# Systems Thinking in Water Governance

**The Thematic and Spatial Integration of Water-Related Challenges on a Regional Scale**

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# Preface

Finding a topic for this research was quite a journey. For a long time, nothing seemed to fit, and I felt without direction. Looking back now, I'm proud of the thesis I've created and excited to share it with you.

The process taught me practical and fun skills. In particular, I really enjoyed conducting interviews with water experts and visualising the findings using Illustrator and Photoshop. During the process, I also learned how to present and discuss my research with confidence and a positive attitude.

I could not have written this thesis without the support of my parents. Especially at the start when I felt lost, they helped me find my way.

A big thank you to Samuel for your ideas, creative thinking, and support throughout the internship. I'm also very grateful for all of my colleagues at Vereniging Deltametropool—you all made this experience genuinely fun. Patrick, thank you for providing guidance throughout the process. Your advice, especially the nudges to "kill your darlings", helped me make important decisions along the way.

And finally, thank you Pepijn for always encouraging me and reminding me that everything isn't so bad as I think.

Enjoy reading!

Rosa van Heel

Rotterdam, 26 June 2025

## Abstract

The accumulation of water-related challenges in the Netherlands, in combination with other societal challenges, presents spatial issues. There is an urgent need to align water and land use with the evolving hydrological conditions. Contemporary water governance often remains fragmented across institutions, overlooking the interconnectedness that all elements of the water system inherently share. This, together with the inherent scarcity of space, leads to the premise that water-related challenges would benefit from integration—both in terms of organisation and practically, in space. However, the extent of integration and the drivers of integration in regional water governance are unclear. To that end, this research explores integration between water-related challenges and land use through a theoretical lens that combines the role of power dynamics in water governance and the individual perspective on interconnectedness. The regional scale is central, as water-related challenges meet the spatial planning domain here. This research draws on desk research, 7 participatory observations, and 12 expert interviews across two case studies: Regional Delta Programme Maas and Regional Delta Programme Zuidwestelijke Delta.

The results indicate that while communication and inter-actor relationships are strong, integration remains limited due to minimal mindset alignment, shared funding, and rule-based mechanisms. Effective communication is largely driven by the recognition among water experts of the numerous interconnections between water-related challenges—most notably flood safety, freshwater availability, water quality, and ecology—and their links to both economic and non-economic functions. Although the spatial implications of these challenges are widely acknowledged, spatial integration—i.e., combining measures for multiple challenges within the same area—is rarely achieved. Limited mindset alignment is primarily due to conflicting timelines and ideologies, with housing and agricultural interests often dominating political debates around land use. In addition, the unequal distribution of resources and lack of rule-based mechanisms hinder integration. Flood safety benefits from the strongest financial, technical, and institutional capacities, while other themes lack comparable support. This limits the capacity for integration between water governance actors and practically, in space.

It is concluded that both agency, through perception of interconnectedness, and structure, through power dynamics, shape the capacity for integration. While recognition of interconnections can promote integration, structural power imbalances more often constrain it. Combining water-related challenges in strategy and in space remains difficult in practice. To strengthen integration, the study recommends establishing flexible funding mechanisms and fostering mutual understanding among actors.

**Keywords:** integration; water governance; power dynamics; systems thinking; interconnectedness

# Contents

## List of abbreviations

BKL – Besluit Kwaliteit Leefomgeving

HWBP – Executive Programme for Flood Safety (*Hoogwaterbeschermingsprogramma*)

KP ZSS – Knowledge Programme Sea Level Rise (*Kennisprogramma Zeespiegelstijging*)

Ministry of BZK – Ministry of the Interior and Kingdom Relations (*Binnenlandse Zaken en Koninkrijksrelaties*)

Ministry of IenW – Ministry of Infrastructure and Water Management

Ministry of LVVN – Ministry of Agriculture, Fisheries, Food Security and Nature

Ministry of VRO – Ministry of Housing and Spatial Planning

NDP – National Delta Programme

PAGW – Executive Programme for Ecology in Major Rivers (*Programmatische Aanpak Grote Rivieren*)

RDP – Regional Delta Programme

RvdR 2.0 – Knowledge Programme Room for the River 2.0 (*Ruimte voor de Rivier 2.0*)

RVO – Rijksdienst voor Ondernemend Nederland

WFD – Water Framework Directive

ZWD – Zuidwestelijke Delta

# 1 Introduction

## 1.1 Background and Urgency

Water-related challenges are accumulating due to climate change and growing populations and economies (Macpherson et al., 2024; Mishra et al., 2021; Wan Rosely & Voulvoulis, 2024). In the Netherlands, Delta scenarios show that challenges regarding freshwater availability, flood safety, and drought will increase substantially in 2050 and 2100. This affects all areas and water consumers (Van der Brugge & De Winter, 2024).

The interactions between natural and human systems are increasingly problematic (Di Baldassarre et al., 2019; Loucks & van Beek, 2017). On the one hand, climate change increases uncertainties and irregularities in water presence (KNMI, 2023; Sukanya & Joseph, 2023). On the other hand, population and economic growth place significant demands on the water system (Ligtvoet et al., 2023; Van Eldik et al., 2024). This creates a mismatch between the desire to control for external factors—like the water system—and the increasingly uncertain behaviour of weather patterns due to climate change (Herman et al., 2020; Timmermans et al., 2012; Zandvoort et al., 2018). As such, spatial planners must account for larger deviation in weather behaviour in their designs. This, alongside increased demand for water, creates one of the largest spatial planning challenges to date (Ligtvoet et al., 2023).

In the Netherlands, water challenges manifest themselves on a spatial scale (Loucks & van Beek, 2017; Macpherson et al., 2024). Tackling water-related problems often require significant amounts of space. For example, dike extensions, creating floodplains, and enlarging urban water buffers (Rijkswaterstaat, 2014). Land is, however, a finite resource and scarce in the Netherlands (Bouma & Slob, 2014; Ministerie van BZK, 2024). Moreover, other current societal crises like the housing shortage, the nitrogen crisis, and an ongoing energy transition compete for space directly and indirectly by adding additional pressure to the water system (Van Eldik et al., 2024).

The urgency to align water and land use with the new water reality is increasingly recognised in science and policy as a "shift to the natural" (Van Eldik et al., 2024). This requires a transformation in how we as a people approach and perceive water (Calder, 2012, p. 1). A transformation can be defined as "radical and system-wide changes to the way we operate politically, economically, and socially, as well as in our interactions with nature" (Kelemen et al., 2023; Limerick et al., 1994; Mapfumo et al., 2017). In context of water, a transformative approach entails moving towards a situation where the natural boundaries of the water system serve as precondition for all spatial development (Bunsen et al., 2021; Kelemen et al., 2023). Such a shift can be considered transformational in the Dutch context, because it breaks with the tradition in Dutch water management to adapt water systems to accommodate demand from other users and sectors (Wiering & Immink, 2006).

## 1.2 Main Current Understanding in Water Governance

Water-related crises and transformation in the approach to water and land use has been addressed by literature from a water governance perspective. Water governance are the social processes across all levels of society that shape how water resources are developed, managed, and used. It aims to steer water systems towards a desirable state (Pahl-Wostl, 2015, p. 26). Water governance plays a pivotal role in reshaping societal perceptions of and approaches to water. It has the capacity to create enabling conditions that open up opportunities for systemic change. It can also stimulate and guide the transformative process (Kelemen et al., 2023).

States and regional governments are typically regarded as the primary actors in managing complex water systems (Macpherson et al., 2024; Pahl-Wostl, 2015). This is largely attributed to the large-scale, political, and costly nature of water-related challenges and corresponding investments. The biophysical realities within complex water systems cannot be carried solely through bottom-up approaches initiated by markets and civil society (Mapfumo et al., 2017). Governments are well-positioned to coordinate efforts, establish policy frameworks, and allocate financial resources (Loucks & van Beek, 2017). As a result, the main responsibility in water governance currently lies with the state (Batory & Svensson, 2019).

Frequently, water-related challenges are rooted in power dynamics and inequality (Özerol et al., 2018). They are not merely a result of a changing hydroclimate or depletion of the resource base, but can be attributed to governance failure at multiple levels (Jiménez et al., 2020; Macpherson et al., 2024; Pahl-Wostl, 2017). Therefore, "the water crisis is largely a governance crisis" (OECD, 2011, p. 17). Take, for example, the high number of casualties resulting from the flooding in Valencia during October and November 2024 (Puig Ferrer, 2024). While the flooding was caused by a high-altitude isolated depression, the casualties can also be partly attributed to unclear institutional responsibilities in flood management. This led to delayed alerts and inadequate spatial planning, particularly the construction of infrastructure on natural floodplains without sufficient flood protection measures (Dieperink et al., 2016; Rasenberg, 2024). This shows that, while water governance can be problematic, it is also a prerequisite for addressing water-related challenges.

The Dutch policy reaction to the accumulation of water related-challenges is two-fold. A transformation in the approach to water and spatial development was set in motion by a letter to parliament in 2022, which advocates for making water and subsurface systems leading factors for all development (Harbers & Heijnen, 2022). This principle has been adopted by subsequent national policies, among others 'Nota Ruimte' (Ministerie van BZK, 2024). Simultaneously, there is an accumulation of national policy programmes dealing with specific water-related challenges. These national policies can be used as 'tools' for regional policies in moving towards a system that, first and foremost, accommodates water.

## 1.3 Problem Definition

Contemporary water governance is typically fragmented among various spatial domains and consistently disregards the interconnectedness of surface and groundwater, the interactions between water quality, quantity, and overall ecosystem health, the connections between industrial, agricultural, and household water security, as well as the dynamics between seawater intrusion, flooding, and salinisation (Barthel, 2014b; Bilalova et al., 2025; Macpherson et al., 2024). Water management practices and responses to governance challenges remain largely dominated by technocratic, scenario-based approaches that prioritise technical and siloed thinking (Di Baldassarre et al., 2019; Martin-Ortega, 2023). This development is reflected in the Netherlands, where flood safety, drinking water, and subsurface water, amongst others, are dealt with in separate national policy programmes (Kamphof et al., 2017; Ministerie van IenW, 2024b).

Fragmentation in water governance poses significant challenges on both practical and systemic levels. Practically, fragmentation leads to a loss of access to new knowledge, missed opportunities for synergies, and inefficient coordination (Angst et al., 2018). The consequent power dynamics between these actors form the foundation of decision-making processes in water governance (Brisbois & De Loë, 2016). Systemically, all elements in the natural water system are inherently connected (Sauvé et al., 2021). Reflecting these relationships in water governance structures and instruments aligns with the theoretical perspective of systems thinking, which emphasises the interconnectedness between components (Bouma & Slob, 2014; Wan Rosely & Voulvoulis, 2024).

Moving from fragmented to integrated water governance is a core issue in water governance for two reasons (Cumiskey et al., 2019). First, the scarcity of available space makes it practically advantageous to address multiple water-related challenges in the same location, 'wasting' less space (Bouma & Slob, 2014; Kidd, 2007). Second, climate change, along with population and economic growth, is expected to heighten uncertainties in water supply and demand. Integrated water governance can enhance flexibility among stakeholders and processes (Van Straalen, 2012), enabling more effective management of these increasing uncertainties (Berjawi et al., 2021). Third, integration breaks away from path dependencies and fosters the development of innovative, forward-thinking water strategies across policy domains, territorial boundaries, and institutional levels (OECD, 2015). Dealing with challenges collectively is ultimately more effective than treating them in isolation (Kidd, 2007).

A regional perspective is provides an appropriate lens for studying water and land use challenges, because it allows for an exploration of how institutional structures (mis)align with hydrological realities (Barthel, 2014a; Barthel & Banzhaf, 2016). As water flows frequently cross political and administrative boundaries, decision-making is challenging (Araral & Wang, 2013). In the Dutch context, actors responsible for water management and spatial planning, such as water boards and provinces, meet at the regional scale. Institutional misfits occur when governance structures do not correspond to the scale and complexity of the water-related challenges they aim to manage (Moore et al., 2024). To overcome this, Regional Delta Programmes attempt to align the interests and responsibilities of regional governance actors. Regional decision-making must balance competing demands and integrate cross-sectoral perspectives to ensure sustainable outcomes for both the water system and the broader socio-economic and environmental context (Rocco & Schweitzer, 2013).

Achieving integration in regional water governance presents two issues. First, water policymakers face the challenge of integrating and interrelating the multiplicity of water-related challenges between actors (Van der Brugge et al., 2024). Since water issues are accumulating and as they are individually challenging and complex (Wan Rosely & Voulvoulis, 2024), policymakers and engineers tend to focus on their own water-related expertise, forming 'thematic siloes' within regional water governance (Macpherson et al., 2024). The second governance challenge is one of integrating the multiplicity of water-related challenges spatially. This is where water governance enters the spatial domain. Measures such as water buffers, dams, dykes and sluices are made to last many decades and determine the future prospect of spatial planning and land use (Zevenbergen et al., 2018).

## 1.4 Research Objective and Questions

The accumulation of water-related challenges in the Netherlands, in combination with other societal challenges, presents spatial issues. This research explores the interconnections between water challenges, their spatial consequences, and the underlying power dynamics from the perspective of water policymakers in a regional context. The research questions are as follows:

*How do the power dynamics in water governance and the perception of interconnectedness of water-related challenges shape the capacity for integration between water-related challenges and land use in Dutch water regions?*

1. How is water governance in Dutch water regions shaped and what is the role of the Regional Delta Programmes in water governance?
2. What power dynamics are visible in regional water governance?
3. How do regional water policymakers perceive interconnections among water-related challenges?
4. How do regional water policymakers perceive interconnections between water-related challenges and land use?
5. What are the enablers and barriers in promoting an integrated approach for water-related challenges and land use in Dutch water regions?

Empirically, this study focusses on two water regions: Zuidwestelijke Delta and Maas. Both are regional components of the National Delta Programme. The research explores the perception of regional water policymakers working with or within the respective Regional Delta Programmes (RDPs). RDPs are well-suited for this analysis due to their function as networking platforms and their active role in regional water governance. Moreover, they are led by water expert teams and explicitly aim to foster integration in the region, making them compatible with a systems thinking approach. The specific water-related challenges are not predefined but emerge inductively during the research process.

## 1.5 Knowledge Gap

In addressing the two integration challenges in water governance, a theoretical gap emerges (Miles, 2017). Existing literature consistently emphasizes structural and inter-actor aspects of integration, but often overlooks the agency of individual actors (Jiménez et al., 2020; Zwarteveen et al., 2017). By focussing on factors like multi-level arrangements, participation, shared goals, and communication (Cumiskey et al., 2019), literature on integration in water governance neglects the perception of that actors hold of themselves, others, and their social and material environments (Zwarteveen et al., 2017). These mental models form their perception of connections between water-related challenges (O'Connor & Levin, 2023), shaping the degree of integration between water-related challenges achieved. A systems thinking perspective can help bridge this theoretical gap by emphasizing the cognitive dimension of integration (Amissah et al., 2020; Kolkman et al., 2005). It reveals how individuals mentally connect water challenges and conceptualise the relation between water and land use. Despite its potential, systems thinking has yet to be applied in case studies on integration in water governance (Wan Rosely & Voulvoulis, 2024). An additional theoretical gap is identified in the literature review by Özerol et al. (2018), who highlight that power and equity have received limited attention in water governance studies.

Besides theoretical deficiencies, prior research also reveals an empirical gap which highlights the need for more thorough examination of the real-world impact of integration within a single sector (Miles, 2017; Trein et al., 2021). Current literature on policy integration and water governance focusses predominantly on bridging the gap between water policy and other policy fields (Ingold et al., 2016), particularly the water-food-energy nexus (Al-Saidi & Elagib, 2017; Roidt & Avellán, 2019). Moreover, the systematic literature review by Voogd et al. (2022) shows that governance-related aspects to individual water problems have been extensively researched. This leaves the enablers and barriers for regional policymakers to integrate individual water themes in their respective regions unexplored (Caniglia et al., 2016).

## 1.6 Scientific and Societal Relevance

The scientific relevance of this research lies in its combination of systems thinking and water governance perspectives. Water governance emphasizes the structural mechanisms that shape framing and decision-making processes, whereas systems thinking examines how individual water experts perceive interconnections between ecological and social systems (Bouma & Slob, 2014). By combining these approaches, the study captures a comprehensive range of factors influencing the capacity for integration between water and land use related challenges. Rather than privileging one perspective, the research juxtaposes both to assess their relative contributions to integration. In addition, the scientific relevance of this research is rooted in its focus on how individual governance participants, in this case water experts, can guide a transformation in a complex (Arnold et al., 2024). Achieving systemic transformation requires that all components of the system evolve, which in turn necessitates an understanding of the interrelations among those components and the underlying drivers of system behaviour (Wan Rosely & Voulvoulis, 2024). In this context, systems thinking offers a suitable approach for addressing the growing complexity of water governance (Whaley, 2022). Unlike reductionist approaches, systems thinking emphasizes a holistic perspective, enabling the identification of intricate governance interactions and the systemic conditions that shape them (Monat & Gannon, 2015).

The societal relevance of this research originates from its contributions to practical knowledge on challenges for integration in regional water governance. While systems thinking and governance perspectives are commonly applied to local water issues, the system dynamics at the intersection of national and regional levels remain relatively underexplored (Fielmua, 2021; Wan Rosely & Voulvoulis, 2024). Existing research tends to focus on bioregional units, such as river basins, as the primary scale of analysis. However, bioregional units usually do not align with political, administrative, social, and economic boundaries (Bouma & Slob, 2014; Whaley, 2022). This misalignment evident in the Netherlands, where boundaries of water regions and other institutions such as provinces and municipalities rarely coincide. Regional Delta Programmes (RDPs) bridge this gap, since they are essentially a networking organisation for stakeholders in water governance in a certain bioregional area. By investigating water and land use integration RDPs face, the research identifies key barriers and enablers and offers practical recommendations to enhance integrative capacity in regional water governance.

## 1.7 Outline

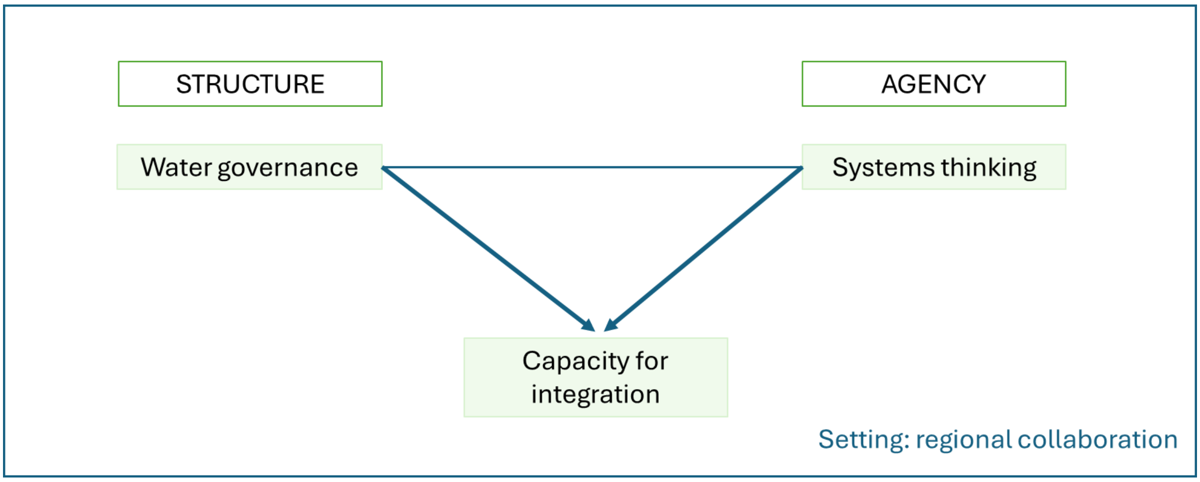
This research begins with presenting the theoretical framework in Chapter 2, examining the interplay between power dynamics in water governance, interconnectedness in systems thinking, and integration. Chapter 3 then describes the methodological approach, detailing the case studies, the methods used for data collection and analysis, and a reflection on validity and reliability. The findings emerging from the analysis are presented in Chapter 4. Finally, Chapter 5 draws conclusions, offers a discussion of the findings, and finishes with recommendations for future research and practice.

# 2 Theoretical Framework

This chapter outlines the theoretical framework of this research, drawing on concepts from water governance, systems thinking, and integration. It is grounded in the interplay between structure and agency, which together shape human behaviour in social systems. Structures are external constraints, institutions, and social constructs, while agency is reflected through free-willed actions of individuals (Jessop, 1996).

Although structure and agency are often seen in contrast, they are deeply interconnected as "people make structures at the same time as structures make people" (Hays, 1994). Through agency, individuals contribute to the creation, recreation, and transformation of structures (Pahl-Wostl, 2015, p. 77). In this thesis, structure is shaped by the governance framework that enables or constrains integration, while agency is reflected in the systems thinking applied by individual actors to the water system. Both play a role in explaining the capacity of integration between water challenges and between aligning water and land use. The relative influence of structure and agency is context-dependent (Giddens, 1984). See the figure below.

*Figure 2.1 Structure and Agency Applied to Capacity for Integration*




The following paragraphs start with an exploration of water governance, focussing on how power dynamics shape water governance. Next, systems thinking theory is discussed, where interconnectedness serves as a core concept. Finally, a synthesis highlights how the capacity for integration is shaped by the interactions between power dynamics in water governance and perceived interconnectedness of water challenges.

## 2.1 Water Governance

### 2.1.1 Definition and Origins

For the purpose of this research, governance refers to "the means through which collective goals are chosen, decisions are made, and action is taken to achieve the chosen goals" (Cosens & Gunderson, 2018, p. 5). The demand for governance in the contemporary world stems from growing complexity of challenges and the growing interdependencies between actors (Driessen et al., 2012). Governance is broader than government, because it also includes the relationship between government and society and thereby how private actors, markets, and interest-based networks self-organise and influence policy decision (Harvey et al., 2024; Lemos & Agrawal, 2006).

Governance can emerge around various topics. One branch of governance is environmental governance, which refers to collective action mediating human interaction with nature and which is particularly concerned with common pool resources (Cosens & Gunderson, 2018, p. 5; Delmas & Young, 2009, p. 16). Within environmental governance, a distinct sub-field of research has developed as 'water governance'. The term water governance started to appear in scholarly work around the year 2000 (Woodhouse & Muller, 2017), and around the same time a growing perception of a "water crisis" emerged, fuelled by a narrative of scarcity (Castro, 2007; UNESCO, 2003; United Nations Development Programme, 2006). It soon became a common understanding that this crisis was, at its core, a governance crisis (OECD, 2011, p. 17). Since then, water governance has evolved into a multi- and interdisciplinary concept (Araral & Wang, 2013). This research adopts the definition provided by Pahl-Wostl (2015), defining water governance as:

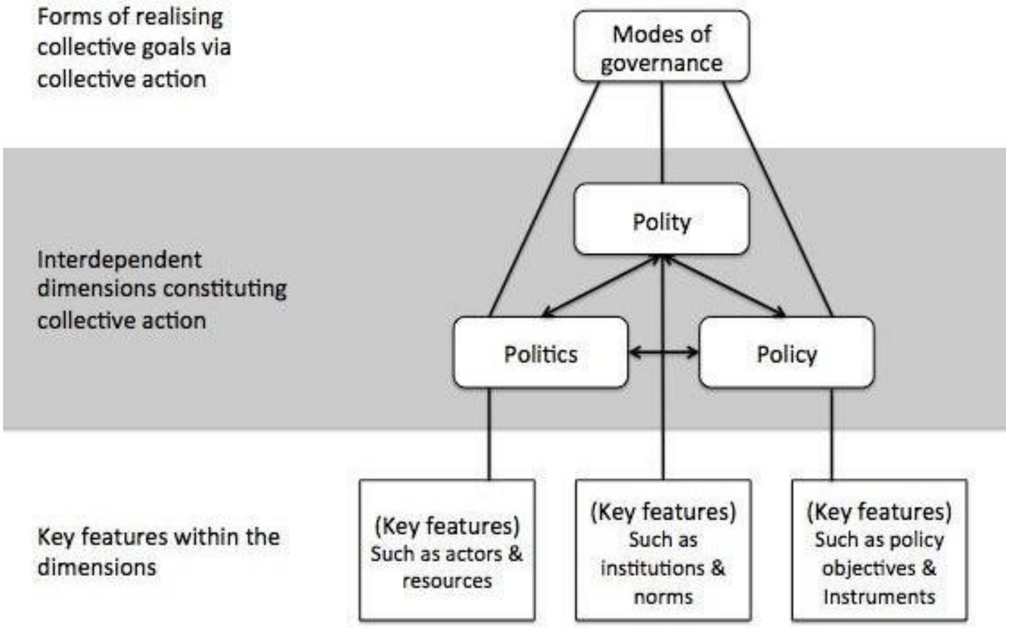
> "The social function that regulates development and management of water resources and provisions of water services at different levels of society and guiding the resource towards a desirable state and away from an undesirable state" (Pahl-Wostl, 2015, p. 26).

