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# Strategies for Transforming Coastal Governance: Addressing Interdependent Dimensions

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## Abstract

Coastal areas are places where land and sea meet. These places offer many socio-economic opportunities but also face profound social and environmental challenges that are often exacerbated by limitations in current governance systems. These limitations include a lack of coordination, unclear mandates and roles, fragmented knowledge, power dynamics, and insufficient stakeholder involvement. Transforming coastal governance is therefore needed to enhance the effectiveness and legitimacy of governance systems and their institutions, but current practices and past experiences have shown that changing governance is anything but easy. In this article, we analyse how three critical governance dimensions: (1) forms of integration of land and sea management; (2) forms of knowledge mobilized; and (3) forms of democracy in their interplay, shape possibilities and limits for transforming governance. Drawing on insights from the literature and three case studies from Spain, the UK, and Norway, we highlight how these different governance dimensions are strongly interrelated and should be addressed in coherent ways to make governance more effective and legitimate.

## Keywords

environmental governance; institutional change; knowledge integration; policy adaptation; sustainability transitions

## 1. Introduction

Coastal areas are increasingly under pressure from rapid urbanization, population growth, and expanding economic activities. Combined with escalating environmental challenges such as climate-induced flooding

and pollution (including plastic waste), these pressures pose significant risks to both ecosystems and human well-being (Jouffray et al., 2020; MacAfee & Löhr, 2024; Neumann et al., 2015). Together, they present complex governance challenges that require a careful balance between conservation efforts and sustainable use of coastal resources (Wu & Wan, 2024). Coastal governance encompasses the policies, institutions, and decision-making processes that regulate and manage coastal zones. It seeks to integrate diverse regulatory frameworks, encourage stakeholder participation, and support sustainable development. Given that many coastal challenges cannot be addressed through purely technical solutions, governance must navigate political complexities while aligning with scientific knowledge as well as national or international regulations (Vega-Muñoz et al., 2021). One of the primary challenges in coastal governance is managing the intricate interactions between land and sea while striving for sustainable coastal social-ecological systems (Dahdouh-Guebas et al., 2021). Sustainable coastal social-ecological systems management is often hindered by persistent challenges such as fragmented management structures, weak institutional capacities, and resistance to change within governance systems (Kelly et al., 2019). These issues reflect broader patterns identified in recent research, showing that transformation in coastal governance is constrained by institutional inertia and conflicting priorities across governance levels (Rölfer et al., 2022). Addressing these issues calls for integrated management approaches that foster coordination across governance levels, both vertically and horizontally.

Transformation in coastal governance requires reflexivity, inclusivity, and the integration of diverse forms of knowledge (Evans et al., 2023). It necessitates addressing the interrelations between the different dimensions of governance, such as participatory governance and scientific expertise. A governance dimension refers to a specific aspect or area of governance that can be distinguished in a governance system. Well-known examples include the legal or economic dimension, but other aspects, such as forms of democracy or types of knowledge, can also be considered distinct governance dimensions (Van Assche et al., 2024). These different dimensions are strongly interwoven. This article aims to explore how analysing the interplay between different governance dimensions can deepen our understanding of the transformation options in coastal governance. More specifically, it analyses the interplay between three dimensions that are particularly relevant for transforming coastal governance: (1) forms of integrating the management of land and sea (Van Assche et al., 2020), (2) forms of knowledge mobilized (Muhl et al., 2023), and (3) forms of democracy (Paramita et al., 2023; Partelow et al., 2020; Schlüter et al., 2020). These dimensions reflect foundational aspects of governance that shape both the processes and outcomes of environmental decision-making. The integration of land and sea governance addresses the ecological interconnectedness of coastal systems, helping to overcome fragmented policies and institutional silos. Mobilizing diverse forms of knowledge, scientific, local, and experiential, ensures that governance strategies are both robust and grounded in context. The form that democracy takes determines who participates in decisions, how power is distributed, and how legitimacy and trust are built. The following section introduces the theoretical perspective and the concept of governance dimensions in more detail, after which the method and results are presented. The article concludes with a discussion of key insights for transforming coastal governance.

## 2. Governance and Its Dimensions

Coastal governance concerns the planning, use, and management of coastal areas. It encompasses a range of public and private actors, as well as various formal and informal institutions. Although most governance systems tend to be fairly stable, there are always sources of change, including the ongoing dynamics in the

configurations of power/knowledge and actor/institution configurations that are self-transformative (Partelow et al., 2020; Schlüter et al., 2020; Van Assche et al., 2013). Some governance transformations are initiated through deliberate reform efforts; however, the outcomes of these interventions often diverge significantly from their original intentions and expectations (Evans et al., 2023). Every outcome, either in the form of specific elements of governance or in the overall structure, recurrently shapes what happens in the future.

The purposive attempts for change in coastal governance systems, including different forms of planning, coordination, steering, and strategy, are made possible because of the stabilizing effects of governance (Van Assche et al., 2013). Governance systems assign roles to certain actors, shaping and limiting their options for planning and policy-making, as well as facilitating certain attempts for changes while delimiting other options. Governance systems also describe the action procedures that need to be followed in order to change the formal procedures of decision-making, such as the adoption or revision of legal rules. The options for sustainability transformations in coastal governance, therefore, depend on the current organization and functioning of the system of coastal governance. In order to better understand the possibilities and limits for sustainable strategies and transformation, it is important to grasp the characteristics of a certain governance system and the paths through which these characteristics evolved (Van Assche et al., 2024).

Each governance system evolves through a sequence of past decisions and developments, which simultaneously shape the conditions for future change (Garud et al., 2010). A particular governance path emerges in a series of decision-making processes, which partly focus on the specific dimensions of governance. As previously described in this article, the governance dimension refers to a specific aspect or area of governance that has an important role in the overall organisation and functioning of a governance system (Van Assche et al., 2013). These governance dimensions reflect the internal distinctions that a given community makes within its governance structures, and over time, they can become increasingly important as organising principles. This process of making distinctions is linked to the structure of policy domains and the topics considered relevant in these domains. The process of making distinctions further depends on the dominant values and ideals in the community and on the specific issues and needs the governance system addresses. Different dimensions can be distinguished, such as, for example, forms of democracy or forms of knowledge. These dimensions are often interconnected and overlapping. The positions on those dimensions are the result of choices made, whereby different positions are possible. Certain positions can stabilize through their embedding in institutions. Both the dimensions that are considered important, as well as the alternative positions on these specific dimensions, tend to show recurring patterns in a specific governance path. Analysing these patterns is therefore useful for strategizing in governance (Van Assche et al., 2024). Certain dimensions and clusters of dimensions will be more common than others. This can depend on the presence of certain ideas and ideologies about democracy and market mechanisms, but also on dominant narratives about particular governance issues or shared conceptual perspectives for thinking of self and community (Partelow et al., 2020). In communities where coastal governance is mostly understood as a local issue, it reflects the ideas and ideologies of local communities. This understanding will trigger different discussions and decision-making processes. As a result, attention is given to distinct governance dimensions and the various positions taken within them. This stands in contrast to approaches that treat coastal areas merely as extensions of either land or sea, where governance is largely shaped by objectives and rules set out in national or international policies. Such differences will also impact attempts to change coastal governance. An analysis of different governance dimensions and the positions on these dimensions can thus

enrich the understanding of the processes of change in governance and the factors that enable and delimit the options for transformation.

