Integrating Environmental Assessment and the Spatial Planning Process

PRACTICE NOTE

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Technical references

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This report and its contents are an expression of the authors' knowledge and conclusions and do not necessarily represent all BioValue partners.

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Linking Environmental Assessment with Spatial Planning Processes to support biodiversity protection and enhancement

This report explores how integration of environmental assessment instruments—Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA)—within spatial planning processes can substantially enhance biodiversity outcomes. Effective integration allows these instruments to contribute proactively and meaningfully to planning, guiding decisions that support sustainable development and biodiversity protection goals. SEA sets the strategic framework by embedding environmental considerations at early planning stages, while EIA addresses project-level impacts, together forming a comprehensive approach to environmental safeguarding. **The report emphasizes the importance of integrating SEA from the outset of the planning process** to avoid the common practice of only assessing impacts after a plan has been drafted – a delayed approach that often limits the influence of assessment on planning outcomes. As shown in Figure 1, the earlier environmental assessment is integrated into the planning process, the greater its influence on critical decisions, ensuring that the most impactful choices are guided by a robust understanding of potential impacts and biodiversity opportunities.

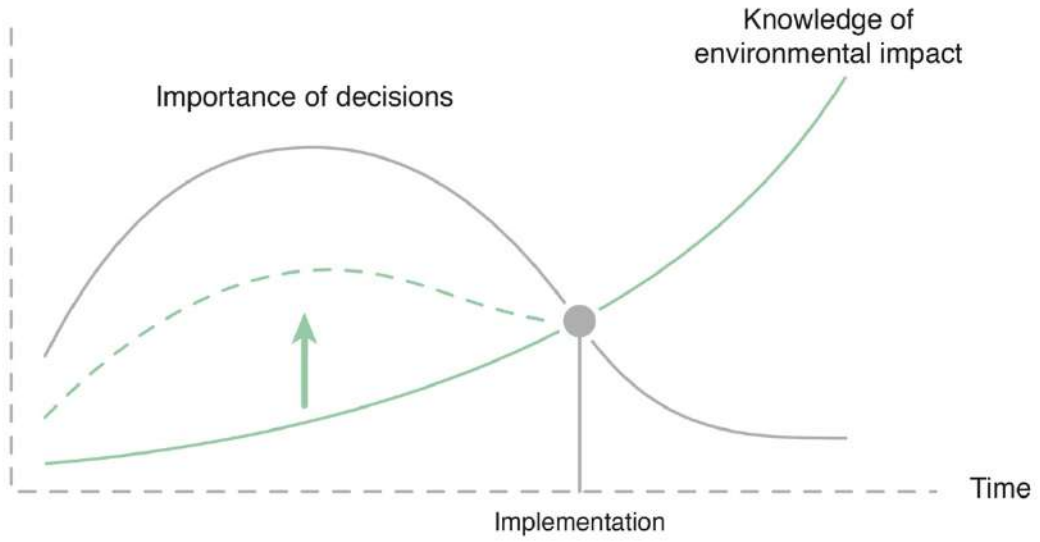

Figure 1.Timing of Environmental Assessment knowledge versus decision-making importance across the planning and implementation process. (Source: Kørnøv et al., 2022; translated).

A key element of this integration is the Causal Loop Tool, developed within the BioValue project, which introduces a systems-thinking approach to visualize interdependencies and feedback loops within environmental and planning systems (Kørnøv et al., 2024). The tool is instrumental in identifying three key leverage points for biodiversity that spatial planning can influence: **habitat**

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quality, total habitat area, and habitat connectivity. By identifying where interventions may yield the most significant impacts, the tool allows SEA and EIA processes to transcends traditional linear assessment, adopting a system-thinking approach that captures the complexity of ecological interactions. This enables planners and EA practitioners to anticipate cascading effects, balance competing objectives, and adopt adaptive strategies that enhance biodiversity resilience.

The report includes a table that demonstrates how SEA, EIA, and the Causal Loop Tool align with the stages of spatial planning – from setting policy agendas through monitoring and evaluation. This structured approach emphasizes practical methods for embedding biodiversity considerations and addressing systemic feedback, helping planners, policymakers, and environmental assessors navigate interlinked ecological and planning objectives.

Outset in a generic spatial planning process

The spatial planning process, as outlined by Partidário (2024) in her recent policy note on spatial planning, is inherently cyclical, progressing through stages from vision-setting and policy alignment to proposal development, implementation, and continuous evaluation (see Figure 2). This cyclical nature is crucial for fostering adaptive planning practices that support sustainability and biodiversity resilience.

