DEALING WITH SALINIZATION IN THE NETHERLANDS

A GOOD GOVERNANCE CASE?

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PREFACE AND ACKNOWLEDGEMENTS

I want to sincerely thank all the people involved in the process of this research. My biggest thanks goes out to my supervisor Carel Dieperink, the six anonymous interview participants and my family and friends. The period during which this master thesis is written, has not always been the easiest due to unforeseen medical circumstances. The support of both my supervisor and family have seriously helped me to reach the goal of finishing this thesis. Despite the sometimes difficult process, I have really enjoyed the in-depth stakeholder interviews and working with the data. I learned a lot from each of the participants, even on subjects like professionalism and critical thinking. I hope everyone enjoys reading, and my fellow researchers and students will use the conclusions from this research as a starting point for future research on the governance of salinization and freshwater. Feedback and / or questions are very welcome and can be sent to my e-mail address.

ABSTRACT

Climate change is putting pressure on freshwater systems across the globe due to increased prevalence of more intense droughts, more extreme weather events and a rising sea-level. As such, governance of water-related systems gets increasingly more attention from scientists. During recent years, the Dutch water system has been put under pressure even more by salinization and droughts. This is directly linked to climate change and freshwater supply. Future scenarios tell that this problem will become more problematic in the future. Recent research on salinization and governance has not yet addressed the two topics combined, which indicated that there is a knowledge gap. As such, this research aimed to provide insights in characteristics of good salinization governance, provide an evaluation of the current Dutch salinization governance, and deliver a set of recommendations for addressing bottlenecks within the current salinization governance system.

To find out whether the governance system of salinization could be considered good, an analytical framework, based on a conceptual framework adopted from Bennett and Satterfield (2018), was constructed for the assessment of the effectiveness, the equitability, the responsiveness, and the robustness of the governance system. During the research various freshwater- and salinization-related policy documents have been analyzed. In addition, a series of in-depth interviews with key stakeholders from the governance system have been conducted. The data, with corresponding scores on various governance objectives and characteristics, gave insights on which objectives of governance are scoring poorly, and which are evaluated as good.

The results showed that policy documents and stakeholder opinions did not align. Following from the results, this research concluded that the implementation of policy is being hold back and that effective and responsive action is not following timely. Most of the participants did especially have critique on the direction, capacity, efficiency, and fairness of the system. As such, there is a need for better implementation of the policy to improve the performance of the system The context-rich stakeholder interviews indicated that there are bottlenecks within the science-policy interface, politicization of freshwater governance and that there is a too flexible approach to freshwater management. This research provided a recommendation for each of these bottlenecks, in order to improve the governance system in the future. Due to some limitations of the research, future research on each of the bottlenecks could provide valuable insights on how to improve the governance system for more effective and timely action.

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1 INTRODUCTION

1.1 THE IMPORTANCE OF GOOD SALINIZATION GOVERNANCE

Although approximately 70% of the Earth's surface is covered by water, only about 2.5% of all water on the globe is considered freshwater (Kaushal et al., 2021). Only about 1% of this freshwater is considered accessible because most is stored in glaciers and other inaccessible places. Climate change is altering weather patterns worldwide, causing more drought stress (Ashraf et al., 2017), more extreme weather events and a rising sea level (Werner et al., 2009). This is globally threatening the majority of low-laying delta regions. Not only does this directly threatens to push the coastal civilian populations land inwards because of flood risks, it also threatens the availability of sufficient freshwater and food. At this moment climate change already affects the availability of sufficient freshwater of good quality. This is mainly the case due to changing weather patterns and related processes, such as increased evaporation, decreased water retention capacity of soils and lower expected amounts of precipitation. The consequences of climate change are already visible, and will according to recent studies, become increasingly more severe in the near future. In 2050, more than halve of the global population will live in regions with water scarcity (Boretti & Rosa, 2019). Recent research has indicated that under current projections for climate, population and the economy, water freshwater demand will exceed supply (Boretti & Rosa, 2019). This is frightening, considering that freshwater is the primary need or resource of almost any life form and product on earth. As such, good governance for freshwater resources is of great importance.

The Netherlands, often renowned for its water management approaches, has had three record breaking drought years during the last decade. The years 2018, 2020 and 2022 are all marked as extremely dry by the Dutch Meteorological Institute ('KNMI - Niet Eerder Deze Eeuw Zo Droog Als Dit Jaar', 2022). The precipitation deficit of the period between April and September 2022 reached 318 mm, which is almost twice as much compared to normal years. The precipitation deficit is calculated by subtracting evaporation and precipitation. The trend of recent years indicates that, in the upcoming decades, there will be more drought stress with various consequences. The droughts have already had negative impacts on agricultural yields, water quality, water availability, land subsidence, water-based transport, and natural ecosystems (Philip, 2020). In addition, the droughts pushed a less known issue on the agenda: salinization. Salinization, or salt intrusion, has recently become a more urgent issue, with increased media coverage during the last couple of years. Despite it being less known as an urgent issue to the public, experts have been warning for the impacts of salinization for a longer time. Yet, the real adverse effects have become clearer during the recent droughts. As such, more widespread interest in how to deal with the issue during the uncertain times of climatic changes, have led to increasing scholarly interest and report requests to knowledge institutes from stakeholders who operate with freshwater resources (Delmans et al., 2022). It has become clear that drought, salinization, and other water issues do not come separately, but are closely linked together. This raises the question whether there is a need for a more integral governance approach for dealing with these matters and if some conceptions on water management need to be rethought.

Salinization into coastal water bodies and the accumulation of salts in aquifers and soils is a natural process caused by waves, storm surges and tides (Paul & Rachid, 2017). Such natural accumulation of salts in the environment is called primary salinization. Salinization is a serious

environmental issue which causes harm to ecosystems, croplands and poses serious threats on socio-economic systems such as the provision of freshwater to urban coastal populations (Chang, 2011). In pre-anthropogenic times freshwater aquifers were less overexploited and refills caused by precipitation and discharge would occur more frequently. Anthropogenic activities such as over-pumping and excess paving have massive impacts on recharge mechanisms of groundwater aquifers, which consequently impacts nutrient loading (Chang, 2011), increases salinization (Chang, 2011), and potentially causes hazardous substances to leech into such freshwater aquifers (Akhtar et al., 2021). Salinization caused by climate change and other external factors is called secondary salinization (Paul & Rachid, 2017). This phenomenon affects natural groundwater flows, having serious consequences to recharge mechanisms and ultimately causing leaching of saltwater into the aquifer systems (Chang, 2011). According to Kaushal et al. (2021) there is a complex interrelationship between *''salt ions and chemical, biological, and geologic parameters with consequences on the natural, social and built environment''*. This problem, also called Freshwater Salinization Syndrome (FSS) has several severe impacts such as damage to ecological systems, pressure on the availability of sufficient drinking water, damages to agricultural food provision and infrastructural corrosion (Kaushal et al., 2021). Over the last decades, salinization has increased to occur globally without recognition like other water pollution issues such as acid rain and eutrophication (Kaushal et al., 2021).

