Rethinking Land–Sea Protection and Restoration: Early Reflections on Governance Innovation from the *BlueGreen Governance* Project

Gianluca Ferraro[1,2], Pierre Failler[1,3], Elisa Furlan[4,5], Jean-Marc Douguet[6]

1) University of Portsmouth, Faculty of Business and Law, Centre for Blue Governance, Richmond Building, Portland Street, Portsmouth, PO1 3DE, United Kingdom
2) University of Valencia, Faculty of Law, Valencia, Spain
3) College of Management, Ocean University of China, Qingdao, China
4) Fondazione CMCC - Centro Euro-Mediterraneo sui Cambiamenti Climatici, Italy
5) Department of Environmental Sciences, Informatics and Statistics, Ca' Foscari University of Venice, Venice, Italy
6) University Paris-Saclay, CNRS, AgroParisTech, Ecologie Systematique et Evolution, 91190, Gif-sur-Yvette, France

Abstract

The Global Biodiversity Framework and the EU Nature Restoration Law are the latest in a series of international efforts addressing biodiversity loss, particularly in coastal and marine ecosystems. These ecosystems are vital to ocean health, community well-being and climate resilience, but face growing degradation. Despite global and regional commitments, effective implementation hinges on national action, often challenged by entrenched institutional legacies, vested interests and fragmented governance. This paper examines how marine and coastal governance in Europe can be reformed to support biodiversity restoration through integrated spatial planning. While restoration policies increasingly call for coordination across the land-sea divide, actual governance and management practices remain slow to adapt. The coast – a multi-level governance zone where local, national, and EU scales intersect – exemplifies these complexities. Drawing on the Horizon Europe "BlueGreen Governance" project, the paper identifies major obstacles to land-sea governance in the integration of rules, structures, knowledge and actors. It also offers concrete examples of governance innovation to improve the management of the land-sea interface along three paths: institutional coordination, evidence advisory systems, and collaborative governance arrangements.

Keywords: subnational governance, innovation, land-sea management, integrated spatial planning, Europe

Biodiversity Restoration

> 'Ultimately the choices we make as a society, expressed through government policies, will determine the future of the coasts.'
>
> (McLaughlin 2010: 539)

1. Introduction

It is generally acknowledged that the ocean plays a critical role in addressing climate change, and that biodiversity protection and restoration can support climate adaptation and mitigation – which gives the conservation of marine and coastal ecosystems a crucial role in both climate adaptation (e.g., through defence against coastal erosion) and mitigation (e.g., through carbon sequestration) (Frazão Santos et al. 2024).

International efforts to conserve biodiversity, halt climate change and promote sustainable development date back to the 1990s (Rio Conference) with the adoption of important global instruments such as the Convention on Biological Diversity, the United Nations Framework Convention on Climate Change, and Agenda 21 (Ferraro & Failler 2024a). More recent initiatives like the Global Biodiversity Framework (2022), the Paris Agreement (2015) and Agenda 2030 – with its set of 17 Sustainable Development Goals – reflect an urgent need to tackle these interconnected problems (Pörtner et al. 2021; UNEP 2023). Yet, despite ambitious global targets, the effective translation of international objectives into national and subnational action remains a formidable task (Ansell 2022). Domestic implementation of international policies often necessitates significant institutional changes (of rules, structures and processes) that can clash with long-established practices (Ferraro 2014).

Governance systems are complex systems with strong path dependencies (Koliba et al. 2022). Institutional innovation is constrained and affected by the context with its existing institutions, networks of actors and capacity (Aldeguer Cerdá 2018). New policies and processes interact, differently in different contexts, with the historical and cultural legacies left from past governments (Grindle 2007). Legacies from the past can also continue to mark how public problems are perceived and addressed (Grindle 2007). In coastal areas, historical legacies, entrenched interests and instances of policy capture have fostered a conservative approach to changes in public policies limiting innovation and adaptation (Ferraro & Failler 2024b; Lawlor & Depellegrin 2023; Partelow et al. 2020).

Coastal zones are fragile areas where land and sea meet. Rivers bring water, sediments and nutrients that build shorelines and support ecosystems (Álvarez-Romero et al. 2011). Yet coastal development often destroys marshes, mangroves and reefs that control erosion, reduce flooding and sustain fisheries. Pollution from land runoff and air emissions lowers water quality and fuels ocean acidification, harming marine species and industries (Kidd et al. 2019). Covering just 8 % of Earth's surface, coasts host dense populations, ports, power plants, farms and tourism – together supporting millions of jobs (Lam et al. 2020; Selig et al. 2019; Singh et al. 2018;). Ongoing "coastalisation," or migration toward the shore, intensifies pressure on these environments (Gonçalves & Pinho 2025). Even inland farming, urbanization and energy projects can boost erosion, sediment loads and pollution downstream (McLaughlin 2010; O'Hagan et al. 2020; Singh et al. 2021). Climate change amplifies these threats through sea-level rise, stronger storms and warming waters (Dale et al. 2019; Furlan et al. 2019; Simeoni et al. 2023; Zennaro et al. 2023). Protecting coasts requires simple, coordinated land-sea planning and adaptive regulations that work at all scales. These changes reduce intertidal habitats and disrupt both terrestrial and marine management strategies, necessitating a reconsideration of existing planning and regulatory approaches (Kidd et al. 2019; Gonçalves & Pinho 2025).

Coastal zones are a shifting interface where human and natural systems evolve together. Climate change will continually redraw the land-sea boundary over time (Frazão Santos et al. 2024). Yet management remains split: land and marine areas are governed by separate policies, legal frameworks and agencies, creating "institutional ruptures" that ignore their ecological links (Tocco et al. 2024; Van Assche et al. 2020; Walsh 2021). In Europe, overlapping national and EU rules add further conflicts, hampering coherent coastal planning and biodiversity protection (O'Hagan et al. 2020; Schlüter et al. 2020; Smith et al. 2011). To address these gaps, we need integrated land-sea governance that aligns spatial planning, environmental safeguards and resource use across the continuum. Such a unified, science-based approach will better conserve biodiversity, reduce climate risks and strengthen the social and economic resilience of coastal communities (Innocenti & Attombri 2024; Van Assche et al. 2020).