This definition conceptualises water primarily as a "resource", a perspective that has, in part, contributed to the ongoing "water crisis" (Araral & Wang, 2013; Castro, 2007). Nevertheless, this definition is used because it invites discussion on what constitutes a desirable state for water. The ability of a governance system to fulfil the social function of water governance depends on contextual conditions. These range from established worldviews to location-specific factors, and are in part determined by the relationships between actors in water governance (Pahl-Wostl, 2017).

Three governance dimension can be distinguished based on the actors involved and their relationships: states, markets, and civil society (Thompson, 1991). While all three apply to water governance, states are the most prominent. They are represented by formal institutions, rely on power through legal rights and regulatory control, are democratically represented, and imply top-down mechanisms. As such, water governance is characterised by centralised governance with the state as driving force (Driessen et al., 2012).

Within each governance dimension, there are three modes of governance that could be primarily addressed: politics, polity or policy (Mullally & Dunphy, 2015). Governance within the politics dimension emphasises the process of decision-making and turning diverse interests into unified actions. This perspective focusses on the significance of actor networks, power dynamics, and the interplay between private and public actors. The polity dimension takes in institutionalist approach in viewing governance as a system of rules shaping actors' actions. They focus on the types of rules, their interdependence, and the overarching logic guiding them. The policy dimension approaches governance as a mode of political steering, focusing instruments such as hierarchical regulation, market-based tools, or voluntary agreements (Pahl-Wostl, 2017).

*Figure 2.2 Modes of Governance by (Mullally & Dunphy, 2015)*




Due to the magnitude of water challenges, water governance relates mostly to the politics mode. Political ecology literature shows that water governance is inherently political, as it involves a series of choices about where water should flow, how much water should flow and what water topics should be prioritised (Haeffner et al., 2021; Rodríguez-Labajos & Martínez-Alier, 2015). This raises fundamental questions about who holds the authority to establish the laws, rules, and norms governing these decisions, as well as the futures they envision (Krause, 2018; Zwarteveen et al., 2017). Subsequently, the governance outcomes shape the distribution of both burdens, such as flood risk, and benefits, such as access to freshwater infrastructure (Schmidt & Peppard, 2014).

### 2.1.2 Power Dynamics in Water Governance

Due to the political nature of water governance, decision– and policymaking and the problematisation and prioritisation of issues occur against the backdrop of power (Bilalova et al., 2025; Macpherson et al., 2024). Although the extent and form vary by context, power dynamics are the underlying factor in decision-making. Power dynamics are structural in nature, because they shape "what is known, what is emphasized and who prevails" (Zeitoun & Allan, 2008, p. 5). They are rooted in external constraints, institutions, and social constructs.

Power dynamics between actors are especially important in collaborative governance settings, where decision-making relies on a certain extent of collaboration between actors with diverse responsibilities and often competing interests (Brisbois & De Loë, 2016). Collaboration is defined as a governance approach where responsibility and power are shared between actors (Carlsson & Berkes, 2005). Power asymmetries are central to the uneven outcomes in any collaboration (Wilson et al., 2019). Consequently, power differences in a collaboration impact the capacity for integration of water- and land related issues (Saravanan et al., 2009).

This research takes a broad view of power dynamics, encompassing all "forces" that affect decision-making in water governance processes. Power dynamics are multi-dimensional and can operate in different forms. Lukes (2005) distinguishes three types of power relevant to collaborative governance settings. First, instrumental power involves the use of resources to compete for influence and shape policy outcomes. It operates through visible, measurable actions, employed by individuals (McIlwain et al., 2024). Second, structural power shapes policy agendas. Actors use it to reinforce dominant views. It can limit marginalized groups' ability to bring forward their issues, even in deliberative processes, by privileging certain viewpoints without the need for direct force. Third, discursive power influences people's thoughts, desires, and perceptions, shaping what they see as desirable or acceptable. It operates through mechanisms like education, media, and lobbying, aligning societal values with the interests of those in control. Since discursive power is often hidden, only the first two dimensions of power are used in this research (Brisbois & De Loë, 2016).

Based on instrumental and structural power by Lukes (2005), Brisbois & De Loë (2016) have identified a set of topics that reveal power dynamics within collaborative settings. To that purpose, this research will use their proposed queries to establish power in water governance.

*Table 2.1 Unveiling Power in Collaborative Processes based on Brisbois & De Loë (2016)*

| Topic | Query |
|---|---|
| **Knowledge and information** | Revealing the knowledge, information, and perspectives that are used and valued. This information can be used to determine whether these inputs and framings sufficiently reflect the interests of all collaborative actors. |
| **Agenda-setting** | Determining how, when, and by whom, collaborative agendas are set. This will help reveal whether actors are excluded, whether control is being exerted to shape agendas in favour of specific interests, and whether decisions on important issues are being restricted. |
| **Politics and ideologies** | Determining the prevailing orientation of state bodies with final decision-making power, and dominant societal values in the context in question. |
| **Financial, technical and institutional capacities** | Understanding the financial, technical, and institutional capacities of actors and how they are utilized both within and external to collaborative processes. Financial capacities refer to access to funding; technical capacities involve expertise and tools; institutional capacities relate to mandates, structures, and legal authority. |

Collaborative processes do not exist in isolation, they are nested in wider social, political, and economic contexts. This means that many power issues within collaborations reflect conditions external to the collaborative process. They transcend the collaborative group scale, yet impact it. (Brisbois & De Loë, 2016). Individual persons with their beliefs, ideas, and perceptions of the world play a role in shaping water governance.

## 2.2 Systems Thinking

Since all elements in the natural water system are connected and the aim is to reach such connection as well in water governance (Bouma & Slob, 2014; Sauvé et al., 2021), the theoretical lens provided by systems thinking is fitting to capture these connections.

### 2.2.1 Definition and Origins

The need for a systems perspective is widely recognised in water management and sustainability research (Dunn et al., 2017; Williams, A. et al., 2017). Systems thinking is an approach to understanding the complexity of social, economic, and ecological systems (Holling, 2001). While it is also used as a language and a collection of tools, it serves as a theoretical perspective in this research. In that regard, systems thinking is a school of thought that “recognizes systems as collections of components that are all interrelated and necessary, and whose interrelationships are at least as important as the components themselves” (Monat & Gannon, 2015).

Systems thinking consists of two interrelated parts. A ‘system’ refers to a basic unit of how the world works and is composed of a purposeful assembly of interconnected, interacting components (Pahl-Wostl, 2015). There are natural systems, such as the solar system or the water system, and human-designed systems, such as religions, countries, traffic jam patterns or water governance. The latter serve a specific purpose, while the former do not necessarily (Monat & Gannon, 2015).

'Thinking' refers to the process of constructing mental models of real-world phenomena (Amissah et al., 2020; Cabrera & Cabrera, 2023). It describes how actors in (water) governance perceive and relate to the natural (water) system. Thus, systems thinking focusses on how different parts of a system interact with each other and how these interactions influence the systems’ overall behaviour, and how the system itself operates within the broader context of its environment (Amissah et al., 2020). In water governance, this perspective helps understand the interactions between the social governance system and the ecological water system.

Originating from General Systems Theory (GST), developed in the mid-20th century, systems thinking emerged as a response to the limitations of reductionist approaches, advocating for the study of systems as wholes rather than isolated parts (Von Bertalanffy, 1968). This approach has since expanded across disciplines. It has since been applied to natural resource management through the concept of ecological resilience, which shows how ecosystems can absorb disturbances while maintaining their function (Holling, 1973). Modern systems thinking focuses on the relationships and dynamics within complex systems and is regarded as a contemporary extension of GST (Fielmua, 2021).

Systems thinking can be applied through the use of system tools, which are helpful in approximating and representing complex realities. A system tool that is particularly useful for understanding the capacity for integration, is the analysis of how interconnectedness is perceived between water-related challenges (Wan Rosely & Voulvoulis, 2024).

### 2.2.2 Interconnectedness

Systems thinking builds on the premise of interconnectedness (Monat & Gannon, 2015). According to Fielmua (2021), “if something is able to function (as) optimally without the presence of a component, then that is merely a collection of things and not a system”. Interconnectedness emphasises that systems cannot be fully understood by examining individual parts in isolation, but rather by considering how those parts work together and influence each other within a larger whole.

In the context of water, the natural water cycle is one interconnected, ecological system. Within the social setting of water governance, the institutions, instruments, policymakers and policies are an interconnected system as well. Understanding the complexity in interconnected ecological and social challenges is important. Governance shapes what the ‘waterscape’ looks like and the behaviour of the water systems shapes our institutions. Systems relate to each other through interactions, feedback and adjustment (Fielmua, 2021).

Water governance can be approached as a system comprised of various components. For example, Voogd et al. (2022) found 5 sub-issues of water governance in their systematic literature review: water distribution, water quality, environmental conservation, flood management, drought management. These components are interconnected, because strategies and management of one sub-issue has consequences for the other sub-issues. Another example is the literature review of (Aguirre & Paredes Cuervo, 2023), who discern three water governance subfields: social governance structures, drinking water management, and collaborative water governance. Whichever sub-issues of water governance are identified, trade-offs and synergies apply to all water governance components, because the water concerned is inherently interconnected.

The organisation of social system reflects the perceived interconnectedness in natural systems. Organisations are “agents in interconnected social, economic and ecological systems” (Williams, A. et al., 2017). The way different organisations are set up to manage water-related challenges reflects how humans perceive interconnections between water issues. This perception of interconnections between components in a system represents agency, because it shows the capacity to recognise and act upon the links within and between systems.

Interconnectedness can be examined by uncovering the distinctions and relationships that individuals perceive (Gjorgjievski et al., 2024). First, distinctions are made through defining the boundaries of something. When we define the boundaries of a concept, we simultaneously determine what it includes and what it excludes. The differentiation between what “belongs” and what “does not belong” helps categorising and making sense of the world. However, it also inherently limits our perspective by excluding what falls outside those boundaries (Cabrera & Cabrera, 2023; Gjorgjievski et al., 2024). Second, relationships reflect how humans interrelate components. At its core, every relationship is based on action-reaction. This can take on different shapes, for example correlation, causation, feedback loops, and input/output (Cabrera & Cabrera, 2015). By reflecting on interconnectedness through distinctions and relationships, we can create a clear picture of which issues in water governance are perceived as related, and which lack connection.

## 2.3 The Concept of Integration

Together, agency and structure are shaped in such a way that individuals will or will not feel a certain sense of ownership—a feeling of ‘mineness’—over integration within water governance and with the spatial domain (Braun et al., 2018; Gallagher, 2000). Combining power in water governance and interconnectedness in systems thinking provides a solid background to uncover the capacity for integration among water-related challenges and between water and land use.

In spatial planning, integration is closely related to creating synergies between actors and organisations—input—as well as between policy and implementation—output (Van Straalen, 2012). It focusses on collaboration and coordination among involved parties, with a central aim to develop a comprehensive perspective on the planning issue or procedure, enabling the alignment and integration of both planning content and stakeholder processes (Kidd, 2007).

In this research, integration is defined as the way “actors balance their multiple overlapping interests to achieve a desired outcome” (Cumiskey et al., 2019). This resonates with Pahl Wostls’ definition of water governance, which ends with “the social function [...] guiding the resource towards a desirable state and away from an undesirable state” (Pahl-Wostl, 2015, p. 26). Both definitions describe a certain ideal situation that should be actively steered towards—with integration as a framework to reach that situation.

Integration is embedded in both water governance and systems thinking, highlighting its role in managing complex interactions. In governance literature, building relationships between actors is a key focus. Specifically, the mechanisms that constrain or strengthen actors’ ability to enable integration are central to collaborative governance settings (Cumiskey et al., 2019). From a systems thinking perspective, integration reflects interconnectedness by combining knowledge on distinctions and relationships, ultimately shaping real world outcomes such as policy. Since human mental models influence these elements, integration is inherently a human-driven process (Siemieniuch & Sinclair, 2006).

### 2.3.1 Thematic and Spatial Integration of Water and Land Use

Integration can be accomplished internally and externally. Internal integration, also referred to as ‘intrasectoral integration’, focusses on aligning different themes within a single sector in a given territory (Trein et al., 2021). This type of integration addresses the siloes that can develop between sub-sectors within a single sector. In this research, such integration is referred to as ‘thematic integration’, given that the water sector encompasses multiple distinct themes. While the natural water cycle is already inherently interconnected, thematic integration involves dismantling siloes between actors that are responsible for different water-related themes (Ordóñez Llancce et al., 2025). For instance, this could entail integrating strategies for freshwater availability and fluvial floods by coordinating funding, policy programmes, and objectives (Kidd, 2007).

External integration, or ‘cross-sectoral integration’, refers to integration between sectors within a given territory (Kidd, 2007; Ordóñez Llancce et al., 2025; Zingerli et al., 2004). A form of external integration is spatial integration. In this research, spatial integration refers to the integration between the systems of water and land use governance, focussing on incorporating the spatial effects of measures for water challenges in land use planning (Candel & Biesbroek, 2016). In literature, the call for integrating the fields of water governance and land use governance is omnipresent (Shandas et al., 2015; Stoker et al., 2022; Wiering & Immink, 2006).

The spatial impacts of water challenges manifest themselves in two way. First, measures for water challenges have a direct, physical spatial impact. For example, reinforcing dikes or increasing water buffers take up land. Second, changing hydrological conditions have a broader, systemic effect on water users and land use planning (Sanchez et al., 2018). As hydrological conditions evolve, water users have to adapt accordingly. For instance, discontinuing the desalinisation of agricultural land due to declining freshwater availability may force farmers to reconsider crop choices or even repurpose land altogether. As such, water conditions are increasingly shaping how and where development can occur (Shandas et al., 2015). The allocation of land use, regulated within the spatial planning domain, is thus closely linked with flood risk, drought resilience, and water quality, amongst others.

### 2.3.2 Governance Capacity for Integration

There are several methods for ‘measuring’ potential for integration. Cumiskey et al. (2019) created a framework for identifying the degree of integration in the field of flood risk management. The article states that the framework can be adapted for other integration challenges. Hence, this research will use it to evaluate the capacity for integration within Dutch water governance and between water governance and land use governance. The integration assessment framework consists of two main components: ‘governance capacity for integration’ and ‘realisation of integration’, both broken down into several indicators (Cumiskey et al., 2019). Only the governance capacity indicators are relevant for this research, since this research approaches water challenges as governance challenges (Jiménez et al., 2020).

The governance capacity for integration can be determined by actor relationships and influencing mechanisms (Gilissen et al., 2015; Cumiskey et al., 2019). Actor relationships are agency-based, because they are mostly expressed through the efforts of individuals (Jessop, 1996). According to Healey (2006), integration in planning first necessitates actors to clarify their own objectives and recognise the need for collaboration, which is enabled through mindset alignment and communication frequency. Influencing mechanisms represent mostly structural factors, because they form external constraints or facilitators on integration. However, since there is a continuous interaction between structure and agency, actor relationships and influencing mechanisms mutually influence each other (Cumiskey et al., 2019).

Actor relationships and influencing mechanisms are shaped by underlying power dynamics and by how individuals perceive interconnectedness. Theoretically speaking, power dynamics between actors influence whose interests are prioritised in decision-making processes, and the way actors do or do not connect issues influences the pathways through which collaboration and knowledge exchange occur. In practice, however, the relative influences of power dynamics and perceived interconnectedness on the capacity for integration are fluid. This reflects reality: structure and agency continuously shape and reshape one another.

Actor relationships:

1. Mindset alignment – The ability of actors to collaborate is strongly influenced by how they understand challenges and how they frame their own goals, interests, and responsibilities (Candel & Biesbroek, 2016). Mindset alignment emerges when actors share an understanding of system interdependencies, believe they have the capacity to contribute to addressing the issue, and demonstrate a willingness to engage in joint efforts (Cumiskey et al., 2019).
2. Communication intensity – The strength of actor interactions is determined by the formality and the frequency of communication. While the outcomes of communication, such as data sharing or the resolution of issues, are also relevant, these aspects fall outside the scope of this research (Cumiskey et al., 2019; Stead, 2008).

Influencing mechanisms:

1. Actor-based mechanisms – This are mechanisms that enhance communication, interaction and knowledge exchange among actors. Examples include working groups, multistakeholder partnerships, collaborative working arrangements, and conferences (Cumiskey et al., 2019). In addition, individual staff positions specifically designed to enhance collaboration also fall under actor-based mechanisms, since they play an important role in building relationships and facilitating engagement between actors (Edelenbos & Van Meerkerk, 2015; Neal et al., 2022).
2. Rule-based mechanisms – These mechanisms provide the legal foundation for both the actions of individual actors and their collaboration. Examples are laws and regulations, joint policy frameworks, intergovernmental agreements, cooperation protocols, information-sharing mandates and framework contracts. Rule-based mechanisms establish the boundaries of authority, clarify roles and responsibilities, and create the conditions under which coordination and integration can occur (Cumiskey et al., 2019).
3. Resource-based mechanisms – These refer to funding arrangements that facilitate the joint implementation of measures by multiple actors. They include subsidies, obligations for financial contributions, and co-financing schemes. Such mechanisms enable actors to pool resources, implement joint activities, hire staff, and carry out projects or programmes (Cumiskey et al., 2019).

Across all these elements, a dynamic interplay exists between individual agency and the formalised mechanisms that shape actors' operational environment (Cumiskey et al., 2019). The framework below combines the indicators for governance capacity for integration, enabling an assessment of the degree of integration. This degree can be classified as high, intermediate, or minimal.

*Table 2.2 Conceptual Framework: Governance Capacity for Integration based on* Cumiskey et *al. (2019)*

| | **Governance capacity for integration** | |
|---|---|---|
| **Degree of Integration** | **Structure – Influencing mechanisms** | **Agency – Actor relationships** |
| **High integration** | (+) Actor-based mechanisms in place and effective (diverse actors involved, benefits outweigh costs, resourced proactive staff).<br>(+) Sufficient rules in place and enforced.<br>(+) Variety of funding mechanisms accessible. | (+) Shared mindset (willingness to work together and understanding of interdependencies).<br>(+) High communication intensity (very frequent, effective two-way interaction). |
| **Intermediate integration** | (+-) Some actor-based mechanisms in place (e.g., focal points, meetings), with varied effectiveness (e.g., poor diversity of actors, insufficient staff).<br>(+/-) Rules available but some are not well designed or enforced.<br>(+/-) Some funding mechanisms but no joint-funding and difficult to combine funding sources. | (+-) Mindsets starting to align (willingness is growing, understanding of joint importance to work together but focus on own interests).<br>(+-) Mixed communication intensity (varied frequency and quality). |
| **Minimal integration** | (-) Only basic actor-based mechanisms in place (e.g., conferences, bilateral meetings) but poor effectiveness.<br>(-) Some rules present but poorly designed or enforced.<br>(-) Poor availability of funding mechanisms. | (-) Different mindsets (poor willingness to work together: "someone else's problem").<br>(-) Poor communication intensity (low frequency and only one-way). |

Using this framework, the capacity for integration can be established based on five components: actor-based mechanisms, rule-based mechanisms, resource-based mechanisms, mindset alignment, and communication intensity. These are shaped by structural- and agency-related factors. The next chapter outlines the methodology employed to operationalise this framework.

# 3 Methodology

This chapter describes the research methods chosen to answer the main question. It begins with a discussion of the research design and selected case studies, followed by an explanation of the data collection and analysis approaches. Finally, the chapter reflects on validity and reliability.

## 3.1 Qualitative Research Design

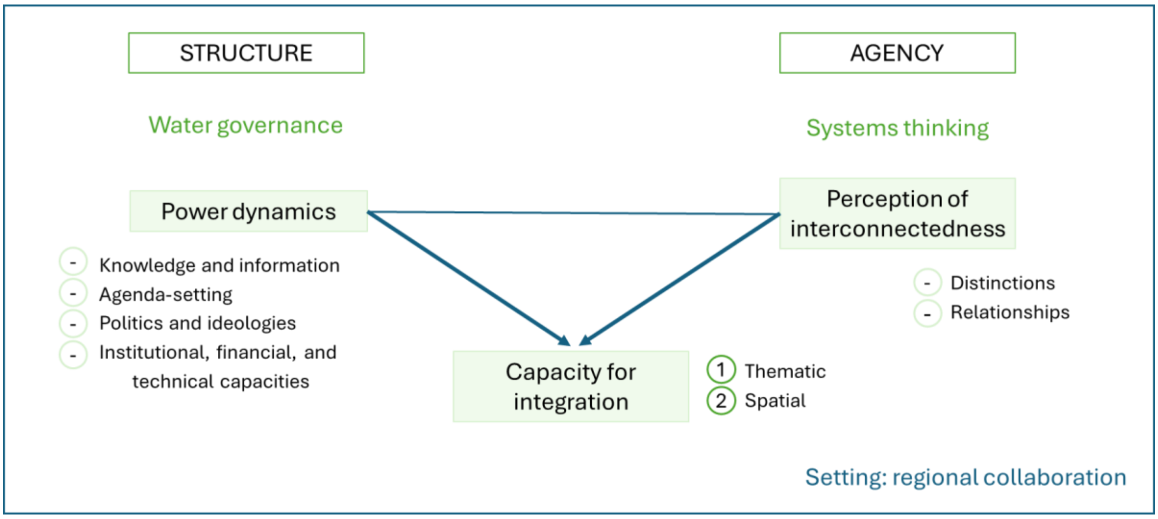
The main aim of this research is to gain a deeper understanding of how structure and agency impact the capacity for integration between water-related challenges and land use on a regional scale. To do so, power dynamics in water governance (structure) and perceived interconnectedness between water challenges (agency) are explored using qualitative research methods. A qualitative approach allows for in-depth understanding of the research issue through the perspectives of the stakeholders, uncovering how they apply meaning to the topic. A qualitative approach also allows for analysing texts and documents to discover patterns and themes within distributed knowledge (Hammarberg et al., 2016).

Capturing reality through an array of factors drawn from systems thinking, power dynamics, and capacity for integration creates a complex research design. While the approach reveals how theoretical elements interact across these frameworks, it gives rise to concerns that the study lacks depth. To address this, the study employs a mixed-methods approach combining desk research, interviews, and participatory observations.

Desk research was conducted to assess the current state of integration between water and land use issues. It served to identify both thematic interconnections and organisational links. This helped prepare for interviews, allowing for more focused questions to be asked. Throughout the research process, participatory observations were carried out in various water experts configurations. This provided insight into the dynamics among water experts, how they perceive land use for water, and what language they use to relate to this. The observations also allowed more specific interview questions to be asked.

The part of the research exploring interconnectedness relates to the personal experience of water experts. The part of the research on power dynamics focusses on water experts' perception of the dynamics between all governance actors and all themes in the region.

*Figure 3.1 Research Design*

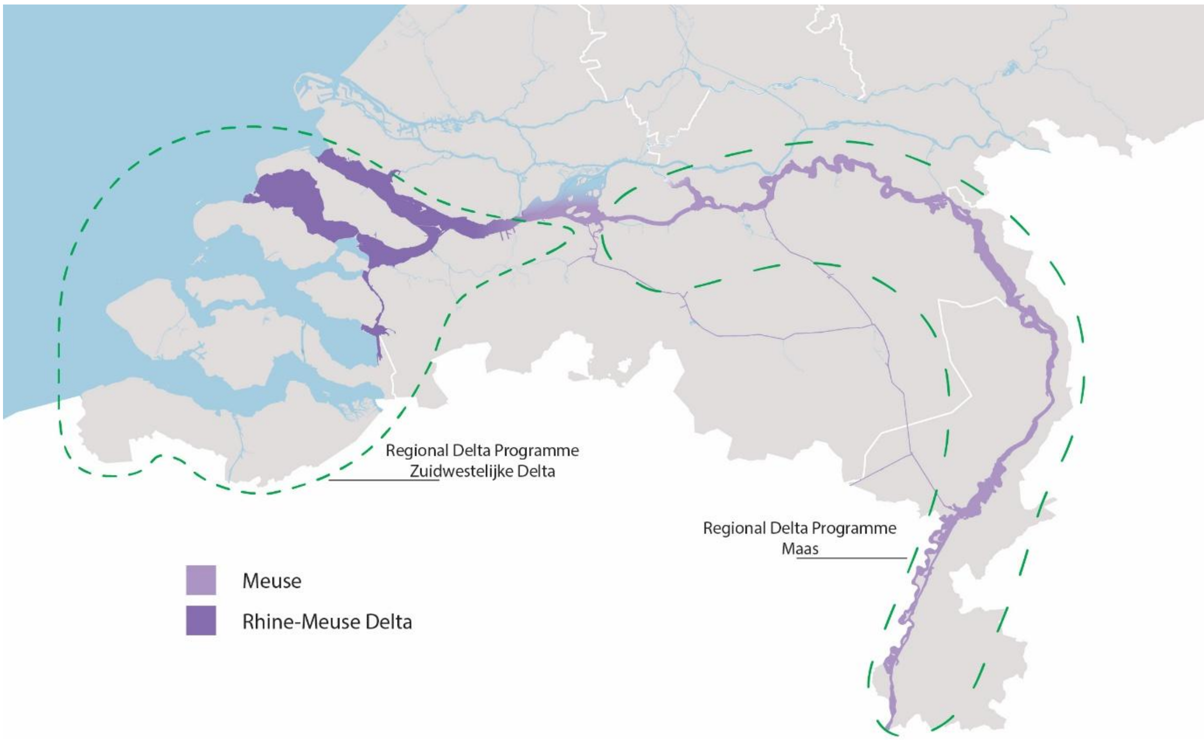


### 3.2 Case Studies

This research examines two case studies: Regional Delta Programme Maas (RDP Maas) and Regional Delta Programme Zuidwestelijke Delta (RDP ZWD). These regions were selected for their diverse contextual characteristics while being interconnected through the same water sources—the river Meuse and the North Sea, see Figure 3.2. Together, they encompass a significant portion of the southern Netherlands' watershed.