Low lying delta's, such as the Dutch delta region, where the river systems of the Rhine, Scheldt and the Meuse meet the North Sea, are most at risk for salinization of groundwater aquifers and surface waters, due to the presence of high hydraulic head and its resulting upward flow of groundwater (Oude Essink et al., 2010). Increased salinization can have serious consequences for drinking water supplies, agriculture, ecosystems, and infrastructural works (Oude Essink et al., 2010). Worldwide about 1.5 - 2 billion people rely on groundwater as their main source of drinking water (Teh & Koh, 2016). Declining water resources in combination with increased salinization pose serious threats on water security (Teh & Koh, 2016). In addition, salinization in combination with vegetation competition, caused by changes of the climate, can pose serious threats to food security (Teh & Koh, 2016). Crop yields are likely to drop due to increased salt concentrations in the soil (Oude Essink et al., 2010). According to recent research by Kumar and Prasad (2018) increased salinization also negatively affects the water retention capacity of the soil, eventually putting even more stress on food and water availability. Salinization of soils can have major impacts on biodiversity and ecosystems through various geochemical processes. Salinization of freshwater increases the mobilization of contaminants in soils and sediments. It can displace toxic heavy metals such as copper, lead, and zinc (Kaushal, 2016). In addition, salinization can increase the leaching of organic nitrogen, ammonium, and phosphorus from ion exchange sites in soils and sediments, leading to a variety of environmental issues such as eutrophication and biodiversity loss (Kaushal, 2016). Plumb (Pb) piping systems for freshwater are also at risk due to chemical reactions caused by increased salt concentrations in drinking water (Kaushal, 2016; Pieper et al. (2018). Due to the variety of adverse effects of salinization, the maximum allowable chlorine concentration in the Netherlands for inland water sources is set at 250 mg/L (Kwadijk et al., 2010). As such, water inlets in various coastal regions in the Netherlands are already closed from time to time. This has impact on water-based transport and ecosystems.

The issue is becoming more urgent than ever now that projections of the IPCC expect the sea is likely to rise more than expected. In 2100 sea-level rise may already exceed the 100 cm range worldwide (Oppenheimer, 2019). Salinization is mentioned within the report as one of the major

challenges which lay ahead for adaptation to the increased sea-level. Governance is considered one of the most important tools for adequately addressing climate-related challenges. Timely and effective management depends on good governance. Although freshwater salinization in arid and semi-arid regions has been the focus for most of the scientific research, papers by Kaushal et al. (2021) and van Alphen et al (2022) points out that there is an additional need for a new focus on salinization in more humid environments and on good governance strategies for salinization and freshwater.

1.2 KNOWLEDGE GAP, RELEVANCE AND RESEARCH OBJECTIVE

Governing environmental issues, such as salinization, is becoming more and more difficult and need a multidisciplinary and integrative governance system, which make sure that stakeholders can steer the issue towards a desired state. This happens through regulatory processes, mechanisms, organizations, and institutions. In fact, such an issue with many uncertainties and ambiguities could be referred to as a 'wicked' problem, described by Rittel & Webber in 1973 as a problem; with no definitive formulation, no stopping rule, and no true-false solution. Such 'wicked' problems can be considered as a symptom of another problem and often also lead to new ones itself.

Although there has been an increase of academic interest in the topic of freshwater salinization (Kaushal et al., 2021; Oude Essink et al., 2010), most research is limited to the impacts and causes of freshwater salinization. A preliminary literature review on Scopus and Google Scholar using the keywords 'governance' and 'salinization' did not give any direct hit. There have been some papers discussing adaptation strategies for increasing sea-levels (Kwadijk et al., 2010; van Alphen et al., 2022), but the largest challenges associated with salinization are most likely to occur in the field of governance because in practice such 'wicked problems' are extremely difficult to manage and solve. This is especially the case due to the uncertainty and ambiguity of environmental issues (Rittel & Weber, 1973), especially those that arise due to the impacts of anthropogenic climate change. It is already acknowledged by the ministry of infrastructure and water that governance is of great importance for freshwater related challenges. In 2012 the governing bodies responsible for water requested a report from the OECD on water governance and the readiness of the governance system for adequately addressing future water related challenges. More research on freshwater related challenges is desired given the fact that changes in environmental systems are accelerating.

Research on governance has according to Bennett and Satterfield (2018) ''*focused on normative or procedural considerations (e.g., participation, recognition, access to justice) rather than substantive concerns (e.g., ecological and social outcomes) related to different governance regimes*''. As such, more qualitative research is desired to get better understanding how such governance characteristics (e.g., participation, recognition) function in a wider governance system. This adds valuable insights for better understanding of governance systems. In order to find more effective and integrative solutions for 'wicked' problems, governance should be less rigid and incorporate adaptive self-learning mechanisms and evaluative tools in order to constantly bend along with the issue or problem (Rijke et al., 2012). In addition, effective communication between science and policy is mentioned as a necessity for well-informed adaptation management and governance systems that perform effective on long-term time scales (Dessai & van der Sluijs, 2007). Such adaptive or responsive governance strategies are often of great importance for the management of complex issues such as is the case with the complex issue of salinization. Yet, every governance system is

unique. As such, it is both interesting and necessary to gather data on which governance characteristics are of importance for effective management strategies for salinization and freshwater. According to Bennett & Satterfield (2018) *''additional efforts are needed to better understand the cause-effect relationship between governance and social and ecological performance''*.

Given the fact that salinization is quite a new pillar of freshwater governance, it is desired that there will be more research on the performance of the governance system. Such considerations will provide valuable insight on what aspects of governance are of most importance, how they are functioning currently and on what aspects there is a necessity for change in order to bend along with the changing environment. This research aims to address all these aspects and aims to provide a series of recommendations which may help to adapt the governance system where necessary. In addition, this research aims to provide knowledge on governance of salinization and aims to provide insights on how to increase the effectiveness of current and future governance strategies for salinization. By adding more substantive knowledge on governance for salinization, I hope to provide additional insight in the importance of adaptivity for freshwater related governance issues.

1.3 RESEARCH FRAMEWORK AND RESEARCH QUESTIONS

The knowledge gap and research aim have led to the construction of the following research questions to add to the scientific domain of good salinization governance:

To what extent can Dutch salinization governance be characterized as good and what lessons can be learned for the future?

1. What can be considered good salinization governance?
2. How can good salinization governance be specified in indicators?
3. To what extent can Dutch salinization governance be considered good according to an analysis of policy documents?
4. To what extent can Dutch salinization governance be considered good according to key stakeholders?
5. Do the results of the analysis of policy documents and of the stakeholder interviews relate?
6. Which lessons can be learned in order to improve salinization governance in the future?

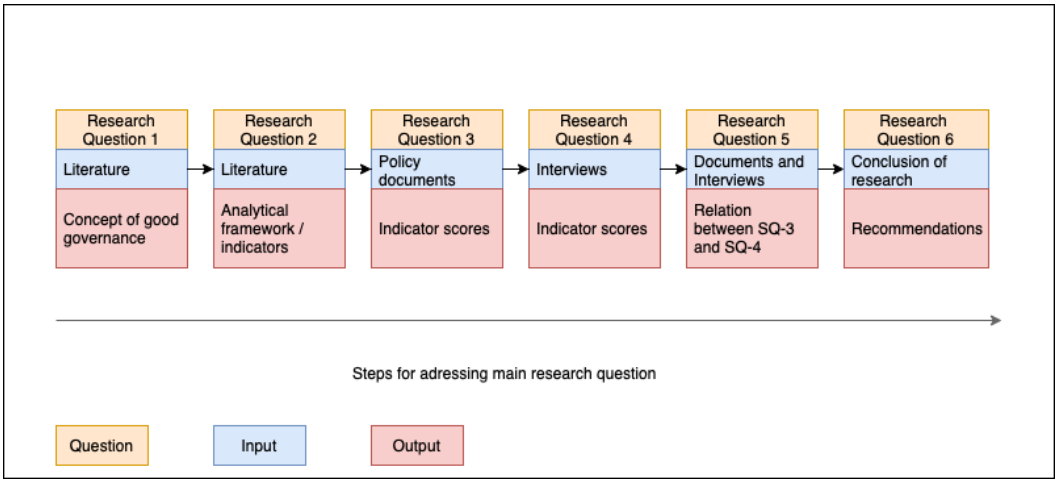

Figure 1: Research framework, indicating the steps taken to answer the main question

The main research **question** evolves from the knowledge gap and research aim. It aims to evaluate the governance system by assessing the system through an adopted framework by Bennett and Satterfield (2018). Good governance is considered essential for managing a freshwater system, especially with the climate-related challenges which lay ahead. In order to get all the information, six sub-questions have been constructed. The six sub-questions are based on the separate steps which need to be taken to gather all the information which is necessary to answer the main research question.

