clean energy solutions. • The plan envisages that all land use changes will be planned with consideration for climate change impacts, including changes in rainfall patterns, increased storminess, and the growing risk of pests and diseases.
[IB-Se-I] Information Baseline – Spatial provision of different sectors – Innovation	• In the plan, Low carbon projects are named.
[AIR-Se-I] Actions /Instruments /Regulations – Spatial provision of different sectors - Innovation	• The islands of Scotland are playing a trailblazing role in innovation to support renewable energy. An example of this is Surf 'n' Turf: Orkney's Community Energy Scotland, this project converts surplus electricity from Orkney's tidal and onshore wind sources into hydrogen. The hydrogen is stored and transported by road and sea to be used in Orkney when needed.
[S-Se-M] Strategy – Spatial provision of different sectors – Multiscale	• The Onshore Wind Policy Statement emphasizes the need for collaboration between developers (companies or organizations building wind projects) and local communities. This cooperation aims to ensure that projects strike a balance between the environmental impacts of onshore wind projects and their benefits. • Developers should strive to provide economic benefits to communities through means such as community ownership of the projects.

	• The plan also highlights the significance of promoting outdoor recreation opportunities and public access to land and stresses the importance of providing accessible green spaces close to residential areas for the well-being and health of people.

Table B 70: Transformative elements related to biodiversity and ES for the National Land Use Framework.

Framework' Codes	Summarized Results
[V-BES-R] Vision – Biodiversity & ES - Restructuring	• The plan discusses the importance of Scotland's land as a valuable resource that significantly impacts the economy, environment, and well-being of the country. • It advocates for a holistic systems approach to land use, considering the interconnectedness of various aspects, including nature, biodiversity, and human benefits. • Scotland aims to be a green country and strives for sustainable land use decisions to meet the needs of current and future generations. • The plan also acknowledges the climate and nature crises as major threats and emphasizes sustainable land use, including forestry and peatland restoration, to achieve Scotland's goal of becoming a net-zero economy. • Peatland restoration is highlighted as crucial for reducing emissions and combating climate change. • Proper land management, soil care, and riparian tree cover are discussed as means to enhance Scotland's resilience to climate change, reducing flooding, erosion, and sustaining water supplies. • Responsible stewardship of natural resources is emphasized to maximize benefits for the people of Scotland, with proper soil management being crucial for improving biodiversity and water quality.
[S-BES-R] Strategy – Biodiversity & ES - Restructuring	• Scotland is investing an additional £500 million in its natural economy, with a focus on woodland creation and peatland restoration. The goal is responsible stewardship of natural resources for the benefit of the people. • To combat climate change and enhance biodiversity, Scotland aims to increase tree planting and peatland restoration rates. Green infrastructure and community connections to the land are emphasized to bring multiple benefits. • The Crofting National Development Plan aims to support crofters and rural areas. Initiatives like the National Peatland Action Plan and National Marine Plan work towards peatland restoration and marine protection.

	• Proper land management can contribute to reducing greenhouse gas emissions and improving biodiversity, air, water, and soil quality. • Scotland also prioritizes its water environment, addressing challenges through the River Basin Management Plan and SEPA's Water Environment Fund.
[IB-BES-R] Information baseline – Biodiversity & ES - Restructuring	• Scotland's plan, titled "One Earth. One home. One shared future," outlines ambitious goals for the environment to combat global climate change and nature crises. • It emphasizes restoring nature and addressing climate change to benefit people, communities, the economy, and global well-being. • Key elements of the plan include recognizing the value of natural capital, which provides social, economic, and environmental benefits, and promoting urban forestry to increase tree canopy cover in cities. • It encourages sustainable agriculture practices through projects like "Valuing Your Soils" and the Soil Regenerative Agriculture Group to support biodiversity and carbon sequestration. • The plan addresses water management through SEPA's Framework for Water and emphasizes the importance of clean, healthy, and diverse seas in the National Marine Plan. • Coastal restoration efforts for habitats, flood, and erosion protection are also highlighted. • Additionally, the plan covers various aspects such as sustainable development on islands, river and water body management, strengthening natural defenses, improving aquaculture regulation, and implementing indicators to assess natural assets.
[AIR-BES-R] Actions /Instruments /Regulations – Biodiversity & ES - Restructuring	• The plan has introduced legislation to protect mountain hares, one of the iconic local species native to the Scottish Highlands, and make their unlicensed culling illegal. Scotland has also funded initiatives to reintroduce other native species to the local natural environment.
[V-BES-P] Vision – Biodiversity & ES – Path-shifting	• The Scottish Government is committed to sustainable land use to address climate and biodiversity challenges. Scotland's land is recognized as playing a crucial role in its sustainable future environmentally, socially, and economically. • To achieve a just transition to a sustainable future, the government aims to understand the costs and benefits of land ownership and use, adopting an ecosystems approach

	that recognizes the interrelatedness of all environmental aspects. • The government intends to prioritize the environment in its actions and work towards a net-zero economy, necessitating significant land use changes, including forestry and peatland restoration. • The 2050 vision is to recognize and value the importance of land resources, delivering enduring benefits and enhancing the nation's wellbeing. • Sustainable land use contributes to fighting climate change, biodiversity loss, supporting communities, and promoting public health. • The critical role of peatland habitats for carbon storage, flood management, and climate resilience is emphasized, as well as the multiple benefits brought by green infrastructure and habitat restoration. • Proper management of soils is highlighted for biodiversity, climate resilience, and water quality, with all landscapes in Scotland recognized for their important roles in enhancing environmental aspects.
[S-BES-P] Strategy – Biodiversity & ES – Path-shifting	• The plan highlights the significance of land-based businesses contributing to Scotland's prosperity while responsibly managing natural resources. • Connecting urban and rural communities to the land is essential for positive land use. Incorporating green infrastructure, like green roofs and rain gardens, offers multiple benefits, including biodiversity enhancement. • Tree planting and expanding woodland areas are crucial for achieving net-zero emissions. • Effective deer management is recognized as vital for addressing biodiversity loss and climate change. • Natural coastal defenses are valuable assets worth protecting from erosion and rising sea levels. • Scottish landscapes act as valuable carbon sinks, reducing greenhouse gas emissions. • Urban areas focus on green networks and spaces, while fertile plains aim to increase biodiversity. • Urban woodlands serve as wildlife corridors for species adapting to climate change, especially in Central Scotland where urban areas create barriers to movement.
[IB-BES-P] Information Baseline – Biodiversity & ES – Path-shifting	• The plan includes the Scottish Forestry Strategy 2019 – 2029, that aims to increase tree canopy cover in cities and towns to improve urban environments and help with climate adaptation.

	• The strategy will review the evidence on how urban forestry contributes to the quality of urban environments and its potential role in climate adaptation. • Planning authorities are now required to prepare Forestry and Woodland Strategies, including policies to protect and enhance woodlands. • The key themes of the plan include urban planning, expanding green networks through urban woodlands, community woodland ownership, reusing vacant and derelict land, and creating blue and green infrastructure for water resilience. • Other key themes include peatland restoration, farming and crofting (Beef Efficiency Scheme), increasing woodland, and the Woodland Carbon Code. • The themes for rivers and water bodies include ensuring healthy water and land, flood risk management, managing land impacts, utilizing the Water Environment Fund, and adopting an Ecosystem Approach. • The plan mentions collaboration with a group working on addressing non-native species and is likely to involve nature-based solutions that use nature's own processes to combat climate change.
[AIR-BES-P] Actions /Instruments /Regulations – Biodiversity & ES - Path-shifting	• The Scottish Government has taken several initiatives to address climate change and biodiversity goals in the agricultural and environmental sectors. • They have established farmer-led groups to propose and implement low carbon farming and land management practices. One such group, the Suckler Beef Climate Group, has already made recommendations. • Additionally, a national legislation has been introduced to protect mountain hares from unlicensed culling, and efforts are being made to reintroduce other native species to Scotland's natural environment. • The government is also working with planning authorities to develop Open Space Strategies, outlining policies for green infrastructure development and use in their districts. • Collaborative efforts are ongoing with various organizations to integrate green infrastructure into social housing developments using a placemaking approach, aiming to mitigate climate change through features like green roofs and rain gardens.
[V-BES-I] Vision – Biodiversity & ES – Innovation	• The plan underscores the importance of prioritizing environmentally sustainable solutions during the COVID-19 recovery phase. It advocates for nature-based approaches to combat climate change and restore the environment, which includes promoting green infrastructure, urban

	woodlands, and forestation. The key point is to incorporate green elements into cities and towns. • The text stresses the need for innovative financing to support these nature-based projects, with a focus on maximizing the impact of both public and private investments. • The Scottish Government is committed to becoming one of the greenest countries, with a focus on preserving and enhancing the natural environment for present and future generations. • Scotland aims to boost climate resilience and contribute to climate mitigation efforts by safeguarding and restoring natural habitats like peatlands, forests, and shorelines. However, it acknowledges the importance of considering broader land-use objectives to maintain the interconnectedness of various ecosystems during efforts to expand forest and woodland cover.
[S-BES-I] Strategy – Biodiversity & ES – Innovation	• The Scottish Government's plans to invest £500 million in the natural economy, including £150 million for woodland creation and £250 million for peatland restoration. Their goals are to combat climate change and enhance biodiversity by increasing tree planting rates and restoring peatland. • They emphasize green infrastructure and pollinator-friendly measures for environmental benefits. • The government aims to achieve net-zero emissions through increased tree planting and collaboration with island partners for nature-based solutions. • All Scottish landscapes are considered valuable carbon sinks. • Urban woodlands are used to improve biodiversity and help species adapt to climate change. • Sustainable farming practices are encouraged for soil preservation and biodiversity. They adopt a natural capital and ecosystems approach for multiple benefits while safeguarding existing interests. • The environmental benefits of flood risk management measures are also recognized.
[IB-BES-I] Information Baseline – Biodiversity & ES – Innovation	• The Scottish Government has undertaken several initiatives to promote sustainable land use and environmental protection. The Planning (Scotland) Act 2019 mandates planning authorities to develop Open Space Strategies, outlining policies for green infrastructure within their districts. • Pilot projects in collaboration with various organizations aim to integrate green infrastructure into social housing

	developments to address climate change and create sustainable designs. • The Pollinator Strategy for Scotland supports wild pollinators and domesticated bees. • Restoration projects demonstrate nature-based approaches to provide wildlife habitats and enhance flood protection. • Urban areas are a focus, with themes like urban planning, green networks, land reclamation, and water resilience. • Other efforts include increasing tree cover, outdoor learning, peatland restoration, Beef Efficiency Scheme, woodland expansion, and combating invasive species.
[V-BES-M] Vision – Biodiversity & ES – Multiscale	• The 2050 Vision for Scotland envisions a future for Scotland where the significance of land resources is fully recognized, understood, and valued. The goal is to make plans and decisions about land use that result in improved and lasting benefits, ultimately enhancing the well-being of the nation. • The plan emphasizes the importance of sustainable land use, which involves utilizing land in a manner that contributes positively to the fight against climate change and biodiversity loss while bringing about broader benefits to the natural environment, supporting communities both socially and economically, and contributing to the overall health and well-being of the population. • The plan also acknowledges the increasing awareness of the crucial role that high-quality outdoor areas and the natural environment play in promoting the health and well-being of individuals.
[S-BES-M] Strategy – Biodiversity & ES – Multiscale	• The Scottish Government is committed to enhance green spaces in cities and towns. For this reason, it has made in place The Green Infrastructure Fund and Green Infrastructure Community Engagement Fund to invest in local green infrastructure and provide benefits to the community from nature, supporting projects in economically deprived areas. • The plan emphasize the importance of encouraging outdoor recreation opportunities and public access to land, especially accessible green spaces near residential areas, due to their positive impact on health and well-being. • The plan also recognize the potential of urban woodland, forests, and trees to create wildlife corridors and stepping stones in urban areas; it highlight the significance of rivers in contributing to nature restoration and creating wildlife corridors, especially in more intensively managed or developed landscapes and emphasize the importance of

	enhanced peri-urban landscapes for nearby urban residents as well as those living in settlements in the peri-urban area, as they provide recreation opportunities and foster biodiversity.
[IB-BES-M] Information Baseline – Biodiversity & ES – Multiscale	• The plan adopts a landscape approach, using illustrative landscapes to represent various types of land in Scotland. This approach showcases ongoing actions and policies throughout Scotland related to land use and aims to demonstrate how different land uses interact with each other and emphasizes the need for integration to support ecosystems, society, the economy, and overall well-being, ultimately working towards a sustainable future. • The plan also emphasizes the importance of understanding how ecosystems function when making land use decisions, to maintain the benefits of ecosystem services that these lands provide and ensure their long-term sustainability.

8.5.3. Scottish Planning Policy

Tables B71, B72, B73, and B74 present the transformative elements that emerged during the content analysis of the Scottish Planning Policy, related to the governance of spatial planning systems, the mitigation hierarchy, the spatial planning provisions for different sectors, and biodiversity and ES, respectively.

Table B 71: Transformative elements related to the governance of spatial planning systems for the Scottish Planning Policy.

Framework' Codes	Summarized Results
[V-G-R] Vision – Governance - Restructuring	• The Government Economic Strategy indicates sustainable economic growth to unlock Scotland's potential. • Sustainable development is part of the commitment of the Scottish Government, reflecting in its Purpose and support for guiding principles. • The goal is a strong, healthy, and just society living within environmental limits. • The spatial strategy aims to be sustainable and achievable, instilling confidence in stakeholders. • Action programs are crucial in driving planned developments and aligning stakeholders, financing, and infrastructure investment. • Communication and project management, such as processing agreements, can clarify information requirements and the timetable for determining proposals.

[S-G-R] Strategy – Governance - Restructuring	• The presence or potential presence of legally protected species is essential in planning applications. Steps must be taken to determine if protected species are present on the site or could be affected by the proposed development. The level of protection afforded by wildlife protection legislation must be considered in the planning and design of the product, and any impacts on protected species should be thoroughly assessed before deciding on the application. Some activities involving European Protected Species and protected animals and plants may require a license to be undertaken legally, and Scottish Natural Heritage is responsible for wildlife licensing in Scotland. • Strategic development plans should safeguard existing strategic assets and prioritize green infrastructure to address cross-boundary needs and opportunities. • Local development plans should enhance existing green infrastructure and promote the creation of new green spaces through a design-led approach, using standards that address local context and ensure appropriate provision and connections with other green assets. • Planning authorities should consider the probability of flooding from all sources when preparing development plans and making planning decisions. The estimated flood risk should be treated as a best estimate, and not a precise forecast, and authorities should not imply that planning permission guarantees the absence of flood risk.
[IB-G-R] Information baseline – Governance - Restructuring	• The plan supports the efficient and transparent handling of planning applications by planning authorities and consultees; applicants should provide good quality and timely supporting information that describes the proposal's economic, environmental and social implications.
[S-G-P] Strategy – Governance – Path-shifting	• The plan's main aim is to ensure that the entire public sector is aligned to deliver sustainable development and protect the environment. • The applicants must engage with local communities, residents, and stakeholders at each stage of operations, starting before applying for planning permission and before commencing any operations. • The planning authorities should consider the probability of flooding from all sources and factor in flood risk when preparing development plans and making planning decisions. The flood risk should be regarded in the plan as a best estimate, not a precise forecast, and authorities should not imply that planning permission means no flood risk. The flood risk framework, which categorizes coastal and watercourse flood risk and provides guidance on

	surface water flooding, should guide development management decisions in local development plans. Developers should consider flood risk and the ability of future occupants to ensure the development before committing to a site or project.
[V-G-I] Vision – Governance – Innovation	• Planning authorities and developers must engage with communities during the preparation of development plans and planning permission applications. Stakeholder engagement should be meaningful and proportionate, with innovative approaches encouraged. Support or concerns expressed by stakeholders on planning matters should be carefully considered in plan development and determining planning applications. Effective engagement leads to better plans, decisions, and outcomes, reducing delays in the planning process. • Integration between land use and community planning is crucial, with development plans closely working with Community Planning Partnerships. • Planning aims to create better places through a collaborative placemaking process, emphasizing sustainable, well-designed places and homes that meet people's needs. • The NPF3 aims to enhance green infrastructure networks, strengthen communities, improve environmental performance, and encourage investment and development. • Planning should prioritize a design-led approach to create high-quality places categorized as prosperous, sustainable, naturally resilient, connected, and low-carbon.
[S-G-I] Strategy – Governance – Innovation	• The Strategic Development Plans (SDP) should safeguard existing strategic or regional assets and identify priorities for green infrastructure that address cross-boundary needs and opportunities. • The SDP aims to enhance existing and promote the creation of new green infrastructure, including retrofitting, through a design-led approach and appropriate standards that consider local context and connections to other green infrastructure assets. • The Local Development Plans (LDP) should encourage the temporary use of unused or underused land as green infrastructure, understanding that it will ensure future development potential identified in the plan is realized. • The LDP can use supplementary guidance or master plans to achieve design-led green infrastructure provision and address deficits or surpluses within the local context.

	• The LDP should use a flood risk framework to guide development, which categorizes coastal and watercourse flood risk into three categories, along with guidance on surface water flooding. The appropriate planning approach for each flood risk category should be considered in the context of the development plan, considering the probabilities of flooding events.
[IB-G-I] Information Baseline – Governance – Innovation	• The natural environment forms the foundation of the spatial strategy in NPF3.
[V-G-M] Vision – Governance – Multiscale	• The planning system encourages proportionate engagement between stakeholders, feedback from stakeholders on planning matters should be carefully considered in plan development and determining planning applications. Innovative approaches like charrettes or mediation initiatives are encouraged for tailored engagement. Effective engagement leads to better plans, decisions, and outcomes while reducing delays in the planning process. Planning authorities and developers must engage with communities during the preparation of development plans and preparing permission applications. • Integration between land use and community planning is crucial, and development plans should work closely with Community Planning Partnerships. Development plans and new developments should contribute to achieving positive outcomes for the community.
[S-G-M] Strategy – Governance – Multiscale	• The planning system should support an integrated approach to coastal planning to ensure that development and regional marine plans are complementary. • The plan involves coordination and collaboration between mainland planning authorities, neighbouring authorities, port authorities, and aquaculture industries. • The plan facilitates collaboration between planning authorities and the Scottish Environment Protection Agency (SEPA) to achieve zero waste objectives outlined in the Zero Waste Plan. • Development plans and development management should consider these objectives to promote sustainable waste management practices. The plan identifies woodlands of high nature conservation value and develops policies for protecting and enhancing their condition and resilience to climate change; it can be supported by supplementary guidance and forestry and woodland strategies. The plan encourages town centre strategies to be prepared collaboratively with community planning partners, businesses, and the local community to ensure that

	development plans align with the aspirations and needs of the local area. • The plan facilitates early discussions between local authorities, developers, and relevant agencies. • The planning system aims to integrate various stakeholders, agencies, and considerations to promote sustainable development, protect environmental assets, and enhance the well-being of communities and the natural environment.
[IB-G-M] Information Baseline – Governance – Multiscale	• The primary responsibility for the operation of the planning system lies with strategic development planning authorities and local and national park authorities. However, all those involved with the system are responsible for engaging and working together constructively and proportionately to achieve quality places for Scotland. This includes the Scottish Government and its agencies, public bodies, statutory consultees, elected members, communities, the general public, developers, applicants, agents, interest groups and representative organisations.

Table B 72: Transformative elements related to the mitigation hierarchy for the Scottish Planning Policy.