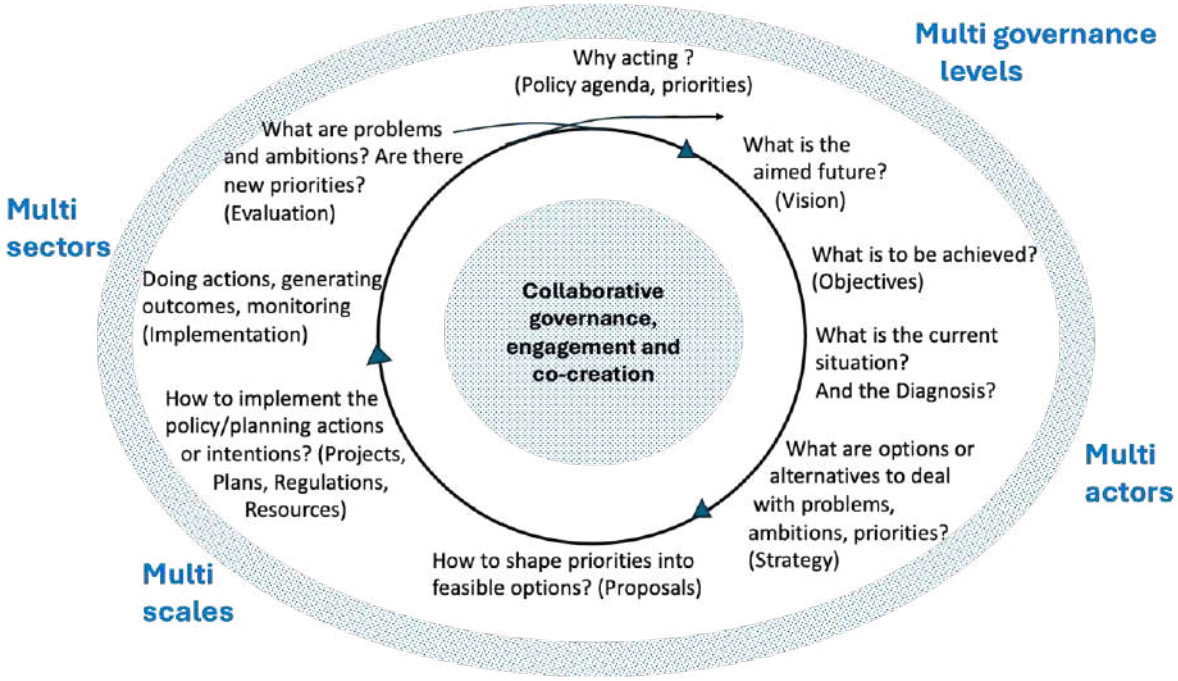

Figure 2 The generic cyclical spatial planning cycle. (Source: Partidário, 2024: 5)

Integrating SEA and EIA across all stages of this cycle strengthens planning by embedding environmental considerations from the very outset. SEA promotes sustainability priorities early on, guiding the strategic context for project-level assessments undertaken by EIA. The combined application helps planners and stakeholders anticipate key environmental challenges, develop mitigation strategies, and identify biodiversity enhancement opportunities early in the planning process. By proactively addressing environmental trade-offs and managing unintended consequences, this approach supports informed decision-making that contributes to resilient, long-term environmental and biodiversity outcomes.

Linking the Causal Loop Tool to SEA and EIA

The Causal Loop Tool is a critical resource in reinforcing SEA's and EIA's integration within spatial planning. The tool employs a system-thinking framework to map complex cause-and-effect relationships between environmental factors, policy decisions, and biodiversity outcomes, thereby enriching both SEA and EIA processes.

Within SEA, the Causal Loop Tool enables planners to identify strategic leverage points early in the planning process. These points – such as habitat quality, total habitat area, and connectivity of habitats – represent critical opportunities for targeted interventions that align with broader sustainability and biodiversity goals. By mapping feedback loops, the tool reveals how specific policy choices may create long-term biodiversity impacts, enabling planners to adopt strategies that prevent negative outcomes before they arise.

In EIA, the Causal Loop Tool provides a more detailed, project-specific perspective. It highlights the interaction between individual development projects and their surrounding ecosystems, allowing practitioners to foresee cascading impacts, such as habitat fragmentation or pollution effects. By capturing the ripple effect of project-level actions, the tool helps practitioners devise targeted mitigation strategies that address root causes instead of symptoms.

Together, SEA and EIA, empowered by the Causal Loop Tool, shifts from a linear assessment approach to a dynamic, systems-based approach. This integration not only improves the responsiveness and adaptability of environmental assessments but also enables them to shape spatial planning outcomes proactively, guiding decision-making toward biodiversity conservation and sustainable development goals.

Proposed Environmental Assessment Integration across the Planning Cycle

Table 1 presents a comprehensive framework that demonstrates the integration of SEA, EIA, and the Causal-Loop Tool at each key stage of the spatial planning process, including policy agenda-setting, vision and objectives formulations, diagnostics, strategy development, proposals, project formulation, implementation, and evaluation. This structured integration allows for a flow of environmental considerations from the earliest stages of policy formulation to the on-ground project execution and post-implementation assessment.