Sub-question 1 provides the necessary background, which is needed to understand the necessity for good salinization governance. This section will conceptualize 'good governance for salinization'.

Sub-question 2 aims to specify good governance into a series of assessment indicators. This question evolves around the construction of the analytical framework which will be used to evaluate the system. This sub-question works upon the conceptualization of good governance for salinization, which arises from sub-question 1.

Sub-question 3 aims to identify to what extent governance characteristics of good governance present in the Dutch governance system of salinization. The latter will assess policy documents by using the analytical framework, which is developed for evaluating governance. Data analysis should provide a list of characteristics which are present, varying from very poor to very good.

Sub-question 4 aims to identify to what extent governance characteristics of good governance present in the Dutch governance system of salinization. The latter will assess interviews by using the analytical framework, which is developed for evaluating governance. Data analysis should provide a list of characteristics which are present, varying from very poor to very good.

Sub-question 5 compares how the data from policy document analysis and stakeholder interviews relate to each other. Moreover, this sub-question aims to find patterns and differences between both results and identify bottlenecks for good salinization governance.

Sub-question 6 aims to provide, if applicable, recommendations for improving the current governance system of salinization.

1.4 OUTLINE OF THE REPORT

The first chapter of this research introduced the issue, the knowledge gap, research objective and a series of research questions that will in the remainder of this research be used to answer the main research question. Chapter 2 discusses how 'good governance' can be conceptualized for salinization and freshwater related governance. Chapter 3 changes the conceptual framework into an analytical framework, which is used for assessing the governance system by analyzing policy documents and in-depth stakeholder interviews. In addition, it discusses the methods which are used: policy document analysis and semi-structured in-depth interviews. This chapter discusses the steps been taken, limitations of the method and implications of the method. Next, the chapters 4, 5, 6 and 7 share the results obtained by both methods for respectively effectiveness of the governance system, equitability of the governance system, responsiveness of the governance system and robustness of the governance system. First both results obtained are discussed separately and next they are compared to each other. These results then provide the basis for the discussion section in chapter 8. This chapter discusses the strength and limitations of the research, the results, the considerations and implications of the results, a series of improvement by interviewees and a series of recommendations that follow from the results and its discussion. Finally, the conclusion shortly repeats the most important results and provides the answer on the main research question in chapter 9. References and all data and tools used within this research can be found in the references and appendix sections.

2 GOOD GOVERNANCE, A CONCEPTUALIZATION

2.1 INTRODUCTION

This chapter aims to provide a clear answer on sub-question 1. This sub-question aims to provide a sufficient knowledge base and conceptualization of good governance for salinization and freshwater. Section 2.2 addresses the governance framework for evaluative research as proposed by Bennett and Satterfield (2018), which is adopted and further explained in section 2.3. This section will provide the basis for the analytical framework, which is further elaborated upon in the methods chapter. The adopted framework will as such, provide the basis for the assessment of the governance system of salinization in the Netherlands.

2.2 THE FRAMEWORK BY BENNETT & SATTERFIELD

Environmental problems are addressed in governance systems which have specific governance characteristics that are present in higher or lower degree. Environmental governance relies on networks of institutions, structures, and processes, in combination with an integrative set of governance objectives and characteristics, that connect at multiple organizational levels (Bennett & Satterfield, 2018). Analyzing relations between stakeholders within governance networks helps us to understand how the regime and its corresponding governance characteristics in the system enhance or hinder effective management of resources such as freshwater (Rijke et al., 2012). It is important to stress the conceptual distinction between governance and management. Management refers to resources, plans, and actions that result from a governance system (Bennett & Satterfield, 2018). Various scientific papers including Adger et al. (2002), Borrini-Feyerabend and Hill (2015) and North (2010) have discussed several objectives and characteristics of environmental governance. Various key characteristics and objectives of environmental governance such as effectivity (Adger et al. 2002), accountability and legitimacy (Plummer et al., 2013), actors and roles (Plummer et al., 2013); Fit, interplay and scale (Plummer et al., 2013); adaptiveness, flexibility and learning (Rijke et al., 2012; Plummer et al., 2013); evaluation and monitoring (Ostrom & Nagendra, 2007; Plummer et al., 2013) and knowledge (Berkes et al., 2007; Plummer et al., 2013) have been adopted by a wide range of governance scholars.

Yet, Bennett and Satterfield (2018) felt like none of these sets of objectives and characteristics mentioned by various papers fully captured the entirety and facets of environmental governance. As such they have built on the work of a rich variety of governance scholars and proposed a new framework, as visualized in Figure 2, including four objectives of governance: effective governance, equitable governance, responsive governance, and robust governance. Each of the main objectives has a list of characteristics which can be present in a higher or lesser degree. The framework presented by Bennett & Satterfield (2018) merges a comprehensive list of governance characteristics and objectives from the scientific scholars into one framework, in order to guide design, evaluation and analysis of environmental governance systems. Bennett and Satterfield believe environmental governance to be something that can be (re)shaped and (re)designed and that the governance outcomes are dependent on evaluation and analysis. The framework can be adapted to the specific needs of any research and used for the development of evaluation indicators. The latter has not been part of the framework because such indicators will require adaptation to fit the

objectives of different initiatives and as such need problem and scale-specific adjustments (Bennett & Satterfield, 2018).

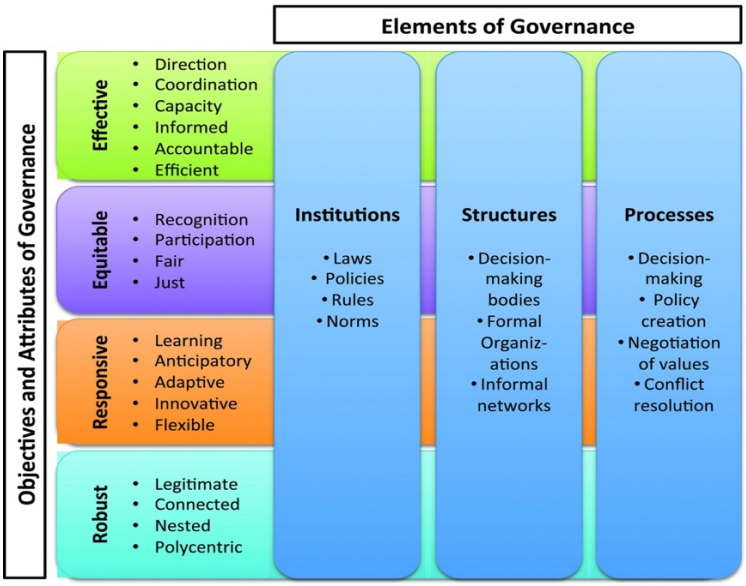

Figure 2: A practical framework for evaluation, design, and analysis of environmental governance (adopted from Bennett & Satterfield, 2018).

