

Bridging landscape classification and policy objectives: the case for crosswalks



Ardea purpurea, Ria de Aveiro, Portugal.
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Introduction

The accelerating triple planetary crisis (climate change, biodiversity loss, and pollution) affects coastal areas and demands integrated solutions aligned with the EU Green Deal. Achieving ecosystem and catchment level-related policy objectives requires spatially explicit information that supports management decisions, balances ecosystem services supply and demand, and addresses trade-offs through mitigation measures. In this context, maps are not only analytical tools but also powerful instruments for communication and engagement, fostering transparency and involvement of all interested parts in restoration efforts.

LUPLES model presents a workflow that estimates pressure levels on lentic waterbodies based on land uses in the catchment and direct basin alterations, allowing the evaluation of how catchment dynamics influence the ecological status of the waterbodies¹.

Landscape units' classification systems are central to mapping and modelling processes. They provide the spatial framework for assessing pressures, ecological status, and restoration priorities. The CORINE Land Cover (CLC) system for landscape units' classification links anthropogenic activities to physicochemical stressors, offering a clear basis for water and land management. In contrast, the European Nature Information System (EUNIS) is a habitat classification system which delivers detailed ecological context, essential for biodiversity and habitat-focused interventions.

KEY MESSAGES

- **Spatial explicit models, like LUPLES (Land Use, Pressures Level, Ecological Status) inform on ecosystems pressure intensity levels and, through predictions of the ecological status, support management options to meet ecosystem-related policy objectives**, namely under the Water Framework Directive and Habitats Directive, but also the Nature Restoration Regulation.
- **Distinct landscape units' classification systems, like the CORINE Land Cover (CLC) and the European Nature Information System (EUNIS), inform policies like the Water Framework Directive (WFD) and Habitats Directive (HD) on pressure intensity levels and habitat identification.**
- Incorporating **multiple classification systems** into pressure-assessment models like LUPLES allows practitioners to derive complementary insights.
- **The EU Nature Restoration Regulation (NRR)** introduces its own EU-wide habitats groups to standardize restoration targets and reporting, that might translate into different results on ecosystems pressure intensity levels and/or predictions of the ecological status, when applying spatial explicit models like LUPLES.
- **Developing crosswalks between CLC, EUNIS and NRR classifications**, safeguarding that landscape units in many cases do not match the different policy-related and governance units, **would support the integration of existing datasets into the new framework under the Nature Restoration Regulation** and maintain the value of current monitoring systems.



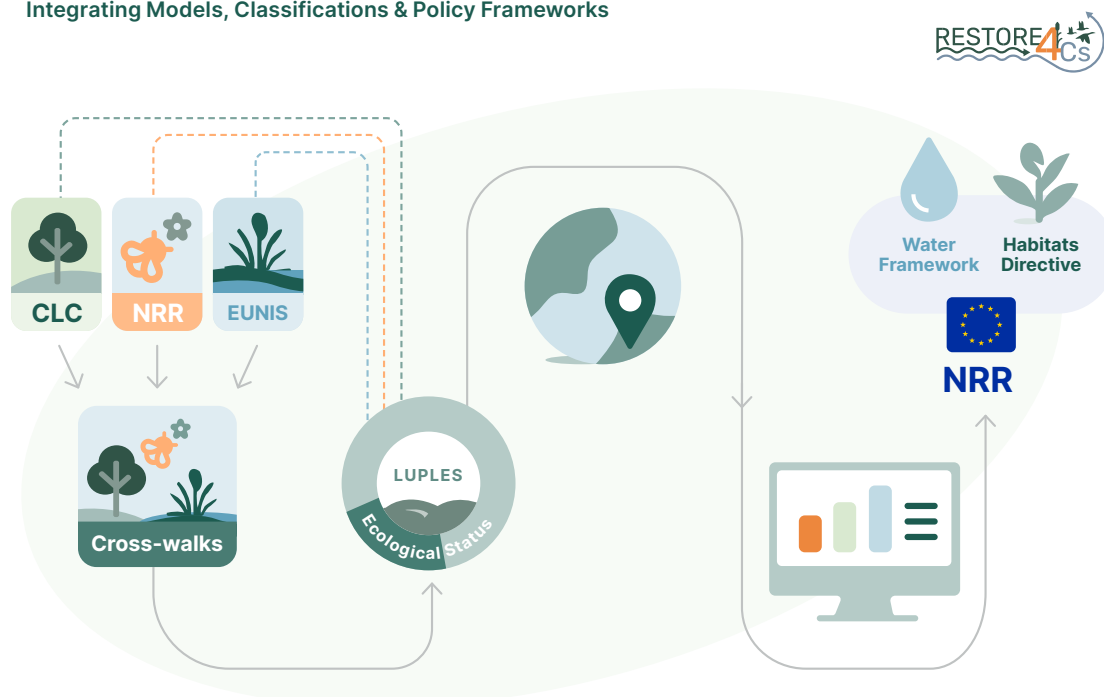
Dunes between Atlantic Ocean (left side) and Ria de Aveiro (right side). © Evgeni Dimitrov / eLTER Grand Campaign

These classification systems are already being used by decision-makers to inform different policies like the [WFD](#) and [HD](#) on pressure intensity levels and ecological status, for the former, and habitat identification, for the later.