This paper addresses the fragmentation in coastal spatial planning by asking: "Why is land–sea institutional integration not happening?". Drawing on case studies from the Horizon Europe project "BlueGreen Governance", it develops practical recommendations to *innovate public governance systems for integrated marine and coastal management and planning at the regional level*. Although its primary focus is on European coastal regions and islands – with their complex, multi-level governance challenges – the strategies it proposes are relevant to coastal areas worldwide. The article is structured as follows. In section 2, the concept of governance innovation is defined. Section 3 details the materials and methods used in this study. In the following sections, dimensions of integration for land-sea governance are defined and investigated (section 4), thus leading to a set of policy recommendations (section 5). Finally, section 6 summarises a possible roadmap of actions to facilitate governance innovations for the purpose of land-sea protection and restoration.

2. Governance innovation

The concepts of "governance and "innovation" are not often used together in the domain of public governance (Hartley & Torfing 2022). Their interrelationship remains an underexplored yet increasingly salient subject within the public administration and policy literature. Although the concepts of "innovation" and "governance" have traditionally been addressed in isolation, recent scholarship stresses their convergence as a critical mechanism for addressing complex, so-called "wicked" problems (Hartley & Torfing 2022). These are persistent problems characterised by 'significant complexity, structural uncertainty, high stakes for a diversity of stakeholders involved, and governance problems' (Kelly et al. 2019: 3). In the contemporary context, innovation in public governance is not merely a desirable feature but a necessity for effective problem solving and societal adaptation. While societies are facing increasingly complex challenges, intertwined crises and wicked problems, innovation in the domain of public governance has become crucial for enabling better responses (Goyal et al. 2025). Indeed, in the literature on environmental governance, innovation is often advocated with the purpose of better addressing pressing environmental challenges (Beunen & Patterson 20219). This section examines the conceptual dimensions of governance and innovation, and explores the emergence of governance innovation.

2.1. Defining governance

Defining governance poses considerable conceptual and empirical challenges in the social sciences (Cairney 2020). Over recent decades, the process of policy-making in modern Western societies has evolved dramatically. Rather than emanating from a single, hierarchical authority, public policy now emerges from the interplay among multiple, heterogeneous actors. These actors include a broad spectrum of public institutions, private organisations and civil society groups, whose interactions form intricate horizontal networks. This paradigm shift has led scholars to reconceptualise as *governance* this new mode of collective decision-making and implementation that transcends traditional bureaucratic boundaries (Blomgren Bingham et al. 2005; Klijn & Koppenjan 2012).

Two salient features characterise modern governance. First, there exists a marked interdependence between public and private organizations. Power is no longer centralised in government; rather, it is shared between governments (in charge of policy-making) and policy networks (that provide expertise in exchange for influence). Second, while governments retain the authority to set agendas and enact policies, they often lack the capacity to unilaterally implement these policies without collaboration. This necessitates a broader and more inclusive approach to governance that leverages the strengths and resources of all stakeholders (Cairney 2020).

This change foregrounds the role of both formal and informal institutions in shaping decision-making and highlights the multifaceted nature of the policy arena. Traditional models of decision-making – often characterised by rigid, top-down hierarchies – have given way to collaborative forms of governance that emphasise partnership, networked interactions and shared responsibilities (Evans et al. 2023), often referred to as New Public Governance (Osborne 2010).

Governance defines who makes decisions, for whom and with what objectives, and encompasses three interrelated dimensions that shape decision-making: institutions, structures and processes. Institutions refer to the formal and informal rules (e.g., legal frameworks, cultural norms and accepted practices) that guide stakeholder interactions. North's (1990) seminal work on institutions highlights that institutions are mechanisms that ensure social order by integrating expectations regarding the behaviour of actors in their political, economic and social interactions. These mechanisms can be either formal—such as constitutions, laws, and policies—or informal—such as customs, traditions, and unwritten codes of conduct. Structures denote the organised entities, ranging from governmental agencies to informal networks that participate in decision-making. Processes involve the operational mechanisms through which governance functions are executed, including policy formulation, conflict resolution, mandate implementation and information exchange (Bennett & Satterfield 2018).

Governance fulfils several vital roles by bringing together different levels of government, sectors and stakeholders to develop coherent policies and strategies. It creates the legal and regulatory instruments – along with enforcement mechanisms – needed to hold everyone accountable and maintain compliance with agreed standards. It ensures that planning, preparedness and funding are closely linked so that ideas can move smoothly from conception to implementation. By establishing institutional frameworks, governance makes it possible to monitor progress, evaluate results and learn adaptively over time. Finally, governance helps build the skills and resources of individual actors, which leads to fairer and more effective policy outcomes (Jiménez et al. 2020).

In particular, *environmental governance* is defined as 'the processes and institutions (e.g., cultural norms, rules) through which societies make decisions that affect the environment (i.e., land and sea)' (Pittman & Armitage 2016: 9). This definition underscores the significance of both the structural and procedural dimensions of governance in shaping environmental policies and outcomes. For the specific focus of this paper, governance is the setting of many decisions, conflicts and trade-offs that guide planning, management and eventually day-to-day activity in marine, coastal and ocean spaces (Greenhill at al. 2020).

2.2. Defining innovation in governance

The concept of innovation remains elusive particularly in the domain of public governance (Heinelt 2022). Innovation in public governance can be understood as the development and execution (by governments) of changes in a policy, programme, project or process as well as the adoption of solutions that depart from established practices in a given place (Aldeguer Cerdá 2018; Grindle 2007). Innovation has three core characteristics according to Heinelt (2022): its practical realisation, contextualisation and voluntary nature.

First, innovations usually refer to ideas that are put into practice. Therefore, they imply and depend on an ideational change, but only once this change has left the conceptual dimension and has been translated into some sort of practice. It is important to note that innovation is not synonymous with invention; rather, it encompasses the practical realisation of novel ideas that lead to tangible changes in *structures*, *processes* or *practices* (Hartley & Torfing 2022). In this respect, innovation can be seen as the confluence of creativity and implementation. Indeed, innovations are best understood as 'new ideas and practices brought into implementation' (Moore & Hartley 2010: 54). This conceptualisation

emphasises that the novelty of an innovation lies not only in its ideation but also in its contextual application.

Second (and following from the first point), the transformation engendered by innovation is contingent upon the environment in which it is applied; an idea that is innovative in one context may be a routine practice in another (Hartley & Torfing 2022). Innovation is at the same time a novelty and an improvement in a specific context. It consists of 'introducing something new in a particular context' (Grindle 2007: 158). The crucial aspect is the improvement in governance they bring in a specific case rather than their absolute novelty or originality (Grindle 2007).