Framework' Codes	Summarized Results
[V-MH-R] Vision – Mitigation Hierarchy- Restructuring	• The NPF3 aims to transition to a low-carbon economy and promote energy sector diversification. • The NPF3 supports catchment-scale flood risk management to build resilience in cities, towns, rural areas, and coastal regions. • Climate change mitigation and adaptation, including flood risk management, are essential considerations in the plan. • The sustainable land use principles from the Land Use Strategy are considered. • Protecting the environment and maintaining water, air, and soil quality are priorities in the plan. • Brownfield land reuse is preferred over developing greenfield sites, and coordinating housing and business development with infrastructure investment is emphasized. • Planning is crucial in reducing vulnerability to flooding for existing and future results.
[S-MH-R] Strategy – Mitigation Hierarchy- Restructuring	• The spatial strategy aims at reducing greenhouse gas emissions and fostering adaptation to climate change. This strategy involves careful planning to support emission

	reduction goals by encouraging measures such as energy efficiency, waste reduction, and sustainable development practices. It highlights the significance of reusing existing resources, maximizing efficiency, and utilizing design and technology to mitigate climate change impacts. • The planning system's key principles include promoting resource efficiency, secondary material use, and zero waste targets. • Additionally, waste management infrastructure should prioritize proximity to appropriate installations. • When considering development, the potential effects on the natural environment should be carefully assessed, with a focus on enhancing ecosystems and minimizing adverse impacts. • Protection of vital resources like woodland and peatland is essential, and any necessary removal should be compensated. • Furthermore, the planning system should take a precautionary approach to flood risk, prioritizing flood avoidance, reduction, and implementing sustainable drainage systems (SuDS). • Strategic and local development plans should be deliverable, taking into account factors like growth, regeneration, and development pressure. • Specific proposals should undergo comprehensive assessments, considering their impact on various aspects, including communities, economic benefits, environmental effects, and cumulative impacts.
[IB-MH-R] Information baseline – Mitigation Hierarchy-Restructuring	• The plans should use strategic flood risk assessment to inform choices about the development location and policies for flood risk management. They should regard the flood maps prepared by Scottish Environment Protection Agency and take account of finalized and approved Flood Risk Management Strategies and Plans and River Basin Management Plans.
[V-MH-P] Vision – Mitigation Hierarchy– Path-shifting	• The Scotland plan aims for a growing, low-carbon economy with reduced disparities in well-being and opportunities. The plan's outcomes focus on achieving a low-carbon society and adapting to climate change. • Efforts are made to reduce and manage waste efficiently and promote resource recovery. • The NPF3 supports a catchment-scale approach to sustainable flood risk management. • The spatial strategy aims to enhance the resilience of cities, towns, and rural areas while addressing vulnerability in coastal regions.

	• Planning is crucial in reducing existing and future developments' exposure to flooding caused by climate change.
[S-MH-P] Strategy – Mitigation Hierarchy– Path-shifting	• The National Planning Framework (NPF) and Scottish Planning Policy (SPP) outcomes aim to create successful sustainable, low-carbon, natural, resilient, and more connected places. • Planning aligned with the Proposals and Policies of the Scottish Government's Report must support the transition to a low-carbon economy focusing on renewable energy generation and resource efficiency. • Development plans should consider the presence of peat and carbon-rich soils, aiming to minimize carbon dioxide emissions during construction and operation. • The siting and design of development should consider local landscape character and potential impacts on the natural environment, emphasizing minimizing adverse effects and enhancing environmental services. • The planning system should promote a precautionary approach to flood risk, including flood avoidance and reduction measures and implementing Sustainable Drainage Systems (SuDS) to avoid increased surface water flooding. • Development plans should use strategic flood risk assessment to guide decisions on location and flood risk management policies, considering flood maps and relevant strategies and plans prepared by the Scottish Environment Protection Agency. • Strategic and local development plans should address significant cross-boundary flooding issues, identifying areas for protection, flood protection schemes, and drainage capacity concerns.
[V-MH-I] Vision – Mitigation Hierarchy– Innovation	• In the plan, the NPF3 will facilitate the transition to a low-carbon economy, particularly by supporting the diversification of the energy sector.
[S-MH-I] Strategy – Mitigation Hierarchy– Innovation	• The spatial strategy aims to reduce greenhouse gas emissions and support adaptation to climate change. • Development plans should consider the potential effects of projects on the natural environment, including major-accident hazard sites and cumulative impacts from incremental changes. • They should also promote the enhancement of degraded landscapes to strengthen biological processes that benefit communities.

	• Considering climate change effects, the planning system should enable a precautionary approach to flood risk from all sources. The plan aims to prevent flood avoidance by safeguarding flood storage and avoiding development in flood-prone areas, flood reduction through flood management measures, and using Sustainable Drainage Systems (SuDS) to minimize surface water flooding. • Local development plans should protect land with potential for flood risk management, such as areas suitable for natural flood management, coastal realignment, or green infrastructure creation. • Sustainable Drainage Systems (SuDS) should be appropriately designed for each development, and long-term maintenance arrangements should be in place to ensure their effectiveness.
[IB-MH-I] Information Baseline – Mitigation Hierarchy– Innovation	• The Climate Change Act 2009 establishes ambitious targets to combat climate change. These targets aim to reduce greenhouse gas emissions by at least 80% by 2050, with an interim goal of 42% reduction by 2020. The targets are set in secondary legislation. • The NPF3 support a catchment-scale approach to sustainable flood risk management.
[S-MH-M] Strategy – Mitigation Hierarchy– Multiscale	• Planning authorities and SEPA should collaborate to achieve the zero-waste objectives outlined in the Zero Waste Plan. • Planning authorities should consider creating new woodland and planting native trees with development projects. If a development impacts the connectivity of essential woodland habitats, suitable mitigation measures should be identified and implemented, preferably integrated into a broader green network strategy. • Both strategic and local development plans should address significant cross-boundary flooding issues; it includes identifying major floodplain areas and storage capacity that need protection from inappropriate development, considering major flood protection schemes, and addressing relevant drainage capacity concerns.

Table B 73: Transformative elements related to spatial planning provision for different sectors for the Scottish Planning Policy.

Framework' Codes	Summarized Results
[V-Se-R] Vision – Spatial provision of different sectors - Restructuring	• The Scottish Planning Policy focuses plan making a more prosperous country with sustainable economic growth. • The efficient use of land, buildings, and infrastructure is prioritized, including support for town centres and regeneration projects. • The planning for terrestrial and marine areas encourages the development of renewable energy technologies and appropriate infrastructure locations. • The low-carbon and low-cost heat generation from renewable sources is essential for reducing greenhouse gas emissions and benefiting communities. • The aquaculture in the plan plays a significant role in the Scottish economy, especially for coastal and island communities. • The planning can support sustainable aquaculture while preserving the dependent ecosystem. • Growth targets are set for marine finfish and shellfish production by 2020, with considerations for the marine environment.
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• The planning system prioritizes place and people's needs over motor vehicle movement, promoting sustainable and active travel choices like walking, cycling, and public transport. • Rural development should support prosperous and sustainable communities while protecting the environment. • Planning should facilitate the transition to a low-carbon economy, supporting renewable energy generation and energy efficiency. • Development plans should consider co-locating energy innovations within business environments. • The planning system should encourage the growth of the aquaculture industry in a sustainable manner and guide development to suitable coastal locations. • Development plans should focus on optimizing existing infrastructure, reducing the need for travel, and promoting walking, cycling, and public transport options. • Active travel networks and sustainable travel modes should be prioritized in development locations. • Significant travel-generating uses should be placed near public transport options, and travel plans may be required for developments generating considerable travel.

	• Buildings and facilities should prioritize accessibility for pedestrians and cyclists while considering operational and servicing access for larger vehicles.
[V-Se-P] Vision – Spatial provision of different sectors – Path-shifting	• In the plan, the NPF3 will facilitate the transition to a low-carbon economy, particularly by supporting energy sector diversification. • The aquaculture in the plan contributes significantly to the Scottish economy for coastal and island communities. • The planning of the marine environment is crucial for achieving sustainable aquaculture while preserving the dependent ecosystem, and it supports growth targets for marine finfish production of up to 210,000 tonnes and sustainable shellfish production of up to 13,000 tonnes by 2020. • The planning is essential in enhancing connectivity and promoting sustainable transportation patterns as part of the shift towards a low-carbon economy.
[S-Se-P] Strategy – Spatial provision of different sectors – Path-shifting	• The outcomes of the NPF and SPP focus on creating a prosperous, sustainable, low-carbon, natural, resilient, and more connected place. • Planning can influence people's choices to reduce environmental impacts, mainly through energy efficiency and waste reduction in consumption and production. • Development plans should identify areas suitable for accommodating various renewable electricity projects, including hydroelectricity generation and energy storage projects. • Planning authorities should provide a spatial framework in the development plan to guide the most appropriate locations for onshore wind farms for developers and communities. • The planning system should support patterns of development that optimize existing infrastructure, reduce the need to travel, encourage walking, cycling, and public transport, enable the integration of transport modes, and facilitate freight movement by rail or water. • Spatial strategies in plans should promote development in locations accessible by walking, cycling, and public transport, with active travel networks identified and opportunities for travel prioritized in the order of walking, cycling, public transportation, and private cars. • Plans should also facilitate integration between different transport modes.
[V-Se-I] Vision – Spatial provision of different sectors – Innovation	• The development considers place and the needs of people before the movement of motor vehicles.

	• It could include using higher densities and a mix of uses that enhance accessibility by reducing reliance on private cars and prioritising sustainable and active travel choices, such as walking, cycling and public transport. • It would include paths and routes that connect places directly and are well-connected with the broader environment beyond the site boundary; this may consist of providing facilities that link different means of travel.
[S-Se-I] Strategy – Spatial provision of different sectors – Innovation	• The planning system in Scotland should support the following things: o The plan supports transforming to a low-carbon economy, achieving national objectives and targets for renewable energy usage by 2020; o it encourages diverse electricity generation from renewable energy technologies and heat networks. o Plan guide development to suitable locations, considering specific issues during proposal assessments. o Plan to promote reduced emissions and energy use in new buildings and infrastructure by enabling development in appropriate areas that support energy efficiency, heat recovery, and efficient energy supply and storage. o Plan upholds the duty to conserve biodiversity under the Nature Conservation Act 2004 and protect and improve Scotland's water environment under the Water Environment and Water Services Act 2003. o The plan applies the Principles for Sustainable Land Use from the Land Use Strategy in significant land use decisions. o Plan to identify required transport infrastructure and public transport services in development plans, including cycle and pedestrian routes, and ensure their deliverability is considered. o Plan support infrastructure provision for positive changes in transport technologies, such as electric vehicle charging points. o The plan finds innovative solutions like demand-responsive public transport and small-scale park-and-ride facilities in rural areas, which aim to reduce the environmental impact of urban centres by developing sustainable urban drainage and district heating networks.

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[S-Se-M] Strategy – Spatial provision of different sectors – Multiscale	• Both strategic and local development planning authorities should identify areas with strategic capacity for wind farms and those with the most significant potential for wind development, considering cross-boundary constraints and opportunities. • Strategic development planning authorities are expected to lead in dealing with cross-boundary issues and coordinate with constituent planning authorities. • Development plans should identify weak or unconnected areas to the national electricity network and facilitate the development of decentralised and mobile energy storage installations. • Proposals affecting regional and country parks should align with their statutory purpose of providing recreational access to the countryside and consider their broader objectives outlined in their management plans and strategies. • Development plans should identify necessary new transport infrastructure and public transport services, including cycle and pedestrian routes, and consider deliverability and responsible parties. • Plans should outline how new infrastructure or services will be delivered and phased, including developer contributions. • Development plans should support the infrastructure necessary for positive changes in transport technologies, such as electric vehicle charging points.

Table B 74: Transformative elements related to biodiversity and ES for the Scottish Planning Policy.

Framework' Codes	Summarized Results
[V-BES-R] Vision – Biodiversity & ES - Restructuring	• Planning should adopt a positive approach that enables high-quality development while efficiently using land to benefit the public and safeguard natural and cultural resources. • The outcome of NPF3 focuses on creating a natural, resilient place by protecting and enhancing our natural and cultural assets and promoting their sustainable use. • The environment is a vital aspect of our cultural identity, contributing to well-being and offering economic opportunities. • The plan emphasises protecting, enhancing, and promoting access to natural heritage, green infrastructure, landscapes, and the wider environment.

[S-BES-R] Strategy – Biodiversity & ES - Restructuring	• The planning system in Scotland aims to protect and efficiently use environmental assets within ecological limits for future generations. It encourages development focused on reusing and sharing existing resources, maximizing efficiency, and preventing resource depletion, including climate change mitigation. • Temporary use of underused land as green infrastructure should be promoted, while considering future development potential. • The system also aims to enhance landscape character, protected sites, species, and water environments, while preserving soils, ancient woodlands, and biodiversity. • Biodiversity benefits should be sought in new developments, avoiding habitat fragmentation. • Remote and fragile areas should prioritize community growth while preserving environmental assets for tourism. • Encouraging economic diversification with sustainable development linked to various sectors while protecting natural and cultural heritage is essential. • Development plans should consider ecosystem services and protect land suitable for specific uses like food production and flood management. • Designated areas and sites should receive appropriate protection. • Plans should address potential environmental impacts and opportunities for enhancing degraded landscapes and biological processes. • Woodlands of high conservation value should be identified and protected. • Development siting and design should consider local landscape character and potential impacts on the environment.
[V-BES-P] Vision – Biodiversity & ES – Path-shifting	• The National Planning Framework and Scottish Planning Policy share consistent outcomes, aiming to create a prosperous, sustainable, low-carbon, natural, resilient, and more connected place. • Planning should explore opportunities for permanent, temporary, or advanced greening of sites to contribute to green and open space networks; this is especially relevant for areas likely to be developed later or deemed unsuitable for development.
[S-BES-P] Strategy – Biodiversity & ES – Path-shifting	• The spatial strategy aims to build resilience and protect the use of environmental assets. • Planning can help live within ecological limits, improve environmental conditions and support communities in enjoying and accessing their environment.

	• Wildland areas in remote upland, mountain, and coastal regions should be safeguarded from intrusive human activity. • Protected species' or potential presence is crucial in planning decisions, and their protection must be considered during the design and planning of developments. • Ancient semi-natural woodlands, hedgerows, and individual trees should be protected from adverse impacts caused by growth in the plan. • To protect migratory fish species in the plan, a presumption should be maintained against further marine finfish farm developments on the north and east coasts.
[V-BES-I] Vision – Biodiversity & ES – Innovation	• The environment in Scotland is a valued national asset that offers opportunities for enjoyment, recreation, and sustainable economic activities. • Planning plays a crucial role in safeguarding, improving, and providing access to critical environmental resources while promoting their sustainable use. • The presence or potential presence of legally protected species is essential in planning application decisions. • NPF3 aims to significantly enhance green infrastructure networks, especially in urban areas, including improved access to open spaces, which can contribute to building stronger, healthier communities. • Green infrastructure is essential for long-term environmental performance and climate resilience. • Integrating green infrastructure networks can also attract investment and promote development.
[S-BES-I] Strategy – Biodiversity & ES – Innovation	• Development of the plan should focus on reusing or sharing existing resources, promoting efficiency and preventing future resource depletion, particularly in energy and waste management. • Local development plans should consider various types and scales of development appropriate within a green belt, including agriculture, woodland, horticulture, and compatible recreational uses. • Green belts may be applicable in highly pressured areas to direct development to suitable locations, protect landscape settings, and provide access to open spaces. • Planning should preserve and enhance green infrastructure, open spaces, and networks to improve air quality, reduce urban heat island effects, increase drainage capacity, and attenuate noise. • Development plans should take a holistic and cross-sectoral approach to green infrastructure, informed by

	audits, strategies, and action plans covering multiple functions such as outdoor access, biodiversity, and flood management. • The planning system should facilitate positive change while maintaining distinctive landscape character, conserving and enhancing protected sites and species, and protecting and improving the water environment and soils. • It should also promote the protection and enhancement of ancient semi-natural woodland, support opportunities for enjoying and learning about the natural environment, and seek benefits for biodiversity from new development.
[IB-BES-I] Information Baseline – Biodiversity & ES – Innovation	• The planning authorities and all public bodies are obliged under the Nature Conservation (Scotland) Act 2004 to further biodiversity conservation.
[AIR-BES-I] Actions /Instruments /Regulations – Biodiversity & ES - Innovation	• The consideration plan in the design of green infrastructure should be given to the qualities of successful places. Green infrastructure should be treated as an integral element in how the proposal responds to local circumstances, including well-integrated into the overall design layout and multi-functional. • Arrangements for the long-term management and maintenance of green infrastructure, and associated water features, including shared facilities, should be incorporated into any planning permission.
[S-BES-M] Strategy – Biodiversity & ES – Multiscale	• Local nature conservation sites in the plan should consider factors like species diversity, rarity, naturalness, contribution to biodiversity objectives, and potential for enhancing habitat connectivity and green networks. • The planning system considers green infrastructure an integral element from the beginning of the planning process. It assesses current and future needs for green infrastructure, facilitates its provision and long-term management, and ensures easy and safe access. • Development plans should take a holistic approach to green infrastructure, considering various functions like open space, active travel, biodiversity, flood management, and more, informed by relevant audits, strategies, and action plans. • Green infrastructure should be planned to enhance air quality, open space, and landscape, reduce urban heat island effects, increase drainage capacity, and attenuate noise. • Proposals affecting regional and country parks should respect their statutory purpose of providing recreational

	access to the countryside and consider their broader objectives outlined in management plans and strategies. • Development plans for aquaculture should consider various factors, including impacts on communities, economic benefits, landscape and visual impact, biological carrying capacity, effects on species and habitats, impacts on the historic environment, interaction with other marine environment users, and cumulative effects.

8.5.4. Cairngorms National Park Local Development Plan 2020

Tables B75, B76, B77, and B78 illustrate the summarized results extracted from the Cairngorms National Park Local Development Plan 2020, related to the governance of spatial planning systems, the mitigation hierarchy, the spatial planning provision for different sectors, and biodiversity and ES, respectively.

Table B 75: Transformative elements related to the governance of spatial planning systems for the Cairngorms National Park Local Development Plan 2020.

Framework' Codes	Summarized Results
[S-G-P] Strategy – Governance – Path-shifting	• The Cairngorms National Park Authority (CNPA) has multiple aims, and when carrying out its functions, it must work to achieve these aims collectively. The authority approach to sustainable development involves giving greater weight to the conservation of natural and cultural heritage, which serves as the foundation for the economic and recreational value of the National Park. • The plan has the purpose of providing a policy framework for land use planning, guiding future development, and being used as a basis for determining planning applications.
[S-G-I] Strategy – Governance – Innovation	• The Cairngorms National Park Authority (CNPA) is responsible for delivering specific aims collectively. The authority reflects a sustainable development approach where conservation of the natural and cultural heritage is prioritized, supporting the economic and recreational value of the National Park. • The purpose of the plan is to provide a framework for guiding future development and to be used in determining planning applications.
[IB-G-M] Information Baseline – Governance – Multiscale	• The plan illustrates the key partnership plans that set out strategies, priority actions and policies for local development, economy and nature.

Table B 76: Transformative elements related to the mitigation hierarchy for the Cairngorms National Park Local Development Plan 2020.

Framework' Codes	Summarized Results
[S-MH-R] Strategy – Mitigation Hierarchy- Restructuring	• The plan to reduce consumption, manage waste, and protect limited resources are essential for conserving National Parks and helping communities transition to a lower-carbon lifestyle. • New housing developments should prioritize meeting local needs rather than increasing the proportion of second homes. Action should protect carbon sinks (e.g., soil and peat) from commercial extraction, minimize disturbances to these resources and associated vegetation, and assess the potential impact on greenhouse gas emissions with appropriate mitigation measures. • The National Park Authority aims to apply natural flood management principles and prevent development in flood-prone areas or actions that may increase flooding risks elsewhere. • A revised assessment is required for new products, and integration with existing Sustainable Drainage Systems (SuDS) must be ensured. • Development requirements should ensure pollution prevention from construction sites and protection of watercourses connected to Special Areas of Conservation (SAC). • Development should focus on sustainable resource use in maintenance and decommissioning, including energy, waste, and water minimization. • Encourage the rehabilitation of redundant rural buildings and the recycling of resources. • Development proposals should be designed to minimize the loss of existing woodland. • Development should make appropriate contributions to address and manage its impacts on surrounding infrastructure and local services to be acceptable in planning terms. Contributions can reduce or compensate for unacceptable effects.
[IB-MH-R] Information baseline – Mitigation Hierarchy-Restructuring	• In considering the impact of new development proposals in European sites and to ensure that its integrity is not compromised, the plan requires that: applicants assess and include an appraisal of the biodiversity interests present within buildings and if there are particular biodiversity interests identified appropriate actions must be taken to account for their protection; a comprehensive survey must be conducted, following a recognized methodology, to

	determine the presence of otters or other qualifying species in the vicinity of the proposed development area; an appraisal to assess the potential impact of the construction activity, design, and use of the development on otters or other qualifying species and if any adverse effects on otters or qualifying species are identified, the development plans must be modified to minimize these effects. • The specific measures and modifications to protect otters or other qualifying species must be detailed in a Species Protection Plan (SPP).
[AIR-MH-R] Actions /Instruments /Regulations – Mitigation Hierarchy-Restructuring	• The plan aims at promoting responsible development and conservation. If ancient semi-natural woodland needs to be removed, the plan mandates that developers must provide compensation by planting native species elsewhere. • When evidence suggests the presence of protected or priority habitats or species on or near a development site, the developer must conduct a focused survey to assess the impact. A species/habitat protection plan must be submitted, outlining measures to avoid, reduce, or mitigate adverse effects. • Proposals for new hill tracks must demonstrate efforts to minimize and reduce negative effects on the National Park's landscape qualities. • Developers should follow NatureScot's good practice guidance for constructing tracks in the Scottish Uplands. • All development proposals should be designed to minimize their impact on climate change, both during construction and after completion. They must comply with at least the minimum standard by the Building Standards Technical Handbook. • Applicants must assess the biodiversity interests within original buildings, such as bats, and take appropriate action to account for and protect these interests. • Development should avoid detrimental impacts on the water environment and aim to improve it where possible. • Developers must demonstrate that any impacts, including cumulative effects, can be effectively mitigated. They should also address potential flooding issues upstream and downstream of the development. • All developments must be located in areas free from medium to high flood risk, considering the predicted impacts of climate change. It should not increase flooding risk elsewhere, add to flood prevention requirements, or hinder the functional floodplain's ability to store or redirect floodwaters.