### *2.1. Key Dimensions in Coastal Governance*

The literature on coastal governance identifies several such governance dimensions, some of which are specific to coastal governance, such as the integration of land and sea, while others are more universal and also relevant to many other governance contexts, such as forms of democracy. The overarching ambition to work towards more sustainable and inclusive forms of coastal governance concerns the following dimensions: (1) forms of integrating the management of land and sea, (2) forms of knowledge mobilized, and (3) forms of democracy.

#### 2.1.1. Forms of Integrating the Management of Land and Sea

The integration of land and sea management is one of the key challenges of coastal governance (Schlüter et al., 2020). This integration can be organized at different levels and in various ways. It can be facilitated by developing integrated frameworks in policies and plans, as well as by bringing together different sectoral strategies through projects and dedicated practices (Ansong et al., 2021; Eger et al., 2021). The need for land–sea integration is especially pronounced in coastal regions where multiple institutions operate across overlapping jurisdictions (Nijamdeen et al., 2023). Coastal governance often suffers from fragmented frameworks, including international agreements, national policies, and regional or local decision-making processes. Such fragmentation often leads to misaligned objectives, policy conflicts, and inefficiencies, ultimately undermining sustainable coastal management. Effective planning in this context involves aligning goals and strategies across different levels of governance and policy sectors to ensure coordinated action (Fobé et al., 2024). In the end, land–sea connectivity supports the sustainability and resilience of both ecosystems and the communities that depend on them (Barcelo et al., 2023).

#### 2.1.2. The Forms of Knowledge Mobilized

Different forms of knowledge are mobilized in governance. On one hand, expert knowledge, including scientific research and technical expertise, plays a critical role in informing evidence-based policies and management strategies. Scientific knowledge, systematically gathered through research and empirical analysis, serves as a cornerstone for effective coastal and marine governance (Connor et al., 2009). It provides essential insights into social-ecological interactions, identifies potential risks, and develops strategies for mitigation and adaptation. Scientific knowledge also enables long-term monitoring and predictive modelling, allowing policymakers to respond proactively to environmental changes while continuously evaluating the effectiveness of governance interventions. However, despite its significance, integrating scientific knowledge into governance is often hindered by communication gaps, institutional silos, and the limited accessibility of research findings to local/relevant practitioners (Turnhout et al., 2016). Furthermore, different forms of expertise might compete over prominence in decision-making processes, depending on power/knowledge dynamics. On the other hand, various forms of other knowledge, including co-produced knowledge, local ecological knowledge (LEK), traditional ecological knowledge (TEK), and experiential knowledge, are equally important in governance (Muhl et al., 2023). For example, LEK is deeply embedded in the lived experiences of coastal communities and provides valuable insights into environmental changes, species behaviours, and ecosystem dynamics that may not be captured through formal scientific

methods (Berkes, 2012). This knowledge is often place-based, accumulated over generations, and reflects adaptive strategies that communities have developed in response to environmental fluctuations (Jasanoff, 2004). While scientific and local knowledge systems can sometimes complement each other, they may also conflict due to differences in epistemological frameworks, power dynamics, and institutional recognition. In some cases, integrating these diverse knowledge systems can enhance governance by fostering co-production of knowledge, where scientists, policymakers, and local communities collaborate to develop shared understandings and more holistic management approaches (Pahl-Wostl, 2009). Mobilizing LEK, TEK, as well as experiential knowledge effectively may require inclusive governance structures that recognize and validate non-scientific forms of expertise. Participatory approaches, such as community-based monitoring, citizen science, and co-management frameworks, can facilitate the integration of local insights into policy and decision-making. For instance, co-management initiatives, where local communities share governance responsibilities with state institutions, have been successful in improving resource management outcomes by bridging scientific and experiential knowledge (Ostrom, 2009). Additionally, boundary organizations and knowledge brokers can help translate and mediate between different knowledge systems, fostering trust and mutual learning among stakeholders (Nijamdeen et al., 2023). By embracing multiple ways of knowing, governance systems can become more adaptive, resilient, and responsive to the complex challenges of coastal management. Which types of knowledge are mobilized and how these relate to each other depend on different institutions, as well as the actors and their positions in governance. In some cases, these forms of knowledge can be effectively integrated, while in others, they may conflict.

### 2.1.3. Forms of Democracy

Governance always combines forms of representative and participatory democracy, each of which comes with different structures for decision-making and with varying expectations regarding the roles and influence of different actors (Held, 2006; Young, 2002). The balance between these forms of democracy shapes governance processes and determines the extent to which different stakeholders can contribute to decision-making. In the context of coastal governance, this balance becomes particularly significant due to the complexity of managing interconnected ecosystems and diverse stakeholder interests. Representative democracy, typically exercised through elected officials and government agencies, plays a crucial role in setting legal frameworks, allocating resources, and enforcing policies (Jentoft, 2007). However, participatory democracy is increasingly emphasized, as it enables local communities, resource users, and non-state actors to engage in decision-making processes, ensuring that policies reflect local needs and knowledge (Pomeroy & Berkes, 1997). Participatory approaches, such as co-management, deliberative forums, and stakeholder advisory councils, foster social learning and adaptive governance, allowing coastal communities and other local stakeholders to respond more effectively to environmental changes (Paramita et al., 2023). Nevertheless, challenges such as power imbalances, conflicts of interest, and institutional constraints often hinder the meaningful participation of marginalized groups (Berkes, 2012). Bridging the gap between representative and participatory democracy in coastal governance requires inclusive institutional arrangements, capacity-building initiatives, and transparent decision-making mechanisms that foster trust among stakeholders (Quimby & Levine, 2018; Shipman & Stojanovic, 2007).

The dimensions discussed in the previous sections can be organized in many ways, with various stakeholders taking diverse views on these aspects and very different positions on the dimensions. The positions and organizational forms that become institutionalized depend on historical developments, power dynamics,

institutional structures, and the broader socio-political context. Integration of land and sea management can, for example, range from fully integrated, ecosystem-based governance (where land and marine policies are aligned) to fragmented governance (where separate institutions govern land and sea with little coordination). For example, in some coastal regions, marine spatial planning is closely linked with terrestrial land-use planning, whereas in others, they remain separate, creating governance gaps (Duck, 2012; Tocco et al., 2024). The forms of knowledge mobilized vary between technocratic, expert-driven governance (where scientific knowledge dominates) and inclusive, co-produced knowledge systems (where local knowledge is integrated into decision-making; Nijamdeen et al., 2023). This reflects the ongoing debate between the role, representation, as well as the opportunities for expertise and community participation in governance (Jasanoff, 2004; Turnhout et al., 2016). Forms of democracy can range from highly centralised, top-down governance (where decisions are made by state authorities with limited public participation) to bottom-up, participatory governance (where local actors have a strong voice in decision-making). Different governance systems strike different balances between representation and participation. Across these dimensions, a range of hybrid approaches to integration, knowledge mobilization, and decision-making coexist.