Third, innovation is a change deliberately and voluntarily introduced in a given space. Public innovation embraces *voluntary* governmental actions to change rules and practices in a direction that has never been taken before in a given place with the deliberate purpose of improving the response to a societal challenge (Heinelt 2022). In some cases, institutional innovation to the solution of public problems can be undertaken to respond to a range of existing problems. In other cases, innovations are needed as an immediate response to pressing issues; these are crises that demand attention (Grindle 2007).

In the domain of public governance, innovation assumes a particularly salient role as it pertains to the theoretical realm of institutional change (Goyal & Pattyn 2024). In practice, public innovation can occur in either the process of public decision-making ("process innovation") or the outputs of that process, i.e. the policies, programmes or services themselves ("product innovation") (van der Heijden 2021). When governments pursue process innovation, they reshape organisational structures, governance practices and multi-level interactions that underpin public governance. By contrast, product innovation involves changes to policy objectives and instruments (Goyal & Pattyn 2024). These changes are more often captured by the terms of "policy change", "public sector innovation" (as administrative reforms), "democratic innovation" (emphasising citizen participation and public engagement) and "governance innovation" (with a focus on process change and evolutions in multi-level dynamics) (Goyal & Pattyn 2024). Across these dimensions, the overarching aim is always the same: to enhance policy effectiveness by improving design, delivery and outcomes of public action (Goyal & Pattyn 2024; Goyal et al. 2025). Ultimately, the extent and nature of innovation – whether in processes or products – critically determine the success or failure of public policies and shape the trajectories of institutional change (Goyal & Pattyn 2024; Hartley & Torfing 2022; Goyal et al. 2025).

Governance innovations are changes that transform the way public governance work (i.e. its *modus operandi*) with an implicit shift of responsibility between different public, private and civil society actors (Hartley & Torfing 2022). Governance innovations differ from other types of public innovations in two ways. First, they transcend the organisational level, involving networks of organisations or the transformation of complex social production systems. Second, they address the processes used to determine what should be produced ("decision-making"), how productive activities are resourced ("financing") and how the performance of social production systems is assessed ("evaluation") (Moore & Hartley 2010). Governance innovations include, but are not limited to, devolving powers to lower levels of government and establishing collaborative arrangements (e.g., *partnerships*) for the design and delivery of policies and services (Moore & Hartley 2010; Tommel & Verdun 2009). They also involve identifying, mobilising and utilising "new wellsprings of resources," such as cognitive (e.g., knowledge), technical (e.g., skills), administrative (e.g., funds) and political (e.g., legitimacy) resources (Moore & Hartley, 2010). Governance innovations include various degrees of decentralisation and greater citizen engagement in public decision-making (e.g., through the introduction of collaborative planning and co-creation).

Goyal and Pattyn (2024: 4) 'particularly invite conceptual and empirical research that synthesizes insights from these areas to deepen comparative policy analysis'. These efforts will be pivotal for

deriving systematic lessons about several aspects of public innovation: drivers and obstacles; mechanisms and actors; design and outcome (Goyal et al. 2025). In particular, research into governance innovations as a distinctive type of public innovation is still in its infancy (Hartley & Torfing 2022). Additionally, literature paying attention to public innovation at the subnational level is extremely limited (Goyal et al. 2025), which makes our investigation on regional governance innovation relevant and timely. In the medium term, this investigation plans to adopt institutionalism as the theoretical framework for understanding some of the aspects above (drivers and obstacles; mechanisms and actors; design and outcome) in the context of multi-level governance. Comparative research would be conducted through process-tracing, possibly in the framework of a comparative historical analysis that relies on the historical strand of new institutionalism. With a prevalence of China, Canada and the United States in the literature on governance innovation (Goyal et al. 2025), our focus on Europe promises to cover existing knowledge gaps.

These different types of public innovations are increasingly perceived as necessary for addressing the causes of contemporary challenges through novel solutions in the attempt of steering societal transitions. Because of the unprecedented complexity of contemporary challenges (often "wicked problems"), understanding the drivers, enabling conditions and impacts of these innovations is crucial (Goyal & Pattyn 2024). The study of (policy, public sector, democratic and governance) innovation would benefit from more understanding about the interaction among institutional environments, power and knowledge. Analysing governance innovation implies a deeper understanding of the democratic input into a political system, the interaction across different sectors and levels, and the role and power of different organisations (Hartley & Torfing 2022). Governance innovations need to be evaluated not only in terms of efficiency, quality and reach (typical for policy and public sector reforms), but also in terms of fairness, legitimacy and social justice (Hartley & Torfing 2022).

3. Material and methods

The data collected for this paper originate from multiple sources: narrative and systematic reviews of academic and grey literature, peer exchanges, interviews, workshops, focus groups and surveys.

Desk research in the form of preliminary (narrative) literature review was conducted in 2021-2022 for the preparation of the project proposal later funded under the Horizon Europe programme of the EU. Once the project was funded, a systematic literature review (SLR) was conducted in 2024, which led to a first project output (Fobé et al. 2024) later re-elaborated more in depth (Fobé et al. 2025). The SLR was conducted on barriers and enablers for policy coherence, stakeholder involvement and institutional change in marine and coastal governance.

Both types of reviews were informed and guided through exchanges with experts from within the project consortium. These exchanges also helped framed informal interviews with additional experts outside the project's research teams and the design of seven workshops in the cases studied by the project. While these informal and exploratory interviews helped the research teams involved in the project to frame the significant issues in land-sea governance, additional formal interviews were conducted to investigate more in detail a set of issues that were case-specific. These additional interviews – together with additional documentary research – allowed tracing how governance innovations emerge and develop in different European regions. The seven workshops were conducted in the first half of 2025 and have informed an internal draft report.

In addition, the results of the SLR were discussed with relevant stakeholders in two focus groups that took place in Valencia (Spain, 7 June 2024) and Las Palmas de Gran Canaria (Spain, 28 March 2025). These two focus groups were complemented with survey conducted through online tools (i.e. Google Forms and Mentimeter). While the first focus group had a narrow geographical scope (on the Valencia

Region), the second one had a broader geographical dimension covering the entire EU area of Macaronesia (i.e. Canary Islands, Azores and Madeira). The event brought together experts, stakeholders and practitioners from across Europe. Participants included national and subnational public organisations, non-governmental organisations, citizens, associations and research institutions.