Each phase in the table specifies how SEA and EIA contribute essential strategic and project specific environmental insights. By incorporating the Causal Loop Tool, this framework is further strengthened, enabling complex cause-and-effect mapping that captures interdependencies across biodiversity and other sustainability dimensions. This helps stakeholders to anticipate unintended consequences, manage trade-offs, and identify synergies, supporting an integrated approach to spatial planning, offering practitioners a practical roadmap for making informed, ecological responsible decisions.

To further support this integration-focused practice, it is beneficial to reference an additional practice note, *Enhancement and mitigation measures for biodiversity in environmental assessment – a catalogue* (Ravn Boess and Kørnøv, 2024). This catalogue provides a suite of targeted measures specifically designed to address biodiversity considerations in spatial planning and infrastructure development. It offers practitioners concrete and actionable options for mitigating adverse impacts on biodiversity while actively promoting ecological benefits. This complements the integrated insights outlined in Table 1, ensuring that both mitigation and enhancement measures are systematically embedded within the planning and assessment framework, thereby aligning environmental assessments with biodiversity objectives and reinforcing the overall sustainability and resilience of spatial planning outcomes.

The table includes this symbol , which is used as a visual indicator to mark stages and actions that represent opportunities for transformative intervention within the spatial planning process. These symbols highlight elements that could be effectively integrated into the process to enhance outcomes but currently do not receive sufficient attention:

1. **Policy agenda**
   Highlights the opportunity for EA to proactively shape strategic priorities by identifying key environmental challenges and opportunities early on. This includes integrating biodiversity and ecosystem service (ESS) considerations into the political agenda, ensuring that these elements are foundational to all subsequent planning. This transformative intervention can guide policymakers to adopt biodiversity benchmarks that set a clear direction from the start.

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2. **Diagnosis**
   Highlights the potential to leverage EA instruments, to conduct baseline assessments and identify vulnerabilities, such as areas prone to habitat fragmentation or environmental degradation. By mapping out existing biodiversity, land use, and ecosystem conditions, practitioners can uncover root causes of environmental issues and highlight areas for intervention. This diagnostic approach allows for a deeper understanding of systemic issues, enabling more effective, informed decisions in subsequent planning stages.

3. **Evaluation**
   Underscores the importance of using feedback from implemented plans to inform future planning cycles. This transformative intervention supports the creation of a continuous learning loop, where insights gained from monitoring biodiversity outcomes and the effectiveness of mitigation and enhancement measures feed back into the planning process. Such an evaluation process ensures that the spatial planning system evolves and adapts to achieve long-term sustainability and biodiversity resilience.

In each of these stages, the signifies strategic intervention points where EA can actively influence planning outcomes, helping to embed biodiversity and sustainability at the core of the spatial planning framework.

SPATIAL PLANNING PROCESS	WP2 INPUTS	
	EAI-process, practice and content	**EAI' s leverage of the Causal-loop tool**
POLICY AGENDAS, PRIORITIES	**Proactively contributing** with EAI in influencing the political agenda by identifying key environmental challenges and opportunities, ensuring that biodiversity and ESS are integral to strategic priorities. SEA can guide early decisions on setting sustainability benchmarks, while EIA addresses project-specific priorities later. **Mitigating impacts** when SEA provides early insights into potential biodiversity risks, allowing mitigation measures (avoidance, minimization, off-setting) to be discussed before formal planning begins. EIA later ensures that these risks are addressed at the project level. **Enhancing biodiversity** when SEA promotes the proactive integration of biodiversity enhancement measures, ensuring that biodiversity priorities – such as habitat restoration and ecosystem connectivity – are prioritized from the outset.	**Identifying leverage points** by helping to identify systemic relationships between political priorities and biodiversity outcomes, showing critical points where interventions (policies) can shift the system toward sustainability. **Highlighting systemic feedback**, showing how political decisions can generate positive or negative feedback loops within biodiversity and ESS, helping to shape policies that anticipate unintended biodiversity consequences.
VISION/ OBJECTIVES	**Ensuring that objectives are aligned with ambitious but realistic goals**, such as reducing habitat fragmentation or increasing green infrastructure. **Identifying mitigation measures early**, ensuring that the plan avoids critical biodiversity loss through clear, enforceable targets. **Identifying enhancement measures during the goal-setting phase**, ensuring that biodiversity enhancement is embedded in the plan objectives, such as increasing green corridors or expanding natural areas within urban plans.	**Offering insights into the feasibility of biodiversity objectives** by mapping interactions, ensuring that goals are both achievable and impactful. **Highlighting trade-offs** between competing objectives (e.g., economic growth through tourism expansion vs. biodiversity preservation), guiding decision-makers to make balanced, informed choices.
DIAGNOSIS	**Baseline assessment** with SEA using existing data to map existing biodiversity, land use and ecosystem conditions to inform planning. An element can also be the mapping of environmental pressures. **Identify vulnerabilities**, such as areas prone to habitat fragmentation, ensuring that plans are designed to mitigate these risks. **Highlighting opportunities** for biodiversity enhancement, such as ecosystem restoration opportunities, ensuring that planning addresses current ecological gaps contributes positively to ecosystems.	**Mapping problem interconnections** and thus, providing a systems-level diagnosis, showing the interconnections between e.g., land-use intensity, biodiversity, and other environmental factors, helping to pinpoint root causes of ecosystem degradation. **Root cause identification** to help identify how past planning decisions have contributed to biodiversity decline, guiding planners to make informed decisions to avoid repeating past mistakes.