### *2.2. Interrelations Between Dimensions*

The interdependence of governance dimensions is well established in the literature on institutional interactions and co-evolution (Van Assche et al., 2024). For example, if we consider land–sea integration and knowledge mobilization, a more integrated land–sea governance system may necessitate the use of diverse knowledge forms as marine and terrestrial ecosystems are governed by different epistemic traditions. For example, in small-scale fisheries governance that integrates land and sea management requires combining LEK with scientific expertise to manage coastal resources effectively (Berkes, 2012). For knowledge mobilization and forms of democracy, the type of knowledge that is privileged in governance can shape who participates in decision-making. If governance relies heavily on expert-driven knowledge, this may limit (or maybe sometimes also give opportunities if this comes from sectoral experts that already work with "a coastal lens") opportunities for participatory democracy, whereas governance systems that emphasize deliberative democracy often seek to incorporate local and indigenous knowledge (Fischer, 2000). When we consider democracy and land–sea integration, the degree of participatory governance can affect how successfully land and sea policies are integrated. Top-down governance may prioritize efficiency, yet struggle to achieve legitimacy (Nijamdeen et al., 2023), while participatory approaches may slow down decision-making but foster greater acceptance and compliance with integrated policies (Pahl-Wostl, 2009).

When analysing governance dimensions, it is essential to recognize that actual decision-making practices often diverge from their formal representations, particularly under conditions of uncertainty and dynamic contexts. As highlighted in studies on knowledge co-production in human-natural systems, decision-making is shaped by complex interactions, power dynamics, and the need for inclusive, adaptive approaches that respond to evolving realities (Moallemi et al., 2023). The position on each dimension is an emergent outcome of a history of interactions between different actors and the rules of coordination these actors adopted. The governance dimensions that are considered relevant and the dominant positions on these dimensions co-evolve (Van Assche et al., 2024). This renders a certain governance configuration more cohesive and characteristic of a particular governance path (Fobé et al., 2024; Van Assche et al., 2013). The choices made tend to reinforce the relevance of a certain dimension and the positions taken. The interdependence between the different dimensions and positions taken creates an important path

dependence in governance evolution. The resulting governance path is shaped by, and specific to, particular coastal conditions (Van Assche et al., 2020). Once things are organized and understood in a certain manner, it becomes harder to change them. Such reflections on dimensions and positions can, for example, help explain why policy integration is often promoted, but also often difficult to achieve, and it can enrich the understanding of the discrepancies between the rhetoric and realities of participation.

Various internal and external drivers and events can shift the position on one governance dimension. Such changes often influence positions on other dimensions, potentially triggering broader transformations in the governance system or, conversely, reinforcing stability and contributing to institutional lock-ins. Together, these dimensions and their relative positions form the foundation for understanding and adapting coastal governance processes to the challenges posed by environmental changes, societal needs, and political dynamics.

## 3. Methodology

In the study, we apply the insights presented in the introduction to three different cases exploring how the interaction between three critical governance dimensions, that is, the integration of land and sea management, knowledge mobilization, and forms of democracy, plays out in the context of coastal governance.

### *3.1. Case Selection*

The three case studies, Valencia (Spain), the Isle of Wight (UK), and the Oslofjord (Norway; Figure 1), were selected to reflect a diversity of coastal governance contexts across Europe. These cases are part of the Blue Green Governance project (https://bggovernance.eu), which focuses on transformations in coastal and marine governance. Each case highlights different challenges and trajectories related to the integration of land and sea management, the mobilization of various forms of knowledge, and the role of democratic structures in governance. The Valencia case exemplifies a context of long-standing tension between environmental conservation and economic development (e.g., port expansion and tourism). The Isle of Wight was selected for its status as a UNESCO Biosphere Reserve and its evolving community participation landscape. Whereas, the Oslofjord case showcases a multi-level governance context where land-based pollution and ecosystem degradation intersect with governance complexity.

### *3.2. Data Collection*

Between May and September 2024, we conducted a qualitative study combining a targeted literature review and semi-structured interviews. The literature review focused on governance pathways, coastal transformation, along with institutional barriers and enablers in Europe, including the three cases. Interview participants included academic stakeholders (key experts) actively involved in the Blue Green Governance project who are also experts in their respective case study regions. The key experts interviewed were primarily academics and researchers, some of whom had ongoing collaborative relationships with policymakers and practitioners in their regions. Their insights provided both empirical knowledge of local governance systems and reflective assessments on governance transformations.


**Figure 1.** Case study locations: Valencia (Spain), the Isle of Wight (UK), and the Oslofjord (Norway).

### *3.3. Approach to Analysis*

Rather than employing formal coding techniques, we used a theory-informed thematic reading of all interview transcripts and relevant documents. Guided by the evolutionary governance theory (Van Assche et al., 2013), we focused on identifying patterns and examples that related to the three key governance dimensions. We looked for illustrative dynamics and interactions, drawing comparisons across the cases to highlight how each governance system evolves through its specific institutional, discursive, and actor configurations. To construct the governance pathways for each case, we examined various aspects, including key events, relevant policies, organizational forms, material aspects, and important discourses, to further develop the governance pathways. These governance pathways were constructed based on the literature and input from key experts representing each case study.

## 4. Results

### *4.1. Case Study Reflections*

We provide a brief overview of each case, followed by an analysis of how the three governance dimensions manifest in the specific context. We then examine the interactions between these dimensions and conclude each case with a figure illustrating its governance path.

### *4.2. The Valencian Case*

The Valencian coastal region in eastern Spain presents a compelling case for examining the challenges of integrated coastal governance in a densely populated and economically dynamic area. Characterized by a long history of tourism, urban development, and environmental policy reforms, the region faces persistent tensions between ecological preservation and economic growth. As pressures on coastal ecosystems intensify, Valencia's experience highlights the importance of coordinating land and sea management, effectively mobilizing diverse forms of knowledge, and balancing representative and participatory democratic practices. This case shows how the interaction of these governance dimensions shapes both policy outcomes and public trust in coastal decision-making (Figure 2).

#### 4.2.1. Integration of Land and Sea Management

In the Valencian case, the integration of land and sea management takes on particular urgency due to the region's long-standing policy complexity and competing coastal interests. The region's approach involves multiple policy layers, from the historical Ley de Costas (Coastal Law of 1969) to more recent plans like Pativel (Territorial Action Plan for the Green Infrastructure of the Coastal Region) in 2018 (Vergés & Larruga, 2023). This integration, however, is not seamless. Conflicting interests between tourism development, private property rights, environmental protection, and urban expansion often create tensions between land–based and marine policy objectives. For instance, while the expansion of the port of Valencia emphasizes economic growth and logistical capacity, it simultaneously encroaches on sensitive coastal ecosystems, creating a governance challenge in balancing these priorities.