3.1. Case selection

Selecting cases that effectively suited the objectives of the research project required careful consideration of three interrelated dimensions: environmental challenges, governance setting and socio-economic context.

First, the study captures the full spectrum of current and projected stressors across the biodiversity–water–climate nexus. Our study focuses on geographical areas expected to experience pronounced environmental pressures:

- Semi-enclosed seas (e.g., the Mediterranean): Storm surges, coastal flooding and erosion, elevated temperatures, and resulting impacts on tourism, agriculture, and the introduction of invasive species.
- Open northern seas (e.g., the North Sea): Pluvial floods and severe windstorms affecting agricultural productivity, nutrient dynamics, and shifts in plant and avian populations.
- Small, isolated islands (e.g., the Canary Islands, Réunion): Land loss from sea-level rise, salinisation of freshwater resources, and consequent threats to fisheries, agriculture, and tourism in resource-constrained archipelagos.

Second, the study aims to encompass a range of institutional arrangements – spanning federal to unitary states – that shape marine and coastal management. Divergent constitutional frameworks influence both the existing governance configurations and the potential pathways for co-creating adaptive solutions.

Third, the study prioritises territories with active stakeholder networks engaged in enhancing marine governance. These actors are poised to participate in policy dialogues convened by the project, thereby generating empirical insights into institutional innovation across biodiversity conservation, water quality management, and climate adaptation.

Based on these criteria, we have identified eight case studies (Table 1) distributed across five marine basins – the Western Mediterranean, Eastern Mediterranean, North Sea, Atlantic Ocean, and Indian Ocean – and encompassing one transnational marine (North Adriatic) and one transnational river basin (Western Scheldt). The subnational governance dimension is explicitly examined within and across basins. This design facilitates comparative analysis across multiple governance scales – local, regional, inter-regional, macro-regional, cross-border, and international – and captures a representative diversity of European governance structures, including overseas territories.

Table 1: Case selection

Case study	Country	Type of state	Sea basin	Examples of major environmental and anthropic pressures
Valencia Region	Spain	Quasi-federal state	Mediterranean Sea	• Temperature increases • Salinisation and erosion • Urban development • Nutrient overload from agriculture or wastewater discharge
North Adriatic	Slovenia Italy	Unitary state Regionalised state	Mediterranean Sea	• Floods • Sea temperature increase • Tourism • Ports
Isle of Wight	United Kingdom	Unitary state	North Sea	• Sea level rise • Floods
Western Scheldt	Belgium the Netherlands	Federal state Decentralised unitary state	North Sea	• Floods • Grey flood management infrastructures
Oslofjord	Norway	Unitary state	North Sea	• Extreme rainfall • Sea temperature increase • Nutrient overload from agriculture or wastewater discharge
Canary Islands	Spain	Quasi-federal state	Atlantic Ocean	• Sea level rise • Coastal erosion • Urban development • Tourism
Reunion Island	France	Decentralised unitary state	Indian Ocean	• Sea level rise • Extreme weather events • Urban development • Overfishing

4. Building a new governance arena: the state of play

Any effort of innovative governance across the land-sea interface requires the constitution of a new "coastal governance arena" (Schlüter et al. 2020) that goes beyond the coast, overcomes the land-sea divide, encompasses marine, coastal and terrestrial spaces, and insists on the watershed for planning and management (Frazão Santos et al. 2024). This new public governance system (at subnational level) needs to be based on the integration of *rules, structures, knowledge* systems and *actors*. This section analyses the major obstacles identified towards such integration from the synthesis of the diverse methods presented in section 3.

4.1. Institutional framework: rules and structures

RULES

Institutional frameworks for the governance, management and planning of coastal and marine areas across Europe, are often characterised by incoherences across two major dimensions: horizontal and vertical. This means that public policies (with their related implementation measures) are often misaligned in terms of objectives, measures, or both, across sectors and jurisdictions. This is a clear obstacle to the development of an integrated land-sea governance. On top of these considerations, it is worth mentioning that the management of watersheds is often overlooked by coastal and marine institutional frameworks.

Several explanatory factors accountable for these institutional (horizontal and vertical) clashes have been thoroughly reviewed in the context of the BlueGreen Governance project (see Fobé et al. 2025). In general, coastal regions (and islands) are often managed by multiple institutions divided along sectoral lines (e.g., fisheries, forestry and agriculture) (Rochette et al. 2015; Singh et al. 2021). Policy areas area usually divided under separate political portfolios with space for conflicting objectives and measures, which impedes land-sea integration (Neimane 2021). As Van Assche et al. (2020: 3) observe, the 'difficulty of policy coordination and integration, on land, at sea, between land and sea' remains a core barrier.

However, evidence from coastal regions and islands involved in BlueGreen Governance are revealing a much more compelling challenge along the vertical dimension, adding another layer of complexity to integrated land-sea governance. Overlapping and (sometimes) competing institutions intertwine across national, regional and local levels (Platjouw et al. 2023). In particular, decentralisation reforms have often resulted in disputes over competences between national and subnational levels, thereby impeding unified coastal strategies (Ferraro & Failler 2024b). Insufficient vertical coordination and unclear delineations between legal frameworks contribute significantly to integrated governance challenges. While the devolution of responsibilities can enhance local perspectives, it may also lead to fragmented responsibilities and complicate coordination efforts. Numerous examples across various countries and sea basins underscore these challenges (Morf et al. 2019; Neimane 2021; Van Assche et al. 2020).

Although these dimensions (horizontal and vertical) are crucial for the integrated governance of land and sea in each single country, a third important one consists of the transnational dimension cutting across national boundaries. This is particularly relevant in geographical regions where subnational entities of different states share the same sea basin (e.g., Macaronesia). However, the absence of a dedicated supranational authority (in addition to the EU law) hinders such transregional harmonisation.

Structures

National governmental organisations are clearly crucial in the integration of land and sea political portfolios. A general administrative fragmentation – across multiple organisational structures (e.g., public agencies) with unclear institutional boundaries – undermines effective coordination. With a myriad administrative units in charge of terrestrial or marine policies, a sectoral approach prevails, impeding land-sea integration (Neimane 2021; Partelow et al. 2020).