STRATEGY	**Exploring various development scenarios** (e.g., low-impact urban development vs high-density development), and assessing how alternatives affect ESS, biodiversity and human well-being. Important for decision-makers to understand the trade-offs and benefits. **Evaluating alternatives with the goal of minimizing environmental impacts**, ensuring that the best possible mitigation strategies are integrated into the plan. **Encouraging the inclusion of enhancement options in plan alternatives**, such as alternatives that prioritize green infrastructure, habitat connectivity, or nature-based solutions.	**Scenario testing of options** by modelling how different planning scenarios affect biodiversity, ESS and other environmental factors, providing a visual understanding of trade-offs and synergies between alternatives. **Feedback loop exploration** showing how different alternatives may trigger positive or negative feedback loops, helping decision-makers select the most sustainable and resilient options.
PROPOSALS	**Shaping priorities into feasible plans** by ensuring that environmental priorities, such as biodiversity conservation and sustainability goals, are embedded into final planning proposals. **Integrating mitigation measures** into the strategic plans, ensuring that risks of biodiversity loss are minimized at a systemic level. **Including biodiversity enhancement measures**, turning environmental priorities into feasible plans, such as initiatives focused on restoration projects or habitat creation.	**Analysis of qualitative effects**, helping to forecast both positive and negative consequences of proposed plans. **Assessing the effectiveness of different mitigation and enhancement strategies**, showing how well they integrate into the overall system, showing potential outcomes and unintended consequences.
PROJECTS/ PLANS/ REGULATIONS/ RESOURCES	**Guiding the formulation of regulations** that support biodiversity protection within the plan. **Guiding formulation of project-level requirements**, ensuring all necessary mitigation measures are built into subsequent development projects and regulations. **Guiding the allocation of resources** for biodiversity enhancement measures, ensuring that funds are directed towards e.g., ecosystem restoration or the creation of green infrastructure.	**Showing effects of investments in biodiversity** (e.g. green infrastructure) and how they can alleviate pressures in other areas (e.g. storm water management), highlighting cascading positive effects **Highlighting interdependencies in the plan**, such as investment in one part of the system (e.g., habitat restoration) can generate benefits across other ecosystem services.
IMPLEMENTATION	**Establishing monitoring frameworks** to help track whether biodiversity mitigation and enhancement measures are effectively implemented.	**Help tracking feedback loops during implementation,** providing insights into whether measures are working as intended or if adjustments are needed. **Supporting adaptive management** by visualizing how changing conditions (e.g., climate variability) may require adaptive management.

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EVALUATION	**Evaluating the success of the implemented plans** in achieving biodiversity, and sustainability goals. SEA evaluates systemic outcomes, while EIA focuses on project-specific impacts.	**Monitoring long-term outcomes** by tracking key biodiversity indicators and system responses, providing ongoing feedback for future planning cycles.
	Providing feedback on mitigation measures, whether they are working as intended, providing feedback for future adjustments if necessary.	**Creating learning loops** where feedback informs implementation and evaluation informs future planning processes, ensuring continuous improvement.
	Providing feedback on enhancement measures, assessing whether they have been effective, ensuring that future plans build on these successes or make adjustments where needed.	

Table 1 Integration of SEA, EIA, and the Causal Loop Tool across key stages of the Spatial Planning Process.

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Conclusion

The report demonstrates how the integration of SEA and EIA, and the Causal Loop Tool within spatial planning can significantly strengthen biodiversity-focused decision-making. By embedding these tools throughout each stage of the spatial planning process, practitioners can incorporate critical environmental insights that support sustainable development and ecological resilience.

The full potential of this integration lies in aligning SEA and EIA with complementary instruments in spatial planning, such as zoning regulations and financial incentives. When combined, these tools provide a cohesive structure that supports biodiversity-enhancing decisions and aligns planning with sustainability. This multi-instrumental approach empowers spatial planning to become a powerful driver of transformative change for biodiversity conservation and sustainable development.

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