2.3 CONCEPTUALIZATION OF GOOD GOVERNANCE FOR SALINIZATION

Good environmental governance is considered essential for addressing issues in an uncertain world (Mehta et al., 2001). For the remainder of this research, we conceptualize good governance for environmental challenges according to the framework provided by Bennett and Satterfield (2018). Good governance relies on the presence of the four objectives of governance which are displayed in Figure 2. The four objectives; effective governance, equitable governance, responsive governance, and robust governance, all together, result in the performance of the governance system on salinization. When each of the governance objectives is sufficiently present, it supports the maintenance of system integrity and functioning, employs inclusive processes, and produces fair outcomes, it enables adaptation to diverse contexts and changing conditions, ensures functioning institutions persist, maintains performance and coping with perturbations and crises (Bennett & Satterfield, 2018). The performance of such governance objectives is dependent on the performance of specific governance characteristics within the governance system. First, the performance of the governance characteristics; 'direction', 'coordination', 'capacity', 'informed', 'accountable' and 'efficient' together result in the effectiveness of the governance system on salinization. Second, the performance of the governance characteristics; 'recognition', 'participation', 'fair' and 'just' together result in the equitability of the governance system on salinization. Third, the performance of the governance characteristics; 'learning', 'anticipatory', 'adaptive', 'innovative', and 'flexible' together result in the responsiveness of the governance system on salinization. And last, the performance of the governance characteristics; 'legitimate', 'connected', 'nested' and 'polycentric' together result in the robustness of the governance system on salinization.

The performance of such governance characteristics is dependent on several elements of governance. These include institutions such as laws, policies, rules, and norms; structures such as

decision-making bodies, formal organizations, and informal networks; and processes such as decision-making, policy creation, negotiation of values and conflict resolution. When building upon the governance characteristics and constructing indicators, these institutions, structures, and processes will be used for analysis of the individual governance characteristics.

Underneath in Table 1, Table 2, Table 3, and Table 4 the conceptualization of the four objectives of good governance – effective governance, equitable governance, responsive governance and robust governance – are displayed. The four pillars are adopted from Bennett and Satterfield (2018). The framework by Bennett and Satterfield (2018) is considered a useful tool for evaluative research and will in in the methods section be transformed in a framework which can be used to assess the presence of specific governance characteristics within the system of freshwater governance or salinization governance more specifically.

2.3.1 EFFECTIVENESS

Table 1: Effective governance (adopted from Bennett & Satterfield, 2018).

Governance objective	Governance Characteristic	Capacity of Governance Characteristic	Idealized Outputs (Functioning)
Effective *Supports maintenance of system integrity and functioning.*	Direction	Scope, goals, and aims are comprehensive, clearly articulated and communicated to stakeholders. Clear boundaries on action and scope exist.	Defines what effective action encompasses and sets milestones for achieving success.
	Coordination	The roles, functions, and mandates of different governments, agencies and organizations are coordinated. A coordinating body or unit is present.	Produces system of rules for use, mechanisms for exclusion, management actions and spatial coverage that are complementary and adequate to achieve objectives. Provides a forum for discussion, debate, negotiating and resolving trade-offs.
	Capacity	Capacity, skills, and resources are sufficient and are being actively developed. Capable and visionary leadership is present. Mechanisms are present to resolve conflicts between groups.	Enables successful decision-making and the initiation, organization, implementation, and evaluation of actions.
	Informed	Planning and management decisions and actions are informed by best	Increases the likelihood that

		available information and integration of a diversity of knowledge types and systems.	management actions will lead to effective outcomes.
	Accountable	Procedures are present to hold governors accountable for performance of system. Mechanisms are in place to ensure that means and rationales for making decisions are transparent.	Ensures that governors act on mandated decisions and that effective actions are being taken.
	Efficient	Efficacy guides decisions regarding management actions and deployment of resources. Time requirements of actors are reasonable. Economic costs and actions taken are commensurate with productivity of system.	Maximizes the productivity of management actions while minimizing the wasteful use of available resources.

2.3.2 EQUITABILITY

Table 2: Equitable governance (adopted from Bennett & Satterfield, 2018).

Governance objective	Governance Characteristic	Capacity of Governance Characteristic	Idealized Outputs (Functioning)
Equitable *Employs inclusive processes and produces fair outcomes.*	Recognition	Policies and processes ensure acknowledgement of respect for and incorporation of diverse perspectives, values, cultures and rights. Views of marginalized and vulnerable groups are considered.	Facilitates socially acceptable governance and perceptions of legitimacy. Aids in the design of management actions that are appropriate to the social context.
	Participation	Spaces and processes to enable participation and collective choice are present. Structures that ensure the representation and engagement of different stakeholder groups are in place.	Contributes to just power relations and decision-making processes. Leads to plans and actions that represent the interests of different groups. Allows parties to democratically debate decisions and maintain dignity.
	Fair	Mechanisms are in place to ensure socio-economic costs and benefits are just and fairly distributed. Rights and responsibilities are shared and assigned fairly. Unequal circumstances are considered.	Ensures a fair balance of costs and benefits accrue to different groups.
	Just	Laws and policies are present to protect local rights and mechanisms ensure that groups have access to justice.	Ensures rights (e.g., title, historical tenure, access, use, management) are not undermined and that reparations or compensation are made for past damages.

2.3.3 RESPONSIVENESS

Table 3: Responsive governance (adopted from Bennett & Satterfield, 2018).

Governance objective	Governance Characteristic	Capacity of Governance Characteristic	Idealized Outputs (Functioning)
Responsive *Enables adaptation to diverse contexts and changing conditions.*	Learning	Monitoring, evaluation, reflections, and communication of performance is institutionalized. Processes and platforms are in place to co-produce knowledge and enhance social and institutional memory.	Facilitates socially acceptable governance and perceptions of legitimacy. Aids in the design of management actions that are appropriate to the social context.
	Anticipatory	Long-term planning and foresight thinking are institutionalized. Known and unknown risks and opportunities are considered, analyzed and planned for.	Produces plans and steps to prepare and prevent consequences of unexpected risks. Enhances knowledge, capacity and flexibility for disturbance.
	Adaptive	Spaces for reflection and deliberation are institutionalized. Processes exist to revisit and evolve policies, institutions and adapt actions.	Ensures that management plans and actions are being actively adapted to reflect changing social-ecological contexts and new knowledge.
	Innovative	Innovation and experimentation are encouraged and success and failures are monitored. A higher risk tolerance is embodied.	Allows change to be seen as an opportunity. Enables new and more effective ideas and actions to emerge.
	Flexible	Policies exist that recognize the need to downscale environmental management and conservation models to fit local realities. Efforts are taken to understand and document about the diverse contexts where policies are applied and to deliberate on necessary adjustments.	Enables governance systems and management models to be adjusted to better fit with local social, cultural, political, economic and environmental contexts.

2.3.4 ROBUSTNESS

Table 4: Robust governance (adopted from Bennett & Satterfield, 2018).