Fragmented organisations with conflicting or overlapping responsibilities are commonly reported in many studies. Although coastal management requires integrated approaches across the land-sea interface, the literature indicates that management responsibilities are divided and siloed across several governmental organisations, often separating the land from the sea (Tocco et al. 2024).

The integration of these structures depends on many factors that play a role in both horizontal and vertical inter-organisational relations (Fobé et al. 2025). Such factors include: clear vs. ambiguous mandates, roles and responsibilities (including financial competences); presence vs. absence (or limited capacity) of a leading authority; shared vs. conflictual definition and understanding of concepts (Evans et al. 2025 – *forthcoming*).

In particular, the reshuffling of mandates, roles and responsibilities can disrupt established power balances, create clashes in inter-organisational relations and lead to bottlenecks in policy-making (both development and implementation). Shifting responsibilities across structures can cause confusion, especially when responsibilities were already not clearly allocated. Such changes can be the result of political events (e.g., electoral cycles – when previous institutional arrangements are wiped away by the new administration – and waves of public sector reforms) or major innovations in governance such as decentralisation processes (Ferraro & Failler 2024b). Responsibilities are also shifting during upwards transfer of power through process of (re)centralisation (Fobé et al. 2025).

A last point that needs to be made for the institutional framework (including both rules and structures) is that there is a recurrent misalignment on both the temporal and spatial level. At the temporal level, natural processes are much more long-term than myopic and volatile political agendas (at any level of governance). At the spatial level, administrative boundaries do not always correctly reflect the ecological boundaries (despite the long-term advocacy for ecosystem-based management).

4.2. Knowledge

Scientific knowledge is widely recognised as a cornerstone of evidence-informed policies in marine and coastal governance (EC 2022). It enables policy-makers to flag potential risks, better understand complex policy problems and design interventions through ex-ante evaluations and ex-post assessments. In the context of marine and coastal systems, such knowledge is essential not only for monitoring and predicting changes in social-ecological interactions but also for guiding long-term *integrated* management strategies. In this sense, scientific knowledge could play a crucial role in promoting evidence-based adaptive policy-making that overcomes the peril of institutional fragmentation (sections 4.1 and 4.2). For instance, effective flows of knowledge could promote and support institutional integration through the use of shared evidence for consistent public decisions (Fobé et al. 2025).

However, the production, transfer and utilisation of science in policy practice remains rather fragmented across sources and disciplines. Indeed, a significant barrier to the political uptake of

knowledge has to do with the access to available data. This does not want to suggest that data are insufficient; most of the time they are dispersed, particularly when it comes to marine and coastal areas. Isolated knowledge systems advise disjointed public policies with important data often scattered across several administrative departments in multiple jurisdictions. Boundaries are also strong across disciplines (e.g., natural sciences vs. social sciences), thus impeding a transdisciplinary, multi-faceted scientific advice to decision-making. When scientific knowledge is used in coastal and marine decision-making, a clear imbalance exists between the use of natural sciences and social sciences. For instance, the former often dominate discussions about climate change, which underscores the need for a more trans-disciplinary approach (Krauss 2020).

This gap in data integration is worsened by the fact that existing knowledge is often communicated to decision-makers in ways that do not meet the needs of policy-makers. This disconnect arises from several factors, including inherent uncertainties in scientific data, ineffective communication, divergent cultures between scientists and policy-makers, and political agendas (Dale et al. 2019). In some cases, political actors strategically undermine scientific evidence, thereby creating doubts about its credibility and legitimacy (Piwowarczyk & Wróbel 2016).

Notwithstanding the importance of input from scientists and experts, forms of technocratic and data-driven decision-making that rely exclusively on scientific knowledge should also be avoided so that other forms of expertise and knowledge are not neglected in the process. Indeed, balancing diverse perspectives (with their perceptions, interests and values) is critical, as distinct types of evidence often compete in the policy arena (Bruckmeier 2014; Pattyn et al. 2022). More efforts should be made to bridge the gap between scientists and policy-makers while also integrating local knowledge. This form of knowledge often provides unique insights unavailable through conventional scientific channels (Bednarek et al. 2018; Pittman & Armitage 2016). Local communities, for instance, can play a crucial role in identifying the feasibility of policy measures, particularly when scientific evidence is marked by uncertainties (Lawlor & Depellegrin 2023; Neimane 2021; Vodden 2015), as in the case of coastal management.

4.3. Actors

Inclusive and participatory approaches are widely regarded as a necessary condition for effective plans and policies in marine and coastal governance. Participation is promoted for both normative and instrumental reasons. It ensures a diversity of insights and helps build mutual trust and support among stakeholders, thereby contributing to more effective policy implementation and robust governance systems (Day et al. 2015).

In particular, addressing the governance of the land-sea interface requires integrating the distinct characteristics of terrestrial and marine systems into a cohesive framework. Governance networks offer a promising solution by creating dynamic, adaptive systems that facilitate multi-level and transboundary policy management (Pittman & Armitage, 2017). These networks distribute power across various societal levels and sectors, enabling flexible collaboration that stands in contrast to traditional top-down approaches (Kapaciauskaite 2011; Pittman & Armitage 2017). Policy networks enable the integration of multiple policy areas (e.g., those concerning both land and sea) and help address collective action challenges through mechanisms of learning, cooperation and bargaining (Ingold 2011; Adam & Kriesi 2019; Vantaggiato & Lubel 2022).

Major obstacles to effective participation are:
— Presence of actual participatory mechanisms,
— Uneven representation,
— Supportive factors.

First, a persistent gap remains between the rhetoric and reality of participation. Stakeholder involvement processes may exist only on paper or operate inconsistently – for example, committees that are established but never meet. The multi-actor nature of marine and coastal governance introduces additional challenges. Stakeholders are not only geographically dispersed but also hold varied views, interests and ideas. This diversity complicates the design and implementation of participatory practices. When stakeholder views are overlooked, the resulting policies may suffer from a lack of social acceptance. Conversely, inclusive participatory approaches that yield jointly agreed solutions can serve as enablers – especially when they take into account the social and economic vulnerabilities of coastal communities (Day et al. 2015). In this regard, creating and leveraging networks that span multiple sectors and scales becomes essential.