The choice to compare two regions rather than focusing on a single one was driven by the interconnected nature of water systems. This approach allows for an examination of how different regional contexts respond to the same water sources, highlighting variations in adaptation, management, and impact (Özerol et al., 2018). This is relevant, because while water governance challenges differ from region to region, the essence of potential solutions have been found to remain the same (Abbas et al., 2023), even for contextually very different regions (Hurlbert & Diaz, 2013). This makes comparing regions a very powerful method to find solutions for water governance challenges. The next sub-chapter will further describe the cases.

*Figure 3.2 RDP Maas and RDP ZWD connected through the river Meuse (own image)*

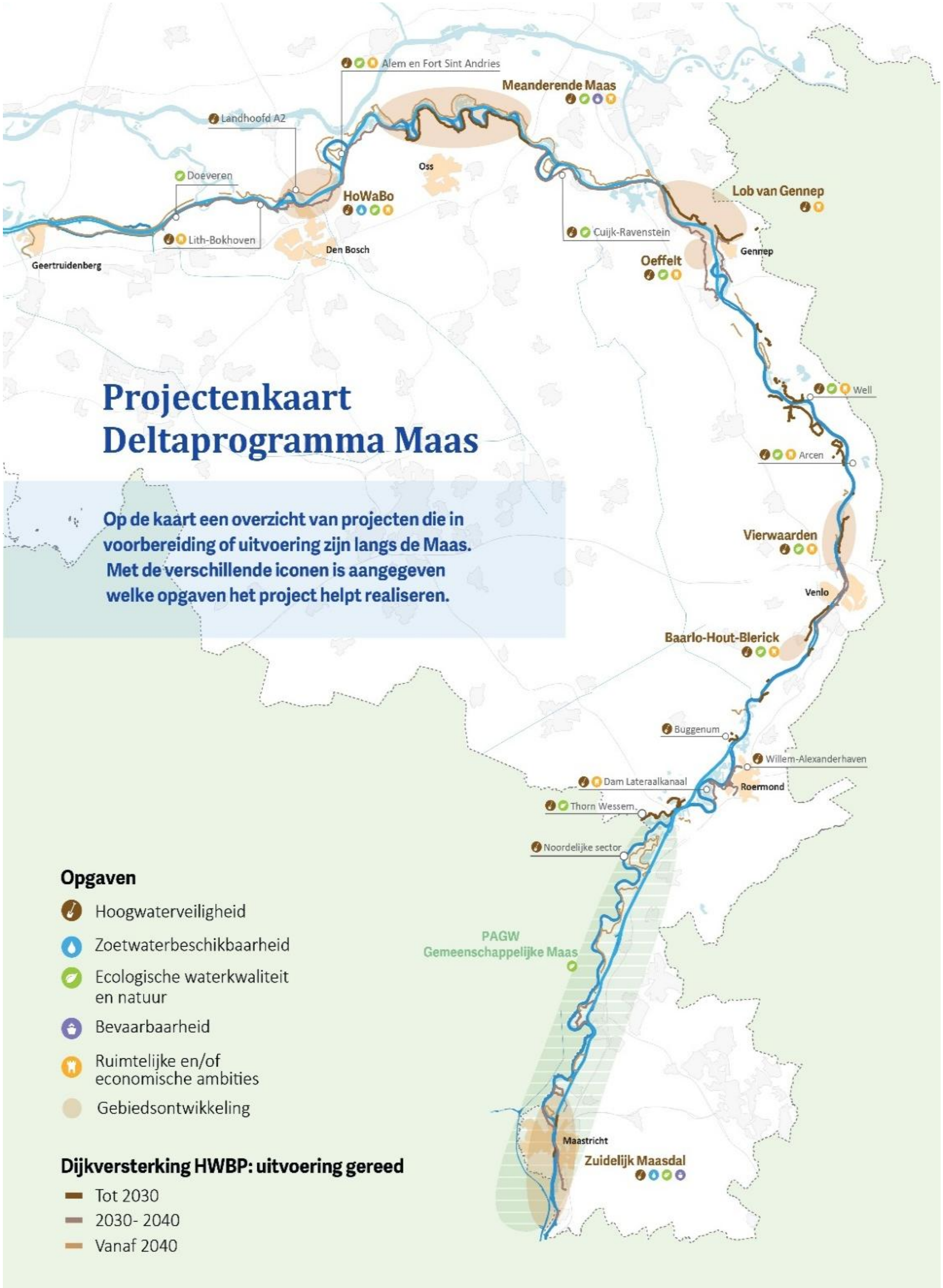



#### 3.2.1 Regional Delta Programme Maas

RDP Maas focusses on the 200 km long Dutch section of the river Meuse, where urban developments, nature reserves, and industrial zones alternate along its riverbanks (Deltaprogramma Maas, 2018). RDP Maas is responsible for an area that stretches from Eijsden, where the river Meuse enters the Netherlands from Belgium, until Geertruidenberg, where the Meuse flows into National Park De Biesbosch. The river runs through the provinces Limburg, Gelderland, and Noord Brabant. The responsible water boards are Limburg, Aa en Maas, and Rivierenland. Rijkswaterstaat Zuid Nederland is the responsible Rijkswaterstaat department. The Meuse can be divided into several sections. In Limburg, it behaves as a fast-flowing gravel river with a narrow profile and limited floodplains. Upon entering Noord-Brabant, the Meuse becomes broader and calmer, and is fully enclosed by dykes (Deltaprogramma Maas, 2018).

Water-related challenges in the Meuse have been outlined by Asselman et al. (2019). These include increasing high peak discharges as well as more low-water discharge, increasing the risk of floods and water shortages. Also, sediment management is a growing concern, especially in the lower stretches of the river where sediment is hardly moving. Lastly, the river's characteristic ecological features have largely disappeared, and water quality remains below standard. Pressing spatial issues include the loss of space for the riverbed over the past decades, as well as limited room for river widening or retention measures due to competing land uses such as urban development, agriculture, and industrial zones.

*Figure 3.3 Geographic Scope of Delta Programme Maas* (*Deltaprogramma Maas, 2025)*



### 3.2.2 Regional Delta Programme Zuidwestelijke Delta

RDP Zuidwestelijke Delta (RDP ZWD) covers the southwestern coastal region of the Netherlands. It stretches from the Haringvliet estuary to Zeeuws Vlaanderen, see Figure 3.4. It encompasses eight major waterways that all function as separate systems due to the man made flood defence system, which includes the Delta Works, see Figure 3.5. The region includes the province of Zeeland and the western part of Noord-Brabant. The responsible water boards are Scheldestromen, Brabantse Delta, and Hollandse Delta. The responsible Rijkswaterstaat department is Zee en Delta.

This region is characterised by its complex estuarine landscape, low population density, and an economy heavily dependent on agriculture, aquaculture, and tourism (CBS, 2024). All major waterways are Natura2000 areas, they have offer qualities for flora and fauna, particularly migratory species (Ministerie van LVVN, 2023).

Water-related issues include increasing salinisation of water due to sea-level rise and reduced freshwater inflow during dry periods, which threatens agriculture, drinking water supplies, and ecosystems . The complex estuarine system, altered by the Delta Works, faces water quality problems in stagnant or semi-enclosed water bodies such as the Grevelingenmeer and Volkerak-Zoommeer. Spatial challenges include the need to balance flood safety, nature restoration, and agriculture, housing, and industry (Nolte et al., 2024).

*Figure 3.4 Geographical Scope of RDP Zuidwestelijke Delta (Defacto Stedenbouw, 2024)*

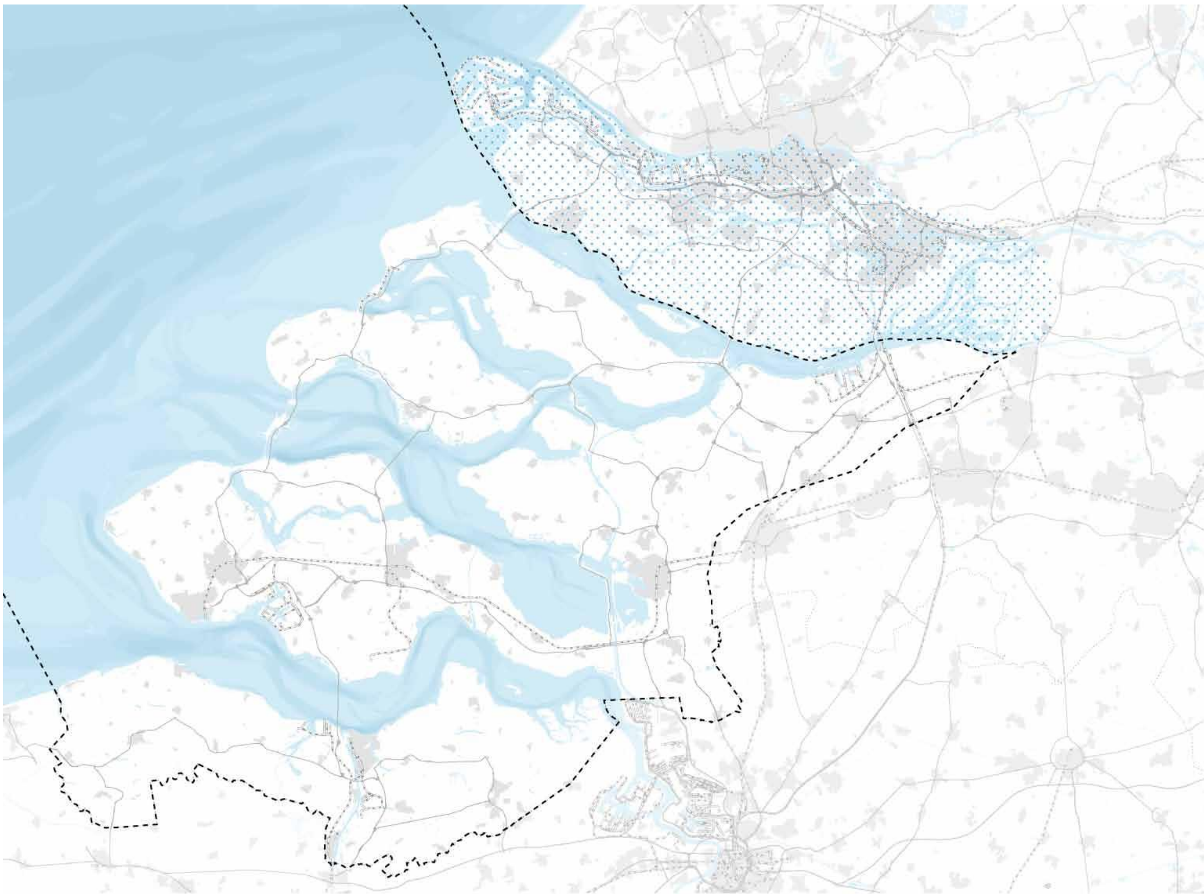


*Figure 3.5 Delta Works (Defacto Stedenbouw, 2024)*

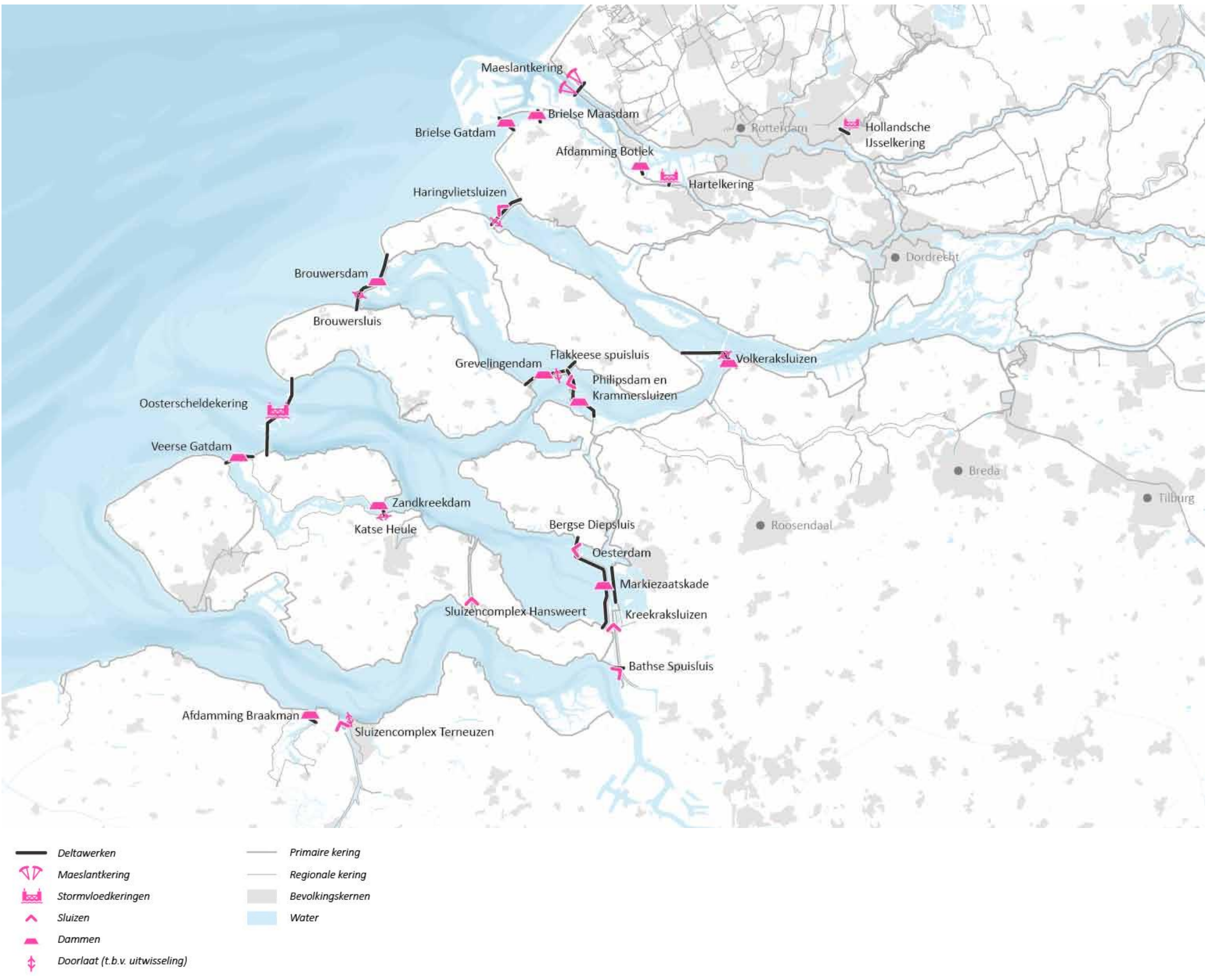
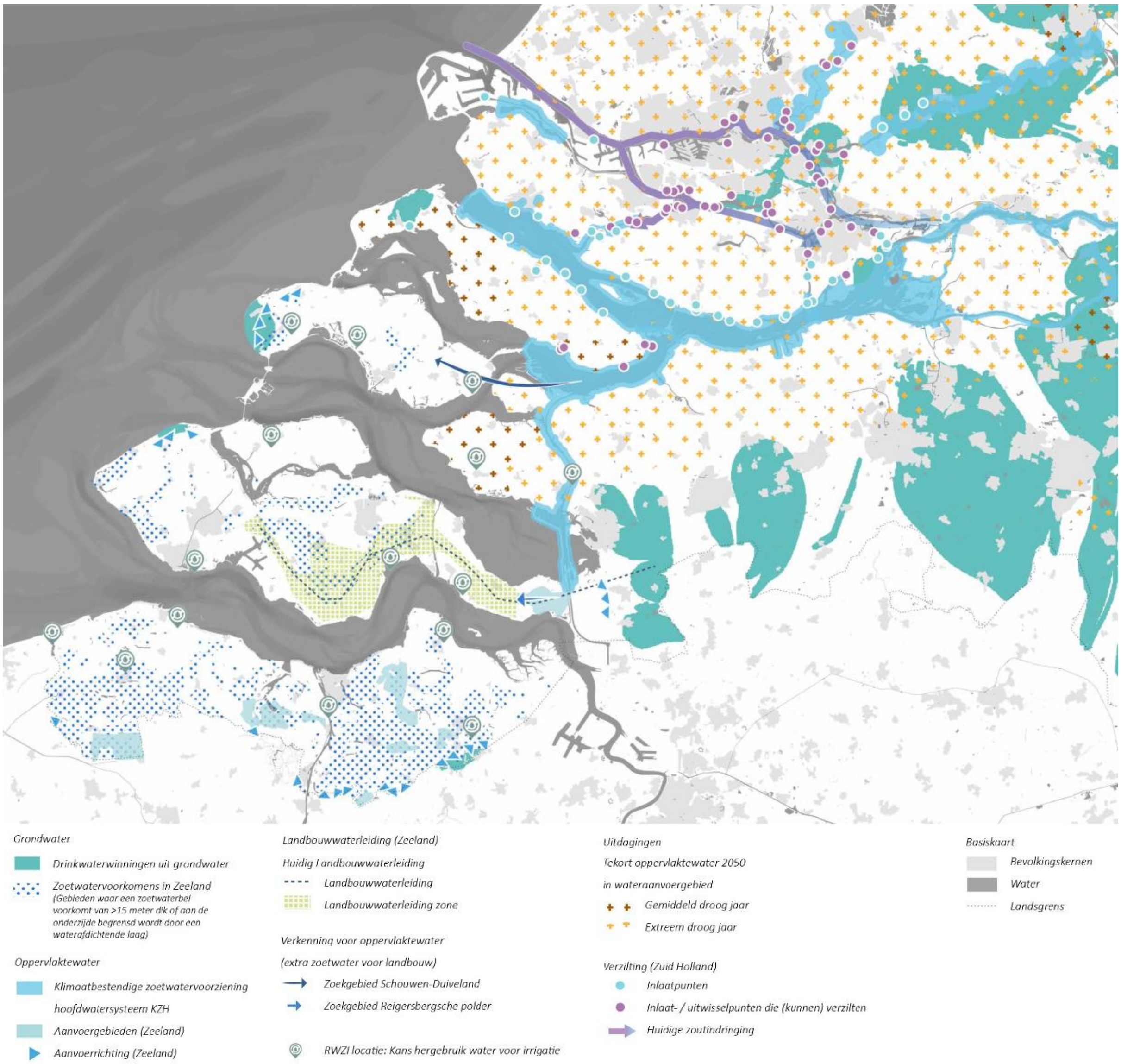


*Figure 3.6 Freshwater in RDP ZWD (Defacto Stedenbouw, 2024)*



### 3.3 Data Collection

This paragraph elaborates on the methods used to collected data: expert interviews, desk research, and participatory observations of water expert group sessions.

#### 3.3.1 Interviews

Expert interviews were the primary research method to explore regional integration of water-related challenges and land use. Interviews are suited because they allow for an in-depth exploration of each individuals' perceptions of interconnectedness in water systems, water governance, and capacity for integration in water regions (O'Connor & Levin, 2023).

Experts are defined as individuals responsible for the development, implementation, or control of solutions, or those with privileged access to decision-making processes (Döringer, 2021). Holding interviews with experts allow the researcher to obtain specialised knowledge on a specific topic (Meuser & Nagel, 2009). Therefore, interviewees become 'data providers' (Cochrane, 2020, p. 42).

Water experts from the Programme Boards of the Regional Delta Programmes Maas and Zuidwestelijke Delta were the main interviewees. Their mission—to develop a long-term water strategy and to enhance regional collaboration—positions them at the intersection of water and spatial planning. These experts possess a deep understanding of water-related challenges in their region—expertise invaluable for mapping the interconnectedness between challenges. They also navigate between various water and spatial planning organisations, providing an excellent understanding of regional water governance. Moreover, experts do not only hold explicit knowledge about technical data and facts, they also possess implicit knowledge from skills and experience that they have gained throughout their career (Döringer, 2021). This is valuable for understanding challenges, tacit practices and interorganisational dynamics, which enabled researching how power dynamics affect the capacity for integration.

In contrast to quantitative surveys, expert interviews allow for the collection of rich and nuanced insights into perceptions, experiences and opinions (Palinkas et al., 2015). The quality of knowledge gained from expert interviews is generally higher than knowledge obtained from quantitative surveys, because experts are usually better informed and more motivated (Dorussen et al., 2005).

Existing scientific research does not agree on a specific number of participants that should be interviewed in order to obtain trustworthy and nuanced data (Alsaawi, 2014). However, Van Eldik et al. (2024) conducted qualitative research on the 'shift to the natural' in Dutch spatial development, analysing four small case studies and interviewing six senior project leaders. Based on this, it was anticipated that 9-12 interviews across two larger case studies would suffice to reach saturation, meaning that no substantial new information emerges from additional interviews and that the researcher attains a deeply nuanced understanding of issues (Guest et al., 2006; Hennink et al., 2017). Given the small size of the Programme Boards of the RDPs, 4/4 members of RDP Maas and 5/9 members of RDP Zuidwestelijke Delta were interviewed. Additionally, 3 water experts closely working with the RDPs were interviewed.

Interviewees were selected through a combination of convenience and purposive sampling. The researcher had met almost all interviewees during participant observation sessions. This facilitated purposive sampling, indicating that the interviewees are chosen for their knowledge and roles relevant to the research questions (Guest et al., 2013). This familiarity likely increased responsiveness to the interview invitations. For the exploratory and validation interviews, a snowball sampling method was used. See Appendix C for a complete list of interviewees and their areas of expertise.

The interviews are semi-structured, following a prepared interview guide, see Appendix B. This offers consistency between interviews while allowing flexibility for follow-up questions based on the participants responses and space for the participants' individual verbal expressions (Kallio et al., 2016).

The interviews contain two components: an inductive part, focussed on systems thinking and perceptions of interrelated water challenges, and a deductive part, first addressing power dynamics and then the capacity for integration, guided by the conceptual framework in Table 2.2. Inductive questions, asked first, allowed for insights to emerge directly from participants' perspectives, allowing for unexpected distinctions and connections. To promote spontaneous responses, interview questions were not shared in advance. Although providing questions beforehand can reduce participant anxiety and encourage more reflective answers (Haukås & Tishakov, 2024), withholding them was important to preserve the inductive nature of the first part by reducing the possibility for the researcher to steer towards certain topics. Afterwards, the deductive approach ensured a structured and theory-driven analysis (Knott et al., 2022).

All interviews were conducted online, in quiet settings. Informed consent was obtained before the start of each interview. The interviews were recorded with MS Teams and a voice recorder on the researchers' phone. Recording equipment was tested beforehand (Easton et al., 2000). All interviews were transcribed, whereafter the recordings were deleted. During transcription, all information was anonymised, ensuring that nothing can be traced back to a specific participant (Nii Laryeafio & Ogbewe, 2023).

Chapter 4 presents the research results, beginning with interconnectedness followed by power dynamics. This order reflects the structure of the topic list and interviews.

### 3.3.2 Desk research

To prepare for the expert interviews, qualitative desk research was conducted through various methods. This preparatory research ensures that the interview guide contains well-informed and targeted questions and that it informs the deductive coding process (Kallio et al., 2016). As a first step, four exploratory interview were held. The first exploratory interview was held with a member of the Deltacomissaris Staff to gain a clearer understanding of the activities, funding, and influence of the National Delta Programme. The other four exploratory interviews were impromptu held with water policymakers working on RDP Zuidwestelijke Delta, RDP Rijnmond-Drechtsteden, and the National Delta Programme to explore how regional water governance is organised and how RDPs operate. These initial conversations did not follow a strict topic list. Instead, a few key discussion points were prepared in advance. The first exploratory interview was recorded and transcribed. The other three exploratory interviews have not been recorded and transcribed, the researcher took notes immediately afterwards.

In addition, desk research was conducted by reviewing key policy papers on water strategies in both case study areas, a full list can be found in Appendix D. These documents have been obtained through the websites of the RDPs, water boards, provinces, and other water authorities in the regions concerned. Additional relevant documents were obtained during interviews with water experts. During the review process, special attention was paid to 1) references or ideas about land use/spatial planning for water and 2) connections or synergies between water-related challenges.

### 3.3.3 Participant Observation

Participant observation is defined as systematically "gathering data on interactions and relationships through the recording of behaviour, conversations, and experiences in situ" of any chosen social setting (Van Maanen, 1995). There are four types: complete observer, observer as participant, participant as observer, and complete participant. In this case, I practised the role of observer as participant, because the water experts knew my position as researcher, but were not familiar with the details of the research itself (Zevenbergen et al., 2018). At the start of each session the researcher introduced herself with a general description of the research. During the sessions the researcher would typically be quiet and take notes of relevant information using a laptop.