#### 4.2.2. Forms of Knowledge Mobilized

Knowledge mobilization in Valencian coastal governance reveals the complexities of scientific, local, and political knowledge in decision-making. Technical knowledge, such as data on coastal erosion and biodiversity, plays a critical role in informing governance decisions (Gonzalez-Alonso et al., 1997). However, as highlighted by the interviewed experts, there are significant barriers to the effective use of this knowledge. For instance, there is a lack of coordination in sharing scientific data between institutions, and political agendas often influence the interpretation and application of scientific findings. The frustration of local stakeholders is also evident in the limited use of participatory knowledge in policymaking, as most decisions are driven by top-down frameworks with insufficient integration of local community perspectives (Miró Pérez & Olcina, 2020). This resonates with other studies where the results are often a gap between available scientific information and its practical application in managing coastal resources (Enguix, 2023).

#### 4.2.3. Forms of Democracy in Coastal Governance

The forms of democracy in Valencian coastal governance blend both representative and participatory elements, yet their interaction often leads to challenges in stakeholder engagement and decision-making. Representative democracy, embodied by government agencies and elected officials, has traditionally dominated decision-making processes, particularly through frameworks such as the Ley de Costas (Alfosea, 2010; Verges & Larruga, 2024). However, the increasing emphasis on participatory democracy is evident in initiatives (i.e., Pativel) and various stakeholder advisory councils. Despite these efforts, participation is often

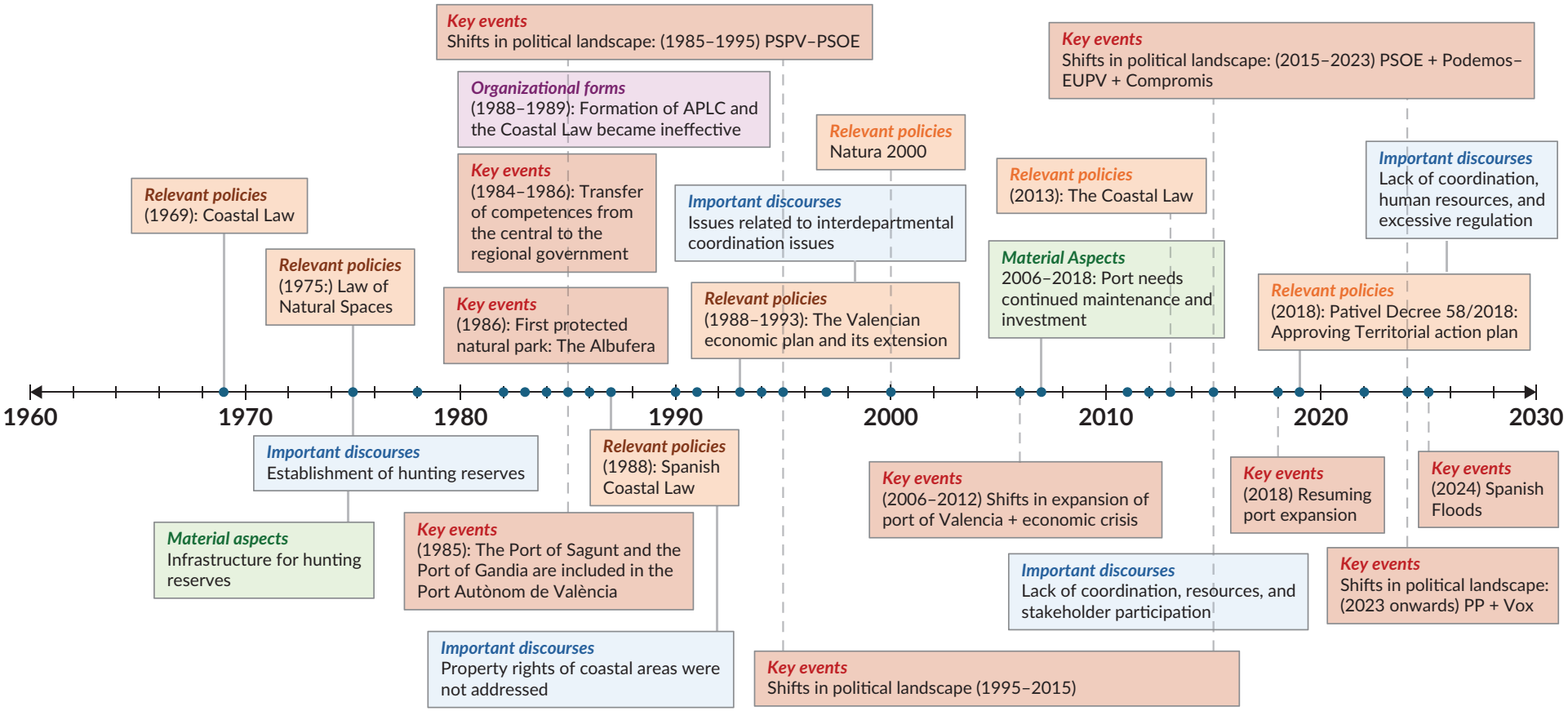


**Figure 2.** Governance path related to coastal and marine governance in Valencia, Spain, from 1970 to 2025. Notes: PSPV stands for Partido Socialista del País Valencià; PSOE for Partido Socialista Obrero Español; EUPV for Esquerra Unida del País Valencià; and PATIVEL for Plan de Acción Territorial de la Infraestructura Verde del Litoral.

limited to actors with vested interests only, while marginalized groups or those without clear economic stakes in coastal management face barriers to involvement. Stakeholder fatigue and a lack of institutional mechanisms for meaningful participation further exacerbate the situation in Valencia. Bridging the gap between these democratic forms requires a careful balance, ensuring that decision-making processes are both inclusive and effective while addressing the power imbalances that often skew participation (Enguix, 2023).

#### 4.2.4. Interaction Between Governance Dimensions

The interaction between the three governance dimensions—the integration of land and sea management, the mobilization of knowledge, and the forms of democracy—shapes the broader governance process in Valencian coastal management. The tension between land and sea-based policies often complicates the application of scientific knowledge, as the priorities of stakeholders involved in land management may not always align with those in marine management (Miró Pérez & Olcina, 2020). Similarly, the forms of democracy at play influence how knowledge is mobilized and who gets to decide which knowledge is valid. Representative democracy tends to prioritize economic or development-driven knowledge, whereas participatory forms of democracy call for the inclusion of local and scientific knowledge, fostering a more holistic approach to governance (Gonzalez-Alonso et al., 1997). The interaction between these dimensions also reveals governance challenges. For example, while the integration of land and sea management in Valencia may promote more cohesive decision-making, the barriers to knowledge sharing and participatory fatigue hinder its effectiveness. This creates a need for governance structures that can simultaneously address the technical complexities of coastal management, incorporate diverse forms of knowledge, and foster meaningful democratic participation at all levels (Enguix, 2023). Thus, the interviewed experts emphasized that achieving a balance between these dimensions is essential for creating adaptive, resilient governance systems capable of responding to the multifaceted challenges faced by coastal communities.