Second, shortcomings in the design and implementation of participatory practices can lead to discrepancies in stakeholder empowerment and may reinforce power imbalances when certain groups are overrepresented (Aukes et al. 2020). Historically, policy formulation in marine and coastal domains was dominated by governmental agencies. Over time, however, a broader range of institutions and stakeholders has become involved. This shift has led to a pluralistic environment in which power is more diffuse, and policy outcomes result from competitive interactions among actors (McLaughlin 2010; van Leeuwen & van Tatenhove 2010; Cairney 2020). The growing involvement of diverse stakeholders often produces an uneven distribution of power, a dynamic further complicated by evolving multi-level governance mechanisms (Parsons et al., 2021; van Leeuwen & van Tatenhove 2010).

Third, the success of networks depends on a set of supportive factors. Indeed, they rely on robust leadership by central actors and core teams, as well as on mobilising the capacities of local communities and non-state actors. Empowering local stakeholders is especially important in environmental governance, where the integration of land-sea interactions (LSIs) necessitates diverse perspectives to spur innovation and raise awareness (Kapaciauskaite 2011; Lawlor & Depellegrin 2023; Rist et al. 2019; Vodden 2015). A wide array of stakeholders enriches the policy process by introducing new insights and fostering a culture of innovation (Neimane 2021; Van Assche et al. 2020). Additional supportive factors such as participatory culture (among public agencies as well as citizens), institutional trust and adequate resources are crucial for facilitating the development of governance networks for land-sea integration (Tocco et al. 2024).

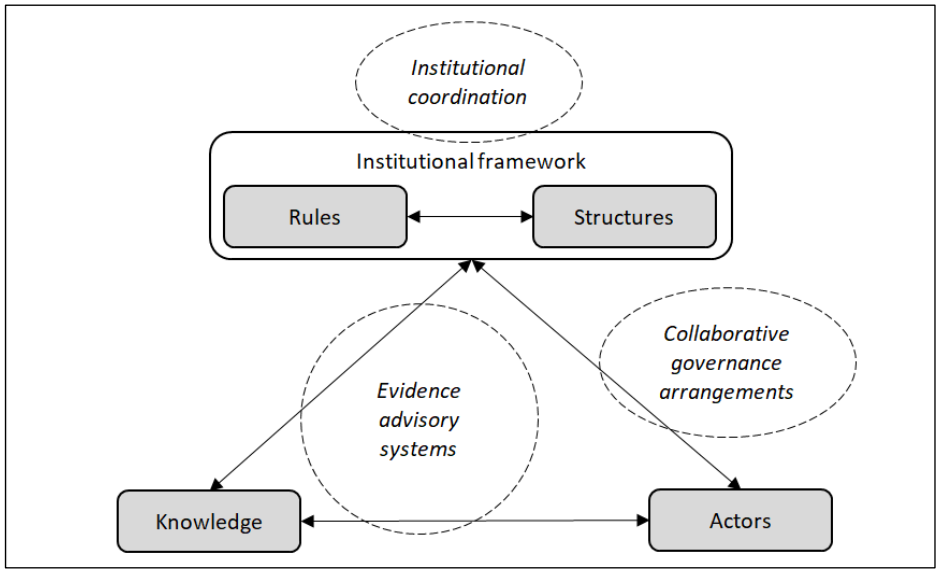
5. Building a new governance arena: the path ahead

Traditional governmental mechanisms (relying on hierarchical, technocratic and bureaucratic arrangements) have often failed to solve complex social, political, economic and environmental problems (Hoss-Golan et al. 2024). In recent decades, governments around the world have introduced changes in existing institutional arrangements or "governance innovations" to ensure more efficient, effective and legitimate problem-solving methods in several societal domains, for instance in spatial planning. These governance innovations have embraced several "experiments" aimed at seeking new plans, new organisational forms, new working methods and new coalitions. These initiatives have often been designed and developed out of the formal politico-administrative systems, which has allowed for a certain degree of creativity and flexibility (van Buuren & Loorbach 2009). They have often been promoted bottom-up with the role of vehicles of change (Hoss-Golan et al. 2024).

The previous section has shown that the pursuit of integrated land-sea governance systems implies challenges at four levels of integration – in the coherence of rules, the coordination of administrative structures, the combination of knowledge systems and the inclusion of actors. Each of these four dimensions of integration brings along its own barriers and path dependencies. This section discusses

possible paths ahead in the pursuit of integration at these various levels and, ultimately, in land-sea management and planning through governance innovations in institutions – as both rules and structures – and processes such as the mechanisms for scientific advice and stakeholder engagement. Three paths are suggested here: institutional coordination to ensure integration of rules and structures; evidence advisory systems that allows for integration of knowledge; and collaborative governance for the integration of actors in decision-making. Each sub-section will also briefly mention positive examples ("good practices") from the case studies involved in the BlueGreen Governance project. The three paths are interrelated and would function better as a coherent whole (figure 1).

Figure 1: Towards an integrative model for land-sea governance



5.1. "Institutional coordination": reconciling different policy priorities

Obstacles linked to rules (section 4.1) and structures (section 4.2) call for a radical revision of (national and subnational) legal frameworks and a reconfiguration of organisational structures in the direction of more coherence and coordination (Bednarek et al. 2018). Strategic documents and new public bodies can be adopted and established in addition to existing policy and administrative frameworks to start these changes.

A notable example in this direction is the *Oslofjord Plan*, i.e. a strategic action adopted by the Norwegian government in 2021 to address the degradation of the Oslofjord ecosystem. The national government's action plan for the Oslofjord promotes a source-to-sea approach, covering the entire catchment area and the marine areas out to 1 nautical mile from the baseline (the same as the Water Framework Directive). The Plan is layered above existing institutional structures (like the River Basin Management Plans) but enhances their implementation. The Oslofjord Plan shifts the management focus from individual water bodies mostly in freshwater to the Oslofjord as final recipient, addressing the cumulative effects on coastal areas and emphasizing the need for upstream run-off reduction measures.

In 2021, the Oslofjord Council was also established to support the implementation of the plan while facing fragmented administrative responsibilities. Both governance innovations take a comprehensive approach, considering the fjord as a whole and engaging relevant authorities and stakeholders across

different governance levels and sectors. They integrate, coordinate and reinforce existing rules and (administrative) structures rather than replacing them (Trubbach et al., *forthcoming*).