Sessions were observed where water experts discussed the recalibration of the Regional Delta Programmes. Because the RDPs are currently in the process of revising their programs, strategies, and aims, there are multiple sessions where their programme managers and experts from the programmes come together to discuss their progress and learn from each other. Access to these sessions was facilitated through the researcher's internship, which provided connections with water experts in Regional Delta Programmes. An overview of the attended sessions is included in Appendix A.

A key strength of participant observation is that it does not interfere with the behaviour of the observed participants, this can provide new ideas and uncover new behaviours. Additionally, it provides a deeper understanding of participants' subculture by exposing the researcher to their jargon and commonly used phrases. Moreover, observing people in their natural environment—rather than in the 'unnatural' setting of an interview—offers a more authentic perspective on their actions and interactions (Kawulich, 2005). An important weaknesses of participant observation is that human observation abilities are strongly biased by past experiences and pre-existing expectations (Mackellar, 2013). Nonetheless, participant observation is expected to make a valuable contribution to this research.

## 3.4 Data Analysis

Interview transcripts, participant observation reports, and documents reviewed as part of the desk research were coded in NVivo to reduce and organise the data, preparing it for analysis. Coding ensures transparency by showing the reader how the researcher linked conclusions to the data (Dunn, K., 2021). A hybrid method of deductive and inductive coding was applied, allowing the researcher to construct a thorough understanding of the information provided by the interviewees (Fereday & Muir-Cochrane, 2006).

The deductive codes are informed by the theoretical framework, providing structure and theoretical relevance from the outset. Open, inductive codes emerged directly from the data, serving the study's exploratory aim. These codes are close to the data, reflecting its actual content rather than being influenced by the researcher's preconceptions or prior understanding (Skjott Linneberg & Korsgaard, 2019). After coding, the codes were organised in a coding scheme using a Concept Map in NVivo. Grouping codes for thematic analysis helps to identify and interpret patterns (Williams, M. & Moser, 2019). The coding scheme can be found in Appendix E.

Paragraphs 0 and 4.3.3 establish the relationships between the deductive and inductive coding elements. This is entirely data driven. As such, the results are theoretically informed but substantively inductive, representing a best-estimate interpretation of reality.

## 3.5 Reliability and Validity

While systematically collecting, organising, describing and interpreting verbal and textual data, qualitative research remains subject to the limitations of validity and reliability (Hammarberg et al., 2016). The reliability of the research, defined as the consistency and stability in the research process and the data, is ensured by employing a standardized interview guide and by applying a uniform, deductive coding scheme (Cypress, 2017). This guarantees that all participants receive the same set of questions and that their responses are analysed in a consistent and systematic manner. Flexibility is maintained by the option to deviate from the interview guide when appropriate and to apply open coding. All methodological adjustments are documented in empirical, methodological, and theoretical memos in NVivo. This creates an audit trail, ensuring the traceability of the decisions made during the process (Cutcliffe & McKenna, 2004). Additionally, contextual information and rich descriptions of the case studies are provided to allow others to assess the applicability of the results to similar instances (Rolfe, 2006).

Validity refers to whether the study accurately captures and represents the meanings, experiences, and realities of the participants within their specific context (Cypress, 2017). For the interviews, the validity depended on the credibility of the experts (Rolfe, 2006). Experts are influenced by external factors, such as power and interests, and may not fully disclose their opinion (Dorussen et al., 2005). This challenge was addressed by assuring anonymity and confidentiality. Also, validatory interviews were carried out to compare and cross-verify the data collected from multiple experts in different roles and organisations (Sandelowski, 1986).

Ecological validity, determined by the degree to which the environment experienced by subjects is an accurate representation of reality, is enhanced by participant observations (Plaza et al., 2019). During the participant observations, the researcher joined meetings held between different RDPs and within single RDPs. In these instances, water experts were in their natural environment. The access to participant observations was provided through the internship the researcher did alongside the research. While the internship provided directions and inspiration for the topic of research, it did not steer the questions or contents of the research.

Furthermore, the researcher is an integral part of the process and final product in qualitative research. Therefore, research bias is a threat to validity. Research bias results from selective observation and selective recording of information and from allowing one's personal views and perspectives to affect how data are interpreted and how the research is conducted. To minimise the effect of research bias, the researcher employed reflexivity by keeping notes that critically reflected personal assumptions (Cypress, 2017).

Lastly, researcher bias can contribute to the possibility of overlooked relationships within the interview-based systems thinking approach. Interview-based systems thinking research is sensitive to question framing and implicit guidance perceived by interviewees. Additionally, human cognitive capacity is inherently limited—no water expert can fully comprehend a single topic in all its complexity, let alone the interactions, relationships, and dependencies with other topics (Lindblom, 2018). These cognitive limitations, affecting both interviewer and interviewees, can lead to the potential absence of connections. To address this, the study incorporates document analysis to identify additional thematic linkages and employs two case studies to broaden the comparative scope.

# 4 Results

The degree of integration—both among water-related challenges and between water and land use—depends on structure and agency. This chapter explores these dynamics through two Regional Delta Programmes (RDPs): Maas and Zuidwestelijke Delta. While the overarching research question applies to Dutch water regions in general, the semi-structured interviews and desk research focus specifically on these two cases. The participant observations and exploratory interviews do include multiple other regional delta programmes.

The results contain four sections. They start with context on regional delta programmes and the selected case studies (5.1), corresponding to subquestion 1. This is followed by the analysis of interconnectedness, power dynamics, and capacity for integration across the two case studies (5.2 and 5.3), answering subquestions 2-4. The results conclude with broader insights into regional enablers and barriers to integration (5.4), answering subquestion 5.

In this chapter, 'actors' are organisations partaking in water governance. However, for the 'interconnectedness' sub-chapters, 'actor' will refer to the individual perspective of interviewees.

## 4.1 Contextual Background

This section introduces the National Delta Programme (NDP) and the Regional Delta Programmes (RDPs). Figure 4.1 provides an overview of interactions between NDP and RPD. The chapter then explores water governance in RDP Zuidwestelijke Delta and RDP Maas, as well as their respective roles and responsibilities.

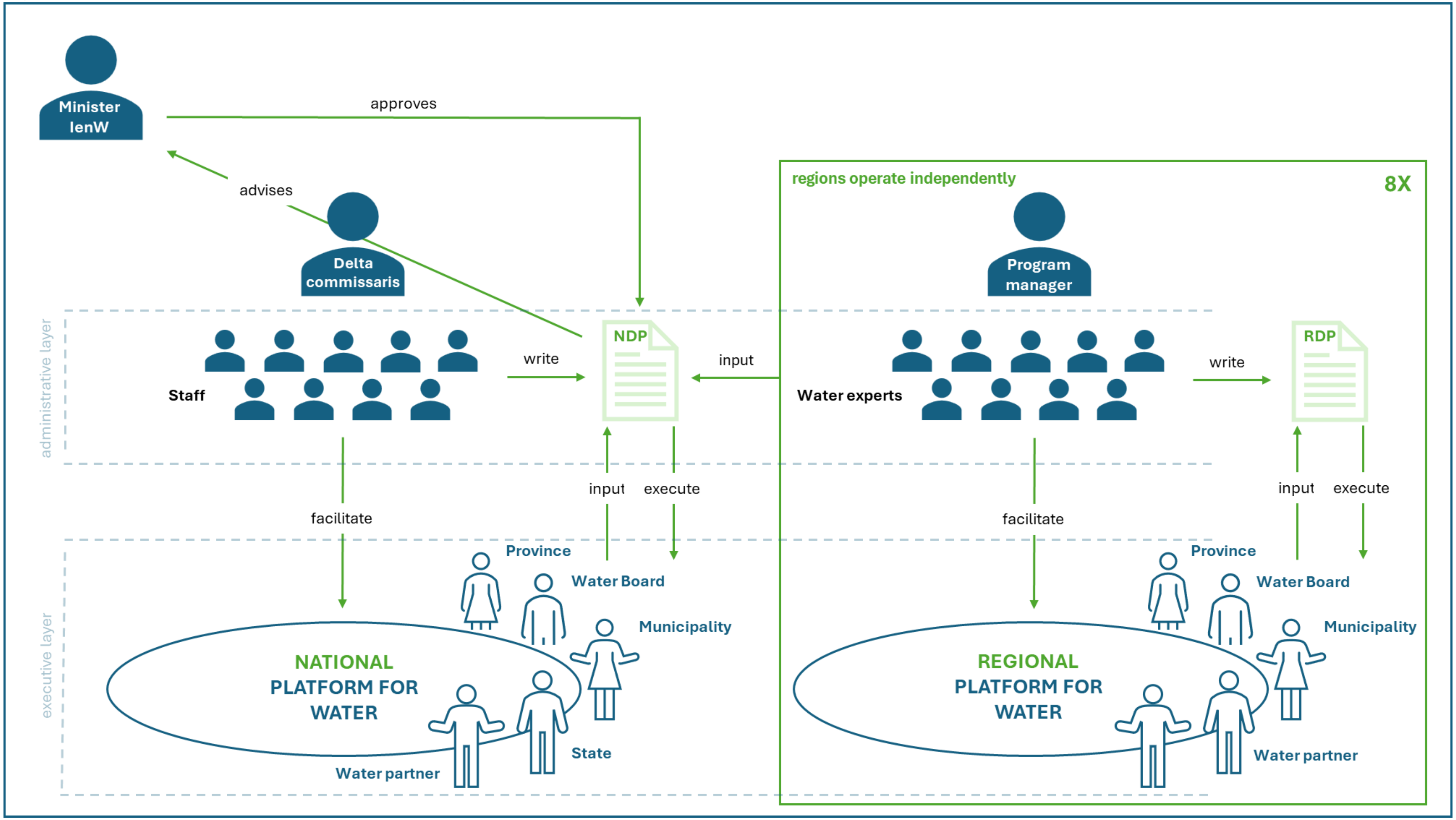
### 4.1.1 The Delta Programme

In the Netherlands, governance on the topic of water is organised in the Delta Programme (DP). The Delta Programme is an inter-governmental organisation driven by water experts that continuously facilitates a platform for governmental organisations to work together all topics related to water. In essence, it functions as a "think tank" for everything related to water.

The NDP was founded in 2010 to ensure flood safety and freshwater availability in the Netherlands.[1] Specifically, the NDP is required to set measures and provisions to prevent flooding and water scarcity, and to improve the ecological quality of water systems.[2] A national platform was deemed necessary, because these water challenges extend beyond regional boundaries (Ministerie van Verkeer en Waterstaat, 2010). Moreover, the Delta Programme focusses on the medium to long term timescale to overcome challenges posed by political changes and to ensure continuation of research and investments in water infrastructure (Zevenbergen et al., 2018). By law, the Delta Programme is required to show how efforts are being made to achieve key objectives related to flood safety and freshwater supply.[3] These objectives are part of a broader,

[1] Waterwet, art. 4.9 lid 2
[2] Waterwet, art. 4.9 lid 2ab
[3] Waterwet, art. 4.9 lid 6

*Figure 4.1 Interaction between National and Regional Delta Programmes*



integrated policy for the physical living environment, the ‘nationale omgevingsvisie’ (novi)—meaning everything related to how the Netherlands is designed and protected against water-related challenges. The NDP has, therefore, a responsibility in showing how water-related objectives impact the physical environment in practice.

The Delta Programme is headed by the *Deltacommisaris*, a special advisor for the Minister of Infrastructure and Water Management.[4] The Deltacommissaris is supported by a small staff and together they facilitate the cooperation and coordination of governmental organisations around the topic of water. They bring together deputies from provinces, municipalities, water boards, and water-related organisations—all democratically elected representatives—to strategize the future of the Dutch waterscapes.[5] Every year, this results in a strategy, which the *Deltacommissaris* presents as an advice to the Minister of IenW. Since the strategy is developed through broad governmental consensus, the Minister will most likely accept it. Once approved, it the responsibility of the governmental organisations to incorporate the strategy—which they themselves decided upon—into their own policies. Governmental organisation are not required to do this: partaking in the Delta Programme requires goodwill. However, the Delta fund also functions as an incentive, because when the State, provinces, municipalities, or water boards implement water strategies on a project basis, they are partly financed by the *Deltafonds*.[6]

The Delta Programme is composed of a thematic and spatial component. Thematically, the NDP works on three themes: flood safety, freshwater availability, and climate adaptation (Ministerie van IenW, 2024b). Spatially, the Delta Programme is divided into eight Regional Delta Programmes (RDPs). The RDPs operate independently from the NDP—water regions do not hold accountability nor need to adhere to the NDP. However, they are required to write a main strategy, v*oorkeursstrategie,* outlining a long term regional water strategy. The *voorkeursstrategieën* of all RDPs serve as input for the advice to the Minister of IenW and are reassessed every six years.

In organisation, RDPs are similar to the NDP: headed by a programme manager, supported by a staff of water experts. Together, they form the Programme Boards, which is the core of the RDPs. The Programme Board of RDP Maas consists of four water experts, seconded from the Province of Gelderland, Water Board Aa en Maas, Water Board Limburg, and Rijkswaterstaat. Their expertise spans water governance, river management, spatial planning, and flood safety. Due to their experience and close team dynamics, they share significant overlapping knowledge. The team works together frequently, meets weekly, and interactions are described as informal.

The Programme Board of RDP ZWD consists of nine water experts, seconded from the Rijkswaterstaat, Province of Zeeland, Water Board Scheldestromen, Deltares, Municipality of Schouwen Duiveland, and RVO. Their expertise lie in: flood safety, freshwater availability, knowledge production- and dissemination, flood prevention, water quality and ecology, and spatial planning. Compared to the Programme Board of RDP Maas, this team is larger and

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[4] Waterwet, art. 3.6a lid 1
[5] Waterwet, art. 3.6d lid 1
[6] Waterwet, art. 7.22a-d

therefore has more capacity and specialisation. They meet biweekly and communication is slightly more formal because of the larger size and the specialisations.

Figures 4.3 and 4.4 visualise on the organisational structures of both RDPs. Notable differences are that RDP Maas emphasises the alignment of timelines of regional actors through the Process Team, which meets ten times a year. RDP ZWD emphasises knowledge production through its Consultation Teams, which separately address three water challenges. Overall, the organisational structures of both RDPs are based around facilitating interaction between governmental organisations. The only place where non-governmental actors formally contribute to decision-making is the Societal Organisations Team, which consists of organisations such as trade associations for fisheries, agriculture, nature, and industries.

*Figure 4.2 Organisational Structure of RDP Maas*


*Figure 4.3 Organisational Structure of RDP Zuidwestelijke Delta*

### 4.1.2 Water Governance in Regional Delta Programmes

Water governance in RDP Maas and RDP Zuidwestelijke Delta (ZWD) is shaped by executive actors and programmes, and knowledge actors and programmes, see Table 4.1. The following paragraphs outline the roles and responsibilities of these actors.

*Table 4.1 Overview of Actors and Programmes in Regional Water Governance*

| | National Water Policy Programmes | Content | Responsible actors |
|---|---|---|---|
| **Executive** | Flood Safety Programme (HWBP) | Flood defence through dike reinforcement | Water boards; Rijkswaterstaat. |
| | Water Framework Directive (WFD) | Chemical and ecological quality of ground- and surface water | Water boards; Provinces; Municipalities. |
| | Programme for Ecology in Major Rivers (PAGW) | Water quality and ecology in major river systems | Ministry of IenW; Ministry of LVVN; Rijkswaterstaat; Staatsbosbeheer; RVO. |
| | Natura2000 | Flora, fauna, and bird habitats | Rijkswaterstaat; Provinces; Nature conservation organisations. |
| **Knowledge** | Room for the River 2.0 (RvdR 2.0) | Future developments in the main river system | Ministry of IenW; Consortium of research institutes. |
| | Knowledge Programme Sea Level Rise (KP ZSS) | Future developments and impact of sea level rise | Ministry of IenW; Consortium of research institutes. |

First, Rijkswaterstaat and water boards are jointly responsible for flood safety. In RDP Maas, Rijkswaterstaat manages flood safety along the main water system and water boards manage flood safety along the regional water system. In RDP ZWD, Rijkswaterstaat sets the standards for the primary flood defences (dikes, dams, and dunes), and the water boards are responsible for their maintenance, both regulated through the Flood Safety Programme (HWBP). Furthermore, Rijkswaterstaat is responsible for ensuring navigability and for maintaining Natura2000 areas in the main river system. Lastly, responsibilities for the Water Framework Directive (WFD) and Programme for Ecology in Major Rivers (PAGW) are scattered, as shown in Table 4.1.

Second, provinces and municipalities are involved in water governance. Provinces are responsible for maintaining the spatial quality of an entire province. They oversee allocation of land for housing, business areas and nature, and are responsible for mobility and rural development. In addition, provinces are in the lead for Natura2000 areas on land. Provinces also support nature conservation organisations (i.a. Staatsbosbeheer, Natuurmonumenten) through subsidies. Municipalities have broad responsibilities, ranging from housing and economic development to ensuring waste- and groundwater management. In RDP ZWD, municipalities collaborate on spatial adaptation solutions, for which RDP ZWD has three dedicated regions.

Third, multiple knowledge institutions are active in water governance. In RDP Maas, RvdR 2.0, an initiative of the Ministry of IenW, is a consortium of knowledge institutes (e.g. Deltares, Arcadis, Witteveen+Bos). It generates knowledge and future projections on the entire Dutch river system, which will inform forthcoming policy advice. In RDP ZWD, KP ZSS, also an initiative of the Ministry of IenW, is a consortium as well that investigates the potential impacts of sea level rise on the Netherlands and explores measures to help prepare for these effects.

Fourth, the RDPs are important actors in water governance themselves, focussing on the main water system. Within the Dutch Meuse catchment area, RDP Maas was established in 2015 as the successor to 'Programma Rivieren', which previously addressed the Rhine and Meuse jointly. This marked a shift in governance towards a more regionally focused approach. RDP Maas initially focussed on flood protection along the Meuse, but growing concerns about the regional water system and about low water levels have broadened the agenda spatially to include the regional water system and thematically to include freshwater availability and nature development. In the Zuidwestelijke Delta, RDP ZWD predates the establishment of the NDP. It was founded in the 1990s to enable collaboration among regional stakeholders on four themes: climate resilience, flood safety, ecology, and economy. Since the launch of the NDP in 2010, RDP ZWD has gained new momentum and has expanded its focus to include freshwater availability and spatial adaptation. However, because it was established prior to the NDP, its scope and ambition are broader.

### 4.1.3 Role of the Regional Delta Programmes in Water Governance

The RDPs play a substantive and a practical role in their regions. The substantive aim of RDPs is to develop a long-term water strategy, *voorkeursstrategie*, with and for their respective regions. The strategies are long term in the sense that they signal impending challenges and the need for future decision-making: *"It's about indicating that problems are on the horizon and that choices will need to be made—but without prescribing specific actions now, as those choices simply cannot yet be made"* (R10[7]). The strategy is designed to align with broader frameworks such as the National Water Programme, into which it must eventually be integrated. The objective of creating a shared strategy for an entire region is also to emphasise that regional actors need each other: *"As Programme Board, it's our responsibility to ensure that we present a proposal everyone agrees with. That's the goal"* (R4). The resulting strategy is shaped through a consensus-driven process grounded in shared knowledge and mutual understanding.

In practical terms, RDPs create a network for regional actors, serve as an intermediary between the national government and the region, and facilitate decision-making. They facilitate a network for regional actors by offering "*a neutral platform where partners can raise issues without requiring an immediate interest, request or formal mandate*" (R6). This encourages open dialogue and the collective identification of shared challenges. As such, the platform promotes ongoing

[7] See Appendix C for a list of all interviewees and their expertise.

knowledge exchange among diverse stakeholders, ensuring both active contributions and widespread awareness of current developments. RDPs act as intermediaries between region and state by relaying insights collected on the local level upward, and translating national-level knowledge back to regional stakeholders. *"We gather a lot of information from our regional partners and projects, while at the same time keeping them informed about the developments we pick up at the national level regarding policy programmes"* (R3). Throughout the process of exchanging knowledge between the national and local scales, the Programme Boards *"filter everything happening around us and compile what's relevant for our executive actors"* (R3). A last practical function of RDPs is facilitating decision-making. It supports regional decision-making by ensuring that regional leaders are well-informed and capable of engaging in constructive dialogue: *"The aim is to ensure that decision-makers are able to have the right conversations with one another"* (R5). Since the executives in the region will be the ones executing and financing projects, they need to know what is happening around them: *"We facilitate those discussions between the decision-makers—that's what we do"* (R4). No executive power lies with the RDP: *"We're merely a partnership, whereas the provinces and municipalities are official authorities"* (R8), indicating that the RDP can only facilitate and advise.

What distinguishes the RDPs as organisations is their broad geographical scope and extensive network. While they are not unique in bringing together water and spatial planning actors, they stands out for the area they cover: *"There are multiple networks, but the added value of the Delta Programme Maas lies—in addition to the content—in its broad geographical scope, from Eijsden to Geertruidenberg"* (R12). In addition to the geographical scope, added value of RDPs lies in their strong regional anchoring and the diversity of actors involved. As one respondent emphasised: *"We create a strong knowledge base with the people around us who are working on the same issues. It's not just one province or a water board working with a national agency—it's much more deeply rooted in the region"* (R11). Both RDPs' networks includes societal stakeholders such as the shipping sector, nature organisations, and recreational water users.

## 4.2 Case 1: Regional Delta Programme Maas

This section first explores perceived interconnectedness and power dynamics, followed by their influence on the capacity for integration in RDP Maas.

### 4.2.1 Agency: Perceived Interconnectedness

The following distinctions between water challenges are made.

**Flood safety is considered** vital for protecting all interests on land. All interviewed water experts agreed that *"Flood safety is so important and crucial for the Netherlands that it is separated from everything else"* (R8), treating the topic as a standalone priority. The focus on flood safety along the Meuse emerged after the floods of 1993 and 1995 and remains closely tied to the management of high water levels. The focus on flood safety is illustrated on the project map (see Figure 3.3), which shows that 18 out of 19 projects currently running along the Meuse include a flood safety objective (Deltaprogramma Maas, 2025).

In contrast, **freshwater availability is seen as** serving third party interests, such as shipping, water utilities, and nature. As one expert noted, "*You don't do freshwater measures for yourself.*

*You do them for others. That's the tricky part"* (R4). A definition of 'freshwater availability' remains unclear (PO3). Concerns about freshwater availability are linked to periods of low water levels: *"When there is no water supply, the availability of freshwater comes under significant pressure, resulting in an insufficient amount of water being accessible"* (R9). This is especially concerning for the Meuse, since it depends entirely on rainfall. Experts pointed to climate projections indicating more frequent droughts and perceive freshwater availability as an increasingly urgent topic.

Besides flood safety and freshwater availability, **economic interests and nature** were mentioned as topics related to water challenges in the Meuse region. Economic interests related to water include shipping (navigability and marinas), recreation, industrial (i.e. sand- and gravel extraction), and agriculture. In regard to nature, water experts recognise that rivers play a crucial role in the broader ecological landscape of the Netherlands, "*Rivers serve as natural corridors in the landscape, along which plants and animals can develop and migrate"* (R9). Along the river, activities are carried out in support of the WFD, there are 12 Natura2000 areas along the Meuse[8] (Ministerie van LVVN, 2023) and PAGW activities are carried out in the areas Grensmaas, Vierwaarden, and Meanderende Maas (Ministerie van IenW, 2024a). The water experts acknowledged substantial challenges for nature in and along the Meuse.

The following relationships between water-related challenges are identified, and illustrated in Figure 4.4.

As **freshwater availability** inherently supports other functions, water experts recognise positive relationships with **shipping, nature, and agriculture**. Low water levels limit shipping, as vessels may be unable to navigate or face longer delays at locks. The weirs for navigability influence the freshwater availability (R4). Riverbed ecosystems are also negatively affected by low water levels and reduced water flow. A further consequence is that low water levels cause the remaining water to heat up more quickly, harming the aquatic ecosystems. Nature along the river is also affected, as low water levels lead to low groundwater levels (R4). Agriculture, too, is highly dependent on freshwater. Drought, essentially a combination of limited freshwater availability and low water levels, has negative impacts on all of these sectors. Respondents also point to the growing awareness that the damage of drought on biodiversity and the economy may be just as impactful as damage caused by flooding (R9).

**Nature** and **extraction of sand, clay, and gravel** for economic purposes are often in conflict. While sand and gravel mining provides raw material for housing and road construction, it creates deep pits along rivers that harm ecosystems as well as the spatial quality of the area. This is especially the case in Limburg, where dozens of meters deep water bodies have been excavated. It calls for a careful balancing of ecological and economic interests (R3).