Governance objective	Governance Characteristic	Capacity of Governance Characteristic	Idealized Outputs (Functioning)
Robust *Ensures functioning institutions persist, maintain performance and cope with perturbations and crises.*	Legitimate	A collective vision shapes policies and guides actions at all scales. Institutional legitimacy is conferred (e.g., in policy) and perceived (e.g., by constituents). Governors act with integrity and consistency. Institutions are transparent.	Ascertains that there is support from above and that there is a supportive constituency.
	Connected	Networks of organizations and actors are strongly linked vertically and horizontally. Bridging organizations are present. Processes are in place to support network development, to develop social relations and to support mutual learning.	Helps to bridge between and across scales. Creates supportive community, produces social capital, fosters respect and trust and builds social memory. Encourages communication, information exchange, enables diffusion of innovations, and facilitates collaboration.
	Nested	Tasks are assigned to appropriate levels. Decision-making authority and responsibility are conferred to the lowest level possible. Self-organization is encouraged and supported. Authority and responsibility is supported by adequate state or other outside support (legal recognition, political will, time commitment) and oversight.	Empowers appropriate entity to take necessary action. Allows also for shaping and adapting institutions and decision-making processes to different local sub-contexts (social circumstances, governance, ecologies) within larger system.
	Polycentric	Decision-making and action taking centers in multiple places, across jurisdictions and at multiple scales interact and cohere towards a common goal. Institutions are present that are diverse and	Helps to buffer against change in one location. Ensures that the governance system does not collapse when faced

		redundant - that serve similar purposes and have overlapping jurisdictions and functions.	with adversity or crises.

2.4 CONCLUSION

Good governance for salinization is conceptualized as good performance of the governance objectives effective governance, equitable governance, responsive governance, and robust governance. These are in turn dependent on the performance of separate governance characteristics. When these do perform according to the idealized outputs as provided in Table 1, Table 2, Table 3 and Table 4; the governance system is functioning in a desired way. This chapter provided the basis for the analytical framework by conceptualizing good governance.

3 METHODS

3.1 INTRODUCTION

Based on the conceptualization of good governance this chapter aims to convert the conceptualization into indicators for evaluative research. Section 3.2 transforms the four objectives of governance into assessment indicators. These governance characteristics allow us to evaluate every governance characteristic based on both policy documents and key stakeholder interviews. Section 3.3 lays out the steps which are taken for the policy documents. Considerations discussed in this section entail: keywords for searching relevant policy documents, selection of policy documents, limitations of the method, and implications of the method. Section 3.4 lays out the steps which are taken for the interviews. Considerations discussed in this section entail: desired stakeholders, stakeholders which are interviewed, research methods, limitations of the method and implications of the method. Section 3.5 discusses how both policy documents and interviews are analyzed and how, based on the results, the scoring will take place. These scores will follow from the analytical framework from section 3.2. Finally, section 3.6 will provide a conclusion with the corresponding answer on sub question 2.

3.2 ANALYTICAL FRAMEWORK – OPERATIONALIZATION OF INDICATORS

Based on the four tables (Table 1, Table 2, Table 3 and Table 4) that entail the conceptualization of good governance, this section will construct a series of governance indicators that belong to the four governance objectives (effectiveness, equitability, responsiveness and robustness). Based on the conceptualization, as adopted from Bennett and Satterfield (2018), each governance characteristic is transformed into an indicator and gets a corresponding scoring scheme and definition of each score. There are five score categories: very poor, poor, sufficient, good, and very good. Very poor, sufficient, and very good have an elaborate explanation on what features of the governance characteristics are present or absent. When assessment results have governance features that belong to both very poor and sufficient, the score is considered poor. Similarly, when the assessment results have governance features that belong to both sufficient and very good, the score is considered good. This choice has been made because it needs to be possible to provide scores to governance characteristics when certain governance features score low while other features score high. As such, the choice has been made to use a five-way category system, instead of a three-way category system. It may also be the case that governance features are completely absent while other governance features score good. In such cases, the score drops 1 category point (e.g., from very good to good).

The four governance objectives are considered performance categories within this analytical framework. These consist of several, related, system performance characteristics. For this research, the governance characteristics, which are based on the framework by Bennett and Satterfield (2018), are considered the performance characteristics for further assessment.

For instance, the effectiveness of the governance system is assessed by providing scores to the indicators that are constructed for the governance characteristics ‘direction’, ‘coordination’,

‘capacity’, ‘informed’, ‘accountable’ and ‘efficient’. These scores together tell us something about the performance of the (partial) system, which in this example is the effectiveness. The four governance objectives and their corresponding indicator scores provide us with a more detailed understanding of the system performance and behavior, now that they are operationalized for qualitative-based scoring.

Later in this research, these indicators will be used for the evaluation of the governance system based on results from policy documents and interviews. The scoring scheme is based on an own interpretation of the framework for design, evaluation, and analysis of governance systems by Bennett and Satterfield (2018). Underneath, Table 5, Table 6, Table 7 and Table 8 present the analytical framework. First Table 5 presents the analytical framework for assessing the effectiveness. Second, Table 6 presents the analytical framework for assessing the equitability. Third, Table 7 presents the analytical framework for assessing the responsiveness. And last, Table 8 presents the analytical framework for assessing the robustness. Together, these indicators provide the analytical lens for assessing how the governance system performs.

3.2.1 INDICATORS FOR EFFECTIVE GOVERNANCE

Table 5: A framework to assess the effectiveness of governance.

Governance characteristic	Very poor (1)	Poor (2)	Sufficient (3)	Good (4)	Very good (5)
Direction	Scope, goals and aims are not sufficiently articulated and communicated to stakeholders. No clear boundaries on action and scope exist.	Has features of both very poor and sufficient.	Scope, goals and aims are articulated and communicated to stakeholders. Some boundaries on action and scope exist.	Has features of both sufficient and very good.	Scope, goals and aims are comprehensive, clearly articulated and communicated to stakeholders. Clear boundaries on action and scope exist.
Coordination	The roles, functions, and mandates of different governments, agencies and organizations are poorly coordinated.	Has features of both very poor and sufficient.	The roles, functions, and mandates of different governments, agencies and organizations are coordinated.	Has features of both sufficient and very good.	The roles, functions, and mandates of different governments, agencies and organizations are coordinated. A coordinating body or unit is present.
Capacity	Capacity, skills and resources are insufficient and are not being actively developed. Leadership is not present. Insufficient mechanisms are present to resolve conflicts between groups.	Has features of both very poor and sufficient.	Capacity, skills and resources are sufficient and are being developed. Capable leadership is present. Mechanisms are somewhat present to resolve conflicts between groups.	Has features of both sufficient and very good.	Capacity, skills and resources are good and are being actively developed. Capable and visionary leadership is present. Mechanisms are present to resolve conflicts between groups.
Informed	Planning and management decisions and actions are informed by poor information and lack integration knowledge types and systems.	Has features of both very poor and sufficient.	Planning and management decisions and actions are informed by available information and integration of some knowledge types and systems.	Has features of both sufficient and very good.	Planning and management decisions and actions are informed by best available information and integration of a diversity of knowledge types and systems.