### *4.3. The Isle of Wight Biosphere Case*

Situated off the southern coast of England, the Isle of Wight is renowned for its rich ecological diversity, notable coastal landscapes, and cultural heritage. As a designated UNESCO Biosphere Reserve, it represents a living laboratory for sustainable development, where environmental protection, economic resilience, and social well-being must be carefully balanced. Its position at the interface of land and sea makes it particularly vulnerable to climate change impacts such as coastal erosion, sea-level rise, and habitat degradation. At the same time, the island's tightly knit communities, reliance on tourism, and proximity to the busy Solent maritime corridor create a unique set of governance challenges. These conditions make the Isle of Wight an ideal case for exploring how different dimensions of governance and their interactions (Figure 3).

#### 4.3.1. Integration of Land and Sea Management

Integrating land and sea management on the Isle of Wight involves navigating a complex landscape of diverse stakeholders, including policymakers, conservationists, local businesses, and residents. Community scepticism, often rooted in a historical mistrust of local authorities, further complicates efforts to establish cohesive governance frameworks. Policies aimed at integrating coastal and terrestrial management are frequently seen as top-down impositions. This perception of exclusion alienates coastal communities,

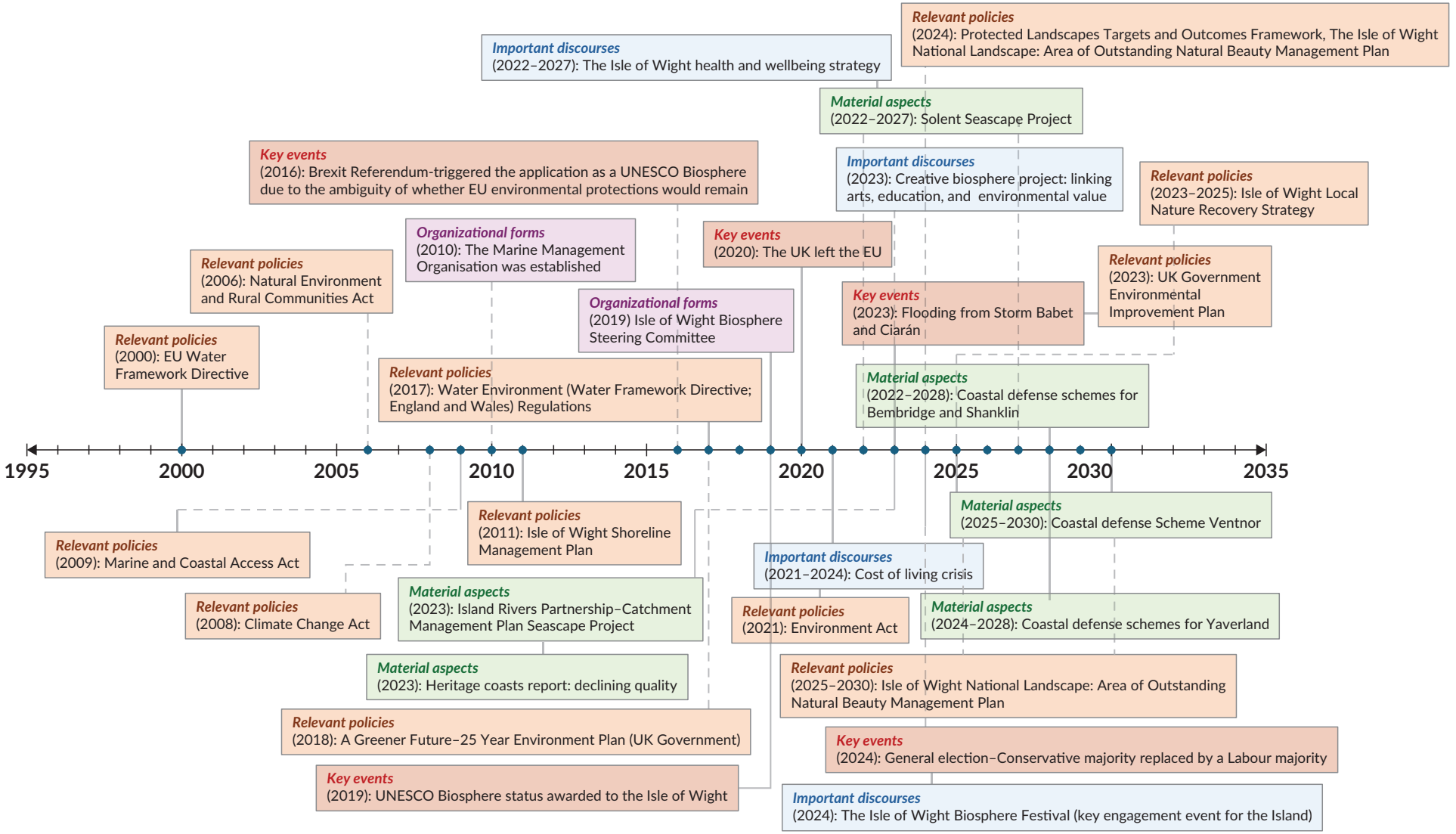


**Figure 3.** Governance path related to coastal and marine governance in the Isle of Wight, UK, from 2000 to 2025.

making it harder to gain widespread support for such initiatives. Decision-making linked to these policies is often shaped by sentimental connections to the past, resulting in hesitancy to adopt plans that deviate from historical environmental baselines or long-standing perceptions of the local landscape. Efforts to develop a cohesive conservation framework face difficulties due to fragmented policies and competing stakeholder interests (McInnes et al., 2003).

#### 4.3.2. Forms of Knowledge Mobilized

The challenge of integrating land and sea management on the Isle of Wight is deeply tied to knowledge production. Scientific expertise plays a crucial role in identifying environmental risks to the island, such as coastal erosion and sea level rise. Scientific research on the Isle of Wight has provided vital insights into coastal ecosystem services, biodiversity threats, and climate adaptation strategies. However, these expert-driven initiatives often struggle to gain traction when they do not incorporate the lived experiences and concerns of local communities. Although local communities possess valuable ecological knowledge about marine ecosystems, such as seagrasses and kelp forests, it proves difficult to integrate this knowledge into a more comprehensive understanding of land–sea interactions. The disconnect between scientific and local knowledge is particularly evident in the post-Brexit landscape, where governance uncertainty has exacerbated mistrust in regulatory frameworks. For example, while conservationists advocate for stricter environmental protections under the Biosphere framework, some residents fear that such measures could limit economic opportunities or impose restrictions on coastal land-use. The tension between scientific expertise and local priorities highlights the need for governance structures that actively engage communities in knowledge production, ensuring that policies are informed by both technical research and local knowledge and experiences.