The integrated management of watersheds in the French overseas islands, such as Reunion Island and Martinique, has made it possible to better articulate the land to the sea. Water management, and more particularly water quality, from upstream to downstream is the common thread of the approach (David et al. 2025). In the mid-2000s, watershed-level water management schemes were developed but were not linked to the developing integrated coastal zone management (Rizand et al. 2006). The European Bathing Water Directive (Directive 2006/7/EC), aimed at strengthening the protection of public health and the environment, has strengthened the link by insisting on the importance of environmental and human activity management at the level of river basins. The chlordecone scandal in Martinique from the mid-2010s onwards reminded us of the need to consider the coastline as the interface between land and sea and therefore the implementation of integrated policies (Thirot et al. 2020).

Institutional coordination is also important across national boundaries as trans-regional cooperation (see section 5.3).

5.2. "Evidence advisory systems": incorporating scientific and local knowledge

Improving institutional capacity in land–sea governance requires enhanced knowledge transfer, experience exchange, and the sharing of good practices among scientists, policymakers and civil society (Morf et al. 2022; Lawlor & Pellegrin 2023). In practice, this means not only generating more data but also reconfiguring governance systems to support the integration of both scientific and local knowledge. As Gonçalves and Pinho (2025) argue, coastal governance must foster collaboration among diverse knowledge systems – scientific, experiential and lay – to build resilient, multifunctional and sustainable coastal landscapes. In particular, incorporating social considerations (into spatial planning) can ensure more equity in public decisions and, thus, also help preventing social conflicts around the use of a shared space (Frazão Santos et al. 2024).

The convergence of scientific insights with dominant societal values can improve the uptake of evidence in policy-making (Neilson & São Marcos 2019). Innovation in this area includes the development of advisory systems that bring knowledge understood as evidence from a broad basis rather than solely science from scholarly experts. These "evidence advisory systems" (Carney 2022) can foster collaboration between public, private and scientific actors to co-create solutions for public problems of coastal and marine governance.

In Spain, for example, the regional government of the Canary Islands relies on advisory committees to guide policy decisions. Some, such as the Climate Change Committee, consist exclusively of scientists, while others, including the Nature Conservation Committee and the Agenda 2030 Committee incorporate diverse stakeholders for broader input. In the Valencia Region, the University of Valencia, in collaboration with local and regional governments, established the Biological Station ICBIBE to conduct and disseminate scientific research involving multiple publics from both experts and laypeople (Lujan et al., *forthcoming*).

The integration of state and non-state actors through a science-policy-society triangle fosters knowledge exchange, dialogue and policy implementation by ensuring that civil society, researchers and policymakers from both terrestrial and marine domains contribute to a cohesive policy process (Reed & Rudman 2023; Glasgow et al. 2012; Kapaciauskaite 2011; Morf et al. 2022; Wyborn et al. 2019). Such integration of multiple communities not only reinforces the legitimacy of policy decisions but also supports a future-oriented collaborative approach and promotes transformative visions that are responsive to the needs of diverse ecosystems.

Indeed, a central challenge in contemporary coastal and marine governance is the need to adapt to profound transformations along the land-sea interface due to "a changing ocean" under climate change (Frazão Santos et al. 2024). The boundaries of coastal areas – encompassing both terrestrial and marine domains – are dynamic and influenced by climate change (Pittman & Armitage 2016). Redesigning governance structures and policy practices requires integrating diverse, forward-looking insights that can inform decisions on temporal scales ranging from 30 to 100 years. Particularly, climate-smart spatial planning – which integrates climate considerations, accounts for cumulative impacts, future environmental conditions and new uses of a territory – is being recognised as increasingly vital in the public debate (Calado et al. 2025; Frazão Santos et al. 2024). With climate change, the past can no longer be taken as the sole reference for public decision-making: 'there is an urgent need to anticipate future changes' (Frazão Santos et al. 2024: 5).

One promising tool in this forward-looking effort is scenario-building. Defined as the descriptions of a range of possible futures (Calado et al. 2021; Frazão Santos et al. 2024), scenarios indicate trajectories of potential future states based on physical, social and economic characteristics. Scenario-building facilitates dialogue among policymakers, planners and stakeholders by enabling them to explore alternative futures, estimate policy impacts and adapt as new information becomes available. It can help generating flexible, alternative visions of future developments. It not only aids in bridging current knowledge gaps but also supports dialogue on how specific policy measures may evolve over time. Moreover, scenarios provide a platform for aligning interventions with long-term policy objectives, although they must be updated continuously in response to emerging crises and new data (Calado et al. 2021).

Another group of innovation encompasses those process arrangements aimed at envisioning promising future perspectives (van Buuren & Loorbach 2009). The Dutch Delta Programme offers an instructive example of this anticipatory approach. Transitioning from traditional adaptive management to anticipatory governance, the Programme employs regularly updated scenarios that combine geophysical changes – such as sea-level rise and extreme weather – with socio-economic trends to inform flood prevention strategies (Fobé et al. 2024).

5.3. "Collaborative governance arrangements": mobilise untapped resources

In general, collaborative forms of governance have emerged as pivotal in the domain of public policy as societies confront complex challenges marked by dispersed knowledge, power and resources. Increasingly, public, private and third-sector actors are brought together through networks and partnerships to jointly explore and resolve problems. These networks and partnerships are social structures in which actors engage in informal, horizontal exchanges of information and resources (Hartley & Torfing 2022). Mechanisms for public participation are among the possible innovations of governance (Grindle 2007; Heinelt 2022).

Institutional reforms that promote collaborative governance can mobilise untapped resources – cognitive (knowledge), technical (skills), administrative (funding), and political (legitimacy) – which are essential for effective policy implementation (Moore & Hartley 2010). At the local level, governance arrangements that emphasize co-creation and partnerships translate national policies into actionable strategies. By embedding collaboration within spatial planning, adaptation and management practices, local governance systems can enhance coordination, mobilise resources, and foster social accountability. Such integrative approaches contribute to sustainable outcomes by aligning policy innovations with the specific needs and capacities of local communities (Ferraro & Failler 2024a). Experimental governance arrangements allow for decision-making roles between governments and citizens to be shifted and institutionalised differently (Ubeis et al. 2019).

Recent years have seen an increase in community-led initiatives, fostering collaborative networks and polycentric coastal governance systems. For instance, on the Isle of Wight, conflict resolution mechanisms have been developed to facilitate dialogue and cooperation among stakeholders. Transnational collaborative governance also holds significant promise for addressing challenges that cross national boundaries. The Flemish-Dutch Scheldt Commission plays a key role in translating high-level political ambitions into administrative and technical measures for the cross-border management of the Western Scheldt. It includes an advisory body known as the Scheldt Council, which exemplifies successful cross-border collaboration by incorporating diverse stakeholder perspectives (e.g., port authorities, environmental and agricultural organisations, and representatives from regional and local governments) from Belgium (Flanders) and the Netherlands (Vitale et al., *forthcoming*). This transnational experiences could also be a useful reference for other cross-border geographical areas such as Macaronesia (see section 4).