However, the recently adopted **Nature Restoration Regulation (NRR)** introduces a new EU-wide classification system of six groups of habitat types to standardize restoration targets and reporting. While promising, this framework might pose additional challenges. A study was conducted within the RESTORE4Cs project, focusing on the Ria de Aveiro Natura 2000 area in Portugal, that includes freshwater, transitional, and coastal waters. The study was framed under the WFD, which served as the reference

policy to demonstrate that pressure intensity levels calculated using LUPLES with CLC, EUNIS, and their combined datasets were dependent on the landscape unit classification system². So, how will the NRR classification system inform and/or compare to CLC and EUNIS? Developing crosswalks, that is, interlinks among the different categories/types of the different classifications, of habitat types and pressure types between CLC, EUNIS, and NRR classifications could enable pressure-assessment models like LUPLES to generate complementary insights, combining anthropogenic pressure mapping with ecological specificity, thus strengthening policy implementation under the WFD, HD and NRR.

Integrating Models, Classifications & Policy Frameworks



Relevance to legislation and strategic frameworks

Implementation of ecosystem-related policies relies on spatially explicit frameworks to inform decisions which contribute to achieving their objectives. A crosswalk of habitat types and pressure types between CLC, EUNIS, and NRR classifications would support implementation of the **EU policies**, particularly:

- i) **Water Framework Directive** which requires pressure and status assessments for water bodies, where CLC supports identifying land-use drivers of pollution and catchment modifications;
- ii) **Habitats Directive** which depends on ecological context for habitat conservation, aligning closely with EUNIS classifications;
- iii) **Marine Strategy Framework Directive**, which extends these principles to marine ecosystems, referring the need to integrate land-sea interactions into maritime spatial planning;

iv) **Nature Restoration Regulation**, which establishes EU-wide restoration targets and reporting standards, introducing a new classification system of habitats.

v) **Land Use, Land Use Change and Forestry (LULUCF) Regulation**. CLC classes can be used to identify land use categories (e.g. forest, grassland, wetland etc) under LU-LUCF and provide a harmonised baseline for land-cover change detection.

Crosswalks of landscape units' classifications and grouping would provide coherence across directives, enabling robust monitoring, reporting, and adaptive management under the **EU Green Deal** and the **EU Biodiversity Strategy for 2030**.



Bocage landscape, Ria de Aveiro, Portugal. © Evgeni Dimitrov / eLTER Grand Campaign

Policy recommendations

Framed in the following **key recommendations**, restoration efforts under the NRR could complement broader policy objectives and deliver cross-cutting tangible benefits for ecosystems and society.

- **Create a working group**, similarly to the Mapping and Assessment of Ecosystem Services working group (MAES WG), **to develop crosswalk tables between CLC, EUNIS, and Nature Restoration Regulation (NRR) landscape units' classifications** to ensure interoperability and continuity of monitoring systems. To this end, build upon existing best practices from ecosystem services classification crosswalks, namely between the Millennium Assessment (MA), The Economics of Ecosystems and Biodiversity (TEEB), Common International Classification of Ecosystem Services (CICES, both v4.3 and v5.2) and Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). This might also facilitate cross-sectoral collaboration between ecologists, site-managers, and all interested stakeholders in general, including citizens, and policymakers, to ensure effective implementation of ecosystem-related policies.
- **Ensure policy coherence and data continuity, by aligning NRR's classification with established systems to prevent fragmentation and duplication of efforts.** A discussion paper similar to the 2011 publication on the *Links between the Water Framework Directive and Nature Directives (Birds Directive and Habitats Directive)* could enable integration of the recommended crosswalks into EU reporting mechanisms to streamline compliance under WFD, HD, MSFD, and NRR.

- As different landscape units provide classification system specific information, to provide coherence across directives, **stakeholder engagement should be supported with clear communication strategies to support spatial visualizations as tools for transparency, engagement, and participatory planning.** This will enable trust and collaboration into environmental management, anticipate potential trade-offs and the co-creation of mitigation measures.
- **Apply the LUPLES model as a tool to promote multifunctional landscapes** by integrating human activities and ecosystem functions within a socio-ecological perspective. Its application aligns land-use planning with biodiversity conservation, water management objectives, and climate action, contributing in this way to the Sustainable Development Goals (SDGs), particularly SDG 6 (Clean Water and Sanitation), SDG 13 (Climate Action), SDG 14 (Life Below Water), and SDG 15 (Life on Land). All these SDGs are interconnected through the hydrological cycle and the role of wetlands, which are critical for water regulation, carbon storage, and biodiversity support. Using integrated classification systems and spatial modelling tools like LUPLES strengthens evidence-based decision-making and supports the design of coherent, cross-sectoral strategies for resilient and adaptive landscape management.

References

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RESTORE4Cs is a Horizon Europe project that aims to evaluate the effects of restoration actions on wetlands' ability to mitigate climate change and deliver a range of ecosystem services, using an integrative socio-ecological systems approach. More information is available at: <https://www.restore4cs.eu/>

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PARTNERS