**Shipping** and **nature** are negatively linked as well. Locks and weirs installed to improve navigability have a harmful impact on aquatic fauna. These structures reduce water flow, making

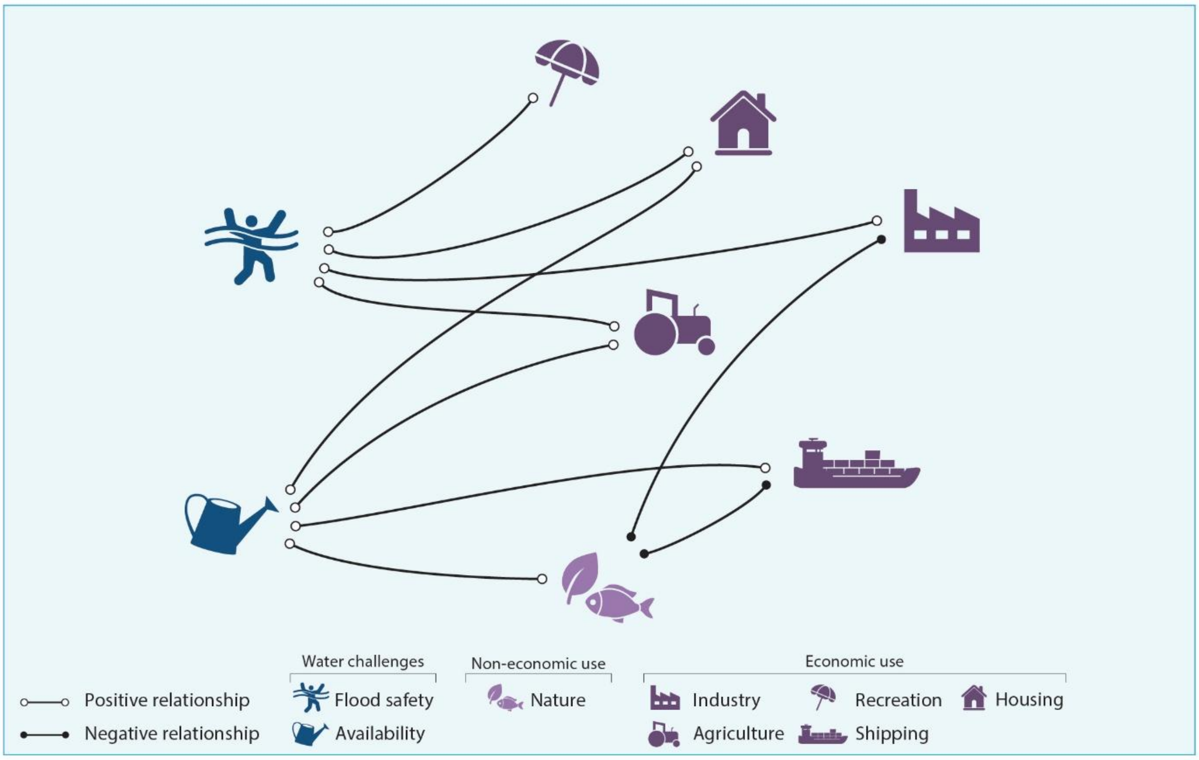
[8] Maas bij Eijsden, Sint Pietersberg & Jekerdal, Bundert- en Elslooerbos, Grensmaas, Leudal, Swalmdal, Roerdal, Geleenbeekdal, Maasduinen, Boschhuizerbergen, Oeffelter Meent, Sint Jansberg.

it difficult or even impossible for flow-dependent species to survive. In addition, continuous turbulence caused by ship waves leads to shoreline erosion. To counter this, most banks have been reinforced, also diminishing natural habitats (Asselman et al., 2019).

Respondents have difficulty recalling substantive connections between **flood safety** and **freshwater availability**, which is synonymous to the connection between high and low water levels. Respondent 4 and 9, however, cautiously imagine a connection: *"We see that drought issues will present a major challenge, which will lead to increasing convergence between water storage for flood safety and water buffering for freshwater availability"* (R9). Though it is unclear what this would entail in practice.

Lastly, **flood safety** is inherently linked to **economic functions on land**, because the latter depend on not being flooded to perform (R3, 8).

*Figure 4.4 Perceived Interconnections in RDP Maas*




The following connections between water challenges and their spatial impact are made.

There are **numerous flood safety measures, all with a direct spatial impact**. River safety policy is built around two strategies: dike reinforcement and riverbed expansion (National Water Plan 2016–2021). Dike reinforcement is more common, though characterised as 'technical' and 'old-fashioned' by respondents (R9, R3). Current efforts encourage riverbed-related measures that accommodate high water levels by increasing discharge. Examples include adding bypasses to the main river or deepening the riverbed itself (R4, R8). However, in many cases, relocating a dike further inland creates sufficient space to manage high water, *"This space alone is often already enough"* (R4), without the need for additional interventions.

**In contrast, spatial measures to improve freshwater availability** remain limited to the 'sponge effect' and the use of water buffers. The sponge effect can be applied in the hinterland of a river and refers to the strategy of *"retaining water in the smallest channels* ['haarvaten']*, holding it everywhere possible"* (R8). However, this remains more of a conceptual ambition than a widely implemented reality. Water buffers, ideally placed upstream, are designed to store larger volumes of water during periods of excess (R9). This highlights a contrast: flood safety measures prioritise fast water discharge, while water availability measures focus on water retention. In theory, retention areas could serve both purposes. However, research cited by water experts shows that retention is not a particularly effective flood safety strategy (Asselman et al., 2025). Instead, flow-enhancing measures are more effective in managing high water levels. As a result, integrated solutions that effectively address both goals remain elusive. Flood safety and water retention require fundamentally different spatial conditions and thus rarely compete for the same space (R4).

Although flood safety and water availability measures do not overlap spatially, they both require substantial land. This is most feasible in land outside of dike-protected zones, in areas *"often already partially within the river's domain and carries a dual function as an active riverbed"* (R8). Using such space for water is relatively straightforward. However, growing demand is also being placed on land within dike-protected zones ('binnendijks'), where spatial claims are far more contested. Respondents point to two reasons for this. First, this land is already in use—whether for housing, agriculture, or nature—and repurposing it for water-related measures can displace existing functions, often triggering local resistance. Second, NIMBYism plays a role: *"When it comes to river widening, stakeholders along the river quickly start asking: why does it have to be on this side? Couldn't it be on the opposite bank? Or a bit further upstream or downstream?"* (R9). Regardless of location, both upstream and downstream areas, as well as both banks, benefit equally from flood safety and storage measures.

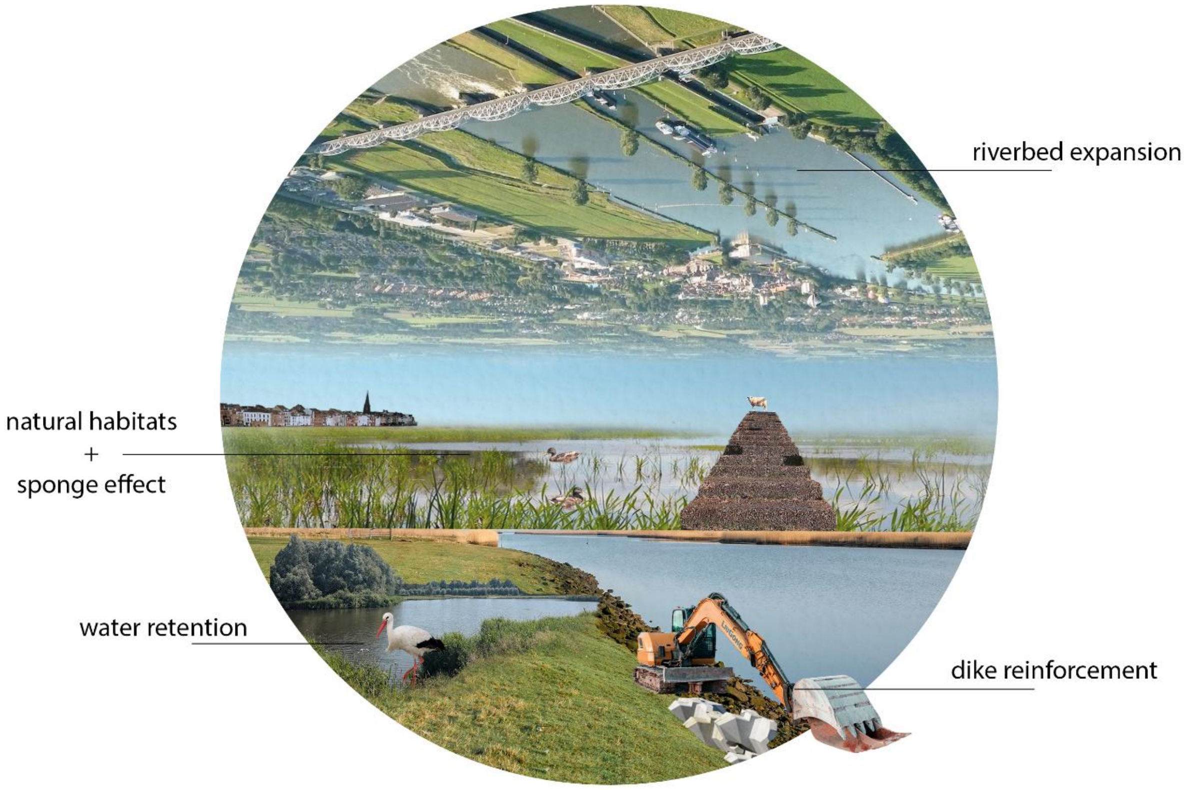
Acquiring land within dike-protected zones appears more difficult for freshwater storage than for flood safety: *"There are hardly any locations available for water storage"* (R4). Using large areas of land for freshwater storage is often perceived as off-limits. Unlike flood safety, freshwater availability is seen as a more complex and diffuse issue that cannot be solved with single, clear-cut measures. One respondent concludes: *"So if it demands a large amount of space, particularly within dike-protected area, it becomes highly challenging"* (R8). The more space an intervention requires, the more resistance it tends to face.

**Nature also competes for space**. It can benefit from dike relocation, which create sheltered areas where nature can thrive. Also the overarching logic is that *"Creating more space for water in one location frees up space for nature elsewhere. You simply can't accommodate all functions in one location"* (R4). This approach to space is pragmatic—it coordinates competing needs across the landscape rather than forcing them into a single location.

Overall, there is a growing competition for scarce space. Water experts while water experts seek more space to improve flood safety, freshwater availability and nature, they face competing demand from other sectors, for example housing and industry. *"Everyone wants a spot along or near the river. But of course, not all of it fits"* (R3). This dilemma puts pressure on existing spatial reservations, dike-protected areas reserved for water along the Meuse. Also, in light of climate change, it might be necessary to claim more space for water. This is perceived as even more difficult: *"You're not going to tear down a house just to move a dike. At least, that's not how things are currently done in the Netherlands—but we think it would be a good idea"* (R8). This shows that space is contested, and allocations are decided upon on the national level.

Regardless of practical limitations, the collage below visualises the different types of spaces that support water challenges, as discussed throughout this section. It shows a potential spatial synergy between ecology (natural habitats) and freshwater availability (sponge effect).

*Figure 4.5 Spatial Measures for Water Challenges along the Meuse*




### 4.2.2 Structure: Power Dynamics

This section explores the power dynamics between actors in regional water governance.

Two primary sources of **knowledge and information** are the insights generated through projects and the findings from ongoing research, particularly RvdR 2.0. Project are evaluated by the RDP team and knowledge abstracted from it disseminated among regional executives. A major part of current research is produced by RvdR 2.0, focusing on two areas: (1) the riverbed and (2) water discharge and spatial planning. The latter has strong regional relevance, particularly concerning current and future spatial reservations for the Meuse. The research outcomes of the consortium are highly influential, as they will be used at the national level to allocate spatial claims for water.

In general, knowledge and information is abundant across all water-related challenges. As one respondent explains: *"In terms of knowledge level, there are consistently very positive* *developments across all themes"* (R9). Awareness of the importance of integration has also grown, with stakeholders recognising this as a multi-faceted challenge, not solely one of flood safety. Nevertheless, respondents identify flood safety as the prevailing perspective, largely because of the Netherlands' long-standing expertise in this area. In contrast, understanding of low river water levels is still developing: *"We need more research on how the river can function well during both high and low water conditions. The latter is a new angle for us, as we've always focused on high water until now"* (R8). Freshwater availability and low water levels are relatively new concerns for the Meuse and raise the most significant knowledge-related questions.

**Agenda-setting** in the region is driven by external events that produce new insights, rather than by political or executive initiatives. These insights often stem from new knowledge or natural hazards. One such catalyst were the high water levels on the Meuse in 2021. The key insight that emerged was that the tributaries of the Meuse could not discharge freely into the Meuse, causing flooding in the hinterland. Although this issue had also emerged in 1995, it only gained full traction on the policy agenda in 2021. This unlocked substantial funding and led to the launch of two policy programmes, *Waterveiligheid en Ruimte Limburg* and *Hoogwaterbescherming Brabant Oost*. Afte this event, a sense of urgency emerged to prioritise the interdependence between tributaries and the main river system, and collaboration between the responsible actors.

Another external event that triggered agenda-setting was the increasing frequency and severity of droughts over the past five years. This brought freshwater availability to the attention. As one respondent explains: *"Only in recent years did the Delta Programme Freshwater started to gain traction, and now it has suddenly become a hot topic because we're seeing a significant shortage emerging"* (R4). As a result, more human resources have been dedicated to freshwater availability and considerable effort is invested into DP Freshwater, whereas this was previously not on the radar. In this case, agenda-setting caused more knowledge production and collaboration between actors. The examples show that agenda-setting can stimulate funding, collaboration, and knowledge production.

**Politics and ideologies** play a significant role in the collaborative setting of RDP Maas. While the RDP aims to focus on the long term, administrators such as provincial deputies, municipal aldermen, and water board chairs ultimately decide how to balance spatial planning and water interests. Every four years, changes in elected officials can shift the weight given to water issues, depending on party priorities. For instance, recent political currents have sparked tensions around land use, particularly in discussions where agricultural land might be repurposed for nature or water storage. The four-year cycle also reveals the tendency in politics to focus on the short long term.

Interests in housing development are prevailing in RDP Maas. This comes from private housing developers as well as municipalities. Municipalities resist long-term water planning when it conflicts with short-term housing ambitions, even lobbying the national government to lift spatial reservations for water. Notably, municipalities are often absent from water governance meetings organised by RDP Maas, making their influence within RDP Maas' formal structure relatively limited. In contrast, provinces and water boards are more frequently present. At the provincial level, urgency for water issues tends to be stronger, but responses are still shaped by the prevailing political orientation. Overall, there is a political tension between short-term, local housing interests, which are decided upon on a national level, and long-term, abstract water needs.

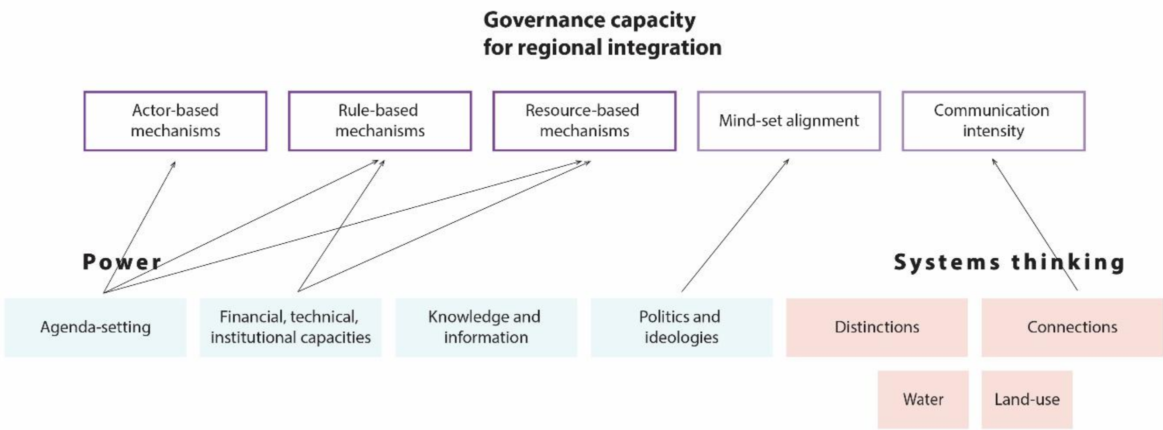
The **financial, technical, and institutional capacities** of regional actors are uneven and linked to the topics actors are responsible for. Flood safety is highly institutionalised. Especially for dike enhancements, which the HWBP offers a robust legal and financial infrastructure for (Jansen & Beurskens, 2025). As one respondent put it, *"Water safety in the Netherlands has been fully institutionalized—it's been taken out of the hands of businesses and citizens; the government takes care of it"* (R9). This clarity is enabled by concrete objectives and well-defined standards. For example, dikes are assessed through a transparent process: they either meet safety standards or must be reinforced. This system allows for long-term planning, with detailed goals for 2050 and 2100, and a logical breakdown from policy ambitions to implementation, funding, and designated authorities.

In contrast, freshwater availability and nature development lack comparable financial, technical, and institutional frameworks. Although there exist ambitions for these topics and there are European frameworks for nature development (WFD and Natura2000), there is no integrated framework guiding these domains from ambition to concrete action. Responsibilities are fragmented across different levels of government, private actors, and land managers, resulting in what one interviewee described as *"a scattered picture of accountability"* (R9). Unlike the structured approach for flood safety, freshwater measures often lack a clear goal, standard, or cost estimate—making it difficult to secure funding or justify investment. One project involving low water levels illustrates the challenge: potential synergies were identified with floodplain development, but the lack of defined measures or budget led to months of debate. The result was a vague designation as a "meekoppelkans" (add-on), not a formal task (R4). This underlines a broader issue: without concrete targets or institutionalised pathways, it remains difficult to mobilise the necessary financial and administrative resources.

### 4.2.3 Capacity for Integration

This section explores the capacity for integration, as summarised in Table 4.2, and explores how it is shaped by power dynamics and systems thinking, as shown below in Figure 4.6.

*Figure 4.6 Interactions between Indicators for Power, Systems Thinking, and Integration Capacity*




**Communication intensity** in the Maas region is high. This is partly facilitated by RDP Maas with its frequent, structured meetings throughout the year. Water experts even describe a "multitude" of meetings, to the point where executives request to scale down the amount of meetings. This is common in water governance, *"In the 'water world', there are truly countless meetings and consultation structures"* (R3). The high frequency of contact is complemented by informal communication. As respondents noted, *"you simply know the people in the network"* (R12) and *"I know people everywhere—at the province, the municipality, the water boards"* (R8). Communication intensity on the crossover between water and spatial planning is the highest between provinces, water boards, and Rijkswaterstaat, with municipalities less involved in RDP Maas. The combination of regular meetings and informal interaction fosters trust and familiarity, enabling quick information-exchange and joint problem-solving (R8).

One explanation for the high communication intensity lies in the strong perceived interconnectedness between water-related challenges and land use. Because water experts in RDP Maas recognise how closely these issues are linked, frequent communication is both necessary and logical.

**Mindset alignment**, defined as the degree to which actors prioritise and share an understanding of challenges, is intermediate in RPD Meuse. Willingness to collaborate is growing due to shared recognition of the scale and complexity of water challenges. However, actors remain focussed on their own interests and timelines. Rijkswaterstaat operates with a clear mandate and long-term view centred on the main river system. Provinces also operate on the long-term, strategic level and can bridge water and spatial planning, though emphasis differs—some see water as integral, others as a constraint to development. Municipalities, by contrast, are oriented towards the short term. Their interests lie in housing and economic development, lacking a sense of urgency for the importance of engaging in long-term water strategies. Consequently, their involvement in water governance is inconsistent. This does offer an explanation for their weaker communication with other actors: they simply do not feel a sense of urgency. Water boards combine long- and short-term goals. They plan for climate impacts long-term, yet also execute projects on the short-term. These differing institutional objectives and planning timelines limit full alignment, even as awareness of shared dependencies is growing.

Political power dynamics can explain mindset misalignment. Especially for actors with elected bodies (municipalities, provinces, and water boards) interests are shaped by the political cycles, mandates, jurisdiction, and portfolios. This affects the degree of mindset alignment, as political actors tend to prioritise actions that boost their popularity and secure funding for their own agendas. This dynamic empowers the actor with the greatest political influence over a given topic to assert their interests. For instance, because municipalities hold significant political weight over spatial claims for water, their preferences often prevail.

Actor-, rule- and resource-based mechanisms are present in the Maas region in differing degrees. **Actor-based mechanisms**, which enhance interaction among actors, are high. As discussed, there are many meetings, communication is informal and knowledge publication and exchange is high. However, a side note is that actor-based mechanisms are also described as somewhat chaotic: *"we're all mixed together, because we're more or less doing the same things"* (R8), and *"it's really quite messy"* (R3). Still, the RDP Maas team effectively facilitates engagement between actors working on different challenges. **Resource-based mechanisms** that facilitate joint implementation of measures, are minimal. This needs to be provided, partly or in full, by the state. For example through regional co-financing, where the state facilitates a budget and requires regional partners jointly to finance a part. This has happened on a project- or situation-basis (R9). **Rule-based mechanisms** that provide a regulatory foundation for collaboration remain limited. While respondents noted efforts to translate RvdR 2.0 outcomes into legal instruments for spatial water-related claims, these do not necessarily foster integration. Additional rule-based mechanisms include provincial policies in Limburg and Noord-Brabant that integrate spatial planning with flood safety into a unified strategy (R9). Beyond these examples, however, overarching regulatory frameworks to support integration are largely absent.

The mechanisms outlined above can largely be understood through the lens of agenda-setting. When an issue is placed on the agenda, it often triggers collaboration among actors, the allocation of financial resources, and the development of relevant policies. Agenda-setting together with a sense of urgency stimulates this more so than any other power mechanism or systems thinking. In addition, a lack of rule-based mechanisms can be attributed to the discrepancies between water challenges regarding their frameworks of financial, technical, and institutional capacities. Differences in individual frameworks for themes make it more difficult to create combined resource-based and rule-based instruments.

*Table 4.2 Governance Capacity for Integration in RDP Maas*

| Degree of Integration | Influencing mechanisms | Actor relationships |
|---|---|---|
| **High** | Actor-based mechanisms in place and effective (diverse actors involved, benefits outweigh costs, resourced proactive staff). | High communication intensity (very frequent, effective two-way interaction). |
| **Intermediate** | | Mind-sets starting to align (willingness is growing, understanding of joint importance to work together but focus on own interests). |
| **Minimal** | Some rules present but poorly designed or enforced.<br>Poor availability of funding mechanisms. | |

This table summarises the findings of this subchapter, showing that the degree of integration varies across indicators. Actor-based mechanisms and communication intensity are high, while mindset alignment is moderate, and rule- and resource-based mechanisms are minimal. The next subchapter discusses the second case study, RDP Zuidwestelijke Delta, and concludes with a similar summary table.

## 4.3 Case 2: Regional Delta Programma Zuidwestelijke Delta

This section first explores perceived interconnectedness and power dynamics, followed by their influence on the capacity for integration in RDP ZWD.

### 4.3.1 Agency: Perceived Interconnectedness

The following distinctions between water-related challenges are made.

**Flood safety** is an important topic in the region, encompassing both land safety (e.g., dike reinforcement) and coastal safety (e.g. sand nourishment). In contrast to RDP Maas, flood safety is related to saline water, since historically floods in the Zuidwestelijke Delta have come from the sea and not from freshwater. Currently, flood safety is perceived as well-managed: "*We're doing the right things and continuing to do them, making only minor experimental adjustments*" (R5). However, major challenges are anticipated in the long term, particularly concerning sea level rise and aging infrastructure like the Oosterscheldekering. While traditional flood protection measures like dike reinforcement remain viable for now, they cannot continue indefinitely: *"You can't just keep raising and widening dikes forever. There's a limit"* (R11).

**Freshwater availability** is understood in terms of available amount. In the Zuidwestelijke Delta, there are areas with and without external freshwater supply, see Figure 3.6. Areas with external supply[9] depend on water from two freshwater sources: Volkerak-Zoommeer and Haringvliet-Hollands Diep, which receive inflow from the Rhine and Meuse. The other areas[10] depend on precipitation and groundwater. Respondents express little concern about freshwater availability in the areas with externe inflow, as the current situation fulfils the demand for freshwater, even in times of low inflow (Nolte et al., 2024). In contrast, there are concerns about the freshwater availability in the areas that depend on precipitation, due to increasing frequency of droughts. Notably, freshwater availability is consistently described in relation to the economic functions it supports (ZuidwestelijkeDelta, 2021).

**Ecology, water quality and nature** are often mentioned jointly. Ecology and nature refer to the entirety of interactions between living organisms and the environment, which encompasses the aquatic and terrestrial systems for flora and fauna. The environment in the Zuidwestelijke Delta is hugely impacted by human interventions, *"With the Delta Works we have defined our water systems, and each system comes with its own ecological character"* (R7). Improving the water quality is fundamental for maintaining and recovering ecological systems (Provincie Zeeland, 2021). Respondents relate ecology, water quality, and nature to the WFD and Natura2000, recognising their failure to meet the objectives of both. This is a topic of serious concern, "*we have established that water quality and ecology have already far exceeded the thresholds*" (R6). Respondents recognise the magnitude of the challenge ahead and often describe it as the most pressing issue facing the region.

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[9] External freshwater supply: Goeree-Overflakkee, Tholen, Sint Philipsland, Reigersbergse polder, West-Brabant

[10] Dependent on precipitation: Schouwen-Duiveland, Walcheren, Noord- en Zuid Beveland

The following relationships between water-related challenges are identified, and illustrated in Figure 4.7.