	• The plan emphasizes avoiding detrimental impacts on ecosystems relying on groundwater.
[V-MH-P] Vision – Mitigation Hierarchy– Path-shifting	• Housing development should prioritize maximizing opportunities for various types of development, including infill (building on vacant or underused land within existing urban areas), conversion (repurposing existing buildings or spaces for residential use), small-scale development (encouraging smaller and more sustainable housing projects), and the redevelopment or reuse of derelict and underused land. The objective of these development strategies is to promote the sustainable use of natural resources in the area.
[S-MH-P] Strategy – Mitigation Hierarchy– Path-shifting	• The National Park's unique qualities are safeguarded from development that would significantly harm them, while the new product aims to enhance these qualities wherever possible. • Efforts are made to support businesses and communities in adopting sustainable practices, such as using less energy, reducing emissions, and generating low-impact renewable energy. • Development should consider carbon sinks and stores, particularly soil and peat. • Steps are taken to protect them from commercial extraction, minimize disturbances to these areas and their associated vegetation, and assess the likely effects of development on greenhouse gas emissions. • Appropriate mitigation measures are identified to mitigate the release of stored carbon due to disturbances. • Reducing consumption, managing waste, and protecting limited resources is crucial for conserving the National Park and facilitating communities' adaptation to a lower carbon lifestyle. • Policy 10 (Resources) emphasizes safeguarding and enhancing the water environment, minimizing the use of treated and abstracted water and promoting sustainable drainage schemes (SuDS). • The conservation objectives focus on avoiding the deterioration of habitats and significant disturbance to qualifying species within the National Park, ensuring the site's integrity and contribution to achieving favourable conservation status for these features. • The design and construction of developments in the National Park aim to reduce carbon emissions, minimize waste, and efficiently use precious resources, thereby promoting environmental sustainability.

[IB-MH-P] Information Baseline – Mitigation Hierarchy– Path-shifting	• The plan requires the submission of detailed assessments according to the nature of the development. This may include a flood risk assessment and/or drainage impact assessment.
[AIR-MH-P] Actions /Instruments /Regulations – Mitigation Hierarchy- Path-shifting	• The plan highlights that development projects to enhance formal and informal recreation and leisure facilities, tourism, leisure-based businesses, and attractions will be supported. Additionally, improved opportunities for responsible outdoor access will also be promoted. However, development projects will only be funded if they have no adverse environmental or amenity impacts on the site or neighbouring areas. • There is a strong emphasis on conserving and enhancing the landscape character and unique qualities of the Cairngorms National Park, including its wildness and the setting of proposed developments. Any development must meet these criteria to avoid a presumption against approval. • The plan outlines requirements related to water resources. Development projects should minimize the use of treated and abstracted water. Surface water and foul water discharge should be treated separately, following the current CIRIA SuDS Manual guidelines. The development should not lead to the deterioration of the current or potential ecological status of water bodies and should avoid detrimental impacts on the water environment. If any results are identified, they must be eliminated through modifications to the development proposal and detailed within a Species Protection Plan. • All development projects should aim to use resources sustainably, including minimizing energy, waste, and water usage. This principle applies to future maintenance arrangements and any decommissioning necessary for the project.
[V-MH-I] Vision – Mitigation Hierarchy– Innovation	• The plan states that housing development should maximise opportunities for infill, conversion, small-scale development, and the redevelopment or reuse of derelict and underused land.
[S-MH-I] Strategy – Mitigation Hierarchy– Innovation	• The plan states that high footfall generating uses such as retail, commercial, leisure, offices, and community facilities should primarily be directed to town centers. If there is no town center identified, proposals for such uses should be located within the settlement boundary. • If a development is proposed outside a town center or settlement boundary, a justification is required that explain

	why the proposal needs the selected location and demonstrate that a sequential approach to site selection has been followed.
[AIR-MH-I] Actions /Instruments /Regulations – Mitigation Hierarchy- Innovation	• The plan requires that all development proposals should be free from medium to high risk of flooding from all sources, taking into account predicted impacts of climate change; they must also not increase the risk of flooding elsewhere, not add to the area of land that requires flood prevention measures, or affect the ability of the functional floodplain to store or move flood waters. • In addition, the development must be designed to minimize its effect on climate change in terms of siting and construction, and, once completed, it should achieve at least the minimum standard in compliance with the Building Standards Technical Handbook. When a proposal involves replacing an existing house and does not include salvaging and reusing materials from the original building, a reasoned justification must be provided. • Taking into account the choice of the area, development proposals for high footfall generating uses should prioritize town centers. However, if a development is proposed outside a town center or settlement boundary, the proposal must include a justification for the selected location and demonstrate that a sequential approach to site selection has been followed.
[AIR-MH-PO] Actions /Instruments /Regulations – Mitigation Hierarchy– Phasing out	• The plan requires that any identified effect on the habitat be eliminated through modifications to the development proposal and detailed within a Species Protection Plan.

Table B 77: Transformative elements related to spatial planning provision for different sectors for the Cairngorms National Park Local Development Plan 2020.

Framework' Codes	Summarized Results
[V-Se-R] Vision – Spatial provision of different sectors - Restructuring	• The plan wants to support Aviemore's status as an exemplar walking and cycling friendly settlement.
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• The park aims to broaden its economic base by incorporating sectors such as creative industries and renewable energy. • Proposals to create, expand, or enhance visitor infrastructure, like paths and strategic routes, are supported when they encourage active travel and have no adverse environmental impacts.

	• The park is focused on increasing renewable energy generation, especially biomass and hydro while ensuring compatibility with conservation efforts and designated sites. • Businesses and communities are encouraged to use less energy, reduce emissions, improve energy efficiency in existing buildings, and generate low-impact renewable energy. • Additionally, the park plans for a changing climate. • The park aims to maximize community benefits by utilizing locally generated power and reinvesting income to support community development. • Promoting high standards of sustainable design and efficient use of energy and materials in construction is emphasized. • The park aims to provide safe and convenient walking and cycling opportunities for active travel and recreation. • The precautionary principle is applied when the impact of the proposed development on natural heritage resources is uncertain. • Modifications to eliminate risks of irreversible damage should be considered, but they should not unnecessarily impede development. • The park supports the development of a low-carbon economy, focusing on energy reduction, resource reuse, and efficient construction. • New products should be well-connected to core paths and off-road routes, promoting sustainable transport methods and reducing reliance on private motor vehicles. • Development proposals should protect and integrate with existing path networks, such as the Aviemore Orbital Path. • Future maintenance and decommissioning arrangements should make sustainable use of resources, including minimizing energy, waste, and water usage.
[AIR-Se-R] Actions /Instruments /Regulations – Spatial provision of different sectors - Restructuring	• The plan states that there are ongoing proposals to enhance the Highland Main Line, aiming to improve railway connections between the northern regions of Scotland and the central belt. • It also underlines that any development plan for Carr Road should include appropriate mitigation measures to address the increased traffic levels. These measures may include traffic calming strategies and the establishment of a new footpath link to the primary school.
[S-Se-P] Strategy – Spatial provision of different sectors – Path-shifting	• Promotion of sustainable transport methods and active travel, which includes encouraging the use of bicycles and reducing the need for excessive travel.

	• Development of sites that create attractive and vibrant communities while minimizing energy usage. • The plan emphasizes promoting active travel and public transport options to reduce reliance on private motor vehicles. • The plan increases renewable energy generation, mainly through biomass and hydro sources, while ensuring it aligns with preserving the National Park's unique qualities and protecting designated sites. • The plan supports businesses and communities to adopt energy-efficient practices, reduce emissions, utilize low-impact renewable energy sources, and plan for climate change. • The plan encourages incorporating renewable energy technologies in new developments, exploring the co-location of facilities, and considering emerging technologies like electric vehicle charging points. • Supporting businesses and communities to use less energy, reduce emissions, and generate low-impact renewable energy, focusing on maximizing community benefits through local energy use or reinvestment of income to support community development.
[AIR-Se-P] Actions /Instruments /Regulations – Spatial provision of different sectors - Path-shifting	• Transport Scotland is developing a £3 billion programme aimed at improving road safety, reducing travel times, and enhancing connections to pedestrian, cycling, and public transport facilities. The programme involves the construction of a route delivered in eleven sections, with seven sections located partly or entirely in the National Park. It also envisages upgrades to a parallel route for non-motorized users, particularly cyclists and walkers, to create a safe off-road route connecting communities, and includes building a new foot/cycle bridge across the River Spey, ensuring both communities are involved as partners. The programme proposes to upgrade the Highland Main Line to enhance rail connections between the north of Scotland and the central belt.
[S-Se-I] Strategy – Spatial provision of different sectors – Innovation	• The plan envisages that new developments must be well connected to core paths and other off-road routes, making it easily accessible and attractive for both residents and visitors. • They also should reuse or share existing resources, maximize resource efficiency, and prevent future resource depletion, including sharing infrastructure with adjacent sites, considering sustainable building materials, and utilizing low-carbon energy technologies.

	• Developments need to promote a low-carbon economy, with a focus on increasing renewable energy generation, particularly biomass and hydro, while preserving the special qualities of the National Park and designated sites. • The plan intends to discourage the use of private cars by providing regular and affordable public transport links and establishing a network of paths for walkers and cyclists within the community and the surrounding area.
[AIR-Se-I] Actions /Instruments /Regulations – Spatial provision of different sectors - Innovation	• The plan requires appropriate mitigation measures, such as traffic calming and the addition of a new footpath linking to the primary school, to address the increased traffic levels resulting from the development of Carr Road. • The plan also demands that development proposals include a comprehensive series of open spaces, connected by footpaths and cycle networks, with a particular emphasis on linking to the woodland outside its boundaries. • Measures will also be taken to protect the adjacent woodland. • Regarding energy from waste proposals, the plan demands that they maximize the energy produced and distribute it locally. • Additionally, measures should be taken to minimize the impact of transporting waste materials to and within the site. • Because the Scottish Government has designated an 'Electric Highway', the plan anticipates the installation of electric vehicle charging hubs within communities along the route to cater to long-distance travelers, local businesses, and residents.
[V-Se-PO] Vision – Spatial provision of different sectors – Phasing out	• The Scottish Government's vision is to phase out the need for new petrol and diesel cars and vans by 2032.
[S-Se-PO] Strategy – Spatial provision of different sectors – Phasing out	• The plan envisages the removal of new informal paths within sensitive parts of Rothiemurchus area, if they develop.

Table B 78: Transformative elements related to biodiversity and ES for the Cairngorms National Park Local Development Plan 2020.

Framework' Codes	Summarized Results
[V-BES-R] Vision – Biodiversity & ES - Restructuring	• The plan's main goal is to guide new development and ensure sufficient land is available for development in appropriate locations, to meet the needs for housing, jobs, and services while also protecting and improving the environment. • The plan also aims at creating special areas that preserve and enhance the natural and cultural heritage of the region with a focus on increasing and enhancing flood management and resilience, likely to address and mitigate the risks posed by flooding.
[S-BES-R] Strategy – Biodiversity & ES - Restructuring	• The plan underlines the National Park formally conserve relevant features and include areas that are important on a local scale. For this reason, the plan states that any new development within the National Park must not lead to the deterioration of the current or potential ecological status of the area or hinder efforts to restore water bodies to good ecological status. • Moreover, any new development should safeguard adjacent ancient woodlands, and the site layout should aim to retain and protect existing mature trees within and adjoining the site. • Two policies act on the current state of natural areas: the Partnership Plan Policy aims to enhance the resilience of habitats, species, and land use to climate change, pests, and diseases and it particularly focuses on collaborating on land use, flood management (including natural flood management), and protecting peat and carbon-rich soils; the Policy 10 supports the protection and enhancement of the water environment, it promotes minimizing the use of treated and abstracted water and encourages the appropriate use of sustainable drainage schemes (SuDS).
[IB-BES-R] Information baseline – Biodiversity & ES - Restructuring	• The plan requires that any new development proposal must ensure the protection of nearby ancient woodland and it may include a National Vegetation Classification survey, a Phase 1 Habitat Survey and Invertebrates Survey, because acid grassland and other significant species might be present.
[AIR-BES-R] Actions /Instruments /Regulations – Biodiversity & ES - Restructuring	• The plan envisages a series of requirements that the development of an area must fulfill. They include: the conduction of a comprehensive survey, using recognized methodology, to determine the presence of otters or other qualifying species near the development site; an

	assessment to evaluate the potential effects of the construction activity, design, and use of the development on otters or qualifying species; a drainage impact assessment to address existing surface water flooding issues; a National Vegetation Classification survey may be required to accompany the plans, depending on alternative development proposals; a survey to verify the possible presence of acid grassland and significant species; a second full survey to determine the presence of otters or other qualifying species in the vicinity of the development. • In addition, if any adverse effects on the integrity of the European site are identified, modifications to the development plans must be made to minimize these effects. A Species Protection Plan (SPP) should be detailed to address protection measures. • Moreover, the development proposals should be detailed to consider and complement the characteristics of the woodland opposite and the nearby developments.
[S-BES-P] Strategy – Biodiversity & ES – Path-shifting	• The plan envisages that development proposals should include open spaces that are accessible to the public and serve multiple functions. These spaces should be of appropriate quantity and quality to meet the needs of the development and provide green infrastructure that connects to wider blue/green networks. • Taking into account biodiversity and species, the development should create opportunities for further biodiversity by promoting the preservation and enhancement of ecological elements and it should take measures to ensure the long-term maintenance of the conservation objectives and the preservation of qualifying species' habitats. • Conservation goals include avoiding the deterioration of habitats of qualifying species and minimizing significant disturbance to these species, to ensure that the site's integrity is maintained and that it contributes appropriately to achieving favorable conservation status for each qualifying feature. • The plan also requires that the development should strive to increase and enhance flood management measures to improve the site's resilience against flooding. For this reason, the open spaces must retain and preferably improve their existing flood storage and conveyance properties. Moreover, existing wetland areas within the site should be incorporated into a SuDS feature.
[IB-BES-P] Information Baseline – Biodiversity & ES – Path-shifting	• The plan regulates development proposals by envisaging that a survey based on the National Vegetation

	Classification may be necessary for any alternative proposal, with the purpose of assessing the existing vegetation and ecological conditions of the proposed development site. • In addition, the plan underlines that the submission of Construction SuDS as part of any Construction Method Statement may also be required.
[AIR-BES-P] Actions /Instruments /Regulations – Biodiversity & ES - Path-shifting	• The plan argues that, when considering the impact of new development and uses on an original building, applicants must assess the biodiversity interests present within the building, such as bats or other wildlife and are required to take appropriate actions to account for and protect these interests. • It also requires that the development of an area must incorporate a SuDS scheme that should be integrated as part of the overall landscape framework for the development and designed to enhance habitats for wildlife.
[V-BES-I] Vision – Biodiversity & ES – Innovation	• The plan promotes the sustainable use of the natural resources of the area.
[S-BES-I] Strategy – Biodiversity & ES – Innovation	• The plan states that development proposals need to incorporate accessible multifunctional open spaces of appropriate quantity and quality to meet the needs of the project; they also should incorporate SuDS in proportion to the scale and nature of the project. These open spaces should also provide green infrastructure to connect with wider blue/green networks. • The plan encourages the promotion of sustainable use of natural resources without negatively impacting the special qualities of the park.
[IB-BES-I] Information Baseline – Biodiversity & ES – Innovation	• The plan requires the submission of Construction SuDS as part of any Construction Method Statement. It also envisages that assessments should follow best practice available at that time, and will be funded by the developer.
[AIR-BES-I] Actions /Instruments /Regulations – Biodiversity & ES - Innovation	• The plan requires that the development of a site must include a SuDS scheme; the scheme should be integrated into the structural landscape framework of the development and aimed at promoting habitat enhancement. • The plan also envisages that the development must incorporate a series of open spaces, which should be interconnected by footpaths and cycle networks, to provide recreational areas and access to nearby woodland areas beyond the site's boundaries.

	• These spaces should be designed to accommodate peripheral planting and a comprehensive tree structure needs to be implemented across the entire area, encompassing street trees and trees within gardens. • In addition, to ensure the preservation and protection of the woodland adjacent to the development site, measure will be taken.
[V-BES-M] Vision – Biodiversity & ES – Multiscale	• The Cairngorms National Park wants to be an outstanding park enjoyed and valued by everyone, where nature and people coexist harmoniously; it aims to be a special place that enhances both the natural and cultural heritage of the area, focusing on preserving and promoting its unique biodiversity and historical assets; it also intends to provide exceptional visitor and learning experiences, ensuring that people can fully enjoy and appreciate the beauty and significance of the park.
[S-BES-M] Strategy – Biodiversity & ES – Multiscale	• The plan emphasizes the importance of incorporating accessible, multifunctional open spaces of sufficient quantity and quality to support development while also providing green infrastructure that connects to broader blue/green networks. • These open spaces should maintain and ideally improve their existing ability to store and convey floodwater.
[IB-BES-M] Information Baseline – Biodiversity & ES – Multiscale	• The plan underlines that around 55% of the National Park is formally designated with specific management arrangements in place to conserve relevant features, and there are other areas that are important on a local scale, and they play a crucial role in connecting formally recognized sites, helping facilitate the movement of species and ensures their long-term sustainability. • The plan encourages the enhancement of small watercourses running through the site, which have been historically straightened, restoring natural features to improve the ecosystem. • In addition it states that any proposals for further development within the site would require a Drainage Impact Assessment to address existing surface water flooding issues.
[AIR-BES-M] Actions /Instruments /Regulations – Biodiversity & ES - Multiscale	• The plan envisages that the development of an area must include a comprehensive series of open spaces interconnected through footpaths and cycle networks. These spaces should also be linked to woodland areas outside the development's boundaries, should be designed to include peripheral planting and should have a

	comprehensive tree structure, including trees along streets and in gardens. • In addition, the plan underlines that measures will be taken to protect the adjacent woodland. • The development should also aim to minimize the use of treated and abstracted water: surface water and foul water discharge must be treated separately, following the guidelines outlined in the current CIRIA SuDS Manual.

8.6. Spain

8.6.1. Regional Planning Guidance of the Basque Country

The following tables summarize the content analysis results of the Regional Planning Guidance of the Basque Country at the NUTS -2 level. Specifically, Table B79, B80, B81, and B82 present the transformative elements related to the governance of spatial planning systems, the mitigation hierarchy, spatial provision of different sectors, and biodiversity and ES, respectively.

Table B 79: Transformative elements related to the governance of spatial planning systems for the Regional Planning Guideline of Basque Country.