Accountable	Procedures are poorly present to hold governors accountable for performance of system. No mechanisms are in place to ensure that means and rationales for making decisions are transparent.	Has features of both very poor and sufficient.	Procedures are somewhat present to hold governors accountable for performance of system. Mechanisms are in place to ensure that means and rationales for making decisions are partly transparent.	Has features of both sufficient and very good.	Procedures are present to hold governors accountable for performance of system. Mechanisms are in place to ensure that means and rationales for making decisions are transparent.
Efficient	Efficacy does not guide decisions regarding management actions and deployment of resources. Time requirements of actors are unreasonable. Economic costs and actions taken are not commensurate with the effectiveness of the system.	Has features of both very poor and sufficient.	Efficacy does partly guide decisions regarding management actions and deployment of resources. Time requirements of actors are reasonable. Economic costs and actions taken are somewhat commensurate with the effectiveness of the system.	Has features of both sufficient and very good.	Efficacy guides decisions regarding management actions and deployment of resources. Time requirements of actors are good. Economic costs and actions taken are commensurate with the effectiveness of the system.

3.2.2 INDICATORS FOR EQUITABLE GOVERNANCE

Table 6: A framework to assess the equitability of governance.

Governance characteristic	Very poor (1)	Poor (2)	Sufficient (3)	Good (4)	Very good (5)
Recognition	Policies and processes do not ensure acknowledgement of, respect for and incorporation of diverse perspectives, values, cultures and rights. Views of marginalized and vulnerable groups are not considered.	Has features of both very poor and sufficient.	Policies and processes somewhat ensure acknowledgement of, respect for and incorporation of diverse perspectives, values, cultures and rights. Views of marginalized and vulnerable groups are considered.	Has features of both sufficient and very good.	Policies and processes ensure acknowledgement of, respect for and incorporation of diverse perspectives, values, cultures and rights. Views of marginalized and vulnerable groups are considered and incorporated.
Participation	Spaces and processes to enable participation and collective choice are not present. Structures that ensure the representation and engagement of different stakeholder groups are not in place.	Has features of both very poor and sufficient.	Spaces and processes to enable participation and collective choice are somewhat present. Structures that ensure the representation and engagement of different stakeholder groups are not/partly in place.	Has features of both sufficient and very good.	Spaces and processes to enable participation and collective choice are present. Structures that ensure the representation and engagement of different stakeholder groups are in place.
Fair	No mechanisms are in place to ensure socio-economic costs and benefits are just and fair distributed. Rights and responsibilities are not shared and not assigned fairly. Unequal circumstances are not considered.	Has features of both very poor and sufficient.	Mechanisms are in place to ensure socio-economic costs and benefits are somewhat fair distributed. Rights and responsibilities are shared and assigned partly. Unequal circumstances are somewhat considered.	Has features of both sufficient and very good.	Mechanisms are in place to ensure socio-economic costs and benefits are just and fair distributed. Rights and responsibilities are shared and assigned fairly. Unequal circumstances are considered.

Just	No laws and policies are present to protect local rights.	Has features of both very poor and sufficient.	Laws and policies are partly present to protect local rights.	Has features of both sufficient and very good.	Laws and policies are present to protect local rights.

3.2.3 INDICATORS FOR RESPONSIVE GOVERNANCE

Table 7: A framework to assess the responsiveness of governance.

Governance characteristic	Very poor (1)	Poor (2)	Sufficient (3)	Good (4)	Very good (5)
Learning	Monitoring, evaluation, reflections, and communication of performance are not institutionalized. Processes and platforms for co-production of knowledge and enhancing social and institutional memory is not present.	Has features of both very poor and sufficient.	Institutionalization of monitoring, evaluation, reflections, and communication of performance is partly present. Processes and platforms are partly in place to co-produce knowledge and enhance social and institutional memory.	Has features of both sufficient and very good.	Monitoring, evaluation, reflections, and communication of performance is institutionalized. Processes and platforms are in place to co-produce knowledge and enhance social and institutional memory.
Anticipatory	Long-term planning and foresight thinking are not institutionalized. Known and unknown risks and opportunities are not considered, analyzed, and planned for.	Has features of both very poor and sufficient.	Long-term planning and foresight thinking are partly institutionalized. Known and unknown risks and opportunities are considered but analysis and planning lacks.	Has features of both sufficient and very good.	Long-term planning and foresight thinking are institutionalized. Known and unknown risks and opportunities are considered, analyzed, and planned for.
Adaptive	Spaces for reflection and deliberation are not institutionalized. No processes exist to revisit and evolve policies, institutions and adapt actions.	Has features of both very poor and sufficient.	Spaces for reflection and deliberation are partly institutionalized. Processes for revision and evolving policies, institutions and adapting actions partly exist.	Has features of both sufficient and very good.	Spaces for reflection and deliberation are institutionalized. Processes exist to revisit and evolve policies, institutions and adapt actions.

Innovative	Innovation and experimentation are not encouraged, and success and failures are insufficiently monitored. A higher risk tolerance is not embodied.	Has features of both very poor and sufficient.	Innovation and experimentation are somewhat encouraged, and success and failures are monitored. A higher risk tolerance is partly embodied.	Has features of both sufficient and very good.	Innovation and experimentation are encouraged, and success and failures are monitored. A higher risk tolerance is embodied.
Flexible	No policies exist that recognize the need to downscale environmental management and conservation models to fit local realities. No efforts are taken to understand and document about the diverse contexts where policies are applied and to deliberate on necessary adjustments.	Has features of both very poor and sufficient.	Some policies exist that recognize the need to downscale environmental management and conservation models to fit local realities. Minor efforts are taken to understand and document about the diverse contexts where policies are applied and to deliberate on necessary adjustments.	Has features of both sufficient and very good.	Policies exist that recognize the need to downscale environmental management and conservation models to fit local realities. Efforts are taken to understand and document about the diverse contexts where policies are applied and to deliberate on necessary adjustments.

3.2.4 INDICATORS FOR ROBUST GOVERNANCE

Table 8: A framework to assess the robustness of governance.

Governance characteristic	Very poor (1)	Poor (2)	Sufficient (3)	Good (4)	Very good (5)
Legitimate	There is no collective vision that shapes policies and guides actions at all scales. Institutional legitimacy is not conferred (e.g., in policy) and perceived (e.g., by constituents). Governors act without integrity and consistency. Institutions are not transparent.	Has features of both very poor and sufficient.	A collective vision shapes policies and guides actions at some scales. Institutional legitimacy is partly conferred (e.g., in policy) and perceived (e.g., by constituents). Governors act with sufficient integrity and consistency. Institutions are mostly transparent.	Has features of both sufficient and very good.	A collective vision shapes policies and guides actions at all scales. Institutional legitimacy is conferred (e.g., in policy) and perceived (e.g., by constituents). Governors act with integrity and consistency. Institutions are transparent.
Connected	Networks of organizations and actors are poorly linked vertically and horizontally. Bridging organizations are not present. Processes are insufficiently in place to support network development, to develop social relations and to support mutual learning.	Has features of both very poor and sufficient.	Networks of organizations and actors are sufficiently linked vertically and horizontally. Bridging organizations are somewhat present. Some processes are in place to support network development, to develop social relations and to support mutual learning.	Has features of both sufficient and very good.	Networks of organizations and actors are strongly linked vertically and horizontally. Bridging organizations are present. Processes are in place to support network development, to develop social relations and to support mutual learning.