The first set of interconnections is found between **salination, agriculture and freshwater availability**. Sea level rise increases pressure beneath dikes, leading to upward seepage (kwel) and increased inland saline water intrusion (R10). This process of salination directly affects agriculture, as brackish and saline water is unsuitable for irrigation. In areas with external freshwater supply, saline water is flushed out to ensure access to fresh ditch water. However, this method is inefficient and unfeasible during droughts (R6). While it is clear that increasing salinisation and more unreliable freshwater availability pose serious challenges for agriculture, the extent of the impact remains ambiguous. Some respondents note that Zeeland has long coexisted with saline conditions and that agriculture will continue, albeit with different crops or management strategies (R10).

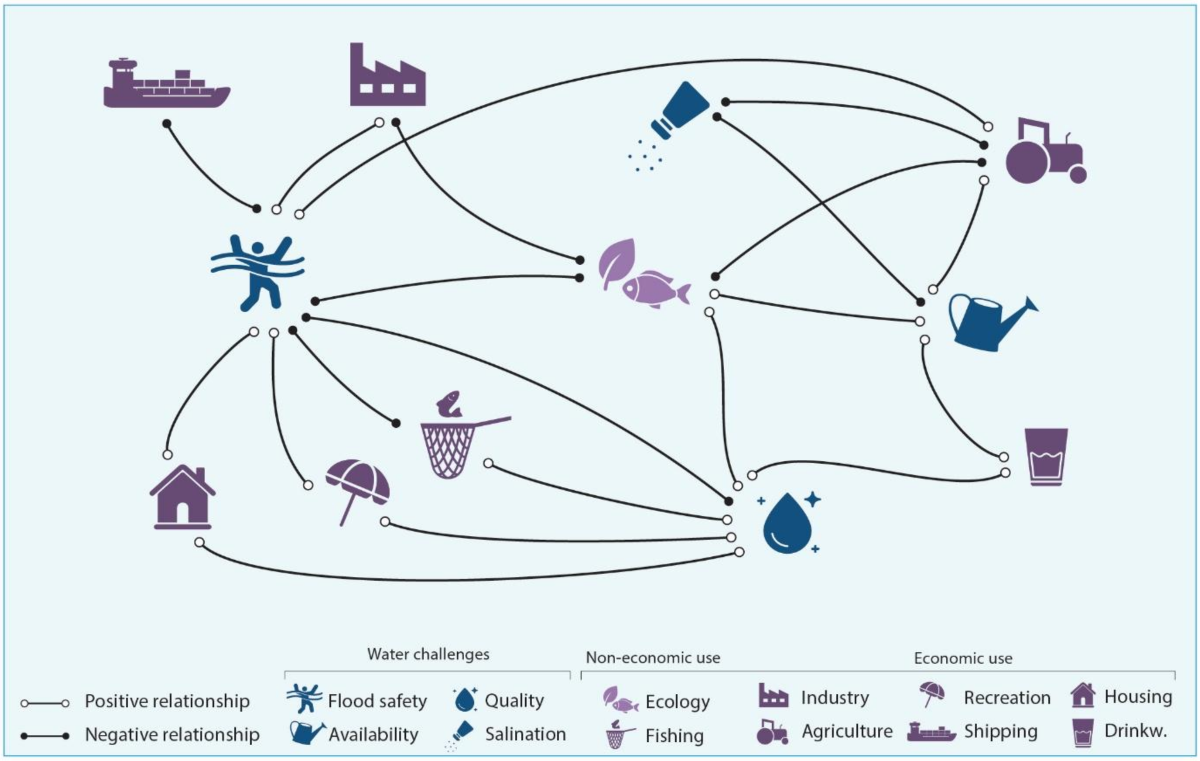
In addition, **freshwater availability** is directly related to **ecology**, particularly due to the increasing periods of drought that diminish freshwater availability. When asked who suffers the most from drought, respondents consistently answer “nature”. Moreover, the possible conversion of the Grevelingenmeer from a saline to a freshwater system will benefit agriculture, but will come at the expense of the ecological system (R6). This tension between agriculture and ecology over freshwater availability is widely recognised, but beneficial solutions for all have not been found (Provincie Zeeland, 2021).

Furthermore, tensions arise between **agriculture and industry** on the one hand and **water quality and ecology** on the other hand. Pollution inflicted by the former negatively impacts the latter (Nolte et al., 2024). In turn, poor **water quality** negatively affects **fisheries, drinking water supply, and the environmental quality** for living and recreation (ZuidwestelijkeDelta, 2020).

The next interconnection exists between **flood safety, economic interests, ecology and water quality**. While the system of Delta Works and dikes have significantly improved flood protection—benefitting housing, recreation, industry, and agriculture—it negatively impacts commercial shipping, fisheries, the ecological system, and water quality. As sea levels rise, the storm surge barriers, such as the Oosterscheldekering, will need to close more frequently, which increasingly disrupts maritime traffic, reduces fish migration, and decreases water quality (ZuidwestelijkeDelta, 2020). The impact of the Delta Works on ecology is particularly strong, as one respondent explains: *“Ecology and flood safety are always connected, because the system of Delta Works and dikes affects the space for natural dynamics and the connectivity for fish migration”* (R7). By compartmentalising water bodies, the Delta Works have eliminated natural transitions between saline and freshwater. This has disrupted ecological continuity and reduced biodiversity: *“Ecology thrives in gentle transition between fresh and saline water, between land and water—but now we have mostly hard transitions”* (R2). Because of this compartmentalisation, ecological systems are completely dependent on how humans manage water quality and water availability.

Lastly, as in RPD Maas, respondents generally do not see relationships between **flood safety** and **freshwater availability**. One exception is the Volkerak-Zoommeer, a freshwater lake that could potentially serve as a buffer when river water levels are high (R7). Additionally, the several man-made water structures, such as the Oesterdam, act as a physical barrier directly separating saline and freshwater systems (R10). Beyond these examples, however, no further links were identified.

*Figure 4.7 Perceived Interconnections in RDP ZWD*




The following connections between water challenges and their spatial impact are made.

The **spatial impact of flood safety measures** depends on whether they are traditional or innovative. Traditional approaches are technical and include raising and reinforcing dikes, sand nourishments along shores, and reinforcing dunes (R2, R6). These interventions require significant space, especially when dikes are widened. This puts pressure on space for housing development and agriculture (R11). Simultaneously, there are numerous projects where dike reinforcement is coupled with the development of nature in the zone behind the dike. Also, new flood safety concepts are emerging that enhance both flood protection and ecological systems. These include broader dike zones and the use of 'flood-safe wetlands' (*wisselpolders* or *waterkerende landschappen*), for example around the Westerschelde (R10, 11). In these systems, part of the primary dike is breached to allow tidal flows into designated agricultural or nature areas, encouraging natural sedimentation (opslibben), while a secondary dike maintains safety. This not only contributes to safety, but also to the ecological recovery. It is considered a *"win-win situation for flood safety and nature"* (R11). Nevertheless, such innovations require significantly more space than traditional flood safety strategies (R2).

In addition, **ecological interests are pressing for more space** within dike-protected areas. Natura2000 objectives often cannot be met outside the dikes, making it necessary to turn to dike-protected areas. As one respondent explains *"Ecological habitats demand significant space in* *dike-protected area, and we are well aware of the societal consequences such claims on land may entail"* (R2), this land often being agricultural.

Furthermore, respondents mentioned **spatial measures to improve freshwater availability**. First, water storage basins for precipitation on farmland. This often initiated by farmers themselves to possess over enough freshwater. Disadvantages to this method are that it negatively impacts spatial quality and that it decreases the arable land of a farmer (Provincie Zeeland, 2021). Second, the possibility of large-scale water buffers to store river-fed freshwater is being discussed. It is, however, questionable if there is enough inflow for that to be possible (R5).

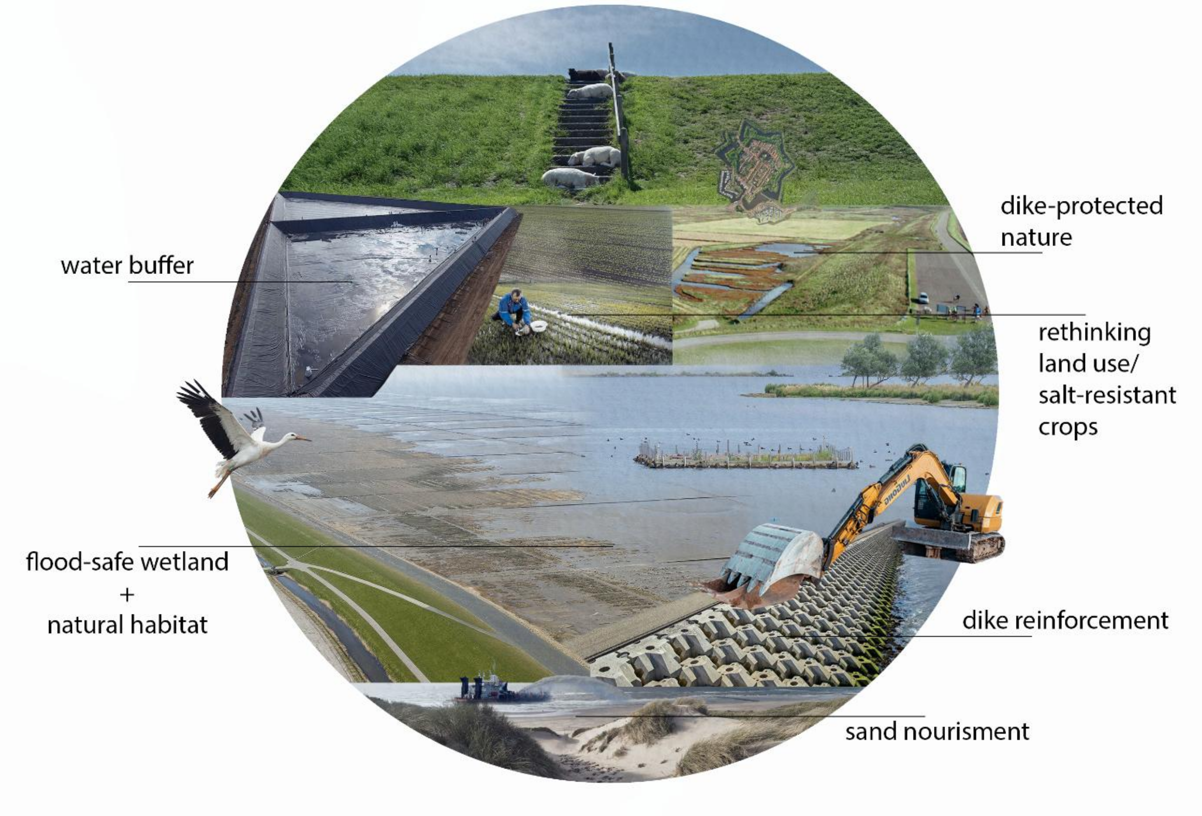
Overall, water experts agree that water-related challenges would benefit from more available hectares. However, space is scarce. Water and land outside of dike-protected areas enjoy the legal protection of Natura2000, making measures other than nature development nearly impossible there. One exception is that flood safety measures within Natura2000 protected areas can be allowed when an agreed upon amount of hectares of nature is compensated elsewhere (R11). Consequently, space is sought inside of dike-protected areas, usually at the expense of agriculture: *"More space for water and nature means less space for agriculture, it's as simple as that"* (R2). All mentioned water strategies relate to agriculture in some way, signalling a conflict of interest.

For both flood protection and freshwater availability, new perspectives on land use are emerging. Namely, organising land use in such a way that it reduces flood risk and decreases freshwater dependency. One respondents explains: *"Also look at the hinterland. How do we design it in a smart way?"* (R11). There is growing awareness that planning decisions, from critical infrastructure to housing, should be informed by long-term flood risk. Likewise, there is an increasing conception that adapting land us, for example planting salt-resistant crops, can lower freshwater demand. This would also be beneficial in light of the increasing salinisation (Provincie Zeeland, 2021)

These shifts in thinking can be linked to spatial adaptation. While RDP ZWD still focusses primarily on the main water system, awareness is growing that water challenges have a major impact on land use (PO5). Water experts are increasingly aware of how heat stress, flood risk, and drought affect—and are affected by—land use (R5). These are all effects of climate change that can be delt with through spatial interventions, in addition to main water system interventions. Though the concept of spatial adaptation remains vague, respondents associate it with ideas of shifting land functions or nature-based solutions, such as flood-safe wetlands, that reduce flood risk in a 'natural' way (R10).

The collage below visualises the different types of spaces that support water challenges, as discussed throughout this section. It shows a potential spatial synergy between ecology (natural habitats) and flood safety (flood-safe wetlands).

*Figure 4.8 Spatial Measures for Water Challenges in the Zuidwestelijke Delta*




### 4.3.2 Structure: Power Dynamics

This section explores the power dynamics between actors in regional water governance.

As in RDP Maas, substantial **knowledge and information** on all water-related challenges is also available in RDP ZWD. This is primarily provided by managing authorities and KP ZSS. Managing authorities gather knowledge through maintenance and their operational responsibilities. Much of this knowledge is highly location-specific, reflecting the regions' unique estuarine dynamic between fresh and saltwater, impacted by human interventions.

Of the water-related challenges, knowledge on traditional flood safety is the furthest developed. This is partly due to KP ZSS (2019 – 2026), which has given an enormous impulse on theoretical understanding of sea level rise impact. This knowledge is highly valued by water experts. There is now a growing urgency to develop practical knowledge on alternative flood protection concepts. As one respondent illustrates: "*If it is 2050 already and you still have to start pilots on alternative flood strategies, you are just too late"* (R11). Sea level rise will have advanced significantly by then. Pilot projects, such as flood-safe wetlands, remain rare but necessary given the many uncertainties: *"Is there enough sedimentation? How do we deal with PFAS? What are the legal implications?"* (R10). This underscores the need for practical knowledge.

While flood protection is now moving to practical application, theoretical knowledge gaps are present for ecology, water quality, and freshwater availability. For water quality, some parameters are still undefined, making it difficult to steer toward ecological goals: *"It's unclear what constitutes a vital ecological system where all species can thrive, so we don't know what to aim* *for"* (R6). Even basic effects are uncertain: *"The Haringvliet sluice is ajar for fish migration, but is that leading to 10% or 50% more fish? We just don't know"* (R7). Current goals focus on maintaining existing conditions, but respondents stress the need for a future-oriented perspective (PO5). Similarly, knowledge on future freshwater demand and availability is incomplete: *"It's not yet fully clear what will be needed in the long term—how much supply is required and how much water will actually be available"* (R6). Notably, there is still no clear indicator or standard for freshwater availability in regions without external freshwater supply (Nolte et al., 2024).

Unlike in the Meuse region, the **agenda** in RDP ZWD is not necessarily set by emerging knowledge or external events. It can be, for example, freshwater availability has gained momentum after the recent analysis of the new climate scenarios and their implications for the region (R6). However, the theme ecology and water quality demonstrates that agenda-setting is largely political. Among executives, freshwater availability and flood safety dominate the agenda, while *"water quality and ecology receive limited attention"* (R5, 6, 11). This persists despite new research, carried out especially for RDP ZWD, which revealed that ecological tipping points have been passed and that objectives under the WFD and Natura 2000 are not being met (Nolte et al., 2024). Water experts recognise this as a *"clear sign there's a task ahead of us"* (R6). Moreover, problems with water quality and ecology have been known since 2014, but never succeeded in positioning itself on the agenda. Yet, decision-makers deprioritise this knowledge, reflecting a strong political bias on agenda-setting.

In contrast to RDP Maas, some choices do not need to be on the agenda, because they are decided elsewhere. Freshwater allocation is decided nationally, within the Rhine-Meuse Delta Decision. This decision concerns choices in the main water system that affect the river area, RDP Rijnmond-Drechtsteden, and RDP ZWD. Also, no immediate decision regarding flood safety are required, and when time comes, these will be made by RDP Rijnmond-Drechtsteden (R5).

Agenda-setting in the Zuidwestelijke Delta is strongly influenced by dominant societal **ideologies and political** priorities. The greatest public support exists in the areas of agriculture, and as a prevailing societal ideology and a strong lobby, it shapes political debates and decisions: *"Zeeland is an agricultural province, so political attention primarily goes to the farming sector"* (R2). As a result, pilots like flood-safe wetlands face resistance because they are associated with depoldering, which is highly controversial in Zeeland. The image of freely letting in seawater is outright dismissed by politicians (R11). The political power of agricultural parties such as BBB complicates matters further; for instance, the BBB-led provincial and water board administrations explicitly oppose further depoldering. The complexity increases when individuals hold dual roles—representing political fractions and regional bodies—forcing them to balance conflicting voices and interests (R10).

The agriculture sentiment also plays a role in the debate about freshwater availability. There are two possible approaches: accepting gradually reduced freshwater availability and implementing water-saving strategies, versus maximising water inflow, mainly benefitting agricultural interests. The former is favoured by water boards Brabantse Delta and Hollandse Delta. The latter is favoured by waterboard Scheldestromen and provincie Zeeland. This debate delays decision making, *"We're not yet agreed on the key freshwater strategy. It's a tense issue which the region must resolve first"* (R5). Further complicating matters, the national government ultimately decides how freshwater is allocated among regions, reinforcing the current impasse.

The prevailing agricultural disposition also affects ecology and spatial planning. Large-scale spatial reservations for natural habitats are necessary to comply with Natura2000 legislation. In the Westerschelde, for example, 2400 hectares still need to be realised (Vlaams-Nederlandse Scheldecommissie, 2024). This is an area roughly equivalent to the size of Delft. This space has yet to be included in legal frameworks through spatial reservations. In practice, it often implies giving up agricultural land for nature (R2). As these spatial decisions are politically determined—and provinces, where agricultural interests are strong, play a key role—this exacerbates the tension between nature and agriculture.

Lastly, a mentality of "doing as always" and "doing what we're good at" shapes much of the water governance approach. It reflects comfort in proven methods: *"It's understandable to stick to what we're good at, but that doesn't mean it's right for the future"* (R2). This sentiment explains why flood safety stands out as a rare consensus: *"Everyone agrees that water safety is important"* (R6). This unity contrasts with the debates over agriculture, nature, and freshwater, showing how political priorities clearly shape what rises to the top of the agenda.

The **financial, technical, and institutional capacities** of actors, as in RDP Maas, differ per theme. For ecology and water quality, institutionalisation is moderate, technical responsibilities are shared by multiple organisations, and funding often lacks. At the European level, ecology and water quality are institutionalised through the WFD and the Natura2000 framework, which together form the foundation for financial, technical, and institutional capacities in the Netherlands. Water boards have all capacities for the WFD, but their capacities have been insufficient to meet the WFD objectives. Natura2000 legislation is translated into nature management plans by Rijkswaterstaat. These documents define conservation objectives and outline corresponding measures, serving as a framework for issuing permits (Rijkswaterstaat, 2016). The latter seems effective: "*Under Natura 2000, it is very difficult to get something permitted, you have to prove that it has no negative impact*" (R7). However, the technical capacities for executing measures to improve natural habitats are dispersed among different actors, depending on the specific measure and location. Furthermore, it is evident that most Natura2000 objectives will not be achieved. Financial capacities for ecology and water quality lack as well, as illustrated: *"We know that the ecological system in the Grevelingenmeer does not function at all. But the necessary measures are unaffordable"* (R5).

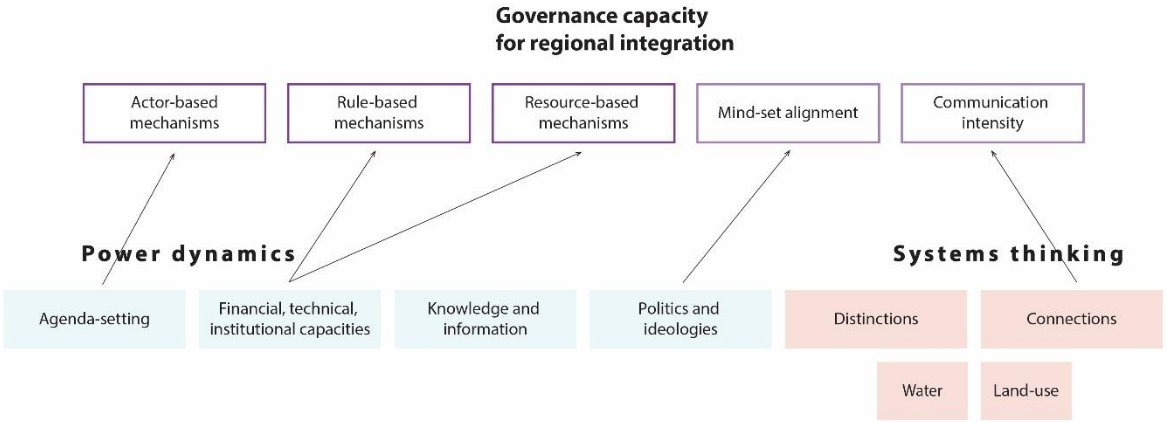
Traditional flood safety strategies have secure financial, technical, and institutional capacities. One respondent explains: *"Flood safety is well regulated by law, there is substantial funding, it's something that everyone considers to be important, and is confidence that any shortcomings can be addressed adequately. However, for issues like water quality and ecology, that is much less the case"* (R6). This illustrates both the institutionalisation of flood safety and the difference with water safety and ecology. As in RDP Maas, flood safety is executed by water boards through the HWBP, which receives funding and has technical expertise. Alternative flood safety strategies, however, are not yet embedded in funding, technical, and institutional capacities, they remain limited to ideas for pilots (R11).

For freshwater availability, technical and institutional capacities lie with Rijkswaterstaat and water boards, who also receive corresponding funding. However, because agenda-setting for freshwater availability is highly impacted by decision made on a national scale, capacities for freshwater in RDP ZWD are relatively limited.

### 4.3.3 Capacity for Integration

This section examines the capacity for integration, as summarised in Table 4.3, and explores how it is influenced by power dynamics and systems thinking, illustrated in Figure 4.9. This closely resembles Figure 4.6, suggesting that that the elements relate to one another in a similar way across both case studies.

*Figure 4.9 Interactions between Indicators for Power, Systems Thinking, and Integration Capacity*




**Communication intensity** is high and in part facilitated by RDP ZWD. Meetings between actors are held regularly throughout the year and communication is often informal. Here, it is also remarked that *"there are many meetings"* (R7) and that *"there is a lot of overlap"* (R2) among participants involved in discussions across different forums. Despite the large number of actors involved in RDP ZWD, people know each other, work on the same dossiers, and engage in daily informal contact. Outside of the formal meetings organised by RDP ZWD, organisations remain in constant communication. One respondent explains: *"There are all sorts of informal loops that ensure each individual authority is kept in the loop"* (R7). Coordination often happens informally, and actors are generally aware of ongoing developments. For instance, respondents describe how feedback on the *voorkeursstrategie* was quickly addressed and resolved through email exchanges between team members, bypassing formal procedures (R10).

As in RDP Maas, a plausible explanation for the high communication intensity lies in the strong perceived interconnectedness between water-related challenges and land use. All the more because *"Zuidwestelijke Delta collaboration has been in place for quite some time, so everyone is involved and aware of it. It's also very easy to refer to, because everyone supports it"* (R10). Actors realise how closely issues are linked, and RDP ZWD provides a platform for communication.

**Mindset alignment** between actors is minimal. Similar to RDP Maas, actors frame their interests and timelines differently. However, unlike RDP Maas, there is little indication of growing awareness of shared dependencies. The interests and timelines of actors in RDP ZWD are as follows. Provinces take a medium-term view, focusing on current and future drought impacts from climate change. Provincial executives mainly prioritise increasing freshwater availability for agriculture. Water boards bridge short- and long-term concerns. Their ‘core business’ (R11) is flood safety, addressed through short-term projects and long-term strategizing with Rijkswaterstaat. They are also responsible for water quality and ecology under the WFD, but do not prioritise this (R2, 5, 11). Though not formally responsible for freshwater availability, water boards encounter it daily and even prioritise it over water quality and ecology (R11). Municipalities focus on short-term housing development and economic interests like recreation and industry: *“They are on a much shorter timescale and stand closer to the people and entrepreneurs”* (R7). This often clashes with the flood safety priorities of water boards. Overall, organisation focus on different priorities, revealing mindset misalignment.

In addition to mindset misalignment, interdependencies between water-related challenges and land use are not formally addressed, despite numerous interconnections described by experts (see Paragraph 4.3.1). As one respondent noted: *“One can’t say no thought has gone into it, but I feel it really hasn’t really come through clearly”* (R5). While each topic is addressed individually, *“how they’re actually connected—that part is still missing”* (R6). An integrated perspective is still lacking. Respondents attribute this to the fact that people think and work from their own ‘silo’ or expertise (R5, 6).

Similar to RDP Maas, political power dynamics help explain mindset misalignment. Non-political institutions, such as the RDP and KP ZSS can focus on the long term, while political bodies (municipalities, provinces, and water boards) are concerned with the short-term cycle of attracting and maintaining votes. Water safety is in every voter’s interest, and thus a political priority. Freshwater availability also serves many interests: *“The executives want to ensure things are well arranged for the water users in their region, such as agriculture, nature, and fruit cultivation”* (R6). Water quality and ecology attract little political or economic attention: *“At the administrative level, water boards show more affinity with those topics [flood safety and freshwater availability] than with ecology and water quality, even though the WFD is undeniably part of their responsibilities”* R11. This reflects the fact that politically, there is only indirect interest in these themes. Overall, misaligned priorities weaken capacity for integration.