Despite strong academic and applied advocacy, questions persist regarding the capacity of collaborative governance to generate successful outcomes and enhance public value (Hartley & Torfing 2022), which opens the way to further research on the topic.

In this context, digitalisation – as an additional form of governance innovation – offers promising avenues by providing new participatory tools that extend engagement opportunities to stakeholders traditionally excluded from decision-making processes (Grindle 2007; Misuraca & Viscusi 2015). By incorporating digital tools into policy design and implementation, governments can create more inclusive environments that promote shared responsibility and co-ownership of outcomes. Co-production of scenarios and the use of digital tools are emerging as interconnected critical elements in modern governance. Data visualisation through dynamic storylines, supported by digitalisation, enhances stakeholder engagement and supports the development of sustainable coastal landscape imaginaries (Calado et al. 2021; Fobé et al. 2024). Such tools not only aid in the effective communication of complex scientific information but also help in aligning diverse knowledge systems and new visions within the science–policy–society interface (Gonçalves & Pinho 2025).

6. Conclusion

Singh et al. (2021) note that a coordinated governance structure is imperative to effectively regulate the complex social-ecological systems at the land-sea interface so that policy-makers can better safeguard both the natural environment and the communities that depend on it. Unfortunately, the governance of terrestrial and marine ecosystems remains fragmented despite the intrinsic interconnections between land and sea. This disjointed management is particularly evident along coastal areas, where converging socio-ecological systems highlight the urgent need for an institutional re-design that better integrates policies, plans and organisations for the management of oceans, seas, coastlines and catchment areas (McLaughlin 2010; Rochette et al. 2015; Schlüter et al. 2020; Van Assche et al. 2020). The complexity of natural processes calls for institutional integration – one that embraces a multi-dimensional policy approach and paves the way for a new public governance system capable of bridging the traditional land-sea divide. The current management of the LSIs is not only fragmented along the terrestrial and marine divide, but also based on past experience and knowledge about the present, and little participative. What is needed, instead, is to develop innovative governance frameworks and reform current governance structures along three dimensions.

First, any effort of innovative governance across the land-sea interface requires the constitution of a new "coastal governance arena" (Schlüter et al. 2020) that goes beyond the coast, overcomes the land-sea divide, encompasses marine, coastal and terrestrial spaces, and insists on the watershed for planning and management. It also needs to consider how climate change will affect all these elements

and their biophysical, spatial and human interactions (Frazão Santos et al. 2024). This new land-sea governance arena needs to be based on the integration of rules, structures, knowledge and actors. The multi-dimensional integration encompasses both the (vertical) multi-level coastal socio-ecological system and (horizontal) cross-sectoral objectives (Roig-Dobón & Sánchez-García 2016). Coordination in land-sea governance also implies the inclusion of diverse forms of knowledge coming from diverse sources and – often diverging – interests of multiple actors (Schlüter et al. 2020). As stressed by Singh et al. (2021: 9), 'Promoting sustainable development at the land-sea interface requires a coordinated governance structure that can effectively regulate and act within complex social-ecological systems'.

Second, the knowledge used to inform new coastal governance arenas needs to be reconsidered in the context of changing environments under the threat of climate change. Therefore, public decisions on spatial development should be shaped not only in a more integrated way but also through the use of adequate instruments informing about the future such as visioning, foresight analysis and scenario development. However, visions, foresights and scenarios are useful to design possible policy responses to complex, yet certain, challenges only if they bring together data based on science and narratives built by communities and societies around these possible futures. The science advice can no longer neglect the very nature of these instruments that are ultimately social processes. Science advice is increasingly recognised as a process that benefits from collective understanding and collaborative input. Thus, opening advisory mechanisms to diverse social inputs (for instance through scenario building in spatial planning) is essential.

Third, the opening of decision-making and science advice mechanisms to social inputs with new ideas, narratives and discourses can only happen through mature forms of collaborative governance that need to be promoted, strengthened and institutionalised at multiple jurisdictional levels with particular attention to the local dimension where proximity can ease policy design and implementation. However, public participation remains uneven, particularly among local stakeholders. In this context, trust among stakeholders is a pivotal enabler of governance innovation (Bodin et al. 2020; Soeteman-Hernandez et al. 2021). Trust facilitates learning within collaborative networks, ultimately enhancing regulatory processes and outcomes. Meanwhile, digital platforms offer promising avenues for increasing transparency and stakeholder engagement. By facilitating new participatory mechanisms, ICT-based applications contribute to more dynamic and inclusive governance processes (Misuraca & Viscusi 2015). The new mode of governance based on network, collaboration and horizontal approaches to decision-making is characterised by systems of relationships, knowledge exchange and dialogue. This makes this type of governance particularly adaptable, which is crucial in conditions of uncertainty, complexity and crisis when issues require new creative solutions (Keast 2022).

Such "institutional re-design" with the creation of new institutions should embrace (new) policies, plans and organisations for the coastal areas (Schlüter et al. 2020; Van Assche et al. 2020). While promoting more harmonious and effective science-policy-society interfaces, policy actions aimed at restoring the natural environment may ultimately improve the interaction between the environment and human activities. The way we think about the sea and the land influences how we govern, plan and manage the land- and sea- scape and its ecosystem restoration for ocean health, climate change and coastal communities.

Finally, change and innovation need to be designed, implemented and institutionalised. Innovations can be institutionalised only if there is a process of formalisation of a change, which passes through writing down innovations (in laws and rules), creating incentives and changing organisational cultures. This institutionalisation from the top (through legislation and regulation) needs to be supported by institutionalisation from bottom up through citizens engagement. However, what remains to be further researched is the historical unravelling of governance innovation in order to

better understand its possible causal mechanisms. New policies and processes interact, differently in different contexts, with the historical and cultural legacies left from past governments. Legacies from the past can also continue to mark how public problems are perceived and addressed. Particularly, it needs to be shown how process of decision-making in subnational governments are changing since regional and local governments are important places for innovation (Grindle 2007).

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