Framework' Codes	Summarized Results
[V-G-R] Vision – Governance - Restructuring	• The guideline adopts a polycentric approach to spatial territorial governance based on complex, diverse, innovative, and complementary territorial elements. In addition, the landscape assumes a transversal character.
[S-G-R] Strategy – Governance - Restructuring	• The guideline aims to improve the coordination and synergies between this Guidance, the partial territorial plans, the sectoral territorial and municipal plans, and across Functional Areas, through a set of assessment and monitoring indicators that can support common planning objectives and actions. • It pursues facilitating the administrative procedure of a plan's development and approval. • The guideline proposes to rely on the jurist actor "Euroregion" to mediate the interactions between different regions and their planning instruments. Moreover, enhancing the number of regulations supporting a collaborative approach is another milestone.
[AIR-G-R] Actions /Instruments /Regulations – Governance - Restructuring	• The guideline integrates the areas of Bayona, San Sebastian, and Irun in the delineated transformative axes (i.e., territorial planning units) to tackle specific issues in these areas. • Regarding protected areas, the guideline establishes several protection categories with precise objectives

	related to aquatic ecosystems. It also indicates coordinating and merging planning and management instruments of forested areas and elaborating a catalog of mountain ecosystems highlighting their role as ES suppliers.
[V-G-P] Vision – Governance – Path-shifting	• The guideline embraces a systemic perspective of the natural environment. • It promotes densification and regeneration, favoring these over new developments. • It envisions the city of Orduña as an ecological city with tourism potential.
[S-G-P] Strategy – Governance – Path-shifting	• The guideline integrates knowledge of ES supply and recognizes the supportive role of green infrastructure. It conceives the mapping and assessment of ES as a tool to manage natural resources sustainably and identify critical areas for protection and restoration within the green infrastructure.
[IB-G-P] Information Baseline – Governance – Path-shifting	• The information baseline of the guideline includes the description and maps of provisioning, regulating, and cultural ecosystem services, the link to specific ecosystems, such as forests, and the demand for some of them. Some of the assessed services include food supply, carbon sequestration, runoff mitigation, pollination, and recreation. • It complements this information with indicators that measures
[AIR-G-P] Actions /Instruments /Regulations – Governance - Path-shifting	• The guideline introduces the concept of green infrastructure and ES into all planning scales. It indicates to the Partial Territorial Plans to develop suitable indicators for the mapping and assessing ES that can detect a decline or improvement in the supply trend. • It also suggests that the COTPV and the Territorial Policy Advisory Board of the Basque Country should actively support participatory processes.
[V-G-I] Vision – Governance – Innovation	• The guideline aligns with the principles of a sustainable, inclusive, intelligent, balanced, and interrelated territory.
[S-G-I] Strategy – Governance – Innovation	• The guideline promotes the integration of biodiversity goals into the spatial planning instruments of the region, acknowledging the socio-economic, cultural, and environmental benefits of the natural capital.
[IB-G-I] Information Baseline – Governance – Innovation	• The information baseline accurately describes the methods, proxies, and data used for the ES assessment. It

	also presents sustainability indicators, including available land according to land use, land-use intensity, and population.
[AIR-G-I] Actions /Instruments /Regulations – Governance - Innovation	• The guideline proposes to regulate protected areas based on their ES. Moreover, it suggests incorporating bioclimatic criteria into land use and building regulations at lower planning scales. • It led to the development of a piloting project to map the green infrastructure of Donostialdea at the functional area scale (NUTS-3) and develop the Partial Territorial Plan upon this project. The guideline suggests upscaling this approach to the rest of the functional areas.
[V-G-M] Vision – Governance – Multiscale	• The guideline highlights the need to consolidate the participatory culture through fostering cooperation and coordination between sectorial policies and spatial planning instruments across scales and territorial units. It also envisions a territory development aligned with the European sustainable development goals and those embedded in the Basque Declaration.
[S-G-M] Strategy – Governance – Multiscale	• This guideline enhances institutional and social engagement by integrating participatory methods and criteria for administrative coordination in spatial planning instruments. It expands regulations for participatory processes to foster interconnectedness and dialogue between neighboring regions like Bayona-San Sebastian and Santander-Bilbao. • Reinforcing the Euroregion and Basque Country Commission's roles is urged. • Integration of multiple planning and management instruments governing the same protection area is encouraged. • Facilitating knowledge exchange between the agrifood and forestry sectors is a target. • Additionally, the guideline underscores consolidating the polycentric model for the three Basque capitals and fostering their complementarity.
[IB-G-M] Information Baseline – Governance – Multiscale	• The guideline documented limited participation during the administrative and public hearing stages of plans' development.
[AIR-G-M] Actions /Instruments /Regulations – Governance - Multiscale	• The guideline assigns the Basque Country Territorial Planning Commission as the coordinating body to ensure the alignment of this guideline and Partial Territorial Plans (NUTS-3) with municipal planning.

	• The "Baseline Document" introduces the guideline proposal and initiates the participatory process leading to the Guidance Advancement document. This process involved several presentations, workshops, and online engagement. • The guideline introduces "Transformative Axes," interconnected territorial units for coordinated planning, and financing of local issues. • It proposes a hierarchical city and town classification based on the polycentric approach, including the three capitals, municipal seats, sub-seats of Functional Areas (NUTS-3), and Transformative Axes. • Water source protection must be integrated into municipal and sectoral plans. Municipalities should create compatibility plans to coordinate and synergize with planning instruments across scales.
[S-G-PO] Strategy – Governance – Phasing out	• Traditionally, there is limited participation during the public hearing stages.
[IB-G-PO] Information Baseline – Governance – Phasing out	• The guideline highlights the lack of ES knowledge integration in the revised document.
[AIR-G-PO] Actions /Instruments /Regulations – Governance – Phasing out	• Past instances highlighted how the previous guideline caused discrepancies in planning instruments due to the numerous Partial and Sectorial Territorial Plans. • Moreover, the abundance of documents, their reviews and participatory processes impede plan revision and approval efficiency. • The guideline removes the "undefined use" land category from the physical environment zoning. This change rectifies the misconception that the areas with this category lacked environmental value.

Table B 80: Transformative elements related to the mitigation hierarchy for the Regional Planning Guideline of Basque Country.

Framework' Codes	Summarized Results
[V-MH-R] Vision – Mitigation Hierarchy- Restructuring	• A common vision is dense and compact settlements, sustainable use and regeneration of land and other natural resources, and protection of valuable ecosystems and ES.
[S-MH-R] Strategy – Mitigation Hierarchy- Restructuring	• The guideline sets various strategies to optimize land use, reducing land consumption to achieve Zero Net Land Degradation. It tasks Partial Territorial Plans with defining urban limits to confine development. Other objectives include encouraging high population density and

	revitalizing underutilized urban areas, including industrial zones. Temporal land use implementation is also pursued, alongside establishing criteria aiding municipalities in calculating the residential capacity index. • The guideline prioritizes planning actions to preserve and restore terrestrial and coastal ecosystems with relevant natural value and their biodiversity, the dynamics and morphology of fluvial ecosystems, wetlands and estuaries, endemic species, and urban green spaces. In this line, it fosters the multifunctionality of ecosystems and the maintenance and enhancement of ES while seeking to balance provisioning and regulating ES. Furthermore, it aims to enhance forest management to address deforestation challenges.
[IB-MH-R] Information baseline – Mitigation Hierarchy-Restructuring	• The guideline outlines to develop homogenized data across the territory to support the impact assessment of human activities on the environment. • It identifies crucial demographic indicators for calculating the residential capacity index, including household size variation and vacant house count. • The degree of industrial area abandonment and land urbanization inform the development of regeneration strategies. • Utilizing information about superficial water body morphology aids in prioritizing restoration efforts.
[AIR-MH-R] Actions /Instruments /Regulations – Mitigation Hierarchy-Restructuring	• The guideline prescribes: o Allow developments exceeding the residential capacity index whenever they constitute an urban re-densification or regeneration intervention. o Prohibit single-family houses unrelated to agricultural activities. o Six categories to regulate non-developable land include special protection, environmental improvement, superficial water bodies protection, etc. Rivers, streams, lakes, and water reservoirs should be cataloged as non-developable land. o Create vegetated buffer zones in between rivers/streams and urbanized areas. o Target regeneration, reutilization, and densification interventions near access points of the transport infrastructure and in former landfills. o Classify valuable headwater zones and related watersheds as protected areas. o Implement compensatory measures to preserve the forest cover and not decline native species population.

	○ Dismantling barriers or constructions affecting fluvial ecosystems and preserving the riverbank vegetation. ○ Avoid barriers to species movement and implement wildlife passengers whenever these cannot be removed. • Moreover, some planning actions include: ○ The establishment of protection regimes in four natural parks. ○ The adaptation of the highway from Ermua to Deba into an eco-boulevard. ○ Reinforce the role of the Nervion Lineal Park as green infrastructure and preserve it from urbanization.
[AIR-MH-P] Actions /Instruments /Regulations – Mitigation Hierarchy- Path-shifting	• The guideline promotes preventive policies targeting groundwater bodies and relevant watersheds.

Table B 81: Transformative elements related to spatial planning provision for different sectors for the Regional Planning Guideline of Basque Country.

Framework' Codes	Summarized Results
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• The guideline proposes reducing long-distance travel through a mix and proximity of land uses and creating pedestrian paths in urban areas. • Improving accessibility to valuable natural sites and high-quality urban environments can tackle social inequalities. • The mix of land uses in compact urban areas, and fostering proximity to agricultural areas were promoted for the public health sector.
[AIR-Se-R] Actions /Instruments /Regulations – Spatial provision of different sectors - Restructuring	• The guideline prescribes deploying tools for bird protection along electric lines. • It stipulates a buried train station for the Abando train station project.
[V-Se-P] Vision – Spatial provision of different sectors – Path-shifting	• The guideline promotes sustainable mobility, strengthening walking and bicycle-based transportation modes. • Public health adopts an approach to positive health that focuses on enabling healthy urban conditions to prevent non-communicable diseases. • The guideline also envisions a tourism approach that aligns with nature protection.

[S-Se-P] Strategy – Spatial provision of different sectors – Path-shifting	• The guideline encourages the creation of pedestrian and bicycle pathways based on the daily routes of the population. • It considers the natural areas' capacity to hold recreational activities without compromising ecological conditions and functions. • It promotes constituting a green infrastructure coordinated at scales and incorporating nature-based solutions into it to adapt to climate change.
[AIR-Se-P] Actions /Instruments /Regulations – Spatial provision of different sectors - Path-shifting	• The guideline indicates the Partial Territorial and Municipal Plans to adopt a preventive approach in managing anthropogenic pressures of the agrifood sector on freshwater sources within protected areas.
[IB-Se-M] Information Baseline – Spatial provision of different sectors – Multiscale	• The guideline integrates the information baseline with the analysis of short- and long-term scenarios on climate change in the Basque Country. The resulting high-resolution maps followed the indications from the IPCC.
[AIR-Se-PO] Actions /Instruments /Regulations – Spatial provision of different sectors – Phasing out	• The Supreme Court dismissed a (past) proposal that introduced maximum limits of land surface dedicated to commercial use located in the urban peripheries.

Table B 82: Transformative elements related to biodiversity and ES for the Regional Planning Guideline of Basque Country.

Framework' Codes	Summarized Results

[S-BES-R]
Strategy – Biodiversity & ES - Restructuring
	• The guideline outlines multiple strategies aimed at enhancing ecosystems, including:
	  ○ Incorporating the principles of green infrastructure and implementing nature-based solutions. For the Vitoria-Gasteiz area, the guideline recommends the expansion of the Green Belt and enhancing the Urban Green Infrastructure. Additionally, it advocates for integrating protected natural areas into the green infrastructure network.
	  ○ Restoring native vegetation in areas lacking tree cover.
	  ○ Implementing technical measures to enhance permeability in infrastructure.
	  ○ Enhancing the forest management approach to regulate resource exploitation.

[IB-BES-R]	• The information baseline encompasses the following key aspects:

Information baseline – Biodiversity & ES - Restructuring	○ The impact of rising sea levels on coastal wetlands and marshlands, leading to species migration towards inland areas. This migration might face obstacles posed by both natural and artificial barriers. ○ The crucial role of the Vittoria Green Belt in ensuring ecological connectivity. ○ Incidents of pollution affect freshwater bodies. ○ The extent of natural and semi-natural habitats (constituting 50.9% of the total territorial area), distribution of habitats of Community interest (totaling 66 distinct habitats), areas under special protection, coverage of native forests (accounting for approximately 47-48% of the territory), and green space accessibility. ○ Diversity of species, population groups, and degree of affection. • The information baseline provides specific indicators and assessment methodologies for retrieving this data.
[AIR-BES-R] Actions /Instruments /Regulations – Biodiversity & ES - Restructuring	• The guideline specifies the following directives for the Partial Territorial Plans: ○ Implementation of restorative and enhancement measures along the Deva riverbank. ○ Assigning various land-use restrictions within the non-developable land category, addressing issues related to natural hazards, climate change, and green infrastructure. ○ Inclusion of protected natural areas, ecological corridors, rivers, surface water bodies, wetlands, green belts, and other multifunctional ecosystems as integral components of the green infrastructure. ○ Establishment of new green spaces in densely populated areas. ○ Creation of buffer zones between buildings and the riverbank to introduce and safeguard riparian vegetation. ○ Reforestation of degraded natural areas and augmentation of forest cover to enhance carbon sequestration potential. Priority should be given to areas designated for Environmental Improvement. Urban zones also demand increased canopy cover. ○ Implementation of nature-based solutions to mitigate flooding events and alleviate the urban heat island effect.

[V-BES-P] Vision – Biodiversity & ES – Path-shifting	• The guideline foresees a territory flourishing with multifunctional and interconnected ecosystems.
[S-BES-P] Strategy – Biodiversity & ES – Path-shifting	• The guideline recognizes the economic advantages of nature-based solutions, including the generation of new employment opportunities, and actively encourages their adoption. It also promotes the enhancement of ecosystem multifunctionality and the preservation of native species through restorative measures.
[IB-BES-P] Information Baseline – Biodiversity & ES – Path-shifting	• The guideline documents the impacts induced by temperature rise and droughts, including population reduction of the Gelidium seaweed, Quercus Robur, Fagus Sylvatica species, and an increased frequency and severity of pests.
[AIR-BES-P] Actions /Instruments /Regulations – Biodiversity & ES - Path-shifting	• Partial Territorial Plans should prioritize restoring the green infrastructure over implementing engineering solutions. • Another measure involves enhancing permeability within internal block courtyards, squares, and sidewalks. • Furthermore, the guideline mandates the consideration of cumulative impacts arising from hydroelectric projects to prevent adverse effects on the ecology and morphodynamics of the territory.
[V-BES-I] Vision – Biodiversity & ES – Innovation	• The guideline positions urban biodiversity as a cornerstone of both quality of life and public health.
[IB-BES-I] Information Baseline – Biodiversity & ES – Innovation	• The guideline provides maps of ecological corridors at the regional scale.
[AIR-BES-I] Actions /Instruments /Regulations – Biodiversity & ES - Innovation	• The guideline stipulates that the Partial Territorial Plans should identify points of convergence between the Green and Built Infrastructures, which could potentially disrupt ecological connectivity. In such instances, plans should prioritize restoring the green infrastructure over implementing engineering solutions.
[V-BES-M] Vision – Biodiversity & ES – Multiscale	• The guideline promotes achieving an interconnected network of natural spaces.
[S-BES-M] Strategy – Biodiversity & ES – Multiscale	• The guideline adopts several multiscale strategies: ○ Incorporating the notion of green infrastructure across all planning scales to foster a systemic understanding of the territory. This involves including natural areas that enhance ecological connectivity and surrounding ecosystems with a different jurisdiction.

	○ Ensuring connectivity between ecosystems separated by artificial barriers, including those along the Transformative Axes. ○ Creating urban green spaces connected through linear greening initiatives, like street trees. ○ Implementing land uses within the green infrastructure that upholds ecological connectivity without interference.
[IB-BES-M] Information Baseline – Biodiversity & ES – Multiscale	• Through mapping ecosystems, the guideline identifies several areas of ecological fragmentation that restorative intervention should target. It also identified the barriers that hinder the correct functioning of these ecosystems.
[AIR-BES-M] Actions /Instruments /Regulations – Biodiversity & ES - Multiscale	• The guideline directives include: ○ Prioritizing intervention to enhance ecological connectivity along the Urdaibai-Goierri corridor and in the Llanada' suroundings, and restore and preserve the Urola, Oria, Kadagua, Nervión, Ibaizabal, Arratia rivers, conceived as ecological corridors. ○ Ensuring that barriers blocking species movement are not introduced. • The guideline instructs the Partial Territorial Plans to map the Green Infrastructure based on the spatial information provided in this document. Municipal plans should formulate regulations that guarantee the continuity of the Green Infrastructure at the urban scale. Municipal plans should consider public green spaces, open spaces, those classified as "general system", and the green belts as elements of the Green Infrastructure. The guideline also outlines permissible land uses within the Green Infrastructure.

8.6.2. Partial Territorial Plan of Central Álava (NUTS – 3)

The following tables summarize the content analysis results of the Partial Territorial Plan of Central Àlava, Spain, which corresponds to the NUTS – 3 level. Specifically, Table B83, B84, B85, and B86 show the transformative elements related to the governance of spatial planning systems, the mitigation hierarchy, spatial provision of different sectors, and biodiversity and ES, respectively.

Table B 83: Transformative elements related to the governance of spatial planning systems for the Partial Territorial Plan of Central Álava.

Framework' Codes	Summarized Results
[S-G-R] Strategy – Governance - Restructuring	• The plan proposes providing local planning authorities with suitable instruments to boost their legislative power in identifying and solving issues quickly. • It highlights the need to develop an action plan against wildfires.
[AIR-G-R] Actions /Instruments /Regulations – Governance - Restructuring	• The Partial Territorial Plan rezoned the non-developable land, assigning the land use categories proposed by the Regional Guidelines.
[V-G-P] Vision – Governance – Path-shifting	• The proposed revision of the Plan introduces a territorial systemic model that harmonizes and synergizes the environmental, economic, and social dimensions. This approach reinforces both rural and urban identities, significantly emphasizing nature's contribution to human well-being.
[S-G-P] Strategy – Governance – Path-shifting	• The Plan aims to preserve natural spaces for their productive, environmental, and recreational values. Land use changes should not diminish these values. It aims at integrating the Green Infrastructure and the ES values. • To ensure participation, the Plan adopts an adaptive planning approach involving periodic proposal reviews and modifications based on stakeholder input.
[IB-G-P] Information Baseline – Governance – Path-shifting	• The Plan underscores the need to transcend the information baseline's purely descriptive role to encourage dynamic interaction with the formulation of planning strategies and actions. • The information baseline illustrates trade-offs that may arise between water reservoirs' recreational potential and their role as vital freshwater sources. • Additionally, it offers high-resolution maps depicting key nature-related variables like soil fertility potential and areas of rich biodiversity.
[V-G-I] Vision – Governance – Innovation	• The Plan recognizes the importance of assessing and integrating the impact of human activities on nature at the global scale into spatial planning.
[AIR-G-I] Actions /Instruments /Regulations – Governance - Innovation	• The Plan, underpinned by the 21/2013 Law, integrated novel analysis elements into environmental impact assessments: climate change mitigation, adaptation, and carbon footprint.

	• To accommodate Covid-19 restrictions, the Plan adopted a hybrid participatory approach, blending digital and in-person methods. This encompassed online workshops, surveys, Zoom sessions, and YouTube streams for information dissemination. Supportive tools like Google Forms, MENTIMETER, JAMBOARD, MIRO, among others, facilitated broader and representative participation, enhancing public perspectives on the territory's future.
[V-G-M] Vision – Governance – Multiscale	• The Plan strives for inclusive, diversified, and educative participation with a robust engagement of social, economic, and institutional stakeholders, fostering an articulated yet unified planning proposal. This approach harmonizes diverse local nuances and addresses challenges outlined by the UN 2030 Agenda, the New Urban Habitat II Agenda, and other global, European, and national policy frameworks.
[S-G-M] Strategy – Governance – Multiscale	• The Plan fosters interdisciplinary and creative discourse among varied public entities and sectors, juxtaposing differing perspectives. • It strives to conduct outreach initiatives concerning the various territorial planning alternatives to engage various population groups. • Additionally, it seeks to tailor engagement methods to individual stakeholder groups' preferences. • An essential strategy involves delineating agents' roles throughout the planning process.
[AIR-G-M] Actions /Instruments /Regulations – Governance - Multiscale	• Participation was organized using two methods: one involving administrative and institutional actors and the other targeting civil society. This included five in-person workshops, 25 semi-structured interviews with strategic actors of diverse expertise and responsibilities, and two online roundtables for presenting planning documents and incorporating participants' inputs. • The Plan developed a Participatory Guideline, employing an accessible, non-technical language that promotes inclusivity. • The Plan stipulates the development of a coordinated management plan among entities overseeing protected natural areas, the Garaio and Landa provincial parks, the Medixur ornithological park, the green infrastructure to boost their recreational value.

Table B 84: Transformative elements related to the mitigation hierarchy for the Partial Territorial Plan of Central Álava.