As a result of the minimal mindset alignment, the *voorkeursstrategie* will remain largely unchanged during recalibration. In RPD ZWD, it is ratified by the Executive Board, meaning *“all of those actors adhere to it”* (R10). Respondents repeatedly said they expect no significant changes in the new *voorkeursstrategie*, due to a lack of agreement among executives (R2, 6, 10). This suggests that mindsets remain too divided to allow for joint-decision making; individual interests continue to dominate.

Mechanisms based on actors, rules, and resources are present to varying degrees. **Actor-based mechanisms** are high. As discussed, there is frequent formal and informal communication and with many opportunities for actors to meet and interact. Cooperation between Rijkswaterstaat, water boards, and the RDP has increased in recent years (PO5). Also, unlike in RDP Maas, municipalities are more embedded in the RDP ZWD network. The Programme Board even includes a 'municipal connector' to strengthen collaboration with municipalities (ZuidwestelijkeDelta, 2024). In general, RDP ZWD has a slightly larger team, providing more capacity to support actor-based mechanisms. This enables them to organise sub-regional sessions with local stakeholders around various water-related challenges and allows the Programme Board to be more active in the region (PO5). **Rule- and resource-based mechanisms** for integration are largely absent in the region. There has been some consideration of combining funding from HWBP and PAGW, but this depends on local initiative (R2). Compensation rules exist for cases where flood safety measures impact nature (R6).

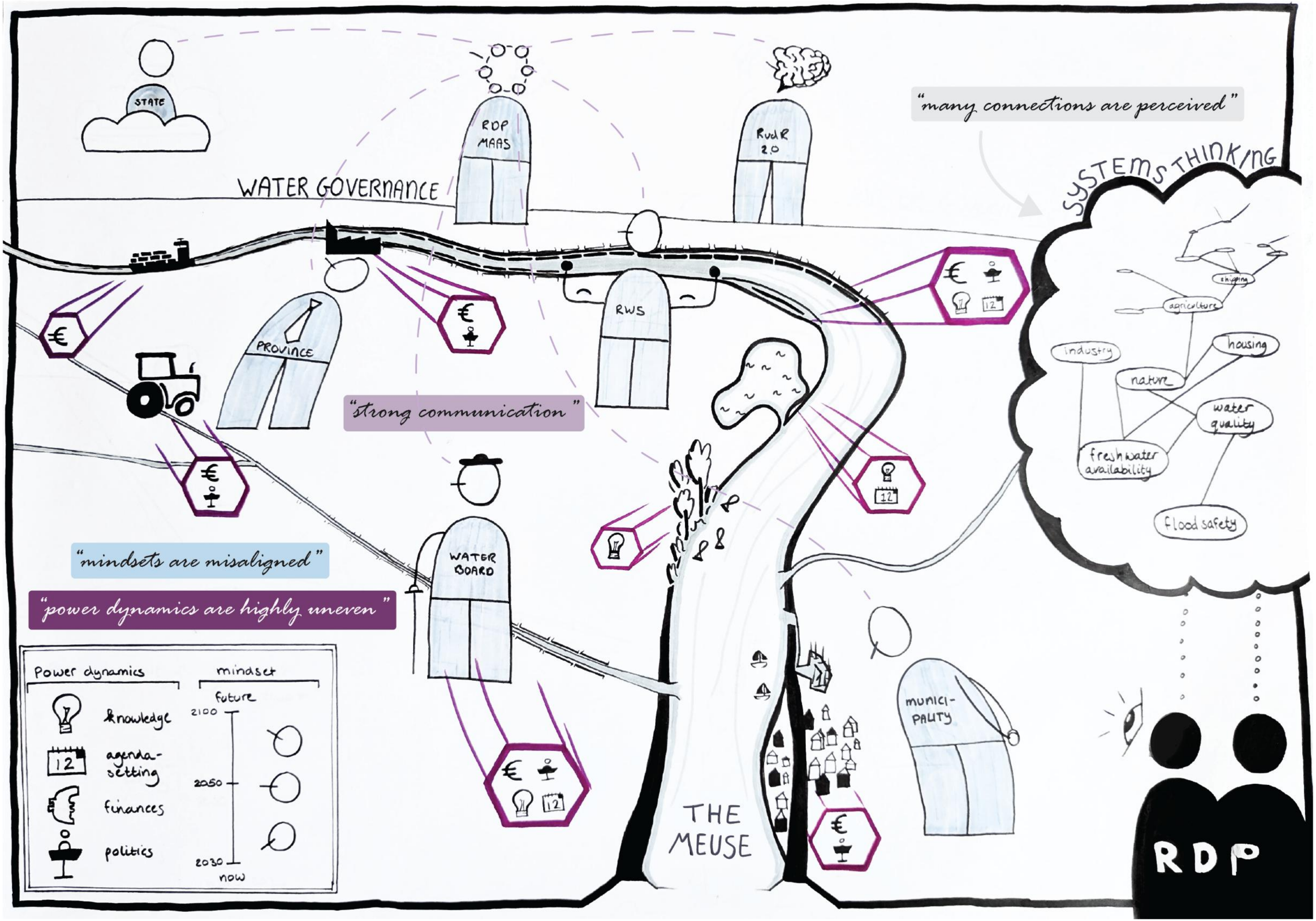
A plausible explanation for the strong actor based mechanisms is not found in power dynamics, but rather in a well-staffed RDP and water experts that realise interconnections between challenges. Rule- and resource-based mechanisms are weak, due to uneven financial, technical, and institutional capacities across themes. Flood safety, for example, is allocated resources and follows a strict set of obligations and timelines through the HWBP. Freshwater availability and water quality and ecology lack comparable support. As a result, institutional strength of one theme can hinder its integration with others.

*Table 4.3 Governance Capacity for Integration in RDP ZWD*

| Degree of Integration | Influencing mechanisms | Actor relationships |
|---|---|---|
| **High** | -Actor-based mechanisms in place and effective (diverse actors involved, benefits outweigh costs, resourced proactive staff). | -High communication intensity (very frequent, effective two-way interaction). |
| **Intermediate** | | |
| **Minimal** | -Some rules present but poorly designed or enforced.<br>-Poor availability of funding mechanisms. | -Different mindsets (poor willingness to work together: "someone else's problem"). |

This table provides an overview of the findings of this subchapter, highlighting how the degree of integration differs across indicators. Actor-based mechanisms and communication intensity are high, while mindset alignment and rule- and resource-based mechanisms are minimal. The next subchapter discusses the enablers and barriers for integration across the two case studies.

But first, the image on the next page visualises the research design and key findings from the case studies. It reflects the perspective of water experts, showing the interconnections they perceive and their views on regional water governance. The image shows mindset misalignment, strong communication mechanisms, and highly uneven power dynamics. While it focuses on RDP Maas, the insights are equally applicable to RDP ZWD.

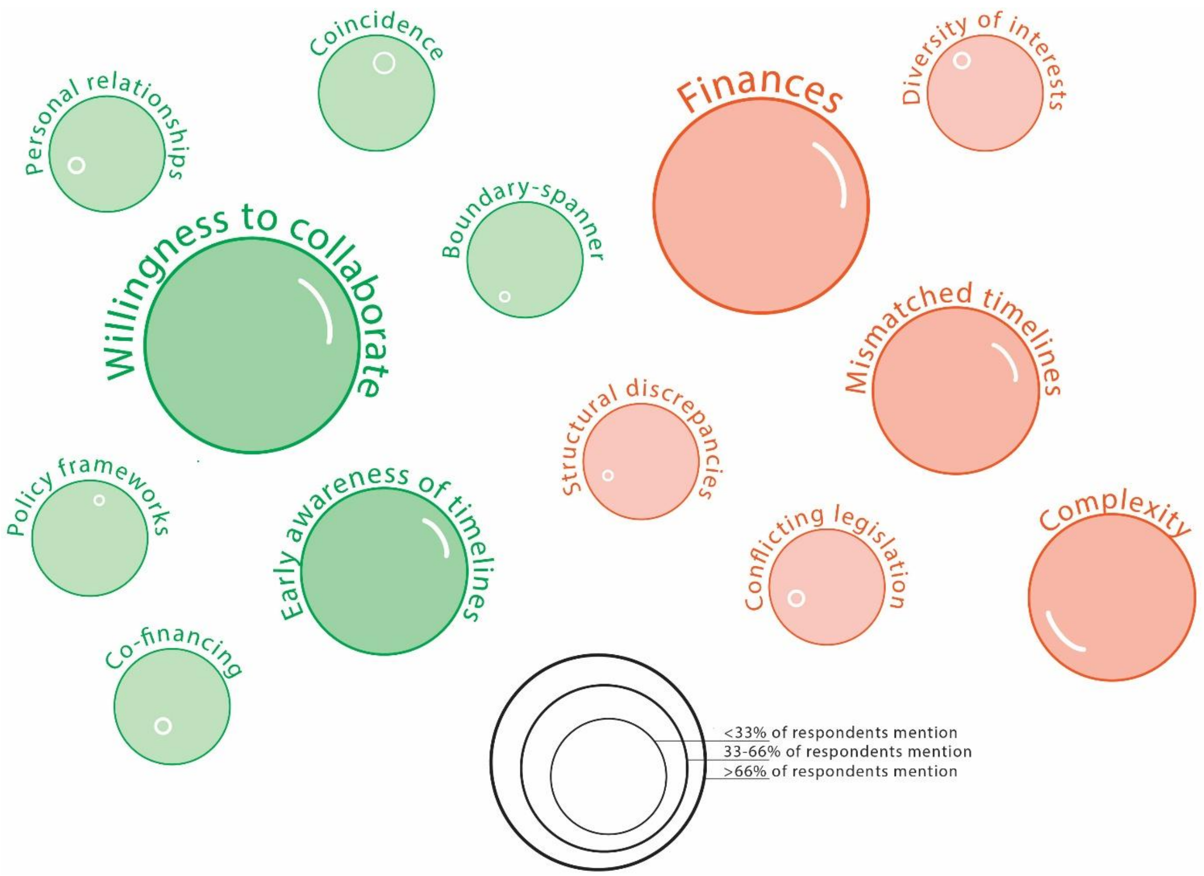


STATE
RDP MAAS
RvdR 2.0
"many connections are perceived"
SYSTEMS THINKING
WATER GOVERNANCE
RWS
PROVINCE
shipping
agriculture
industry
housing
nature
water quality
fresh water availability
flood safety
"strong communication"
WATER BOARD
"mindsets are misaligned"
"power dynamics are highly uneven"
MUNICI-PALITY
THE MEUSE
RDP
Power dynamics
knowledge
agenda-setting
finances
politics
mindset
future
2100
2050
2030
now

## 4.4 Enablers and Barriers for Integration

Despite contextual differences, the enablers and barriers for integration between water-related challenges and land use were largely similar for both Regional Delta Programme's (RDPs). This is in line with literature: although regional contexts differ, challenges and solutions for water governance often come down to the same factors (Abbas et al., 2023; Hurlbert & Diaz, 2013). This subsection begins by discussing the enablers, followed by the barriers.

*Figure 4.10 Barriers and Enablers for Integration*




### 4.4.1 Enablers

Regional integration of water-related challenges and land use is driven by a combination of 1) agency-related factors: willingness, interpersonal relationships, and coincidence, and 2) structure-related factors: early awareness of timelines, boundary-spanning actors, co-financing, and policy frameworks.

A key enabler for integration is **willingness** among water experts to pursue integrated outcomes. This commitment to collaboration is broadly observed across actors in water management. As one interviewee noted: *"The national government, the provinces, Rijkswaterstaat, and the water boards—we are all eager to realize great, integrated projects"* (R12). This willingness is omnipresent on the level of individual water and land use experts *"everyone finds it logical to collaborate and implement measures that combine multiple themes"* (R11). It is gradually operationalised on a strategic level through the coordination between actors and programmes. This involves discussions at directorate levels on how to harmonise interventions. For example, alignment is being explored between the programmes Room for the River 2.0 (RvdR 2.0) and the Flood Protection Programme (HWBP) in RDP Maas. Similarly, efforts are made in RDP ZWD to align HWBP and the programme for ecology and water quality in major water bodies (PAGW).

In addition to willingness for actor-level collaboration, **interpersonal relationships** are important enablers. Familiarity developed through previous collaborations or through meetings organised by the Delta Programme can facilitate cooperation and reduce the need for formal coordination mechanisms. In enabling integration, this is especially important for executives, who are responsible for a specific portfolio and a certain amount of money. An example is the Ooijen-Wanssum project, where existing relationships among decision-makers contributed to them combining funds and realising an integrated spatial development for flood safety and nature. A respondent commented: *"Why it worked there and not elsewhere? That's hard to say. But what you do notice is that there was a willingness to work together here, and I think the fact that they knew each other really contributed to that"* (R12). Knowing each other and being strongly embedded in the network allows actors to work across institutional mandates.

Interpersonal relationships are highly dynamic, particularly because elected executives rotate every few years. For this reason, successful integration is also partly attributed to **coincidence**. As one respondent noted: *"When executives who have known each other for a long time happen to come together"* (R12). Another added: *"It [integration] often arises naturally, when two parties happen to want something at the same time"* (R8). In a third instance, the 'Waterdunen project' in RDP ZWD was able to combine nature development, a camping, and dike reinforcement. The different parties *"were willing to invest a bit more than you normally would, because they saw 'perspective' in the area, so sometimes these things come together through coincidences"* (R6). While these instances may be coincidental, they nonetheless underscore the agency of individual actors to recognise and act upon opportunities as they arise.

**Early awareness of timelines** is another condition for successful integration. As one respondent explains: *"As long as you know each other's planning very early on, then I believe a lot is possible"* (R8). When actors inform each other early on of their timelines and they engage in dialogue about area-specific challenges and opportunities, this fosters a shared understanding of the area and the interrelationships within it. From here, a regional spatial development vision can be developed, serving as the foundation for long-term collaboration (Jansen & Beurskens, 2025).

This is closely related to **financing**. Integrating objectives requires combining funds and aligning goals from the outset. This, in turn, demands that actors look beyond individual interests and focus on shared outcomes. Financing can be aligned either voluntarily—between actors who trust each other and are committed to joint goals—or as a response to national requirements. For example, in the Ooijen-Wanssum project, shared financing was realised in an early stage by executives that knew each other and were willing to combine funds to reach shared goals. However, respondents note that such instances are extraordinary. In other cases, co-financing is mandated by national programmes, since the implementation of measures following a national policy programme often requires regional cofinancing. As one respondent explains, *"This requirement often serves as an incentive for municipalities, water authorities, and provinces to* *collaborate and pool their resources”* (R9). This enables integration. Still, creative thinking usually necessary to create a financial alliance between the stakeholders (Jansen & Beurskens, 2025).

In addition, a **boundary spanner**, an actor with the capacity to coordinate the process of integration and serve as the main point of contact, supports integration. For example, in the integration of HWBP and PAGW, the Programme Board of RDP ZWD took the lead. In the Ooijen-Wanssum project, a single individual led the initiative for 13 years (R8).

Finally, **policy frameworks** play a key role in creating conditions for integration. In the Meuse region, the introduction of integral river management in 2019—further developed through RvdR 2.0—has contributed to a more integrated perspective at the national policy level. This development has helped align strategic goals and provided a stronger foundation for programmatic coordination. In Gelderland and North Brabant, authorities have gone further by embedding integration into formal planning instruments. They jointly developed an interprovincial structure vision for river expansion. This provided not only a shared planning framework but also a legal mechanism to legitimise spatial interventions.

#### 4.4.2 Barriers

Barriers to integration are predominantly structural, and include institutionalisation discrepancies, financial and timeline constraints, conflicting regulations, the inherent complexity of integration, and a multiplicity of interests.

The first barrier to integration lies in the **structural discrepancy between policy domains**. While flood safety has a well-defined framework linking ambitions to goals, financing, and responsible authorities, the domains of freshwater availability and nature development are still lacking such an implementation structure. This causes ambiguity, for example for freshwater availability, a respondent remarked *"You don’t really know what the task is. You could say, 'every cubic metre helps,' so to speak. It’s not like we’re saying, 'It has to be at least this much.' No, I don’t know. It’s sometimes really difficult to figure out what exactly you want to achieve in projects when it comes to freshwater availability"* (R4). The domain of ecology and water quality is not consistently regarded as a priority within water governance. This structural imbalance contributes to—and is reinforced by—a perceived lack of legitimacy for themes outside of flood safety. Because these domains are less institutionalised and less clearly defined, they are more easily deprioritised during decision-making processes. As a result, integration becomes more difficult, and less institutionalised topics are more frequently excluded.

Even when discrepancies are overcome and actors show willingness to integrate multiple challenges in one area, **financial barriers** pose a significant challenge. Regionally, stakeholders may express support for integration, but this often shifts when funding must come from their own budgets: *“Everyone is in favour of integration—until the money has to come out of their own pocket”* (R12). Regional decision-makers can easily argue that no funding can come from their portfolio. Nationally, financial barriers arise because programmes like HWBP, PAGW, and WFD have separate objectives. As one respondent described *“Everyone agrees combining programmes would be beneficial and this is being discussed continuously, but each programme still need to be executed”* (R7). The correspondent funds for programme objectives are fragmented and rigid, with resources strictly labelled for specific purposes. As one respondent noted, *"Heaven forbid that a single euro allocated for dike reinforcement is spent on another goal"* (R12). Another example is the slogan of water boards (and thus HWBP), which translates to "modest and cost-effective", leaves no room for other budget uses. Consequently, the numerous rules within programmes make "*integrated initiatives nearly impossible"* (R11).

Moreover, different funding sources often operate on **mismatched timelines**: *"One budget runs from 2030 to 2033, while another follows a completely different schedule"* (R12). This goes for subsidies as well, which are usually tied to strict conditions. As another respondent explains, *"You can't delay a project to combine it with a future measure if the subsidy terms are strict and time-bound"* (R8). These timing issues can derail opportunities for joint planning, even when regions are ready to act integrally. Struggles to align finances can lead to a sense of hopelessness among individual actors. One respondent illustrates: *"The fact that multiple challenges converge in the northern sector of the Maasplassen was already known ten years ago, but progress stalled due to the absence of funding. Over time, this led to a sense of resignation: 'It's not going to work anyway'"* (R12). This illustrates how financial structures—although logical within their own domains—often stand in the way of realising integrated outcomes.

Another barrier is **conflicting legislation and regulations**. National challenges, such as the energy transition, are imposed top-down on regions, claiming space and often leaving little room for integrated approaches. Additionally, current Natura2000 legislation prohibits disturbance of intertidal zones, meaning that possible integrated project must take place within dike-protected areas. However, these areas are claimed for agriculture and housing—land that many societal stakeholders are unwilling to give up.

Another barrier is the **complexity** of project-based integration, which demands additional time, funding, and effort. Respondents note that integrated area developments often take significantly longer to implement—typically between 10 and 15 years. Even when projects are supported by a shared regional vision, joint funding, and alignment with sectoral programme requirements, integration still demands time and patience (R8, R9). Responsibility is another concern: if a project runs over time or budget, it raises the question of who bears the risk. In addition, these projects tend to be relatively expensive in the short term due to the high level of coordination required. However, this financial picture might look completely different on the long term (R11). Yet, long-term uncertainty remains: *"Does it still work in 50 years?"* (R7).

A last barrier is the wide **diversity of interests**, of which some are perceived as irreconcilable. Respondents noted that conflicting agendas often undermine collaboration: *"It all falls apart when one party believes they don't need to take another's interests into account, because there are simply too many conflicting agendas"* (R8). Another respondent added, *"It's not always possible to bridge opposing interests"* (R9). The divide between water-related goals and broader spatial planning interests—such as housing, urban development, or economic infrastructure—can be even more pronounced. In the perception of water experts, economic stakeholders may view water-related goals as secondary: *"They think, to put it bluntly, 'That water stuff is too complicated. We'll expand the harbour first and deal with the rest later'"* (R8). These kinds of disconnects between 'water interests' and 'economic interests' present a major challenge to achieving integrated outcomes.

# 5 Conclusion and Discussion

## 5.1 Conclusion

Five sub-questions were formulated to answer the main research question. These are addressed using two water regions: RDP Zuidwestelijke Delta (ZWD) and RDP Maas. The first sub-question is: *How is water governance in Dutch water regions shaped and what is the role of the Regional Delta Programmes in water governance?* Regional water governance in the Netherlands is shaped by a combination of regional governmental and societal actors, and steered by the national government. The regional governmental actors are mandated to oversee water safety (water boards and Rijkswaterstaat) and spatial planning (municipalities and provinces). Responsibilities for freshwater availability, water quality, ecology, and nature development are scattered. While non-governmental actors, such as trade associations for fisheries, agriculture, nature, and industries, contribute to the debate, decision-making and implementation remain primarily a governmental affair. Within this regional water governance landscape, Regional Delta Programme's (RDPs) function as networking organisations, facilitating communication and collaboration among stakeholders in water governance in the region. RDPs bring together regional stakeholders to create a long-term shared strategy for water and land use.

The second sub-question is: *What power dynamics are visible in regional water governance?* All four types of power dynamics as identified in the literature review are present: 1) knowledge and information; 2) agenda-setting; 3) politics and ideologies; and 4) financial, technical, and institutional capacities. First, a broad knowledge base exists across water-related challenges, reflecting the interests of all stakeholders. Flood safety stands out, especially in RDP ZWD, where it received a boost through the Knowledge Programme Sea Level Rise (KP ZSS). Water availability, water quality, and ecology have the most knowledge-related questions that remain to be solved. Second, agenda-setting differs between regions. RDP Maas is primarily reactive to external triggers like weather events and new publications. RDP ZWD's agenda-setting is more politically driven, with new external events playing a secondary role. Third, in both regions, political influences caused tensions in water governance. This was more pronounced in RDP ZWD, where the agriculture lobby dominates the discourse on water. Governance in RDP Maas is less politically charged, though housing development interests shapes the debate on spatial reservations for water. Fourth, in both regions, the financial, technical, and institutional capacities are unevenly distributed across actors and themes. Flood safety benefits from a solid legal foundation, dedicated funding, established institutions, and well-developed technical solutions. In contrast, themes such as freshwater availability, water quality, and ecology lack comparable support in most of these capacities.

The third sub-question is: *How do regional water policymakers perceive interconnections among water-related challenges?* Across both case studies, numerous interconnections between water-related challenges were identified (flood safety, freshwater availability, water quality), economic water use (housing, agriculture, industry, recreation, fishing, shipping) and non-economic water use (nature and ecology). Due to the broader thematic scope of RDP ZWD, more interconnections were found here. In both regions, flood safety was regarded as essential for all economic functions. Furthermore, RDP Maas currently considers freshwater availability as a priority, and most connections centred around this theme. In RDP ZWD, ecology and water quality stands central to most water challenges and user functions. A notable gap in both case studies was the lack of perceived connection between freshwater availability and flood safety. In RDP Maas these themes were even presented as conflicting: while flood safety solutions aim to discharge water more quickly, freshwater availability measures aim at water retention. However, the overall strong presence of perceived interconnections indicates an understanding of the importance of integration.

The fourth sub-question is: *How do regional water policymakers perceive interconnections between water-related challenges and land use?* Land is widely perceived as scarce, yet every water challenge benefits from additional space—creating inherent tensions. The types of space needed differ: flood safety requires land alongside water bodies for dike reinforcements and water bypasses; freshwater safety needs inland water buffers or basins; and water quality and ecology benefit from expanded natural habitats both within and outside dike-protected areas. Across both cases, the spatial implications of flood safety are the most clearly defined and understood. In contrast, the spatial requirements for freshwater and nature are more ambiguous, likely due to greater knowledge uncertainty and weaker financial, technical, and institutional capacities. As a result, the most direct tension arises between flood safety and other land uses. In RDP ZWD, this tension is most pronounced between flood safety and agricultural land, whereas in RDP Maas it lies between flood safety and housing development. While regional interests play a significant role, land allocation decisions are ultimately made by the national government, making the spatial needs of water a highly political issue. The diversity of spatial claims, coupled with overall land scarcity, complicates spatial integration. Although synergies remain underdeveloped, ideas are emerging—such as combining flood safety with ecology in RDP ZWD, and combining nature goals with freshwater availability in RDP Maas. Lastly, awareness is growing that adaptations in land use are necessary to face water-challenges.

The fifth sub-question is: *What are the enablers and barriers in promoting an integrated approach for water-related challenges and land use in Dutch water regions?* Enablers are primarily agency-driven while barriers tend to be structure-related. Successful integration is most often attributed to individual willingness to collaborate, personal relationships and networks, and sometimes to coincidence or luck. Conversely, funding is consistently cited as the most prominent barrier. The existing system, both nationally and regionally, is organised around policy programmes, each with their own goals, budgets, and timelines. These frameworks are highly rigid, making it difficult to reallocate resources or align objectives across themes. This is compounded by disparities in financial, technical, and institutional capacities between flood safety and other water-related challenges. When capacities are concentrated on flood safety, integrating this with less-resourced themes becomes practically complex with funding and deadlines, but also risk muddling with established priorities. Another barrier is the perceived complexity of integration, reflecting unresolved knowledge-related issues. While there is broad support for combining solutions across challenges in shared spaces, stakeholders often ask: *how*? Here, a clear distinction emerges between local, project-based integration and the integration of entire policy programmes. The former can succeed despite structural barriers, thanks to agency-driven enablers. The latter requires coordinated, structural action at the national level.