#### 4.3.3. Forms of Democracy in Coastal Governance

On the Isle of Wight, decision-making power is largely concentrated in formal institutions, while grassroots organizations and community groups are playing an increasingly active role in advocating for alternative governance approaches. A key challenge lies not simply in the use of expert knowledge but in the dominance of certain sectors, particularly those tied to traditional investment priorities, in shaping which knowledge is mobilized. This sectoral bias can influence how policies supporting land–sea integration are framed and whose interests they reflect. The Isle of Wight case illustrates the importance of structured, inclusive engagement mechanisms that allow diverse stakeholders to contribute to governance processes. For instance, uncertainties around the understanding of what the biosphere designation means to the island have highlighted the role of participatory forums where local communities and experts engage in dialogue. These forums have helped to build public trust and ensure that governance strategies reflect both scientific insights and the experiences and perspectives of local communities. An example of how they are bridging different perspectives includes the Biosphere Festival, which effectively brought together a diverse audience that fostered a sense of community, highlighted the role of the biosphere, and provided free/low-cost nature education events. In practice, opportunities for co-management have enabled local actors to play a direct role in shaping and implementing policies, contributing to governance structures that are more responsive and adaptive to changing environmental and social conditions.

#### 4.3.4. Interaction Between Governance Dimensions

The interviews illustrate that coastal governance in the Isle of Wight is making progress toward integrating land and sea management, but challenges remain. The interviewees explained that local communities possess valuable ecological knowledge about marine ecosystems, but it is not always easy to integrate this form of knowledge with the findings of scientific studies. Despite ongoing collaborations between local knowledge holders and academic institutions to bridge this gap, integration at a systemic level is still evolving. Governance structures combine both participatory and representative democratic elements, with active community involvement through grassroots events and formal engagement with government agencies and NGOs. Overall, the case highlights the importance of co-production of knowledge and adaptive governance, suggesting a promising yet complex trajectory toward a more integrated and inclusive coastal governance model. This case study highlights the deep interconnections between the different governance dimensions. Land–sea integration cannot be achieved without effective knowledge mobilization, and knowledge alone is insufficient unless supported by democratic governance structures that foster trust and participation. Conversely, participatory governance is most effective when it draws on both expert and local knowledge to inform decision-making. The Isle of Wight's journey underscores the importance of integrating expertise, community knowledge, and democratic participation to build sustainable governance models that are both effective and equitable. At the same time, governance structures shape how knowledge is valued and mobilized. When decision-making remains centralized, scientific expertise often takes precedence over local insights. By contrast, more participatory governance structures can facilitate the integration of diverse knowledge systems, creating more socially accepted and effective policies. The Isle of Wight's governance evolution demonstrates that sustainable coastal management cannot rely on expertise alone; it must also incorporate democratic legitimacy and community buy-in.

### *4.4. The Oslofjord Case*

The Oslofjord, located in southeastern Norway, is recognized for both its ecological value and socio-economic significance. Home to diverse marine habitats, the fjord supports a wide range of activities, including fisheries, recreation, tourism, and maritime transport, that make it central to the livelihoods and well-being of surrounding communities. In recent decades, however, the Oslofjord has experienced growing environmental stress due to pollution, habitat degradation, and intensified human activity. These pressures have triggered rising public concern and spurred renewed policy focus, making the area a compelling case for examining the challenges and opportunities of integrated coastal governance and to explore the interaction between different governance dimensions, in a densely used yet ecologically sensitive marine environment (Figure 4).

#### 4.4.1. Integration of Land and Sea Management

The degradation of the Oslofjord ecosystem is largely driven by land-based pollution sources, such as agricultural runoff and wastewater discharge. The Oslofjord action plan has been developed to tackle these challenges; although it has contributed to a reduction in nitrogen inputs, its limited long-term vision underscores a persistent challenge in land–sea governance: aligning environmental objectives with infrastructure development and broader economic priorities.