Framework' Codes	Summarized Results
[V-MH-R] Vision – Mitigation Hierarchy- Restructuring	• The Plan pursues the conservation and enhancement of biodiversity and natural resources and the reuse of land to avoid urban expansion.
[S-MH-R] Strategy – Mitigation Hierarchy- Restructuring	• The Plan prioritizes safeguarding natural habitats like forests and wetlands, valuing them more than human development activities. • Furthermore, its goal is to restore rivers, recognizing their importance in regulating the water cycle, protecting diverse species, and improving water quality. • The Plan will introduce strategies combining mining and restoration efforts to balance economic gains with environmental protection. • Another approach involves optimizing land use by re-densifying urban zones, reusing vacant spaces within cities and industrial areas, and setting boundaries to limit land expansion. • The Plan supports a green infrastructure extending into urban and rural areas to enhance biodiversity.
[AIR-MH-R] Actions /Instruments /Regulations – Mitigation Hierarchy- Restructuring	• The Plan mandates safeguarding green spaces in isolated residential zones and introducing compensating measures like establishing urban forests. This aims to counterbalance denser urban development where green spaces are lacking. • Protecting Red Natura 2000 sites involves including them within the category of non-developable land. • Additionally, the Plan advises executing conservation measures within Vittoria's Green Belt. • The urban expansion is confined to a 3,979-hectare land extension.
[S-MH-P] Strategy – Mitigation Hierarchy– Path-shifting	• The Plan prioritizes the deployment of preventive measures against negative environmental effects.
[S-MH-PO] Strategy – Mitigation Hierarchy– Phasing out	• As part of the SEA, the Plan proposes measures to tackle negative environmental impacts. However, these do not explicitly consider biodiversity enhancement goals.

Table B 85: Transformative elements related to the spatial planning provision for different sectors for the Partial Territorial Plan of Central Álava.

Framework' Codes	Summarized Results
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• The Plan promotes designing criteria and compensatory actions for a nature-friendly mobility mode. • The proposal includes establishing land bank programs for the new agricultural model and encouraging urban photovoltaic systems to minimize energy impacts on agricultural areas.
[IB-Se-R] Information baseline – Spatial provision of different sectors - Restructuring	• Not found.
[AIR-Se-R] Actions /Instruments /Regulations – Spatial provision of different sectors - Restructuring	• The Plan mandates decreasing the usage of chemical pesticides and fertilizers.
[V-Se-P] Vision – Spatial provision of different sectors – Path-shifting	• The Plan underscores the transition from traditional to ecological agriculture.
[S-Se-P] Strategy – Spatial provision of different sectors – Path-shifting	• The Plan seeks a tourism that intertwining nature-based recreational and educational activities.
[S-Se-PO] Strategy – Spatial provision of different sectors – Phasing out	• The revised Plan suggests reevaluating the AP-1 highway expansion and Vittoria's circular highway projects due to significant environmental impacts.

Table B 86: Transformative elements related to biodiversity and ES for the Partial Territorial Plan of Central Álava.

Framework' Codes	Summarized Results
[V-BES-R] Vision – Biodiversity & ES - Restructuring	• The overarching goal of the Plan is to preserve and enhance biodiversity.
[S-BES-R] Strategy – Biodiversity & ES - Restructuring	• The Plan aims to establish an articulated green infrastructure that preserves valuable agricultural lands and permeates urbanized areas. This involves completing Vittoria's urban green belt, extending it to encompass the Zadorra area to curtail urban expansion, and implementing nature-based solutions to enhance overall territorial resilience. • The Plan also emphasizes the harmonious integration of agricultural and rural areas with autochthonous forest patches. • Additionally, the proposal underscores the preservation of native trees within urban zones.

	• It aims to protect the functioning of ecosystems to guarantee the supply of ES to the local community.
[IB-BES-R] Information baseline – Biodiversity & ES - Restructuring	• The information baseline encompasses the spatial distribution of vegetation species and forest types in Alava Central, along with an inventory of natural parks and areas protected by regulations such as Natura 2000, Habitat European Directive, Special Protection for Birds, and Community interest zones. These measures cover more than 35% of the territory. • It also enumerates the vertebrate fauna count within the territory, representing 89% of the species found in the Basque Country.
[AIR-BES-R] Actions /Instruments /Regulations – Biodiversity & ES - Restructuring	• The Plan encourages retaining vegetation cover in erosion-prone zones. • It designates elements and specific areas for inclusion in the green infrastructure, including protected zones, areas with valuable ecosystem services, and ecological corridors. Conservation actions should focus on the Green Belt and tributary areas of the Bayas River. • The Plan identified areas classified as forestry land use and protected surface water. The former encompasses wood production zones without protection. The latter pertains to rivers, streams, and their tributary areas.
[S-BES-P] Strategy – Biodiversity & ES – Path-shifting	• The Plan aims to improve various ES, including carbon sequestration, stormwater infiltration, and soil erosion control. • It proposes to take advantage of forest residues. • It also underscores the significance of reversing the trend of exceeding planetary boundaries.
[AIR-BES-P] Actions /Instruments /Regulations – Biodiversity & ES - Path-shifting	• The implementation of constructed wetlands takes precedence over engineering solutions for stormwater treatment.
[S-BES-I] Strategy – Biodiversity & ES – Innovation	• The plan emphasizes addressing conflicts between green and built infrastructures.
[IB-BES-I] Information Baseline – Biodiversity & ES – Innovation	• The information baseline describes how Alava Central performs according to the planetary boundaries' thresholds, which exceeds them. • The Plan proposes merging two spatial datasets—soil pollution levels and the probability of fluvial flooding occurrences over a 500-year return period—to devise interventions that mitigate pollutant discharge into water reservoirs and rivers.
[AIR-BES-I] Actions /Instruments /Regulations – Biodiversity & ES - Innovation	• The Plan promotes integrating green roofs with photovoltaic panel systems.

[S-BES-M] Strategy – Biodiversity & ES – Multiscale	• The Plan supports creating a green infrastructure linking urban and peri-urban green and blue spaces while minimizing conflicts with built infrastructure.
[AIR-BES-M] Actions /Instruments /Regulations – Biodiversity & ES - Multiscale	• The Plan pinpoints key ecological fragmentation areas for restoration interventions and careful land use selection and design. These encompass intersections with highways, train lines, and the Mercedes-Benz factory.

8.6.3. General Urban Development Plan of Vittoria-Gasteiz

The following tables summarize the content analysis results of the General Urban Development Plan of Vittoria-Gasteiz, Spain, which correspond to the level of Local Admistrative Units. Specifically, Table B87, B88, B89, and B90 show the transformative elements related to the governance of spatial planning systems, the mitigation hierarchy, spatial provision of different sectors, and biodiversity and ES, respectively.

Table B 87: Transformative elements related to the governance of spatial planning systems for the General Urban Development Plan of Vittoria-Gasteiz.

Framework' Codes	Summarized Results
[S-G-R] Strategy – Governance - Restructuring	• A Plan' strategy bases planning decisions on reliable and high-quality information. • The Plan aims to develop suitable tools for local authorities to monitor the implementation of the Plan's regulations. • It proposes mechanisms of transfer development rights to operate the rezoning of developable areas. • It establishes constraints for green belt areas, and special plans regulate their development.
[AIR-G-R] Actions /Instruments /Regulations – Governance - Restructuring	• The Plan incorporates the non-developable land-use category and constraints to regulate land use, prioritizing biodiversity, connectivity, and ecosystem services. Special plans regulate activities in non-developable areas, with land-use modifications requiring complex licensing. • The Green Infrastructure and General Green Belt constraints serve as distinct tools for governing green belt area development since it accommodates diverse land uses and ownerships. • The Plan integrates community gardens as a green space typology within private space regulations, aiming to enhance their expansion across the municipality. • It also integrates its guidelines with optimal bioclimatic practices from various manuals tailored to the municipality's context.

	• Supported by Decreto 123/2012, it increases flexibility in planning public open spaces' transformations (e.g., service reallocation). This involves simplifying administrative processes to facilitate planning proposal execution, such as pedestrian pathway creation. • By conducting a thorough descriptive analysis, the Plan confirms the alignment of its strategies and directives with guidance from supra-municipal and sector-specific plans.
[V-G-P] Vision – Governance – Path-shifting	• The Plan embraces the vision of a transparent, integrated, and inclusive planning process that balances the territory's needs.
[S-G-P] Strategy – Governance – Path-shifting	• The Plan acknowledges the multifaceted value of the green belt and its diverse ecosystem services. It integrates these services into planning decisions for new non-developable areas, encompassing projects, uses, and activities.
[AIR-G-P] Actions /Instruments /Regulations – Governance - Path-shifting	• The Plan changed the regulatory regime of some green spaces within the Green Belt, reclassifying them as urban parks. • Several norms of the plans considered cultural and provisioning ecosystem services, such as food supply and timber production, supplied by municipal ecosystems.
[S-G-I] Strategy – Governance – Innovation	• The Plan proposes using information on various ecosystem services to define non-developable areas' regulations.
[AIR-G-I] Actions /Instruments /Regulations – Governance - Innovation	• The Plan integrated the information on ES and indicators of environmental quality, such as water quality, biodiversity, and soil permeability, developed by the Centre of Environmental Studies of Vittoria.
[V-G-M] Vision – Governance – Multiscale	• The Plan set the vision of an integrated and inclusive planning approach that boosts the participation of civil society and stakeholders acting transversally across different sectors.
[S-G-M] Strategy – Governance – Multiscale	• The Plan strives to enact a participatory process, engaging diverse stakeholders, including public departments, local businesses, and autonomous bodies, to support various planning stages collaboratively. • It additionally seeks to enhance synergies with diverse sectoral plans, incorporating their objectives into the strategies of the Plan.
[AIR-G-M] Actions /Instruments /Regulations – Governance - Multiscale	• The Plan integrated suggestions from Basque Country's Regional Planning Guidance, the Agroforestry Sectoral Plan, ZEC/ZEPA regulations, and Urban Tree Management Plan to assign non-developable land use class to some

	areas. This coordination extended the Green Infrastructure constraints to encompass buffer zones of ZEC/ZEPA areas.

Table B 88: Transformative elements related to the mitigation hierarchy for the General Urban Development Plan of Vittoria-Gasteiz.

Framework' Codes	Summarized Results
[V-MH-R] Vision – Mitigation Hierarchy- Restructuring	• The Plan follows compact city principles to prevent urban expansion and excess land consumption. It safeguards valuable natural areas and enacts compensatory measures to mitigate negative impacts.
[S-MH-R] Strategy – Mitigation Hierarchy- Restructuring	• The Plan establishes goals for conserving high-biodiversity, tree-covered regions; revitalizing degraded natural zones, abandoned landfills, wetlands, rivers, and riverbank vegetation; and enhancing the green belt. • The Plan suggests rezoning specific zones to establish a non-developable regime in harmony with biodiversity protection objectives. It also advocates re-densification in urban areas to curb land consumption.
[AIR-MH-R] Actions /Instruments /Regulations – Mitigation Hierarchy- Restructuring	• The Plan classifies diverse conditions within non-developable land-use (553.79 ha), supporting the plan's strategies alignment with mitigation hierarchy goals—conservation and enhancement. For instance, 'Natural environmental enhancement' mirrors 'special protection' regime. • Moreover, residential agroforestry structures are banned, promoting workers' residences in municipality towns. • In the Lauka neighborhood, the Plan transfers development rights to vacant lots. This supports urban density and compactness and curbs land consumption. • The plan restores six green belt parks, emphasizing completing ecological corridors. It proposes tree cover protection via General Systems' land use constraints and enlarges the Salburua wetland perimeter to include the area in Natura 2000 network. • The plan delineates measures for mitigating and compensating negative impacts on vegetation and soil. It advises employing a low-impact building foundation in carbon storage-constrained zones. It proposes replanting trees affected by construction and meticulous design with porous materials to minimize sealed soil and maximize green spaces.

	• The plan suggests placing new agro-industry activities in anthropized areas for environmental improvement to prevent natural land consumption.
[S-MH-P] Strategy – Mitigation Hierarchy– Path-shifting	• The Plan acknowledges the need for a proactive assessment of ecosystem degradation, prioritizing prevention over compensation. It also promotes efficient resource utilization while minimizing ecosystem impacts.
[AIR-MH-P] Actions /Instruments /Regulations – Mitigation Hierarchy- Path-shifting	• The Plan reclassifies previously undeveloped developable areas as non-developable zones to curb land consumption.
[S-MH-I] Strategy – Mitigation Hierarchy– Innovation	• The Plan regards the "Indicator for Urban Sustainability Plan" as crucial for identifying corrective measures to address adverse environmental impacts.

Table B 89: Transformative elements related to the spatial planning provision for different sectors for the General Urban Development Plan of Vittoria-Gasteiz.

Framework' Codes	Summarized Results
[V-Se-R] Vision – Spatial provision of different sectors - Restructuring	The Plan envisaged fostering sustainable mobility.
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• Climate change: The Plan devised climate change mitigation and adaptation strategies, including ecological networks and building green facades. • Mobility: The Plan focuses on improving pedestrian and bicycle paths, connecting urban green spaces, and mitigating aquifer and air pollution. Another strategy involves spatial adjustments to the transport network, which includes burying the train line and part of the city's highway ring and reducing highway lanes to address urban land impacts. • Agrifood: The plan's agrifood sector strategies involve rezoning agricultural areas as non-developable and highly protected agricultural land categories to uphold their agricultural value. Another approach strengthens local food production, curbing transportation expenses. It also encourages adopting ecological agricultural practices across 7,500 hectares, aligning with the EU Action Plan for Organic Production. • Water: The strategy promotes an integrated water management approach to safeguard aquifer water quality. • Energy: The Plan supports renewable energy on rooftops to limit land use. Another strategy enhances carbon sequestration via green roofs and expanded forest cover. It

	also suggests integrating carbon neutrality aims into sectoral plans. • Tourism: The plan acknowledges the cultural and recreational values of the green belt, aiming to strengthen it by encouraging an eco-tourism approach. This involves proposing the integration of additional recreational services in the area. • Waste management: The Plan aims to integrate recycling, reusing, and self-composting principles to reduce pollutant release. It also prioritizes enhanced waste disposal control.
[AIR-Se-R] Actions /Instruments /Regulations – Spatial provision of different sectors - Restructuring	• Climate change: Actions for climate adaptation include (i) imposing land use constraints on areas with carbon sequestration potential and (ii) implementing specific designs and materials to improve runoff infiltration, such as using permeable pavement. • Mobility: The Plan prescribes burying certain city segments of the train line, narrowing select streets, and establishing new pedestrian and bicycle paths with integrated vegetation, enhancing green space accessibility. • Energy: The plan proposed to locate solar panels on rooftops, avoiding ground-level land occupation and sealing. • Agrifood: To enhance urban food production proximity, the Plan restricts cultivated area and aligns agricultural structures with local building norms when near towns.
[S-Se-P] Strategy – Spatial provision of different sectors – Path-shifting	• Climate change: The plan seeks to reduce the vulnerability to climate change through mitigation and adaptation measures and incrementing permeable surfaces in urban areas. • Agrifood: The Plan suggests promoting organic fertilization strategies in the agricultural sector toward decarbonization.
[V-Se-I] Vision – Spatial provision of different sectors – Innovation	• Public health: The Plan establishes an integrated vision of a healthy city, prioritizing nature protection for public health well-being.
[S-Se-I] Strategy – Spatial provision of different sectors – Innovation	• Waste management: The Plan mentioned the engagement in the EU POSIDON projects for on-site soil remediation, preventing contaminated land disposal in landfills.
[AIR-Se-I] Actions /Instruments /Regulations – Spatial provision of different sectors - Innovation	• Public health: The Plan cites a practical guideline, co-developed with multiple municipalities, for evaluating planning action impacts on public health.

[S-Se-M] Strategy – Spatial provision of different sectors – Multiscale	• Mobility: the Plan seeks to enhance the connectivity across urban, peri-urban, and rural gradient areas through pedestrian and bicycle paths and connections.
[S-Se-PO] Strategy – Spatial provision of different sectors – Phasing out	• Industry: The plan suggests raising the municipality's building area ratio to accommodate the expansion of a major local economic activity, the Mercedes Benz factory.

Table B 90: Transformative elements related to biodiversity and ES for the General Urban Development Plan of Vittoria-Gasteiz.

Framework' Codes	Summarized Results
[V-BES-R] Vision – Biodiversity & ES - Restructuring	• The plan envisages a city with robust biodiversity and strong connectivity to public green spaces.
[S-BES-R] Strategy – Biodiversity & ES - Restructuring	• The plan employs diverse strategies for biodiversity enhancement, including safeguarding valuable terrestrial and aquatic ecosystems, notably wetlands vital for ecological connectivity. It prioritizes riverbank vegetation preservation and protected area expansion. • The Plan introduces urban densification in line with the goal of a compact, cohesive city. This optimizes and redistributes public green spaces, ensuring equitable access based on projected population density. This includes reallocating excess green space from high-availability zones to urban areas expecting population growth but lacking natural attributes. • The Plan focuses on strengthening and diversifying the green belt's functions. The aim is to expand the network of green spaces that offer cultural ecosystem services, enhance tourism, and improve overall urban environmental quality and public health. • The plan emphasizes reforestation, setting measurable carbon sequestration goals, promoting green roofs, and envisioning street trees for ecological connectivity and urban aesthetics. • The plan commits to regreening initiatives for a stronger urban green infrastructure. It actively promotes nature-based solutions, like green roofs, facades, urban forests, community gardens, and Sustainable Urban Drainage Systems.
[IB-BES-R] Information baseline – Biodiversity & ES - Restructuring	• Baseline information comprehensively describes municipal ecosystems, including Natura 2000, ZEC, ZEPA areas, fluvial ecosystems, ecological corridors, wetlands, and the

	green belt. It also covers ecosystems hosting vulnerable/protected species and valuable trees. • It analyses biodiversity indicators, ES supply, and green space per capita for various distances from populated zones and types of green spaces. This result was compared to WHO standards and other urban European contexts.
[AIR-BES-R] Actions /Instruments /Regulations – Biodiversity & ES - Restructuring	• The plan reorganizes developable land into non-developable categories: natural environmental enhancement, human-influenced environmental enhancement, forests, agriculture, livestock, mountain pastures, and surface water protection. Activities within these zones are governed by three options: defined, compatible, and restricted uses. They consider cultural and provisioning ES like recreation, food, and timber, and based on them some areas became protection zones (18.03% of non-developable land). The rezoning expanded the green belt and revitalized industrial sectors with public green spaces. • The plan linked the Environmental Improvement category with two land use constraints in specific areas. One focuses on restoring degraded natural areas to their original states, while the other allows development in human-altered natural zones, ensuring untouched natural spaces remain preserved. • The Plan enforces additional constraints on non-developable zones. The Green Infrastructure constraint covers sites like the Green Belt, wetlands, rivers, streams, LIC, ZEPA, ZEC zones. The Natural Hazards constraint addresses aquifer pollution, soil erosion, climate change, and carbon sequestration risks. • The plan designates varied zones for creating green spaces, including community gardens, urban parks, forests, and river buffers. Some spaces merge with the Green Belt. It also sets rules for private green areas, mandating 65% surface vegetation and permeable materials. • The plan indicates avoiding artificial fences and using hedges to delimit the land units physically. • It recommends a minimum tree count for specific areas and encourages maximizing permeable surfaces in private open spaces.
[S-BES-P] Strategy – Biodiversity & ES – Path-shifting	• The plan aims to develop Green Infrastructure to enhance biodiversity and ES, reimagining the green belt as a structural and cross-cutting element that links diverse city parts. It also advocates increasing public access to green spaces for broader ES accessibility.