Nested	Tasks are not assigned to appropriate levels. Decision-making authority and responsibility are not conferred to the lowest level possible. Self-organization is not supported. Authority and responsibility is not supported by adequate state or other outside support (legal recognition, political will, time commitment) and oversight.	Has features of both very poor and sufficient.	Tasks are partly assigned to appropriate levels. Decision-making authority and responsibility are partly conferred to the lowest level possible. Self-organization is supported but not encouraged. Authority and responsibility is partly supported by adequate state or other outside support (legal recognition, political will, time commitment) and oversight.	Has features of both sufficient and very good.	Tasks are assigned to appropriate levels. Decision-making authority and responsibility are conferred to the lowest level possible. Self-organization is encouraged and supported. Authority and responsibility is supported by adequate state or other outside support (legal recognition, political will, time commitment) and oversight.
Polycentric	Decision-making and action taking centers in multiple places, across jurisdictions and at multiple scales do not interact and fail to cohere towards a common goal. Institutions that are diverse and redundant - that serve similar purposes and have overlapping jurisdictions and functions are not present.	Has features of both very poor and sufficient.	Decision-making and action taking centers in multiple places, across jurisdictions and at multiple scales partly interact but cohere towards a common goal. Institutions are present that are not diverse and redundant – but serve similar purposes and have overlapping jurisdictions and functions.	Has features of both sufficient and very good.	Decision-making and action taking centers in multiple places, across jurisdictions and at multiple scales interact and cohere towards a common goal. Institutions are present that are diverse and redundant - that serve similar purposes and have overlapping jurisdictions and functions.

3.3 POLICY DOCUMENTS

During the gathering of policy documents, it became clear that the governance of salinization is mainly integrated within freshwater policies, instead of having separate legislation and policies. As such, the inclusion of freshwater related policy documents was a must. The change of direction led to more results and as such a stronger base to draw conclusions from. For example, periods of extreme drought have led to increased salinization of both waterways and groundwater aquifers. As such, not only the Dutch translations of salinization and salinization (verzilting, verzilting and zoutindringing)

are part of the list of keywords, which are being used for gathering policy documents related to the governance system. Underneath, Table 9 shows a series of Dutch keywords which have been selected after considering expert judgements which have been obtained during the in-depth interviews. This was possible because the stakeholder interviews and gathering of policy documents happened simultaneously. Based on the selection keywords in Table 9, a series of national (Table 10) documents have been selected. These documents will provide the input for the analysis of the governance system. These documents are used for the analysis, which will be elaborated upon in section 3.5.

Table 9: Keywords for selecting policy (related) documents

Keyword (English)	Dutch translation
Smart water management	Slim water management
Drought	Droogte
Freshwater (strategy)	Zoetwater (strategie)
(Ground)water management	(Grond)water beheer
Salinization / salt intrusion	Verzilting /zoutwater indringing
Delta Program	Delta Programma
Water management and KRW	Water management en Kader Richtlijn Water (KRW)
Water boards	Waterschappen
River basin management	Stroomgebiedsbeheer
Delta facts	Delta facts

Table 10: Selected national policy documents for further analysis on governance and salinization

No.	Document	Includes keywords (Dutch)	Includes keywords (English)	Involved Institutions
1	Handreiking verzilting	Verzilting	Salinization	Rijkswaterstaat
2	Handreiking beheer van grondwaterkwaliteit onder de omgevingswet	Grondwater beheer	Groundwater Management	Ministerie van Infrastructuur en Waterstaat
3	Delta programma 2023	Delta Programma	Delta Program	Ministerie van Infrastructuur en Waterstaat
4	Synthese Document Deltaprogramma Zoetwater 2021	Delta Programma; Zoetwater	Delta Program	Ministerie van Infrastructuur en Waterstaat
5	Nederland beter weerbaar tegen droogte – Eindrapportage beleidstafel droogte	Droogte	Drought	Ministerie van Infrastructuur en Waterstaat
6	Handreiking KRW doelen 2018	KRW	KRW	Ministerie van Infrastructuur en Waterstaat; STOWA; Unie van Waterschappen; Interprovenciaal overleg
7	Klimaatbestendige zoetwatervoorziening hoofdwatersysteem 2020	Zoetwater	Freshwater	Rijkswaterstaat
8	Werkprogramma, Tijdschema, en Belangrijke Waterbeheerkwesties voor de stroomgebiedsbeheerplannen 2022-2027 Kaderrichtlijn Water	Water beheer; stroomgebiedsbeheer	Water management; River basin management	Rijksoverheid
9	Stroomgebiedsbeheerplannen Rijn, Maas, Schelde en Eems 2022-2027	Stroomgebiedsbeheer	River basin management	Rijksoverheid
10	Deltafact verzilting	Verzilting	Salinization	STOWA knowledge program

The selected policy documents are carefully studied, and relevant statements and topics are then matched to respective governance characteristic indicators in a NVivo coding scheme. They are not directly scored, but only matched, in order to create a comprehensive list with statements and topics which are relevant for a specific governance characteristic.

Such analysis of policy documents is considered a qualitative method. Interpretive results are sometimes criticized as biased (Anderson, 2010). As such, good understanding of the data is fundamentally important for drawing conclusions. Qualitative data analysis is as such considered the most important step in a qualitative research process. Qualitative research produces large amounts of contextually laden, subjective, and richly detailed data (Leech & Onwuegbuzie, 2011). As such a short summary of the result is presented for each governance characteristic. These short summaries, which will be presented in the results of chapters 4, 5, 6 and 7 and explain why certain governance characteristics received a specific score. Whereas the analytical framework can be used to reproduce the scoring of the capacities in other research, the concerned scores are based on personal interpretation of the statements and topics derived from policy documents. Exact quotes from the various policy documents, which have been translated to English, are presented in *Appendix 1 – Detailed results document analysis*. As such, the line of thought behind the conclusions can be extracted to improve validity and reliability. The strength of using a qualitative research design results in the ability to revise the research framework and direction of the research during the research process.

3.4 INTERVIEWS

Participants for interviews can be recruited in various ways. The first step entails thinking about the governance system and deciding on what factors are relevant for selecting participants. For this research, the stakeholders relevant for this research are considered members of the governance system of freshwater, or salinization more specifically. Preferably all participants have a different role within the governance system to provide insights on how stakeholders think differently about the system. Selecting too many of the same stakeholders may cause biased outcomes. Often people holding the same position in a system, have similar thoughts on how the system functions. In a perfect research outline, multiple interviews are conducted with all stakeholder types (Knott et al., 2022). Yet, time constraints and difficulties in getting cooperation for interviews made this impossible. As such, it is likely that the stop criterion for data saturation will not be completely met. As such, this research uses the purposive sampling method. Purposive sampling is considered a useful mode for interview-based research of which the number of interviews is too little to be statistically representative (Knott et al., 2022). Such a method aims to add depth via rich insights about a set of participants rather than adding breadth via representativeness (Knott et al., 2022).

In a perfect research, participants will include stakeholders from the entire spectrum of stakeholders involved in the governance system of freshwater or salinization. Various factors will then have an impact on whether this is feasible or not. Mapping the entire system is as such the first step for selecting the stakeholders. Figure 3 shows the entirety of stakeholders and actors present within the system. The mapping of stakeholders is based on expert opinions from the first stakeholder interviews and a systematic review of literature. There are several institutional layers

(grey), various private stakeholders (orange) and several institutions for knowledge transfer and advise (yellow).