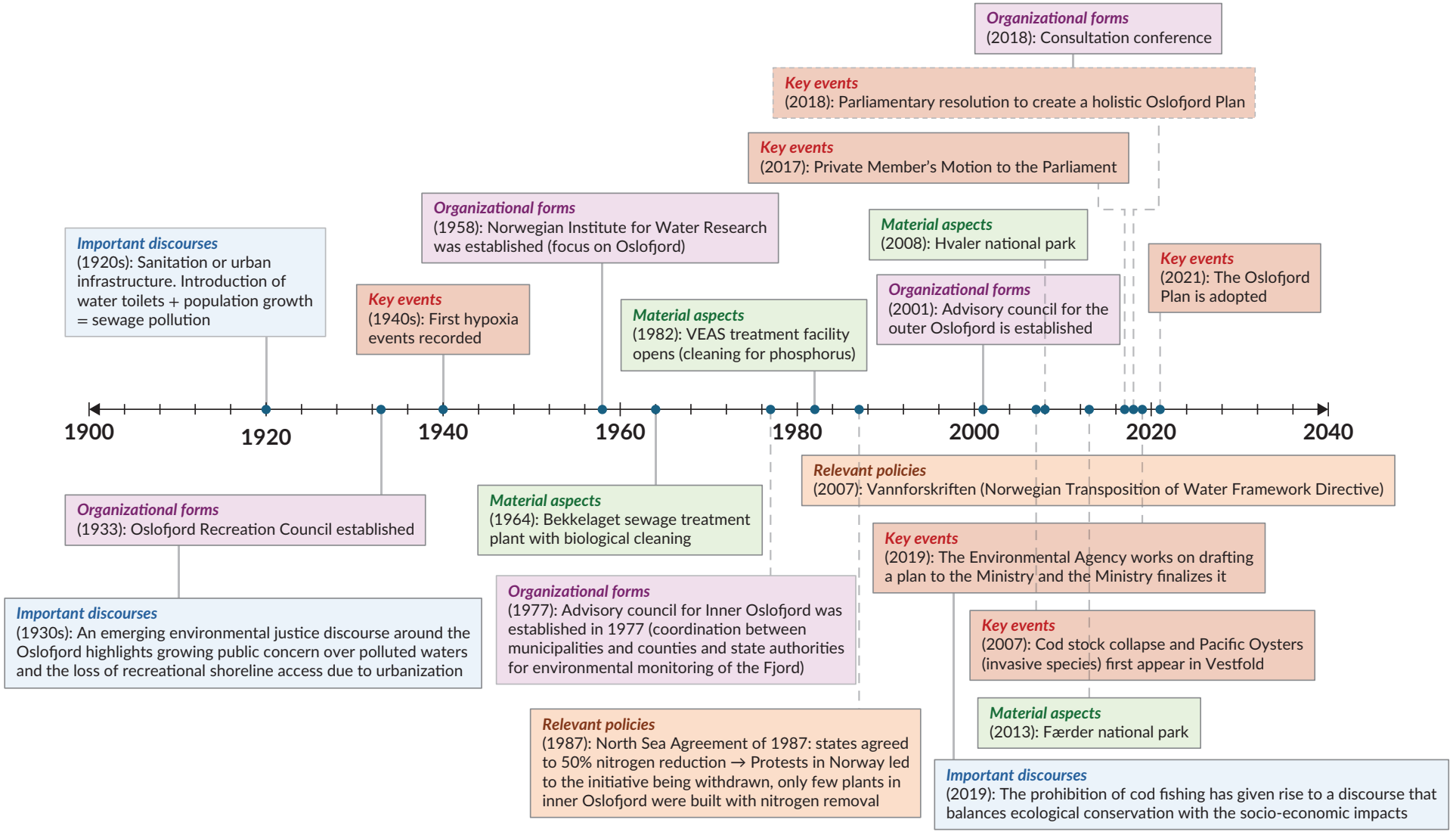


**Figure 4.** Governance path related to coastal and marine governance in the Oslofjord, Norway, from the 1920s to 2021.

To support coordination across governance levels, the Oslofjord Council was established. However, its effectiveness has been constrained by a focus on reporting actions rather than assessing their ecological impacts. According to interviewees, this lack of functional integration reflects deeper institutional shortcomings, where governance frameworks often struggle to connect policy implementation with the ecological requirements of complex systems. Without a more dynamic and adaptive approach, one that incorporates climate change considerations, continuous monitoring, and iterative learning of land–sea governance efforts, may continue to fall short in reversing the fjord's ongoing environmental decline.

#### 4.4.2. Forms of Knowledge Mobilized

The role of knowledge production in Oslofjord governance is crucial, as scientific research informs management decisions regarding pollution control, habitat restoration, and biodiversity conservation. However, the governance framework has historically struggled to incorporate ecological knowledge effectively. The initial action plan relied heavily on traditional mitigation measures such as reducing nutrient inputs without fully considering the broader ecological dynamics at play. Furthermore, the absence of clear ecological indicators has hindered the ability to measure the effectiveness of conservation efforts. While scientific assessments have identified ongoing environmental decline, governance institutions have been slow to integrate new knowledge into policy adjustments. This misalignment highlights the challenge of bridging the gap between scientific expertise and decision-making processes. Recent developments, such as the introduction of marine gardens and technological solutions, indicate a shift towards a more innovative approach. However, these measures have not yet been fully embedded within the governance framework. The integration of industry perspectives and local knowledge remains critical for improving the alignment between management strategies and ecosystem functions. The interviewed experts indicated that without a stronger emphasis on knowledge co-production, governance risks continuing a cycle of reactive rather than proactive environmental management.

#### 4.4.3. Forms of Democracy in Coastal Governance

The forms of democracy in the Oslofjord rely on a combination of representative and participatory mechanisms. The Oslofjord Council, composed of municipalities, county governors, and sector agencies, plays a central role in coordinating environmental actions. However, its approach has been criticized for focusing on administrative processes rather than fostering deeper stakeholder engagement. A major challenge in participatory governance is ensuring that diverse stakeholders, ranging from local communities and environmental groups to industries and policymakers, have meaningful influence in decision-making. The historical lack of industry engagement has limited the ability to develop more holistic management strategies that align environmental goals with economic realities. Moreover, the absence of clear ecological indicators weakens accountability and transparency in governance processes, reducing public trust in management efforts. According to interviewed experts, to improve governance legitimacy and effectiveness of the fjord, stronger participatory mechanisms are needed to bridge the divide between expert knowledge and local concerns.

#### 4.4.4. Interaction Between Governance Dimensions

Reflecting on the Oslofjord case, it becomes clear that integrating land and sea management is a complex process shaped by local governance and broader environmental policies. The Oslofjord Plan demonstrates an attempt to move beyond a municipality-focused approach to a more holistic perspective that considers the entire catchment area. However, this shift is not without challenges, as municipalities often resist interference from higher levels of government, while also needing state support to address issues like sewage treatment and water quality management. Scientific expertise plays a key role in understanding the issues at hand, but municipalities struggle to fully access and utilize this knowledge, especially when it comes to technical solutions. Despite this, local stakeholders remain heavily involved in decision-making, and there is growing recognition of the need for collaboration across various levels of governance. Ultimately, the case shows that effective environmental management requires a balance between local autonomy, state intervention, and scientific input, all while ensuring that political support at the municipal level drives meaningful action.

## 5. Discussion

The three cases clearly demonstrate how each governance system is shaped by a particular way of organizing the planning and use of coastal areas. The cases also show how the options for transforming coastal governance systems are shaped by existing governance structures and choices made concerning the three dimensions this article focuses on. The distribution of different tasks and responsibilities over different authorities, the hierarchical and sectoral division of particular responsibilities, the strong reliance on scientific knowledge in the formulation of policies, and the dominance of certain sectors, types of land use, and vested interests strongly influence the social-environmental challenges and how governance responds to them. These aspects also influence the implementation of policies as well as the attempt to reform governance in all three cases—the three dimensions are strongly interwoven. By examining these cases, we can identify some of the key challenges and opportunities for transforming coastal governance.

### *5.1. Land–Sea Integration*

The cases confirm the general insight that the integration of land and sea management remains one of the most persistent governance challenges, as land-based activities, such as urbanization, agriculture, and industrial development, have profound impacts on marine ecosystems. The Valencian case illustrates how fragmented policies create tensions between conservation efforts and economic development. For example, while Pativel seeks to preserve coastal ecosystems, the expansion of the Port of Valencia continues to place pressure on these fragile environments (Miró Pérez & Olcina, 2020). Similarly, in the Oslofjord, land-based pollution from agriculture and wastewater significantly contributes to marine degradation. Yet, actors struggle to align land-use planning with marine conservation, as municipal spatial plans often inadequately regulate fjord usage, and existing marine management frameworks frequently overlook coastal areas, leading to fragmented and ineffective governance. On the Isle of Wight, the challenge of land–sea integration is further complicated by deep-rooted community scepticism toward authorities and governance processes. While scientific expertise is essential in identifying threats such as sea-level rise and erosion, this knowledge must be effectively communicated and aligned with local perspectives to avoid resistance. Across all three cases, the difficulty of coordinating across governance levels and departments, each with

distinct mandates, interests, and institutional cultures, limits the capacity to address land–sea interdependencies. Furthermore, they regularly seem to promote different and competing interests. Integrating land and sea thus either requires new overarching structures that bring these different ways of organizing together, or a profound reorganization of these different ways of organizing and their position in the overarching governance system. Both options may face resistance due to institutional inertia, actor familiarity with established practices, and vested interests embedded in current governance systems.

### *5.2. Knowledge Mobilization*

The integration of different forms of scientific expertise, local knowledge, and policy insights (Berkes, 2012; Turnhout et al., 2016) is another key challenge that plays a role in the three cases. Across all three case studies, governance structures have struggled to translate knowledge into action due to fragmented information sharing and political constraints. In Valencia, scientific data on coastal erosion and biodiversity loss are widely available but underutilized due to bureaucratic inefficiencies and political inertia. In the Isle of Wight, the failure to integrate community knowledge into decision-making has led to resistance from local stakeholders, particularly in conservation initiatives. The Oslofjord case highlights the importance of ecological indicators in guiding policy; however, governance institutions have been slow to incorporate new scientific findings into regulatory frameworks. The cases thus show that existing forms of organizing are strongly interwoven with specific types of knowledge that are not easily exchanged. The challenges are greater if other types of knowledge, either different types of expertise or forms of local knowledge, conflict with dominant discourses. These other types of knowledge may either be seen as irrelevant or even conflicting or threatening. The cases also draw attention to the limits of knowledge integration by demonstrating that there will always be different perspectives and views, and different ideas about how knowledge should be mobilized and used in decision-making processes. These are power/knowledge dynamics that play out in every community and governance system but may be even more complex in coastal governance because of the enormous diversity in topics, views, and interests, and because the ecological, economic, and political stakes are often vast.