	• The Plan targets a rise in native species population by addressing areas with low canopy cover and invasive species. • The Plan highlights the need to reverse detrimental human activities like urban expansion, chemical pesticide use in agriculture, and pollution discharge into water bodies and soil.
[IB-BES-P] Information Baseline – Biodiversity & ES – Path-shifting	• The information baseline encompasses spatial analysis of carbon sequestration and the supply of other ES in the municipality.
[AIR-BES-P] Actions /Instruments /Regulations – Biodiversity & ES - Path-shifting	• The Plan implements nature-based solutions like infiltration trenches and vegetated detention ponds to manage stormwater and prevent local flooding.
[S-BES-I] Strategy – Biodiversity & ES – Innovation	• The plan aims to boost biodiversity through nature-based solutions and strengthen green infrastructure. Aligned with the EU context, the Plan engages in the soil remediation project POSIDON and embraces the biodiversity indicators outlined in the Nature Restoration Law. This project employs innovative phytoremediation techniques for enhanced biodiversity and ecosystem services.
[AIR-BES-I] Actions /Instruments /Regulations – Biodiversity & ES - Innovation	• The Plan recommends using construction techniques and materials that support biodiversity, e.g., that facilitate bird nesting in buildings. • It defines land-use constraints based on innovative criteria, including ecological corridor conditions and green infrastructure.
[S-BES-M] Strategy – Biodiversity & ES – Multiscale	• Maintaining and enriching ecological connectivity is crucial in green belt land use decisions. The Plan aims to enhance links within the green belt's green spaces, like the Salburua wetland while expanding its size. It also emphasizes transverse connectivity from the green belt into the urban core.
[IB-BES-M] Information Baseline – Biodiversity & ES – Multiscale	• The information baseline relies on several maps developed by the Municipal Centre for Environmental Studies describing biodiversity and ecosystems and the ecological connectivity within the municipality.
[AIR-BES-M] Actions /Instruments /Regulations – Biodiversity & ES - Multiscale	• The plan establishes eight new green corridors connecting areas within the green belt and hierarchical green axes in the form of street trees, linking the green belt to the city center. It also prescribes expanding the urban parks within the green belt and restorative actions in degraded areas in it.

	• Restoration efforts targeted all rivers and the Betolaza stream, using re-vegetation techniques to establish buffer zones between rivers and new developments. • Based on the findings from the Environmental Study Centre's analysis of ecological corridors, the Plan strategically assigns green infrastructure constraints to certain areas. Moreover, it underscores the importance of assessing ecological connectivity in areas affected by built infrastructures to guide the prioritization of planning actions.
[AIR-BES-PO] Actions /Instruments /Regulations – Biodiversity & ES – Phasing out	• Given that the city surpasses the WHO's minimum green space availability per capita, the plan explores transforming low-value ecological green spaces. It also examines the potential for allowing certain agricultural activities within portions of the green belt.

8.7. Switzerland

8.7.1. Territorial Plan Switzerland

The following tables illustrate the summarized results obtained from analyzing the Territorial Plan Switzerland. Specifically, Table B91 shows the transformative elements related to the governance of spatial planning systems, Table B92 those related to the mitigation hierarchy, Table B93 those related to the spatial planning provision for different sectors, and Table B94 those related to biodiversity and ES.

Table B 91: Transformative elements related to the governance of spatial planning systems for the Territorial Plan Switzerland.

Framework' Codes	Summarized Results
[V-G-R] Vision – Governance - Restructuring	• Safeguard space diversity. • Enhance regional cohesion. • Promote solidarity among population groups. • Boost Switzerland's competitiveness.
[S-G-R] Strategy – Governance - Restructuring	• Collaboration between Confederation, Cantons, cities, and municipalities. • Adaptable solutions for living spaces and economic zones. • Innovative cost-benefit approaches. • Quality of life preservation and enhancement.
[S-G-M] Strategy – Governance – Multiscale	• Advance intervention areas through collaborative projects among local entities. • Foster partnerships among cities of different scales, including large, medium, and small.

[AIR-G-M] Actions /Instruments /Regulations – Governance - Multiscale	• Support existing collaborations in rural areas, that include inter-municipal projects within the framework of the new regional policy and model projects of the Federal Rural Space Network.

Table B 92: Transformative elements related to the mitigation hierarchy for the Territorial Plan Switzerland.

Framework' Codes	Summarized Results
[V-MH-R] Vision – Mitigation Hierarchy- Restructuring	• Minimize the loss of valuable agricultural land due to new developments while preserving natural resources and rural areas. • Harmonize land use with natural hazards.
[S-MH-R] Strategy – Mitigation Hierarchy- Restructuring	• Switzerland prioritizes sustainable land use through regional collaboration. • Urban development centers on existing areas to protect nature and heritage. • Energy efficiency, renewables, and environmental quality are focal points. • The goal is to curb urban sprawl, safeguard green spaces, and rural landscapes. • Agriculture is supported, and urban areas are densified for sustainable growth.

Table B 93: Transformative elements related to spatial planning provision for different sectors for the Territorial Plan Switzerland.

Framework' Codes	Summarized Results
[V-Se-R] Vision – Spatial provision of different sectors - Restructuring	• Switzerland emphasizes international competitiveness through excellence in services, innovation, research, and resource optimization. • It avoids urbanization in undeveloped areas and focuses on energy efficiency, renewable energy, and environmental conservation in settlements. • The aim is to create conditions for sustainable energy consumption.
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• Switzerland's priority is to preserve natural resources through responsible land use. • Settlements are developed inwardly, with a focus on valuing landscapes and avoiding urbanization in undeveloped areas. • Collaborative efforts aim to reduce energy consumption, promote renewables, and maintain water and air quality.

	• Transportation supports compact settlement growth to reduce negative impacts on housing, energy, and landscapes. • Key goals include coordinated urban development, conservation of rural landscapes, and support for agriculture. • Efficient transport planning, urban connectivity, and rural-urban linkages are top priorities.
[V-Se-P] Vision – Spatial provision of different sectors – Path-shifting	• Switzerland has become a flagship country for energy-efficient settlements. It offers excellent framework conditions for the efficient production and use of renewable energy and energy transport and storage.
[S-Se-M] Strategy – Spatial provision of different sectors – Multiscale	• The federal government, cantons, cities, and municipalities create, operate, and maintain a financially viable, energy-efficient transportation network with limited land impact.
[S-Se-PO] Strategy – Spatial provision of different sectors – Phasing out	• Institutional agencies remove negative economic incentives that lead to disproportionate mobility and optimize the capacity of existing infrastructure before building new infrastructure.

Table B 94: Transformative elements related to biodiversity and ES for the Territorial Plan Switzerland.

Framework' Codes	Summarized Results
[V-BES-R] Vision – Biodiversity & ES - Restructuring	• Switzerland's priority is international competitiveness and enhancing quality of life and environmental standards. • Goals include optimizing energy use, preserving cultural heritage, and fostering innovation. • The nation promotes quality densification in both urban and rural areas, capitalizing on regional strengths and conserving natural resources. • Switzerland's polycentric cities and municipalities offer diverse urban, economic, and cultural richness, contributing to the nation's well-being. • Landscape integration into territorial planning is further pursued.
[S-BES-R] Strategy – Biodiversity & ES - Restructuring	• Switzerland preserves natural resources' extent and quality. • Spatial planning decisions emphasize efficient land use. • Settlements should grow inwards, valuing landscapes. • Avoid urbanizing and building in undeveloped zones. • Partners cut energy usage in territories, boost renewables, and maintain water, drinking water, and air quality. They

	also coordinate forest functions and enhance their value. Urban areas are densified while protecting green spaces.
[S-BES-P] Strategy – Biodiversity & ES – Path-shifting	• The plan's strategies make room for biodiversity.
[S-BES-I] Strategy – Biodiversity & ES – Innovation	• The strategy of the plan supports the multiple functions of river and lake spaces.
[V-BES-M] Vision – Biodiversity & ES – Multiscale	• Switzerland prioritizes quality of life and environmental standards. • It preserves historical-cultural landmarks, promote high-quality densification in both urban and rural areas, and enhance regional strengths. • Switzerland's diverse urban, economic, and cultural richness, alongside high living standards, strengthens its appeal as an economic and tourist hub. • Each region harnesses its potential, contributing to the nation's well-being and settlement quality.
[IB-BES-M] Information Baseline – Biodiversity & ES – Multiscale	• Swiss regions are encouraged to identify their strengths and distinct characteristics and promote them externally.

8.7.2. Cantonal-Ticino Master Plan Revision (explanatory Report)

Tables B95, B96, B97, and B98 illustrated the summarized transformative elements extracted from the content analysis of the Cantonal-Ticino Master Plan Revision, related to the governance of spatial planning systems, the mitigation hierarchy, the spatial planning provision for different sectors, and biodiversity and ES, respectively.

Table B 95: Transformative elements related to the governance of spatial planning systems for the Cantonal-Ticino Master Plan Revision.

Framework' Codes	Summarized Results
[V-G-R] Vision – Governance - Restructuring	• The plan calls for enhancing the role of public transport and promoting bicycle and pedestrian mobility, ensuring and restoring the quality of ecosystems, with particular attention to priority areas, implementing new lines and upgrading existing lines, such as connections with Varese/Malpensa, direct Locarno-Lugano connection through the Monte Ceneri base tunnel, and doubling the Cadenazzo-Tenero section. • The sheet coordinates planning measures concerning the Locarno agglomeration, integrating nature, landscape, settlements and mobility. Extensive participatory processes are a unique aspect of the project, involving various actors in its development.

[S-G-R] Strategy – Governance - Restructuring	• At the cantonal level, the plan includes updating the General Study for the Protection and Enhancement of Lake Shores, preparing Cantonal Use Plans in areas without adequate municipal planning, promoting procedures for the reclamation and acquisition of state-owned and lake lands, supporting local authorities in purchasing lake lands, and establishing recreation areas and trails around the lake. • The Agriculture Section collaborates with the Spatial Development Section to manage recreational activities in agricultural land and supports ecological interconnection projects to counter agricultural land abandonment. • At the municipal level, the plan involves adjusting Regulatory Plans to restrict the protection zone between the lake and land area, planning compartments of particular public value through Regulatory Plans, promoting the multifunctionality of the shores, cooperating with the canton to create and manage recreation areas, and protecting cultural heritage and valuable natural areas. • The plan establishes a Canton Land Observatory for continuous monitoring and coordinated development by municipalities. • The municipalities act as promoters of the plan, supported by the canton as advisors. • The plan also encourages active management of protected areas and management contracts with farms.
[IB-G-R] Information baseline – Governance - Restructuring	• The Verzasca Foundation is setting criteria to protect and improve alpine regions and working with the Patricians to create a list of priority actions related to buildings, alpine pasture infrastructure, and pasture enhancement. • The Land Department has developed a Guideline on CAP (Conservation Area Plan) to support municipalities' responsibilities. • The Parliament has allocated 4 million francs as financial aid for municipalities to cover the costs associated with preparing the CAP. • Additionally, there is a separate allocation of 5 million francs to co-finance compensation for potential reductions in building possibilities resulting from the recalibration of building zones during the adjustment of land use plans.
[AIR-G-R] Actions /Instruments /Regulations – Governance - Restructuring	• The Riveo-Visletto land-use project has highlighted the possibility of solving complex problems by integrating the sectors and actors involved. • The plan promotes an increased focus on slow mobility. Sheet M10 requires integrating slow mobility into the Agglomeration Programs to plan and promote a

	comprehensive vision of pedestrian and bicycle route networks.
[V-G-P] Vision – Governance – Path-shifting	• The plan suggests that a participatory and responsible approach to land management can be promoted through targeted cantonal and municipal policies for traditional out-of-area buildings. This shift would allow for a move away from a consumerist attitude toward nature and the landscape, instead promoting more direct and active involvement in preserving and enhancing environmental heritage.
[S-G-P] Strategy – Governance – Path-shifting	• The plan provides for creating and managing natural parks, particularly those of national and cantonal importance. Parks must balance conserving the natural environment, cultural heritage and landscape with economic and tourism promotion objectives. • The participation of local communities is essential in the creation of parks. • At the cantonal level, several Sections are involved, such as spatial development and agriculture, which promote the product of recreation areas, consolidate cultural heritage and cooperate in land management. • Municipalities are called upon to adjust their land use plans and promote the protection of lake strips. I • n addition, the importance of public participation and awareness in spatial planning and design is emphasized. • An Interdepartmental Working Group has been established to follow up on nature park projects and cooperate with the federal government.
[S-G-I] Strategy – Governance – Innovation	• The plan provides for the creation of nature parks, encouraging local communities to create exemplary nature parks, complying with federally and internationally set criteria and categories of protection, balancing the objectives of environmental conservation, cultural heritage, landscape, and economic and tourism development, inspecting the decision-making autonomy of local entities and the participation of the population. • At the cantonal level, the plan provides for the following: support to municipalities in the adjustment of Regulatory Plans, determination and preparation of decrees for the protection of nature conservation areas, coordination of projects concerning hydraulic safety, preparation of management plans for forests and natural environments, and support for stone activity. • The plan provides for the cooperation of municipalities in pursuing the directions and measures set out in the sheet

	and the specification and consolidation of planning measures in the Regulatory Plans. • The plan promotes participation and exchange of ideas in spatial planning and design to find shared and quality solutions to spatial transformations. • The plan provides for active management of protected areas, including management contracts with farms and management through operators for areas not attractive to agriculture.
[AIR-G-I] Actions /Instruments /Regulations – Governance - Innovation	• The planning strategy of the Riveo-Visletto landscaping project is based on integrating the different sectors and stakeholders involved, moving beyond simple consensus to finding answers to complex problems. This approach has enabled defining implementation solutions that benefit all sectors involved.
[V-G-M] Vision – Governance – Multiscale	• The plan focuses on promoting and coordinating Agglomeration Programs to achieve the vision of Città-Ticino. It emphasizes the coordination between settlement development and mobility for sustainability, incorporating prevention, protection, and environmental remediation principles into planning. • The plan also encourages the use of public transportation and the development of infrastructure works. The Construction Division of the cantonal Regulatory Plan is responsible for designing and implementing infrastructure projects of regional significance, and various bodies with specific tasks contribute to the coordination and implementation process. • The Lugano Regional Transportation Commission plays a key role in preparing and updating the Agglomeration Plan, while policy consolidation and cooperation among agglomeration municipalities are promoted. • The plan recognizes the importance of collaboration with neighboring regions like Grisons, Uri, Valais, Lombardy, and Piedmont, especially in issues related to drinking water protection and other transboundary matters.
[S-G-M] Strategy – Governance – Multiscale	• The State Council adopts planning zones to safeguard specific provisions. The Land Department coordinates quarry policy and promotes the use of local stone in public projects. The Department of Finance and Economy supports the stone quarrying and processing industry. The Section of Air, Water, and Soil Protection reviews environmental assessments. The Section on Local Government examines patrician leases. The Spatial

	Development Section assists municipalities in adjusting Master Plans. • At the cantonal level, the Cantonal Master Plan has tasks to promote settlement and sustainable mobility. It also coordinates between municipalities in the agglomeration. • At the municipal level, it promotes the use of local stone and adjusts Master Plans. The canton encourages the establishment of natural parks and coordinates planning activities accordingly. Municipalities collaborate to create nature parks of national or cantonal importance, involving various cantonal services in their management and promotion. Additionally, the canton supports the development of quality public spaces. • Overall, different departments and sections work together to influence settlement quality and involve the population in adopting Cultural Landscape Quality Plans.
[IB-G-M] Information Baseline – Governance – Multiscale	• The Verzasca Foundation establishes criteria for preserving and enhancing alpine areas and promotes a catalog of priority interventions on alpine pasture buildings, infrastructure and pastures. • Several cantonal departments contribute to the achievement of the goals of the board: Cultural Heritage Office, Agriculture Section, Forestry Section, Economic Development Office, Land Cadastre and Reorganization Office, Local Government Section, and Waterways Office.
[AIR-G-M] Actions /Instruments /Regulations – Governance - Multiscale	• The planning approach of the Riveo-Visletto landscaping project focuses on integrating various sectors and stakeholders, going beyond mere consensus to address intricate challenges. This inclusive strategy has led to the identification of implementation solutions that benefit all involved parties.

Table B 96: Transformative elements related to the mitigation hierarchy for the Cantonal-Ticino Master Plan Revision.

Framework' Codes	Summarized Results
[V-MH-R] Vision – Mitigation Hierarchy- Restructuring	• The plan adopts local measures on building zones to avoid oversizing and high urbanization costs, contains settlement sprawl and directs population and job growth differentially in various functional spaces, promotes sparing and sustainable land use, and preserves vacant spaces through the containment of building zones. • Spatial planning is based on sparing land use and orderly development of settlements. The plan compensates for the decrease in land area dictated by essential needs, if possible, in nature; actively protects and manages the

	landscape to avoid depletion, conservation and natural degradation. • The plan promotes health by preventing and reducing environmental loads, noise pollution and sustainable use of resources, and protects and enhances the lake landscape.
[S-MH-R] Strategy – Mitigation Hierarchy- Restructuring	• The plan proposes the establishment of protection decrees to create nature reserves and protection zones for important natural areas like geotopes, peatlands, marshes, floodplains, amphibian breeding sites, and dry meadows. • The plan also focuses on curbing urban sprawl, preventing pollution, and safeguarding water sources. • Furthermore, the plan emphasizes the protection of intact river components through ecologically justified interventions. • It suggests the creation of buffer zones and connections between natural areas along the rivers, considering compatible uses and ecologically responsible restoration efforts. • To control urban sprawl, the plan proposes enhancing traditional cores and discouraging expansions of neighborhoods. It suggests intensifying building within existing settlements while maintaining quality standards. • Nature protection measures would apply to landscapes and biotopes, with constraints from the Nature Protection Law. • The plan advocates for increasing settlement density and promoting functional mixing with the rational use of undeveloped land. • Initiatives to redevelop and regroup existing industrial areas are also proposed, based on the principle of sparing land use.
[IB-MH-R] Information baseline – Mitigation Hierarchy- Restructuring	• The plan addresses the challenges of widespread building and declining agricultural areas. It notes that areas below 500 m asl constitute only 14.5 per cent of the canton's land, yet they accommodate over 80 per cent of the population and more than 90 per cent of the jobs. A well-developed infrastructure network accompanies this concentration of settlements on the valley floor. However, the plan recognizes an issue with land allocation for building purposes. Currently, 34 per cent of the designated area in the Master Plans remains unoccupied, leading to a surplus of available space. In fact, the land reserve for building is at least three times greater than the current requirements.
[AIR-MH-R] Actions /Instruments /Regulations – Mitigation Hierarchy- Restructuring	• In 1980, the Federal Urgent Decree-protected shores were placed in a "planning zone" through the Executive Decree on Provisional Land Use Planning. This measure mainly

	affected municipalities without a land use plan and usually excluded the possibility of building zones along the banks. Until 1990, with the enactment of the Cantonal Law implementing the Federal Spatial Planning Act, the canton's powers regarding building along the lakeshore remained unchanged. The 1990 Master Plan made it possible to achieve some specific goals and helped contain undesirable developments, such as the loss of agricultural land.
[V-MH-P] Vision – Mitigation Hierarchy– Path-shifting	• The plan avoids the increase of environmental loads and reduces them if possible by designing ecologically compatible interventions accompanied by accompanying measures, preserves free spaces through the containment of building areas, protects landscapes characterized by forests, open spaces and the alpine regions below 2,000 m.a.s.l., and implements the Regulatory Plan, by the Federal Spatial Planning Law, to contain the extension of settlements, improve the quality of the built fabric and encourage concentrated building. • The plan provides for the planning of new infrastructure while considering the preservation of open space, incorporates assessments according to sustainable development principles in decision-making and planning, promotes health through the prevention and reduction of environmental loads, noise pollution and sustainable use of resources, and protects and enhances the lake landscape.
[S-MH-P] Strategy – Mitigation Hierarchy– Path-shifting	• The plan provides for adopting protection decrees to establish nature reserves and nature protection zones for bogs, marshes, floodplains, amphibian breeding sites, and dry meadows of national importance. • The plan provides for the integral protection of intact or high-natured river ecosystem components, with uses only for ecologically justified environmental restoration and enhancement. • It aso envisages buffer areas and connections between naturalistic regions related to the river system to protect, enhance and revitalise ecological functions with compatible uses. • The plan envisages guaranteeing the extension and spatial distribution of forest area, keeping landscape characteristics and diversity, management interventions, buffer strips, creating new biotopes and converting the agricultural regions to compensate for adverse anthropogenic effects. • The influential role of the area of environmental, nature and landscape preservation and the promotion of

	pioneering initiatives in conservation are featured in the plan.
[AIR-MH-P] Actions /Instruments /Regulations – Mitigation Hierarchy- Path-shifting	• The plan increases the number of preventive interventions to support the protective function of the forest.
[S-MH-I] Strategy – Mitigation Hierarchy– Innovation	• The lack of spontaneous formation of new natural environments due to the impediment of flood dynamics and the acceleration of soil maturation processes due to increased productivity and decreased water table are the problems addressed in the plan. To offset these adverse effects of human action, management measures, the creation of protective buffer strips when necessary, the restoration of new biotopes, and the conversion of some areas currently used for intensive agriculture are needed. These measures are essential to preserve and improve environmental quality and promote sustainable land management.
[V-MH-M] Vision – Mitigation Hierarchy– Multiscale	• To be adequate, the protection of the canton's natural heritage must be marked by a comprehensive view and based on objective grounds.
[S-MH-PO] Strategy – Mitigation Hierarchy– Phasing out	• The plan aims to tackle the issues caused by excessive expansion of dispersed buildings, particularly in peri-urban areas. To address these challenges, the plan advocates for policies and strategies that promote sustainable spatial planning and encourage compact and integrated urban and rural development.