The main question is: *How do the power dynamics in water governance and the perception of interconnectedness of the multiplicity of water-related challenges shape the capacity for integration between water-related challenges and land use in Dutch water regions?* The capacity for integration differed per indicator. Across both cases, communication intensity and actor-based mechanisms are high. Mindset alignment is intermediate to minimal and rule- and resource-based mechanisms are minimal. This gives a scattered view of the capacity for integration. Systems thinking—agency—shapes the capacity for integration by influencing which interconnections between themes are recognised or overlooked. A broad overview of interconnections was identified by water experts and desk research documents, highlighting the inherent complexity and interdependence between water-related challenges. The high communication intensity can be attributed to the perceived connections. The recognition of how issues are linked makes frequent communication both necessary and logical.

Power dynamics—structure—shape the capacity for integration through prevailing politics and ideologies, through discrepancies in financial, technical, and institutional capacities, and through the agenda-setting of issues. First, political cycles and prevailing ideologies create an environment that stimulates advancing individual interests. This, in turn, sets the tone for mindset misalignment. Elected actors enact their own interests to remain politically popular. Dominant political influences on land use are agriculture, housing development, and flood safety. The largest mindset misalignment is between municipalities, focussing on the short term, and the other institutions, focussing on the medium to long term. Second, the discrepancies in financial, technical, and institutional expertise across themes hinder the development of overarching rule- and resource-based mechanisms needed for integration. Every theme remains confined to its own policy programmes, funding streams, and executing organisations. The differing strengths of these structures between themes further complicate efforts for integration. Third, the networking function of the RDPs facilitates strong actor-based mechanisms. Agenda-setting of issues can contribute to actor-based mechanisms, by creating urgency for the collaboration between actors, finances, and policies.

In conclusion, both agency, through perception of interconnectedness, and structure, through power dynamics, shape the capacity for integration between water-related challenges and land use. Perceived interconnections tend to stimulate integration, whereas power imbalances generally discourage integration. Across both case studies, structural power imbalances appear to have greater influence than individual willingness or the recognition of linkages between themes. Combining water-related challenges in strategy and in space remains difficult in practice.

## 5.2 Discussion

This discussion aims to place the research findings within a broader perspective. The identified theoretical knowledge gap lies in the literature's limited attention to the agency of individual actors in the context of water governance (Jiménez et al., 2020). This research has addressed this gap by applying systems thinking to regional water governance case studies. It has analysed the distinctions and interconnections identified between water-related and land use themes in two water regions. However, the analysis of distinctions and interconnections is not a substitute for systems thinking as a whole, and its application alone does not guarantee the design of genuinely systemic solutions (Wan Rosely & Voulvoulis, 2024). Still, this study demonstrates that systems thinking research can give voice to agency, particularly in relation to the capacity for integration. Existing literature highlights that the current multitude of water-related challenges in the Netherlands is fundamentally a governance challenge of integrating water- and land use (Macpherson et al., 2024; Van Eldik et al., 2024). This study builds on that insight by showing that this understanding is not only theoretical but also widely shared at the individual level within the water sector. The strong awareness of interconnectedness among water experts indirectly reflects a recognition of the need to address water and land use issues through an integrated approach. The reflection on interconnectedness in the conclusion has painted a clear picture of which issues are perceived as related, and which lack connection.

The empirical knowledge gap underscored the need to examine the capacity for integration within a single sector, rather than across multiple sectors (Trein et al., 2021). This research has demonstrated that the water sector itself constitutes a complex web of actors, responsibilities, interests, and capabilities. It is also deeply interwoven with economic and non-economic water uses. This indicates that integration within a single sector cannot be taken for granted. In this research, this is reflected in the barriers posed by national policy programmes. Programmes within the water sector, for example PAGW, WFD and HWBP, operate with separate budgets, timelines, and objectives, even though they apply to the same water systems. This hinders thematic integration. At the same time, this research also shows the potential of integration within the water sector, demonstrated by the well-established and frequent communication between organisations.

This study has contributed scientifically by uncovering a wide range of factors that expose both individual agency and underlying structural dynamics. By juxtaposing these two dimensions, it becomes clear that both shape the capacity for integration. Previous research also emphasises the continuous interaction between agency and structure (Hays, 1994). Consistent with this, this study shows that power dynamics and systems thinking mutually influence one another. The perceived legitimacy of a water challenge is both influenced by—and in turn shapes—its structural embeddedness within legal frameworks, policy documents, financial instruments, and executing agencies. Water challenges with weaker structural embeddedness, such as water quality and ecology, are often perceived as subordinate relative to other challenges. This dynamic reinforces itself and contributes to discrepancies between themes, ultimately affecting the overall capacity for integration. This suggests that capacity for integration is not only a technical or institutional challenge but also a question of perceived legitimacy and structural prioritisation. Therefore, future research should pay close attention to how certain challenges gain or lack structural embeddedness, and how this influences their visibility and perceived importance in governance processes.

The theoretical framework outlines the central role of governmental actors in water governance, situated with the governance triangle of state, market, and civil society (Thompson, 1991). Findings indicate that the state's role is particularly strong for flood safety, which is in line with centralised governance mode (Driessen et al., 2012). However, other water challenges, such as water quality, ecology, and freshwater availability, are governed through more fragmented arrangements involving economic actors and civil society. For instance, responsibilities for water quality and ecology are scattered across nature organisations, provinces and water boards, while drinking water companies and households hold responsibility for freshwater availability. These challenges are less characterised by centralised governance, and more by self-governance (Driessen et al., 2012). Within the governance structure of the RDPs, civil society is absent. Economic actors are represented, although with a minimal, advisory role. However, a reassessment of responsibilities is emerging: there is growing momentum for governmental actors to delegate some responsibility for flood safety to market- and civil society actors, while simultaneously expanding the state's role in managing freshwater availability, ecology, and water quality. The balance within the governance triangle appears to be shifting. Water governance is becoming more dynamic and increasingly reliant on non-governmental actors. Such shifting responsibilities in governance, however, can cause temporary 'gaps' or ambiguities (Trell & Van Geet, 2019). Therefore, attention should be paid to how perceived responsibilities develop over time.

The theoretical framework explored thematic and spatial integration within and between water challenges and land use. Spatial integration proved to be more tangible, as it was primarily understood by water experts in local terms—namely as combining different measures for several water challenges within a defined spatial perimeter. Thematic integration was understood as aligning strategies for water challenges. The insight that emerged is that both spatial and thematic integration are ultimately constrained by the rigidity of national policy programmes. These programmes are inflexible in goal-setting and funding structures, making integration at the local level difficult and thematic integration almost impossible. Moreover, the national government plays a decisive role in land use allocation, further reinforcing the importance of national-level coordination. This suggests that, although the regional scale offers a practical entry point for exploring systems thinking and power dynamics, the core of the integration challenge lies at the national level of governance. With literature indicating that incentives provided by the central government determine the motivation of local governments to engage in innovative, integrated planning initiatives (Pahl-Wostl, 2017), there is a need for national leadership that enablers, rather than constrains, regional integration efforts.

## 5.3 Recommendations for Future Research

The comprehensive scope of this research opens up multiple directions for future research. First, the results revealed that politics and ideologies are an influential power dynamic that shape the capacity for integration in water governance. On this basis, future research could further examine how political agendas, value systems, and ideological orientations influence decision-making processes in water governance. This research aimed to research these dynamics through participatory observations. However, access was limited to settings where actors exchanged information, rather than decision-making settings. It is in the latter where power dynamics such as politics and ideologies are most visible. Therefore, it is recommended to apply participatory observations to explore political influences in water governance in decision-making settings. Another approach to exploring political influences is discourse analysis of policy debates and planning documents. The provincial scale is fitting for both approaches, as this would capture the interactions between municipalities, provinces, and water boards.

Secondly, future research could further explore the barriers in aligning and integrating national policy programmes. This has emerged as a main structural barrier to the integration of water challenges and land use. This could be explored through policy analysis combined with stakeholder interviews across the ministries of IenW, LVVN, and VRO. Such research could investigate misalignments in objectives, timelines, funding mechanisms, and institutional mandates, and assess how these contribute to fragmentation.

Another recommendation is to include the perspective of spatial planners. In this research, the effects of the changing hydrological situation on land use and water users were examined through the perspective of water experts. Conflicts over the use of space were identified, primarily between housing, agriculture, measures for flood safety, and space for natural habitats. Balancing these competing needs is central to spatial planning. Therefore, insight into how spatial planners perceive and navigate the spatial impacts of water-related challenges would enrich the understanding of cross-sectoral integration. This could be executed by conducting semi-structured interviews with municipal and national spatial planners.

A final recommendation is to broaden the analytical scope beyond governmental actors. In light of shifting responsibilities within water governance, future research could explore how economic actors perceive the effect of changing hydrological realities on land use and water users. A systems-thinking approach, supported by semi-structured interviews, would be well-suited. Key actors to include are housing developers and agricultural stakeholders, because of their prominent influence on the political debate. Other interesting economic actors are drinking water companies, nature conservation organisations, and the shipping sector.

## 5.4 Implications for Planning Practice

The identified enablers and barriers for integration, as shown in Figure 4.10, suggest several implications for planning practice. First, communication- and actor-based mechanisms on the regional scale result in several enablers for integration: enhancing interpersonal relationships, engaging in dialogue, and creating a shared understanding. While effective, these enablers are still largely coincidental and ad hoc. Therefore, RDPs should strengthen their networking roles to ensure continuity and resilience beyond individual relationships or projects. In addition, municipalities engage the least in communication- and actor-based mechanisms in water governance. Their focus tends to be on short-term, immediate concerns, whereas other actors often work with longer-term perspectives. RDPs could take a more proactive role in engaging municipalities and aligning temporal perspectives. Additionally, RDPs could strengthen their integrative potential by more actively involving non-governmental actors, whose perspectives are currently underrepresented in regional governance.

Another implication for planning practice is that the national government should reduce the rigidity of financing and timelines of policy programmes and subsidies—it hinders joint planning, even when actors are willing. A solution would be to develop flexible funding schemes enables the combination of resources across policy goals, giving local actors the space to implement integrated solutions. While integrating multiple objectives within one areas will remain complex, financial flexibility can better equip actors to navigate and manage this complexity. Importantly, this implication is not about increasing funding, but about enabling more adaptive allocation.

Lastly, visualising integration opportunities can enhance policymakers' understanding of what integration might look like and would help reduce siloed thinking. Scenario-based workshops, for instance, could support national policymakers in exploring how greater alignment might be operationalised. Local case studies that successfully integrated multiple objectives could serve as examples in these sessions.

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# 7 Appendix A: Participatory Observations

*Details of the participatory observations*

| | Date | Location | Time | Participants | Topic | Setting |
|---|---|---|---|---|---|---|
| **1** | 19/12/24 | Utrecht | 10.00 – 13.00 | RDP IJsselmeergebied working session | Recalibration RDP IJsselmeergebied | Water experts from RDP IJsselmeergebied discussed discuss the recalibration of their strategy |
| **2** | 22/01/25 | Utrecht | 10.00 – 16.00 | 20 water experts from all RDPs | Recalibration session all RDPs | Representatives of all RDPs discussed and compared progress on recalibration of the RDPs |
| **3** | 05/03/25 | Den Bosch | 14.00 – 16.00 | 4 water experts from RDP Maas | Recalibration RDP Maas | Water experts from RDP Maas visualised possible future scenarios on a map for their recalibration |
| **4** | 06/03/25 | Haarlem | 13.00 – 17.00 | 10 spatial planners + 40 water experts (from drinking water companies, water boards, Rijkswaterstaat) | Omgevingsvisie Province North Holland | Spatial Planning department of the Province of North Holland invited 40 water experts to think about future waterscapes in North Holland |
| **5** | 14/03/25 | Delft | 09.30 – 13.00 | 8 water experts from RDP ZWD | Recalibration RDP Zuidwestelijke Delta | Water experts from RDP Zuidwestelijke Delta discussed the recalibration of their strategy |
| **6** | 18/03/25 | Utrecht | 10.00 – 13.00 | 20 water experts from all RDPs | Recalibration session all RDPs | Representatives of all RDPs discussed and compared progress on recalibration of the RDPs |
| **7** | 09/04/25 | Rotterdam | 13.00 – 16.30 | 15 stakeholders from water and spatial planning. | RDP DPRD Workshop on the impact of local spatial developments on flood safety | RDP Rijnmond Drechtsteden organised a session with stakeholders from PoR, municipalities, province South Holland, and water boards for the recalibration of their strategy |

# 8 Appendix B: Interview Guide

**0. Introduction**

- Introducing research
- Outlining interview structure
- Requesting consent to record

**1. Interviewee Information**

- Can you describe your role in the Delta Programme (DP) and your background?
- How many days per week do you work on the DP? From which organisation? For how long?

**2. Interconnectedness**

Water – water

- What water-related challenges does the DP address? What is your specialization?
- What are the links between water themes X, Y, Z? Are any connections missing?
- What other policies exist for themes X, Y, Z in the region? How does the DP relate to them? What obligations arise from them for the DP?
- How is knowledge from these other programs used?
- Can you describe collaboration and communication with organisations responsible for these policies?
- Are there obligations to integrate different themes at the project level?
- What are the main barriers and enablers for integrated projects?
- What funding mechanisms are available?

Water – land use

- What types of measures could improve theme X, Y, Z? How do these impact land use?
- Can you explain the concept of reserving space for water?
    - What barriers are encountered in doing so?
    - What land use functions are affected by these spatial reservations?
    - Is there pressure from other sectors to abandon reserved space?
- Do you monitor spatial planning policies? If yes, what obligations arise from them?
- How is cooperation and communication with spatial planning authorities?
- Is there a budget available for collaboration with RO (research/projects/policy)?
- To what extent is it the DP's responsibility to consider the spatial implications of water measures?

**3. Organisation, governance, and power dynamics**

*Actor-based mechanisms + Communication intensity*

- What role does the RDP play in the region?
- Can you tell us about the products/services/activities provided by this DP?
- To whom is the RDP acountable, and how?

- Can you briefly explain how the RDP is organised?
- Team water experts, describe:
  - Size, seconded organisations, division of tasks
  - Frequency of contact, in-person collaboration, and work form
  - How would you describe internal communication?
  - Who decides what the team works on?
  - What meetings with other organisations/programmes do you attend? How do they influence daily work and long-term direction?
- Governing board
  - Composition and size of the governing board
  - Frequency of contact with the board
  - Who sets the agenda for meetings with the board?
  - How would you describe communication with the board?
  - To what extent do you anticipate on the political orientation of the board members?
  - What role does political orientation of board members play?
  - What conflicting interests exist? How are they managed?
  - What influence do board members and civil service groups have on strategic direction?

*Mindset alignment*

- What are the main priorities of the stakeholders in the region?
- What is the focus in the current recalibration process?
  - What changes compared to the current strategy?
  - What are the main point of discussion?

*If remains unclear from the previous conversation: Knowledge and information + Resources*

- Can you explain how knowledge is gathered?
- Who provides this knowledge and how is it used?
- Can you explain how this DP is funded?
  - How do these funding sources influence the activities?
  - How are these resources allocated?

**4. Closing**

- Any remaining questions, topics or remarks to add?
- Recommendations for other people to speak with?
- Thank you

# 9 Appendix C: Interviews

*Interviews*

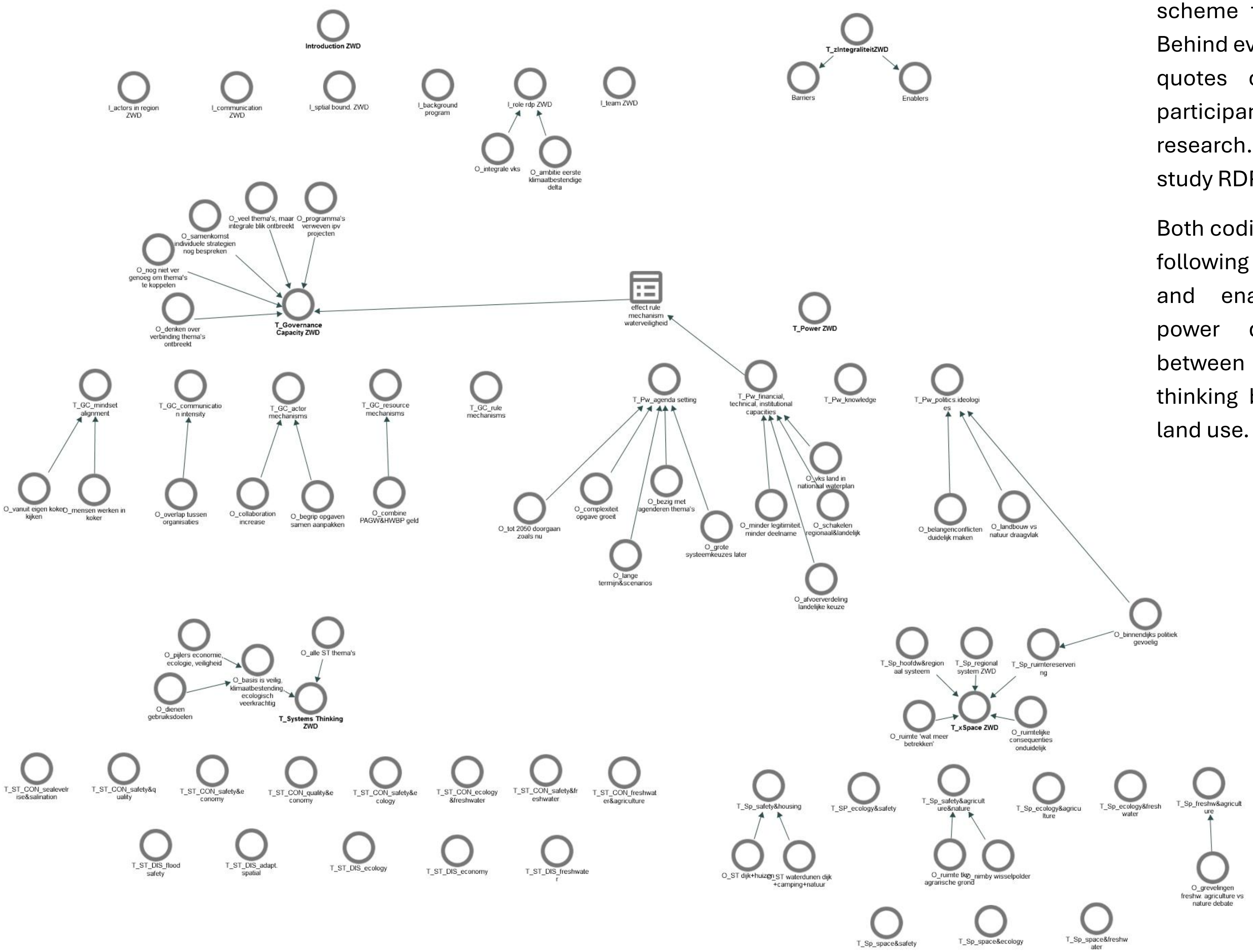
| R | Date | Location | Duration | Organisation | Function interviewee | Type of interview |
|---|---|---|---|---|---|---|
| **1** | 25/02/25 | Online | 34 mins | National Delta Programme | Process manager for the NDP, general water expert | Exploratory |
| **2** | 08/04/25 | Online | 62 mins | RDP ZWD | Water quality and ecology expert | Semi-structured |
| **3** | 08/04/25 | Online | 90 mins | RDP Maas | Governance coordinator and flood safety expert | Semi-structured |
| **4** | 10/04/25 | Online | 55 mins | RDP Maas | Flood safety and freshwater availability expert | Semi-structured |
| **5** | 11/04/25 | Online | 63 mins | RDP ZWD | Head of RDP ZWD, general water expert | Semi-structured |
| **6** | 16/04/25 | Online | 73 mins | RDP ZWD | Manager recalibration RDP, flood safety expert | Semi-structured |
| **7** | 17/04/25 | Online | 77 mins | Deltares | General water expert, focus on knowledge production & dissemination | Semi-structured, Validatory |
| **8** | 22/04/25 | Online | 60 mins | RDP Maas | General water expert, focus on spatial planning | Semi-structured |
| **9** | 25/04/25 | Online | 59 mins | RDP Maas | Head of RDP Maas, general water expert | Semi-structured |
| **10** | 01/05/25 | Online | 58 mins | RDP ZWD | Sea level rise expert and spatial planner | Semi-structured |
| **11** | 08/05/25 | Online | 56 mins | RDP ZWD | Flood safety expert | Semi-structured |
| **12** | 21/05/25 | Online | 29 mins | Water Board Limburg | Flood safety expert | Semi-structured, Validatory |

# 10 Appendix D: Documents

*Regional water policies*

| | Region | Document | Reference |
|---|---|---|---|
| **1** | ZWD | Gebiedsagenda 2050 | Zuidwestelijke Delta (2020). *Gebiedsagenda Zuidwestelijke Delta 2050*. https://zwdelta.nl/app/uploads/2022/03/gebiedsagenda_zuidwestelijke_delta_2050_interactief.pdf |
| **2** | ZWD | Integrale Voorkeursstrategie | Zuidwestelijke Delta (2021). *Integrale Voorkeursstrategie Zuidwestelijke Delta*. https://zwdelta.nl/app/uploads/2022/01/deltaprogramma_2021_integrale_voorkeursstrategie_zuidwestelijke_delta.pdf |
| **3** | ZWD | Gebiedsatlas | Defacto Stedenbouw (2024). *Atlas van de Zuidwestelijke Delta*. https://www.zwdelta.nl/app/uploads/2025/01/Atlas-Zuidwestelijke-Delta_oktober2024_highres.pdf |
| **4** | ZWD | Verkennende Systeemanalyse | Nolte, A., Grashof, J., & Bolman, B. (2024). *Verkennende Systeemanalyse Zuidwestelijke Delta*. https://publications.deltares.nl/11210350_004_0002.pdf |
| **5** | ZWD | Uitvoeringsprogramma Zuidwestelijke Delta | Zuidwestelijke Delta (2024). *Verbonden in Verandering. Uitvoeringsprogramma Zuidwestelijke Delta 2024*. https://www.zwdelta.nl/app/uploads/2024/01/Uitvoeringsprogramma-Zuidwestelijke-Delta_2024.pdf |
| **6** | ZWD | Zeeuws Deltaplan Zoetwater | Provincie Zeeland (2021). *Zeeuws Deltaplan Zoetwater*. https://www.zeeland.nl/sites/default/files/2022-02/Zeeuws%20Deltaplan%20Zoet%20Water.pdf |
| **7** | Maas | Adaptieve Uitvoeringsstrategie Maas | Deltaprogramma Maas (2019). *Adaptieve Uitvoeringsstrategie Maas 2020-2050*. https://www.deltaprogramma.nl/binaries/deltacommissaris/documenten/publicaties/2019/10/24/adaptieve-uitvoeringsstrategie-maas/Adaptieve+Uitvoeringsstrategie+Maas_DEF.pdf |
| **8** | Maas | Factsheet Deltaprogramma Maas | Deltaprogramma Maas (2023). *Betrokkenen bij het Deltaprogramma Maas*. https://www.deltaprogramma.nl/documenten/publicaties/2023/02/01/factsheet-betrokkenen-bij-deltaprogramma-maas |
| **9** | Maas | Ruimtelijk Perspectief Maas | Deltaprogramma Maas (2018). *Ruimtelijk Perspectief Maas*. https://www.deltaprogramma.nl/binaries/deltacommissaris/documenten/publicaties/2018/09/18/ruimtelijk-perspectief-maas-positionering-kansen-en-ambities-in-relatie-tot-maatregelen-hoogwaterveiligheid/180709+Werkdocument+Ruimtelijk+Perspectief+Maas_downloadversie.pdf |
| **10** | Maas | Ontwerpprogramma Integraal Riviermanagement | Ministerie van Infrastructuur en Waterstaat (2023). *Naar een toekomstbestendig rivierengebied. Ontwerp Programma Integraal Riviermanagement*. https://open.overheid.nl/documenten/dpc-fbe26ffe799372f44daf6e41e0bf43687d3eaa4d/pdf |
| **11** | Maas | De Maas, klaar voor de toekomst | Deltaprogramma Maas (2025). *De Maas, klaar voor de toekomst*. https://www.deltaprogramma.nl/binaries/deltacommissaris/documenten/publicaties/2025/04/02/projectenkaart-maas/Projectenkaart+Deltaprogramma+Maas.pdf |
| **12** | Maas | De Maas krijgt meer ruimte | Beurskens, K. & Jansen, C. (2025). *De Maas krijgt meer ruimte*. https://magazines.deltaprogramma.nl/deltanieuws/ |

# 11 Appendix E: Coding Scheme




This is a screen print of the coding scheme for the case study RDP ZWD. Behind every node, there is a collection of quotes coming from the interviews, participant observations, and desk research. The coding scheme for the case study RDP Maas is similar.

Both coding schemes are divided into the following groups: introduction, barriers and enablers, governance capacity, power dynamics, systems thinking between water challenges, systems thinking between water challenges and land use.