

Governance Pathways for Implementing Nature-Based Solutions: From the Legal Framework to the Participatory Approach of the Italian NATALIE Case Study

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Abstract In the Veneto region (Italy), rising temperatures and increasingly frequent extreme precipitation events—potentially up to +120% under high-emission scenarios—intensify the vulnerability of agricultural landscapes (ARPAV, 2023). Agriculture occupies around 60% of regional land (Regione del Veneto, 2021) and contributes to over 15% of pressures on the Venice Lagoon's water bodies. Traditional consortia have long been responsible for the safeguarding and managing the water in extensive canal systems (L.R. 12/2009), but between 2021–2023, their maintenance required ~95.5 kT/year of raw materials (CBAR, 2024), demonstrating incompatibility under climate urgency.

Nature-based Solutions (NbS) offer viable alternatives. Within the Horizon Europe NATALIE project, pilot interventions in the Venice Lagoon basin are testing selective maintenance of riparian vegetation riverbank extension and vegetation-based restoration, aiming to reduce material impact and enhance ecosystem services. Ambition to scale such solutions, besides proving the economic benefit, requires navigating a multi-level governance system to ensure long-term viability. This study investigates the feasibility of NbS in CBAR-managed canals, focusing on the legal framework from the specific context of water management (eg. Piano di Tutela delle Acque e Piano Gestione Acque) and participatory insights from two Transformation Labs (TLs).

The legal framework recognizes climate challenges and pressures on water bodies, supported by socio-environmental data. It aligns with broader goals like the EU Habitat Directive, relevant for NbS targeting ecological restoration. TLs complemented unaddressed climate impacts—such as seasonal unpredictability and reduced planting windows. Although it identifies key stakeholders for water safeguarding, it overlooks the socio-political challenges crucial for NbS uptake—such as fragmentation of responsibilities, limited stakeholder engagement, and public resistance that were collected as inputs from the TLs. The legal measures lack direct mention of NbS, referring only to related terms (e.g., renaturalization, retention basins), that would be pertinent to align regulations with EU strategies and help mainstream its adoption. The participatory activities also identified and co-designed insightful context-specific solutions including multifunctional green spaces, accessible monitoring tools, and the strategic visibility of pilot projects.

Incorporating top-down regulatory instruments with participatory governance illustrates the potential of governance models to foster more inclusive, efficient and resilient NbS implementation and ensure long-term viability from the constructed

stakeholder awareness and cooperability. It offers a pathway towards scalable implementation of NbS in the CBAR-managed canals, addressing the climate urgency.