Table B 97: Transformative elements related to spatial planning provision for different sectors for the Cantonal-Ticino Master Plan Revision.

Framework' Codes	Summarized Results
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• The plan aims to preserve agricultural land by designating suitable areas for agriculture in Regulatory Plans. • It focuses on improving accessibility to regional rail stops, ensuring safe access for pedestrians and cyclists. • The plan also aims to enhance the value of rail stations through urban planning measures, create quality public spaces, and encourage settlements that utilize rail services. • Additionally, it supports the energy upgrading of housing through energy efficiency and renewable energy usage. • Strategic settlement development in well-connected locations with public transportation and major roadways is emphasized, along with the renewal of existing buildings. Slow mobility is encouraged by promoting pedestrian and

	bicycle routes, accessibility to central areas, and improved interface with public transportation. • The plan discourages haphazard building expansion and aims for the modernization and completion of the railway network. • It supports the efficient use of land, redevelopment of industrial areas, and implementing a sustainable energy policy that balances different energy sources and emphasizes renewable energy.
[IB-Se-R] Information baseline – Spatial provision of different sectors - Restructuring	• The plan, known as utilization planning, encompasses municipal Master Plans or Particular Plans, and in specific situations, cantonal Utilization Plans. • The plan entails conducting geological and environmental assessments, particularly for material extraction exceeding 300,000 m3, and implementing a management program during the construction process as per the utilization planning guidelines. • Each municipality is required to validate the size of building zones using the prescribed method outlined in the annexes to the plan. • Furthermore, they must integrate the urban planning approach outlined in their Municipal Action Program for quality-centered settlement development into the Master Plans.
[AIR-Se-R] Actions /Instruments /Regulations – Spatial provision of different sectors - Restructuring	• The plan aims to promote integration between public transport, slow mobility, settlement, and recreation areas. It includes upgrades to roads and the construction of a regional bicycle route. • The plan improves accessibility, reduces traffic at the Lugano Sud highway interchange, and encourages the use of combined public transport and slow mobility (Bike & Ride) at key transport stops. Institutional actors are required to prioritize slow mobility in Agglomeration Programs. • Additionally, the plan enhances the regional bicycle network through footbridges and new connections, improves safety along connecting routes to the lake, and secures bicycle-pedestrian networks in the agglomeration. • It also contains building areas within defined perimeters, verifies the feasibility of Master Plans in peri-urban areas, and enhances the urban and inter-regional public transportation network with new lines and services, including rail and bus expansions.

[V-Se-P] Vision – Spatial provision of different sectors – Path-shifting	• Federal agglomeration policy has encouraged the development of slow mobility infrastructure for everyday travel, not just for tourism purposes. • It is essential to plan for the final settlement of brownfields to promote landscape and naturalistic enhancement and prevent uncontrolled abandonment in the plan. • New mining areas are excluded from protected areas and water protection zones. Land use planning objectives include sustainable development, quality of life improvement and environmental protection. • Settlement sprawl must be contained, and population and job growth must be differentially directed in different functional spaces. • Urban roadways must be upgraded to improve the livability, usability and accessibility of the neighbourhoods they pass through.
[S-Se-P] Strategy – Spatial provision of different sectors – Path-shifting	• The plan considers as necessary to confirm and strengthen the policy expressed in the 1990 Master Plan in protecting agriculture. Settlement expansion should focus on strategic locations, especially in areas well-served by public transportation and major thoroughfares. This implies the mobilization of building reserves and the renovation of the existing building fabric while respecting historical evidence and the identity of places. The main objective of the new Master Plan is to limit widespread and haphazard building.
[AIR-Se-P] Actions /Instruments /Regulations – Spatial provision of different sectors - Path-shifting	• The plan calls for limiting the growth of building zones and containing building areas within the perimeters defined by the current Regulatory Plans. • The plan promotes the verification of PR containment in the peri-urban areas of the municipalities of Bellinzona and Lumino. • To manage urban growth sustainably, measures are already provided for in the Cantonal Master Plan, which deal with settlement development, building zone management and settlement quality. • In addition, the plan identifies urban compartments that are well served by public transport at the railway stops in Bellinzona, Giubiasco, Castione and Cadenazzo.
[S-Se-I] Strategy – Spatial provision of different sectors – Innovation	• The plan provides for coordinating financial incentives with spillover effects on settlement quality, for example, in energy conservation, health promotion, housing policy, nature protection, nature and school mobility.
[IB-Se-I] Information Baseline – Spatial provision of different sectors – Innovation	• The plan requires all municipalities to verify the size of building zones using the method outlined in the annexes to the sheet. This verification must include the table of

	containability and a compendium of the state of urbanization. Subsequently, municipalities must adjust their master plans, integrating them with the urban planning approach developed in their Municipal Action Program for quality centripetal settlement development. In this way, the plan promotes sustainable spatial planning to encourage balanced, high-quality settlement development.
[AIR-Se-I] Actions /Instruments /Regulations – Spatial provision of different sectors - Innovation	• The Department of Spatial Planning has prepared a Guideline on the Land Use Plan to support municipalities in their planning tasks. • Parliament has allocated a credit of 4 million francs to participate in the costs borne by municipalities in preparing the Cantonal Action Program. • In addition, the plan decided on another credit of 5 million francs to co-finance the compensation arising from the recalibration of building zones as part of the adjustment of master plans. • The plan promoted the installation of wood heating systems through a specific decree.
[V-Se-M] Vision – Spatial provision of different sectors – Multiscale	• The plan promotes slow mobility, including walking and cycling, in Canton Ticino. It serves as a guideline for the Regional Transport Commissions to develop slow mobility initiatives within agglomeration programs. At the local level, municipalities are required to design and implement slow mobility routes that connect neighborhoods to the public transport network. • Under the "Energetics" project, the plan focuses on landscape preservation and advocates for alternative energy sources like wood and forest management. It also aims to curb settlement sprawl to foster energy conservation. • Moreover, the plan incorporates the "Health and Welfare" project, which encompasses settlement policies and mobility strategies to minimize pollution and preserve cultural heritage.
[S-Se-M] Strategy – Spatial provision of different sectors – Multiscale	• The plan prioritizes mobility and implementation of a new railway line, following strategic principles such as complementarity between different means of transportation and ensuring mobility for the entire population. • The plan encourages complementarity between means of transportation, promoting public transport in urban areas, combined mobility and slow traffic.

	• The plan provides for completing the regional bicycle network and parking spaces at significant attraction centres. • It stops public road transport and uses equalization measures among municipalities to group industrial areas and support priority areas. • The plan implements the new Ticino-Lombardy regional rail system with efficient connections within City-Ticino and accumulations in the Insubric region, promoting economic and urban development projects at stations. • Support the modernization and completion of the railway network, including the extension of AlpTransit to the cantonal boundaries and the connection to Milan, as well as the construction of a new link to Varese and the Milan-Malpensa Intercontinental airport.
[AIR-Se-M] Actions /Instruments /Regulations – Spatial provision of different sectors - Multiscale	• The Department of Spatial Planning has drafted the Guidelines on the Land Use Plan to support municipalities in their spatial planning tasks. • At the same time, Parliament has allocated a credit of 4 million francs to contribute to the costs of its preparation. In addition, another credit of 5 million francs has been earmarked to co-finance compensation for possible decreases in building possibilities, which could result from the recalibration of building zones as part of the adjustment of land-use plans.
[V-Se-PO] Vision – Spatial provision of different sectors – Phasing out	• In the peri-urban, an area with extensive solid residential, the plan limits the development of low-density neighbourhoods.
[S-Se-PO] Strategy – Spatial provision of different sectors – Phasing out	• The plan ensures the function of ecological connection in the area through land use planning that does not create additional barriers in the landscape and reduces building potential in places unsuitable for building, sensitive, or with landscape problems. • The plan stipulates that existing building zones should not be expanded, and changes in the perimeter of building zones should be compensated immediately without increasing the overall building areas. • The plan preserves the peri-urban area as a residential zone, curbing the sprawl of low-density housing neighbourhoods and ensuring a concentration of residents and jobs to support activities and services, and removes private moorings that conflict with environmental objectives and suppress buoy fields.

Table B 98: Transformative elements related to biodiversity and ES for the Cantonal-Ticino Master Plan Revision.

Framework' Codes	Summarized Results
[V-BES-R] Vision – Biodiversity & ES - Restructuring	• According to the plan, preserving surface and groundwater quality is essential for the ecosystem, landscape and tourist attractiveness. • The plan's planning strategy for the Verzasca Valley aims to promote socio-economic recovery while safeguarding the landscape and natural components. • The plan promotes the public enjoyment of lake shores and the creation of natural parks with integration among the various biological members. • Water policy ensures water quantity, quality, rational supply, and respect for reserve areas. • Forest management aims to provide protection, sustainable production, recreation, and biodiversity. • Natural heritage is protected, enhanced, and considered fundamental to cantonal identity. • Landscape force lines preserve settlement-free spaces and enhance emerging natural and landscape components. • Qualitative rehabilitation of built-up areas, creation of public spaces, and renewal of historical centres are priorities in the plan. • The plan supports the creation of large protected areas for environmental enhancement and regional economic development. • The plan aims to ensure quality, attractive and safe public spaces.
[S-BES-R] Strategy – Biodiversity & ES - Restructuring	• The plan focuses on promoting and preserving wildlife corridors by improving wildlife passageways and enhancing forest protection. • It aims to prevent and limit damage caused by pests, pollutants, and fires while controlling wild, ungulate populations for the forest's future. • Integrated management of streams and lakes is emphasized for flood protection, water supply, and recreation, balancing use and protection while maintaining sufficient space for streams to contain floods, promote biodiversity, and provide recreational opportunities. • The plan aims to safeguard and enhance the natural environment, particularly the Verzasca Valley landscape, by protecting and enhancing biodiversity in typical natural habitats and preserving biotopes and natural components.

	• It emphasizes the role of the forest as a recreational space, promoting leisure activities that respect the forest ecosystem and sensitive natural areas. • Additionally, the plan addresses potential conflicts and promotes interconnection between different river-lacustrine ecosystems to facilitate fish migration. • The plan suggests establishing protection zones along lake shores to ensure unified development projects for biodiversity and other land uses. • It emphasizes conserving and restoring aquatic environments' naturalness, rehabilitating sections with insufficient minimum runoff, and protecting lake shores. • Moreover, the plan emphasizes creating nature reserves, maintaining state-owned areas, and developing a network of green spaces for recreation and leisure. • Comprehensive projects will be implemented to protect and enhance the landscape, encompassing natural components, lakes, waterways, agricultural and forest land, as well as traditional and modern settlements.
[IB-BES-R] Information baseline – Biodiversity & ES - Restructuring	• The plan focuses on proximity to recreation areas, which are mainly undeveloped spaces like fields, meadows, forests, etc., located near inhabited regions. These areas prioritize agriculture, forest protection, and nature preservation while permitting recreational activities. • Specific studies are proposed to survey the flora and fauna of the Valley and create comprehensive inventories of nature-interest areas. • Settlement development is encouraged in well-connected locations, focusing on preserving the traditional built heritage. • Water quality monitoring, climate change studies on water resources, and groundwater vulnerability mapping are crucial. • The plan also emphasizes the need for protected areas and a mapped list of objects deserving protection, including landscape districts.
[AIR-BES-R] Actions /Instruments /Regulations – Biodiversity & ES - Restructuring	• The Cantonal Law on Nature Protection established the coordination of all activities and related impacts on nature protection requirements, becoming a legal obligation in 2001. • Water protection is ensured through the Federal Water Protection Act and its ordinance, which regulates water use for qualitative and quantitative surface and groundwater protection. • Projects and initiatives are underway to create cantonal nature and peri-urban parks to enable the population to

	connect with nature and discover the dynamics of ecosystems. • Spatial planning promotes measures to protect and enhance the natural, agricultural, and cultural landscape, focusing on natural and agricultural components. • The plan establishes natural parks of national importance, which has been favored by the revision of the Federal Law on the Protection of Nature and Landscape. Also, some areas are already becoming parks of cantonal importance. • The plan has planned interventions for enhancing recreation and nature protection areas along rivers, streams, valley bottom areas, and lakes.
[V-BES-P] Vision – Biodiversity & ES – Path-shifting	• The plan emphasizes actively promoting nature conservation through restoration and management measures. • It advocates keeping natural soils between settlements intact and encourages the establishment of natural parks, integrating natural components in spatial planning. • Health, safety, and environmental respect are key goals to enhance the canton's livability. • The plan recognizes the significance of the canton's natural heritage and aims to protect and enhance it. • It promotes the creation of national and regional parks, focusing on preserving the natural environment and cultural landscape for economic and social attractiveness. • The plan underscores the importance of safeguarding water quantity and quality through a comprehensive water policy. • The landscape's alternating pattern of settled and vacant land, with agricultural and natural areas, defines Ticino's ordinary landscape. • Biodiversity preservation is essential for assessing the plan's spatial development sustainability. • Landscape quality is tied to conserving natural components and their interactions with human activities. • The plan advocates integrating all spatial activities while respecting the landscape and biodiversity in nature protection efforts. • Green spaces like forests and protected areas play a significant role in ecological, landscape, and urban planning. • Securing funding for acquiring and restoring lakeshores is necessary. • A healthy and well-managed forest protects settlements, offers renewable wood resources, and serves as a recreational space for the population.

[S-BES-P] Strategy – Biodiversity & ES – Path-shifting	• The plan proposes several strategies to integrate private outdoor spaces with public spaces, focusing on minimizing construction waste and promoting the use of materials on-site. • It emphasizes the preservation and enhancement of nature and landscape through the interconnection of urban parks and open spaces while valuing historical and spatial elements. • The plan advocates establishing nature reserves and conservation areas, prioritizing preserving traditional rural landscapes. • Furthermore, the plan aims to create a network of green spaces combining recreation, leisure, and nature protection, including promoting new natural parks to preserve cultural, landscape, and natural components. • It highlights the significance of watercourses, lakes, and forests in protecting settlements, supporting wood production, and providing recreational opportunities. • Additionally, the plan stresses the importance of coordinating land use and water protection efforts, focusing on preserving quality soils for water cycle purification. • It utilizes the district as a reference unit for landscape analysis and design, emphasizing sustainable development and public enjoyment of state-owned areas and lakeshores. • In summary, the plan advocates for an integrated approach to urban planning that values nature, landscape, and culture while promoting sustainable practices for construction, land use, and nature conservation.
[IB-BES-P] Information Baseline – Biodiversity & ES – Path-shifting	• The plan covers the area of natural land components and has promoted the analysis, knowledge, and enhancement of natural heritage. The general study of the current situation shows that the percentage of natural and semi-natural environments in the plan should be considered as a minimum limit, so it is necessary to preserve and protect them. • In addition, the plan intends to establish landscape protection zones through spatial planning instruments and nature protection zones for natural compartments indicated in inventories, such as the federal inventory of sites, landscapes, and natural monuments of national importance (BLN) and the federal inventory of marshlands of national importance.
[AIR-BES-P] Actions /Instruments /Regulations – Biodiversity & ES - Path-shifting	• The plan proposes a district and sub-area plan for spatial planning and landscape design, creating the Neighborhood Recreation Area - Laveggio Park to enhance the river as a

	structuring element of the valley floor landscape, focusing on the naturalistic and recreational dimension. • Peri-urban nature parks, close to urban agglomerations, allow people to connect with nature and discover ecosystems. • The Nature Protection Law establishes the category of nature parks, territories with important natural content supportive of recreational, educational, economic and social promotion.
[V-BES-I] Vision – Biodiversity & ES – Innovation	• The plan's primary objective is to preserve the ecological functionality of the landscape, with particular attention to biological diversity. • The plan aims to protect the area's naturalistic values through land management measures and ecological restoration of river ecosystems. • River dynamics will be maintained on large stretches, and the banks will be preserved naturally. • In addition, the plan will seek to protect large areas of intact biotopes and promote scientific knowledge of river ecosystems, disseminating the results to the local and tourist populations. • Specific facilities for nature and landscape protection, promotion and enhancement are also planned.
[S-BES-I] Strategy – Biodiversity & ES – Innovation	• The plan envisions enhancing the forest's leisure function in urban and tourist areas, while respecting the ecosystem and preserving naturalistically valuable regions. • It encourages strategies for nature and landscape preservation, including urban parks, historical sites, and multiple uses of lakeshores. • The plan promotes forest evolution and ecological connections, restoring open areas and preserving forested regions. • Integrated management of streams and lakes is prioritized, ensuring interconnection between different ecosystems and facilitating fish migration. • The plan also focuses on creating protection zones along lake shores, reclaiming state-owned regions for public use, and incorporating waterways as a fundamental land-use planning principle.
[IB-BES-I] Information Baseline – Biodiversity & ES – Innovation	• The plan aims to study and catalog the flora and fauna in the Valley, which are not well-known. It also focuses on creating an inventory of landscapes, natural monuments, and geotopes of cantonal significance to support protected areas.

	• Water quality monitoring and groundwater vulnerability mapping are essential to safeguard drinking water sources and address climate change impacts on water resources. • Land use planning will establish landscape and nature protection zones for federal inventory sites and national marshlands. • The plan utilizes a cadastre of occupancy and ecological conditions for lakeshores, providing essential information for restoration. • Additionally, mapping the protected area system is necessary for its promotion and effectiveness.
[AIR-BES-I] Actions /Instruments /Regulations – Biodiversity & ES - Innovation	• The plan stipulates that owners of unused farmland may be required to tolerate free management by third parties. • It also envisages the possibility of planning at the district level or with specific sub-tables for geographic units, the development interventions for Lower Malcantone, including the enhancement of recreational trails. • The plan aims at ensuring accessibility by public transportation, planning interventions for landscape-naturalistic rehabilitation, particularly the renaturation of waterways and redevelopment of the Cassarate riverfront, and collaborating for nature protection within the forest area and the creation of forest reserves. • The plan establishes a cantonal fund for municipalities that improve or rehabilitate agricultural regions.
[V-BES-M] Vision – Biodiversity & ES – Multiscale	• Alluvial areas should be managed to ensure the ecological functionality of the landscape, conserve naturalistic values, enhance river ecosystems, preserve river dynamics, and promote the preservation of intact biotopes. • Restoring lake shores is an essential goal for the plan, as is protecting and enhancing the landscape by preserving settlement-free spaces and networking large open areas. • Regional planning is necessary to address landscape issues that transcend municipal boundaries. • There is a need to create a network of strategic alliances in the plan to enhance the spatial richness of the canton and promote collaboration among different networks of separate localities.
[S-BES-M] Strategy – Biodiversity & ES – Multiscale	• The plan focuses on preserving forests and ecological connections through various measures. • It emphasizes preserving and restoring open areas in scenic regions and protecting forest areas in valley bottoms and urbanized zones to maintain ecological connections and prevent fragmentation.