### *5.3. Democratic Structures*

The three case studies show that there are significant barriers to inclusive participation and that outcomes and decisions from participatory processes are not always integrated into decisions made by authorities. In Valencia, representative forms of decision-making have historically favoured economic interests, limiting the influence of civil society and local environmental groups in decision-making (Miró Pérez & Olcina, 2020). On the Isle of Wight, governance legitimacy has been undermined by community scepticism toward local authorities, particularly in post-Brexit environmental governance. Similarly, in the Oslofjord, participatory structures such as the Oslofjord Council have struggled to engage industries in governance discussions, leading to weakened public trust in management strategies. The cases highlight the difficulties of introducing participatory approaches, particularly if these go beyond decision-making concerning a specific plan or vision. Such participatory approaches may not always align with other forms of decision-making and the more dominant representative forms of decision-making that are institutionalized. The cases also show that participatory processes are always embedded in larger structures of decision-making and subject to dominant (prevailing or mainstream) views and interests. Different decision-making approaches can yield conflicting outcomes, and ignoring these may erode trust in governance and hinder participatory coastal transformation.

### *5.4. Interactions Between Governance Dimensions: A Path Towards Transformation*

The cases highlight how the three governance dimensions—land–sea integration, knowledge mobilization, and democratic forms—are interrelated, shaping both current coastal governance and its potential for transformation. The cases show that a change in one dimension (e.g., using scientific knowledge or increasing local participation) is difficult and that efforts to transform coastal governance are often undermined by the interplay between all three dimensions. Current forms of organizing related to the three key dimensions and their interdependencies thus create a strong path dependency. The cases show that failure to bring change in one dimension might also weaken attempts to make changes in the other dimensions. For example, in Valencia, the fragmented integration of land and sea policies has undermined knowledge-sharing mechanisms and restricted stakeholder participation. In contrast, the Isle of Wight biosphere initiative demonstrates that enhanced participatory structures can improve the mobilization of diverse knowledge sources, ultimately strengthening land–sea governance. A better understanding of the different ways governance is structured concerning each dimension helps to enrich our understanding of the co-evolution in coastal governance and distinguish realistic transformation options from normative ideals. The focus on dimensions and ways of organizing can thus enrich existing theories of coastal transformation and the attempts to transform coastal governance.

As shown in Table 1, the three case studies reveal how land–sea integration, knowledge mobilization, and democratic forms vary across contexts. Each case presents a unique configuration of how these dimensions interact and evolve, highlighting both distinct paths and shared challenges. Beyond clarifying these dimensions, we identified recurring patterns and dynamics that show how each governance system adapts to context-specific pressures, including events, policies, organizational forms, material conditions, and discourses. This enabled a nuanced understanding of governance functions and transformations across

**Table 1.** Comparative analysis of the three critical governance dimensions of Valencia (Spain), the Isle of Wight (UK), the Oslofjord (Norway), and the main lessons learned.

| Governance dimension | Valencia, Spain | Isle of Wight, UK | Oslofjord, Norway | Lessons learned |
|---|---|---|---|---|
| Land–sea integration | Fragmented governance and tensions between urban expansion and ecosystem protection | Progressing toward integration through biosphere efforts, hindered by mistrust | Partially integrated and policy misalignment with ecological priorities | Institutional fragmentation hampers integration, and it requires a long-term vision and stakeholder trust |
| Knowledge mobilization | Dominated by technical expertise and limited incorporation of local knowledge | Weak connection between scientific insight and community experience | Strong reliance on scientific data and insufficient co-production and ecological metrics | Bridging scientific and local knowledge is essential for socially accepted and adaptive governance |
| Forms of democracy | Predominantly representative and minimal participatory engagement | Formal governance structures with increasing grassroots activism | Combination of representative councils and limited participatory mechanisms | Participatory governance must be meaningfully institutionalized to strengthen legitimacy and inclusiveness |

cases. Figures 2, 3, and 4 illustrate integrative governance pathways, showing how challenges emerge and are addressed. The comparative analysis deepens understanding of the three dimensions and suggests entry points for improving coastal governance.

## 6. Conclusions and recommendations

The analysis highlights the importance of past choices on the three key governance dimensions—land–sea integration, knowledge mobilization, and forms of democracy—their interdependencies, and the structural challenges involved in adapting governance systems. A more comprehensive understanding of these governance dimensions helps identify both constraints and opportunities for transformation. Once dimensions crystallize, and once positions are taken, these features and categories can entrench themselves, while their transformation is limited by what happens in the other dimensions. The case studies illustrate that such interdependence not only constrains but also guides change. How this influence plays out depends heavily on the specific governance path and institutional configuration.

What can be said in general is that attempts at transformation towards integration of land and sea governance and towards enhanced observation and adaptation ought to be informed by a localized analysis of governance dimensions and the nature of their interdependence. What further transpires from the cases is that a fixed set of normative principles for good coastal governance must be regarded as no more than a convenient fiction. Indeed, our cases all indicated issues with participation, knowledge, and policy integration and differentiation, yet they also demonstrated that correct forms and degrees, as well as participation, cannot be defined in the abstract. Moreover, the analyses suggest that our distinction between participation and representation was useful, and that forms of democracy make all the difference in delineating transformation options, yet also that we might have to broaden our definition of that dimension to include other aspects, including centralization/decentralization and individualist/collectivist. If we rethink the forms of democracy as a more synthetic concept in this manner, recognizing a wider variety of forms, different intensities, and functions of participation becomes possible, while the dimension can be more easily used as a strong first indicator in future analyses.

Future research can expand beyond these insights to explore their interactions with additional factors such as economic incentives, legal frameworks, and institutional path dependencies. Examining how existing institutional structures, power dynamics, and decision-making processes influence transformation efforts will provide valuable insights into the barriers and enablers of governance change. To support effective governance interventions, practical conceptual tools should be developed, enabling policymakers, practitioners, and stakeholders to analyze their governance contexts and identify adaptive strategies tailored to their specific needs. Additionally, a balanced perspective is necessary when approaching governance change, recognizing both its possibilities and limitations. Moving away from overly normative approaches and grounding strategies in empirical realities will enhance their feasibility, ensuring that governance reforms remain actionable, politically viable, and sustainable over time.

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## Conflict of Interests

In this article, editorial decisions were undertaken by Gianluca Ferraro (University of Portsmouth).

## Data Availability

Data supporting the findings of this study are available from the authors upon request.

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