	• Additionally, the plan includes landscape projects prioritizing district and local scales, considering them intermediate scales between municipal and cantonal levels. • Biodiversity in forests is promoted through the completion and management of protected areas, ecological connections, and the provision of corridors and quiet spaces for wildlife. • Furthermore, the plan emphasizes conserving and enhancing natural and landscape components such as green areas, lake shores, and waterways. Inter-municipal coordination is encouraged to create a coherent landscape framework between municipal master plans, employing various tools like district plans, sub-plans, inter-municipal planning, and the cantonal land use plan. • Lastly, the plan envisions establishing a green space network that integrates recreation and leisure with nature protection, agricultural use, and forest management. • District projects aim to protect and enhance the landscape by integrating various natural components, agricultural and forest lands, water bodies, and traditional and modern settlements.
[IB-BES-M] Information Baseline – Biodiversity & ES – Multiscale	• The plan identifies and includes neighborhood recreation areas that meet specific requirements, contributing to the City-Ticino's functionality and attractiveness. These areas have high catchment scenic qualities but may also face conflicts from inappropriate use. Core areas must be appropriately distributed across the region. • To complement the protected area system, the plan proposes actions like inventories for landscapes, natural monuments, and geotopes of cantonal importance. • Landscape interpretation should occur on district, local, and point scale scales. Protecting spatial compartments like the Magadino Plan and unique elements such as deltas and floodplains is emphasized. • Landscape and nature protection zones are suggested for natural compartments of national importance. • The plan introduces new concepts, including graduated protection throughout the territory, even in urban areas.
[AIR-BES-M] Actions /Instruments /Regulations – Biodiversity & ES - Multiscale	• The plan calls for the ecological enhancement of the shoreline and the construction of a new trail, with the intervention of the canton through a Cantonal Utilization Plan and the Proposed Comprehensive Landscape Project as a cognitive tool for spatial planning and landscape design. • The plan proposes the implementation of natural parks of cantonal importance, focusing on the preservation and

	connection of unbuilt spaces, recovery of characteristic features, and naturalistic forest management projects. • The plan includes the protection and enhancement of the natural, agricultural, and cultural landscape context, with a focus on natural and agricultural components, specific projects such as the creation of the Piano di Magadino Park and the Ticino River floodplain proximity recreation area for the enhancement of naturalistic, environmental, agricultural and recreational aspects.
[S-BES-PO] Strategy – Biodiversity & ES – Phasing out	• In the medium term, the plan may also consider punctual destruction of dams.
[AIR-BES-PO] Actions /Instruments /Regulations – Biodiversity & ES – Phasing out	• In the 1980s, the Department of Buildings and Infrastructure designated all protected shorelines as a "planning zone" under the Executive Decree on the Provisional Order on Spatial Planning. This measure applied to municipalities without a land use plan and typically excluded building zones along the banks. Until 1990, when the Cantonal Law Implementing the Federal Spatial Planning Act was enforced, the canton's authority to construct buildings along lake shores remained largely unchanged.

8.7.3. Municipal action program of Bellinzona

The tables presented in this section illustrate the transformative elements identified through the content analysis of the municipal action program of the city of Bellinzona. Specifically, Table B99, B100, B101, and B102 show the summarized results related to the governance of spatial planning systems, the mitigation hierarchy, the spatial planning provisions for different sectors, and biodiversity and ES, respectively.

Table B 99: Transformative elements related to the governance of spatial planning systems for the Municipal action program of Bellinzona.

Framework' Codes	Summarized Results
[S-G-P] Strategy – Governance – Path-shifting	• The goal is to standardize building regulations and their unification into a single planning instrument. This will thus allow for a more direct, understandable, and unambiguous application of the different land use plans until they are standardized, following a process that will take longer.
[V-G-I] Vision – Governance – Innovation	• The plan aims to harmonize the 13 existing land use plans to create a single Land Use Plan (LUP) and enhance the identity and vitality of the 13 neighborhoods through qualified and coordinated development. It promotes

	awareness and preservation of the environment, landscape, and territorial heritage with quality concepts. • The plan also focuses on transitioning towards a city of sustainable mobility by reducing individual motorized transportation, reordering existing building zones instead of extending them (based on a methodology to be developed), and adapting to climate change to improve resilience and citizen well-being. • Moreover, it establishes actions and procedures to implement the Single Master Plan while enhancing the distinctiveness of each neighborhood.
[S-G-I] Strategy – Governance – Innovation	• The plan involved many local and supra-municipal stakeholders in its drafting. A vital aspect of the plan is the enhancement of private spaces facing green areas, incentivizing owners to take care of them to integrate them into the landscape and environmental system. • For the City of Bellinzona, the plan calls for establishing a municipal advisory commission to evaluate and pre-advise urban, architectural and landscape projects.
[S-G-M] Strategy – Governance – Multiscale	• The plan goal is to standardize building regulations and their unification into a single planning instrument. This will thus allow for a more direct, understandable, and unambiguous application of the different land use plans until they are standardized, following a process that will take longer.

Table B 100: Transformative elements related to the mitigation hierarchy for the Municipal action program of Bellinzona.

Framework' Codes	Summarized Results
[V-MH-R] Vision – Mitigation Hierarchy- Restructuring	• The plan states that living and working spaces should be sought in existing building areas. • Planning must enhance the identity and vitality of the 13 neighbourhoods for coordinated development and preserve the environment, landscape and land heritage with quality planning. • One goal of the plan is to transform the city toward sustainable mobility by reducing motorized individual transportation. • Building zones are to be reordered rather than expanded, following a methodology to be developed with climate adaptation-oriented planning to improve the resilience and well-being of citizens.

	• The definition of actions and procedures serves to achieve a unified Master Plan by enhancing the peculiarities of each neighbourhood. • Sensitive areas in the plan are places with urban, architectural, environmental, social, and identity values that must be protected from settlement sprawl or infrastructure interventions that conflict with them.
[S-MH-R] Strategy – Mitigation Hierarchy- Restructuring	• The plan aims for quality centripetal development, using the existing building fabric best and enhancing major strategic subdivisions and services. The plan's main strategies include: urban redevelopment to improve residential quality, protection of sensitive areas and preservation of the ISOS (Inventory of Objects Subject to Protection) core, enhancement of Camorino's identity as a center of social aggregation, redevelopment of the South Gateway to Bellinzona and the In Busciurina road, protection of sensitive areas in contact with the Piano di Magadino Park, and enhancement of the neighborhood center and access infrastructure to the mountain of Sponda destra. • The plan confirms the agricultural vocation of a subdivision subject to the planning area and promotes the conversion and restoration of areas in the agricultural zone and the environmental remediation of polluted sites. • It aims to reduce land consumption for new development, promote public spaces to foster social relations and encourage the creation of semi-natural landscapes to increase biodiversity and landscape quality. • In addition, the plan preserves hillside areas from development and enhances terraced vineyards, which are recognized for their strong identity value in the landscape. Clear limits are set on settlements to contain expansion pressure on natural areas and ensure adequate distance from building to natural heritage.
[AIR-MH-R] Actions /Instruments /Regulations – Mitigation Hierarchy- Restructuring	• The plan calls for the enhancement of natural areas, conservation and enjoyment of the forest and the mouth of the creek through walking trails.
[S-MH-P] Strategy – Mitigation Hierarchy– Path-shifting	• New settlements should be concentrated in the coming years within existing building zones. Central and suburban areas, as codified in functional spaces, should be densified appropriately by the urban quality and functions of the regions in which they are located.
[S-MH-I] Strategy – Mitigation Hierarchy– Innovation	• The plan highlights the City of Bellinzona's participation in a cantonal strategy covering transportation infrastructure,

	which has benefits such as reducing noise pollution and regaining land for diverse uses. • The Municipal Action Program of the City of Bellinzona serves as a tool for sustainable development and includes concrete climate adaptive measures.
[AIR-MH-I] Actions /Instruments /Regulations – Mitigation Hierarchy- Innovation	• The plan calls for the creation of soundproof hills and landscape enhancement of the stretch of highway between Gorduno and Moleno.
[S-MH-PO] Strategy – Mitigation Hierarchy– Phasing out	• Reduction of building potential should be pursued in places that, due to morphological characteristics or lack of urbanization, are unsuitable for building, lend themselves manifestly to other functions (e.g., agricultural) and in sensitive places, where the granted building potential raises problems of landscape insertion (e.g., near nuclei, cultural heritage sites, along the shores of lakes).

Table B 101: Transformative elements related to the spatial planning provision for different sectors for the Municipal action program of Bellinzona.

Framework' Codes	Summarized Results
[V-Se-R] Vision – Spatial provision of different sectors - Restructuring	• The plan seeks living and working spaces in existing building areas, connected to public transportation. One objective of the plan is to increase care and enhancement of green and public spaces, integrate sustainable mobility and public transit, ensure compact settlements, preserve characteristic places, and improve the quality of life through quality urbanism and architecture. • The plan envisions enhancing the identity and vitality of the 13 neighborhoods through coordinated development, preservation of the environment, landscape, and land heritage with quality planning, and a shift towards a city of sustainable mobility by reducing individual motorized transportation. • The building zones in the plan will be reorganized without extensions, following a development methodology with climate adaptation-oriented planning to improve the resilience and well-being of citizens. • The definition of actions aims to achieve a single Master Plan by enhancing the peculiarities of each neighborhood. • The plan includes the implementation of development poles as vital areas with socio-economic functions, connected to bicycle and pedestrian mobility. It also involves urban redevelopment and improvements to urban

	axes to enhance the livability and attractiveness of the places and promote sustainable mobility. • Furthermore, the plan emphasizes enhancing the historic core of Gnosca, including the possibility of making some streets in the historic center pedestrian-friendly. It offers opportunities for redevelopment and increasing landscape value in agricultural areas.
[S-Se-R] Strategy – Spatial provision of different sectors - Restructuring	• The plan calls for centripetal development and consolidation of the Bellinzona district's identity as a critical urban hub; settlement concentration in places well served by public transportation, with green, public spaces and quality architecture; regeneration of areas passable by cyclists and pedestrians, promoting sustainable mobility; renaturation of the Ticino River and connection to large green areas; and increased biodiversity and protection of wildlife corridors. • The plan encourages the enhancement of the landscape through agriculture and the use of alternative agricultural techniques; the creation of continuous and attractive bicycle and pedestrian connections; the promotion of bicycle use with an efficient bicycle network; the result of a pedestrian-friendly city, with Zone 30 and quality public spaces; and incentivizes sustainable mobility in workplaces, promoting bicycle and pedestrian paths and public transportation. • At the energy level, the plan incentivizes the development of photovoltaic plants and micro-hydroelectric power plants for renewable energy, the construction of a biogas plant to reduce greenhouse gas emissions, zero-mile compost production, and separate collection of wet waste, intelligent management of parking spaces with sensors to optimize traffic, raising awareness of renewable heat production through "Energy Region," and providing incentives for the purchase of home charging stations for electric vehicles.
[AIR-Se-R] Actions /Instruments /Regulations – Spatial provision of different sectors - Restructuring	• The plan wants to establish traffic-restricted zones (Zones 30 and Zones 20) and implement 'happy islands' around school buildings to improve the quality of urban space. The plan also highlights the need to cover transportation infrastructure to promote sustainable mobility. • In addition, interventions are planned to enhance the river and agricultural areas, such as riverbed widening, naturalistic interventions, and constructing of a reservoir and ecological bridge with securing bicycle routes to preserve the landscape and improve the usability of public areas.

	• Digitization of public transport and creation of bicycle parking spaces at public transport stops are further measures to promote more sustainable mobility.
[V-Se-P] Vision – Spatial provision of different sectors – Path-shifting	• The plan considers an increasingly pressing need to move in an organized and sustainable way. Travel needs are increasing, and the mode of transportation used affects economic and environmental impacts in different ways, as well as quality of life. The goal is to move from a city still oriented toward motorized individual transportation to a city of sustainable mobility, particularly bicycling.
[S-Se-P] Strategy – Spatial provision of different sectors – Path-shifting	• The plan analyses a subdivision currently subject to a planning zone (ZP), and its aim is to ensure the un-buildability of its vacant areas before any decision on its future. The intention is to confirm the agricultural vocation of the entire subdivision while also incorporating craft areas that have become residual following the construction of the AlpTransit building. The intended agricultural destination has the merit of preserving a possible future use of the site after 2040, when the railway bypass of the Bellinzonese, for the location of a station of cantonal significance.
[S-Se-I] Strategy – Spatial provision of different sectors – Innovation	• The plan includes the development of photovoltaic plants for renewable energy production, the enhancement of water resources through the creation of micro-hydroelectric power plants, and the construction of a biogas plant to reduce greenhouse gas emissions into the atmosphere, the production of zero-mile compost for the sustainable management of organic waste. • The plan encourages the separate collection of wet waste to promote recycling, the creation of new neighbourhood power plants based on renewable energy for efficient heating and cooling, intelligent parking lot management with sensors to optimize traffic, raising awareness of renewable heat production through "Energy Region," and providing incentives for the purchase of home charging stations for electric vehicles. • The plan increases accessibility to agricultural areas for people by encouraging pleasant routes for cyclists and pedestrians, use of permaculture to increase biodiversity and promote environmental sustainability, and the extension of the Bike Sharing network to enable the use of bicycles as a sustainable means of transportation.
[AIR-Se-I] Actions /Instruments	• The plan proposes a series of interventions to improve the public transport system and the quality of urban space in a given area. Among the interventions, the plan calls for

/Regulations – Spatial provision of different sectors - Innovation	introducing new transit lines, upgrading stops to meet standards for people with disabilities, digitizing the service to improve user information, and evaluating an "on-demand" service for areas not covered by traditional public transport. • In addition, the plan suggests the creation of bicycle parking spaces at bus stops to encourage intermodality. • In terms of urban interventions, the plan proposes the establishment of Zone 30 on all residential streets, the implementation of Zone 20 and pedestrian zones in neighbourhood centres, the creation of "happy islands" around school buildings, and punctual upgrades to improve the quality of urban space and adjust lighting and greenery along pedestrian routes and in parking areas.
[V-Se-PO] Vision – Spatial provision of different sectors – Phasing out	The Federal Spatial Planning Act amendment requires a change of course since settlement sprawl is no longer sustainable in the medium to long term. The plan incentivizes the decrease of adverse effects due to vehicular traffic.
[S-Se-PO] Strategy – Spatial provision of different sectors – Phasing out	Action is needed to limit vehicular transit in the city centre by containing parasitic motorized vehicular traffic that endangers the safety of pedestrians and bicyclists.

Table B 102: Transformative elements related to biodiversity and ES for the Municipal action program of Bellinzona.

Framework' Codes	Summarized Results
[V-BES-R] Vision – Biodiversity & ES - Restructuring	• The plan calls for enhancing the network of green spaces and public areas, greater integration and efficiency of sustainable mobility and public transportation, compacting settlements with more efficient use of building areas, safeguarding characteristic locations, improving the quality of life through quality urban planning and architecture, upgrading the SPAB animal shelter in Gorduno, and enhancing the diversity of public spaces and green areas in the city of Bellinzona, involving the Ticino River, the agricultural landscape, mountain slopes, and forests.
[S-BES-R] Strategy – Biodiversity & ES - Restructuring	• The plan encourages centripetal development, concentrating settlements, improving built quality, and delineating a quality urban neighbourhood with a network of public and green spaces. • The plan calls for hydraulic improvements and revitalization of the Ticino River for safety, landscape integration and recreational and tourism value. • The plan promotes the creation of continuous routes along the streams and connections with the banks of the Ticino

	River, ensuring the continuity of ways and a sustainable mobility network. • The plan provides for increasing the quality of living and housing through open and green spaces, the interconnection and enhancement of public spaces and green areas as indispensable elements of quality of life. • The plan ensures permeability between settlements and open space, especially along the Ticino River Park system and minor waterways or in forested areas, and creates a buffer for public use that is always accessible, permeable and of quality between settlements and open space.
[AIR-BES-R] Actions /Instruments /Regulations – Biodiversity & ES - Restructuring	• The plan calls for the enhancement and renaturation of minor waterways and their mouths, access to the Ticino River Park, and increased pedestrian paths within vegetated areas.
[V-BES-P] Vision – Biodiversity & ES – Path-shifting	• The plan recognizes the Ticino River as the structuring backbone of the new municipality of Bellinzona and a vital source of biodiversity, crucial for adapting to climate change. • The plan emphasizes that urban ecosystems play a pivotal role in preserving biodiversity and promoting well-being, and that green areas contribute to people's physical and psychological well-being while maintaining environmental balance. • The plan aims to enhance the Ticino River as a space for recreation, biodiversity, and climate change adaptation. • Additionally, the plan stresses the importance of increasing biodiversity as a crucial measure in combating climate change. • Moreover, creating pathways and recreational spaces along waterways provides opportunities for the community, and green infrastructure, including existing and planned green areas, contributes to energetically, environmentally, and socially improving the urban environment. • Prioritizing health and well-being is considered critical, along with providing access to naturalistic spaces outside the urban environment through new housing arrangements. The use and enjoyment of natural areas along the Ticino River are essential for the population's well-being.
[S-BES-P] Strategy – Biodiversity & ES – Path-shifting	• The plan envisages the creation of a Ticino River Park as the structuring backbone for the new Bellinzona Municipality, connected to the city and a source of biodiversity.

	• The plan starts with setting public spaces and green areas to determine the conformation and density of use of building zones. • The plan encourages semi-natural landscapes such as hedgerows, flowering fallows, or extensive meadows for biodiversity and landscape quality. • It promotes a systemic and interdisciplinary approach in spatial and landscape planning, with green infrastructure as a methodological, energy-efficient, and environmentally-efficient model. • The plan encourages meshes of green areas as an ecological network connection and climate resilience device, with widespread biodiversity and renaturation of brownfields and waterways, preservation of ecosystems through the gradual development of mixed forests to increase biodiversity and forest resilience, and local heat island effect mitigation measures, such as developing green spaces, planting new trees, shading vacant areas, de-impermeabilizing surfaces, vegetating roofs and facades, and rehabilitating buildings to cool them sustainably.
[AIR-BES-P] Actions /Instruments /Regulations – Biodiversity & ES - Path-shifting	• The plan calls for the enhancement and renaturation of minor waterways and their mouths, access to the Ticino River Park, and increased pedestrian paths in the vegetation.
[V-BES-I] Vision – Biodiversity & ES – Innovation	• The work for creating a single Land Use Plan (LUP) considers the identity and vitality of neighborhoods and is aimed at preserving land assets and promoting sustainable mobility. • The plan must also consider climate adaptation and define procedures, timelines and harmonization of standards for rezoning building zones, ensuring equitable development resilient to climate change.
[S-BES-I] Strategy – Biodiversity & ES – Innovation	• The plan's urban planning is based on creating a network of public spaces and green areas to promote a more vital and sustainable city. • The plan includes renaturing the Ticino River and connecting it with large green areas, increasing biodiversity and protecting wildlife corridors. • It also promotes widening sidewalks and new crossings that will help moderate traffic and improve sustainable mobility. • The plan provides: the coverage of transportation infrastructure and the use of alternative agricultural techniques aim at reducing environmental impact and promoting sustainability; the enhancement of private

	spaces, the creation of pedestrian paths and the mitigation of the heat island effect are other measures to improve the quality of life and the usability of the urban area.
[IB-BES-I] Information Baseline – Biodiversity & ES – Innovation	• The city of Bellinzona has already begun to undertake measures to adapt to climate change: a survey campaign will make it possible by the end of 2020 to have climate mapping of the city centre, which can be integrated with outdoor mapping in 2021.
[AIR-BES-I] Actions /Instruments /Regulations – Biodiversity & ES - Innovation	• The plan aims to improve and enhance several landscape and environmental areas between Gorduno and Moleno. • The plan proposes a series of measures and interventions, mainly public, to make these areas more accessible, attractive and usable for the community. The main actions in the plan include: the creation of sound-absorbing hills and landscape enhancement of the highway between Gorduno and Moleno, the reduction of impervious surface through the use of permeable parking lots and clear mixtures for sidewalks and bicycle and pedestrian paths, the ralization of shade points in critical waiting areas and installation of shade sails and water features in plazas and rest areas, and the promotion of the use of clear synthetic materials in plazas intended for play, the mapping of water points and completion of the network where it is lacking, including the creation of "shade paths" to reach the main points of the city, improvements and access to the river in the different areas of the river park (Torretta, Boschetti, Saleggi, Moleno-Preonzo), and the preservation of the landscape function of agricultural areas and enhancement of terraced vineyards.
[V-BES-M] Vision – Biodiversity & ES – Multiscale	• The plan emphasizes that some of the rials already have very pleasant and well-organized paths. Still, sometimes they encounter discontinuities. So, it will be essential to ensure the presence of pathways that will branch off along the neighborhood streams and along the banks of the Ticino, as well as a sustainable mobility network that will significantly expand the leisure offerings.
[S-BES-M] Strategy – Biodiversity & ES – Multiscale	• The plan calls for creating a Ticino River Park, extending from the Piano di Magadino to Moleno, including nearby recreation areas. • The plan promotes participation in a cantonal strategy for covering transportation infrastructure to reduce noise pollution and rewire landscapes and settlements. • The plan provides for environmental redevelopment and improvement projects in the river park, including punctual enlargements, river accesses, naturalistic interventions,

	bicycle and pedestrian paths, and enhancement of agricultural areas and parks related to the river to encourage the creation of new green areas.