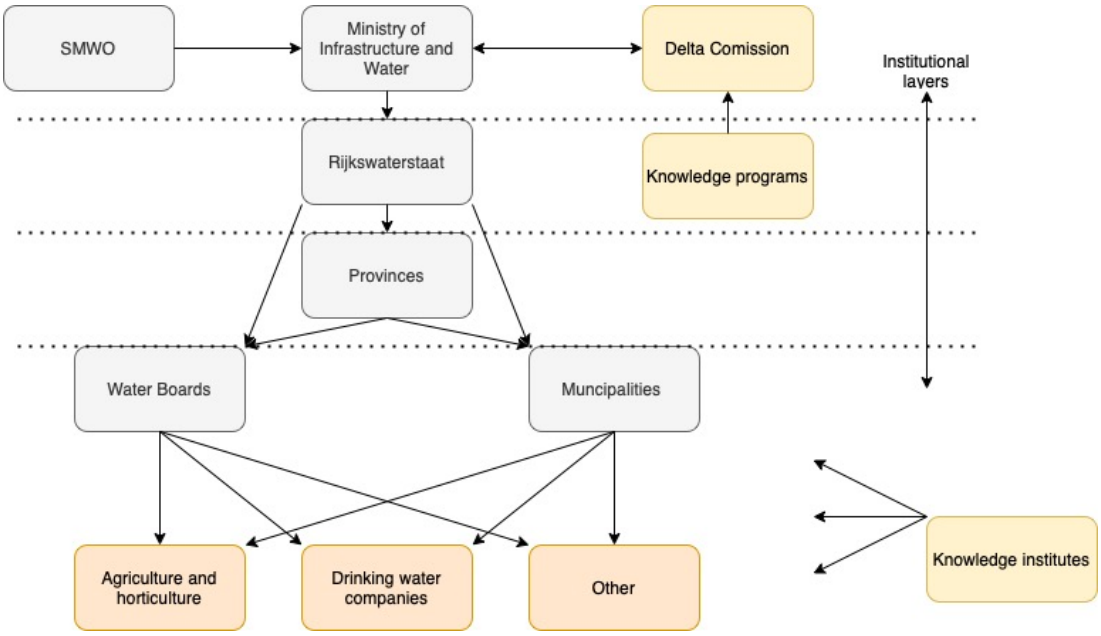

Figure 3: Mapping of relevant stakeholders and actors active in the governance system of freshwater and salinization

After contacting each of the stakeholders and actors mentioned in Figure 3, several responded. The only two which have not been contacted are agricultural/ horticulture stakeholders and other non-governmental stakeholder such as environmental organizations. This decision was made after the consideration that such stakeholders have insufficient governance system understanding and that their interpretation of the system would vary widely from region to region. When considering the time constraints of this research, it is not feasible to talk to wide spectrum of stakeholders from agricultural companies located within various regions. Other organizations have similar situations and are not included in the list of stakeholder participants for the interviews.

The selection of stakeholders for interviews was partly based on the personal network of my supervisor. Others have been contacted by using my personal network and sending out e-mails. Despite intensive efforts to get Rijkswaterstaat and Ministry of Infrastructure and Water employees, which are working on salinization or freshwater policy, to do an interview, none of these efforts succeeded. Interview 3 was conducted with an employee of the SMWO, which is part of Rijkswaterstaat. Yet, stakeholder interviews with employees with expertise in other disciplines would have been a valuable addition to this research. Given the fact that Rijkswaterstaat is the leading authority on water, this may cause reliability issues in the results. Despite not having direct contact with the delta committee employees, an interview was conducted with a stakeholder from the knowledge program on sea-level rise, who gives advice to the Delta Commissioner. Preferably there would have been more interviews, but time constraints led to the choice to stop after interview six. Overall, the participants included are from all institutional layers including SMWO (national),

Province (regional), Water board (sub-regional), with additions from experts from knowledge institutes (2 participants) and an expert from the knowledge program sea-level rise. Table 11 shows all the interviews conducted with the reason of selecting the specific stakeholder.

Table 11: Selection of stakeholders for in-depth interviews

Interview No.	Stakeholder from	specialization	Reason of selection
1.	Deltares	Expert hydrogeology	Person X is an expert on freshwater and salinization. Person X published academic papers on salinization and has a lot of interaction with governmental, non-governmental organizations and institutions.
2.	KRW water	Senior researcher / project manager	Person X is an expert on freshwater and salinization. Person X works and interacts with a lot of governmental, non-governmental organizations and institutions, and initiates pilots.
3.	Rijkswaterstaat - SMWO (National Steering group for water crises and floods)	Managing during crisis situations with multiple stakeholders	Person X is an expert on freshwater division during times of drought or other extreme events. The organization where person X is employed, provides information on how to act during times of crisis.
4.	Province Zeeland	Water and environmental governance	Person X works at the province Zeeland on topics related to freshwater and environmental conservation. Person X is situated within the

			governance system of freshwater and has close contact with other key stakeholders such as water boards, Rijkswaterstaat and consuming sectors.
5.	Advice group / knowledge program sea-level rise	Lobbying for integrative water management	Person X lobbies for more integrative solutions for sea-level rise, drought and salinization. Person X is part of the knowledge program on sea-level rise and gives recommendations to the Delta Commissioner.
6.	Water Board Delfland	Policy advisor monitoring and water	Person X is policy advisor freshwater supply at the water board Delfland. Person X has a lot of interaction between consumers and stakeholders such as Rijkswaterstaat and other water boards.

A semi-structured in-depth interview outline is used for the interviews. In-depth interviews are considered a qualitative research method (Knott, 2022). A semi-structured interview combines features of highly structured interviews and entirely unstructured interviews (Knott et al., 2022). A topic guide, which is provided in *Appendix 3 - Topic list for in-depth semi-structured interviews (Dutch)*, provides the interviewer with the structure to ask the questions which are relevant for this research. The first section of the interview is used to gather information on the interviewee's view on salinization, the state of the system, management strategies and future bottlenecks. By doing so, system knowledge is obtained to get a better understanding of how the system works and performs. This information is used on top of the more structured data, which is obtained during the structured part of the interview. Such information will later be matched to corresponding indicators or used as input for recommendation by key stakeholders. The second part of the interview consists of structured questions which are used to derive information for the assessment of the 19 indicators in the analytical framework. In-depth interviews are often multivalent and give room for different interpretations (Knott et al., 2022). The most important factor is according to Knott et al. (2022) therefore is not data saturation, but merely *''if the research design allows for collecting rich and*

textured data that provides insight into participants' understandings, accounts, perceptions, and interpretations''.

A topic guide often starts off with (a) relatively easy and open-ended question(s). After these more open-ended questions, more concrete questions follow which are of concern for the research questions (Knott et al., 2022). Such questions sometimes ask for probes from the interviewer to make questions less challenging. Most importantly, questions during interviews need to avoid foreclosing the possibility that participants disagree with the premise of the questions, which often affect the participants willingness to talk with the researcher (Knott et al., 2022). Most ideally, a topic list, for an interview ranging between 90-120 minutes, consists of two pages with questions and probes. Given the fact that this research aims for interviews ranging between 45 to 90 minutes, the topic list will be one to two pages. The topic list which has been constructed for this research is approximately two pages. The questions for the structured part of the interview are constructed based on their ability to obtain relevant information for specific indicators. The interviews take place online, through Microsoft Teams, which is ideal for recording the interviews (assuming there is permission from the participants).

Before starting the interviews, it is important to consider the ethical considerations of interviews. Such ethical considerations involve harm minimization, informed consent, anonymity and confidentiality, and reflexivity and positionality (Knott et al., 2022). For this research this relates mainly to not sharing personal opinions of other participants, not sharing confidential information, minimizing the risk of anyone being exposed to political detriment and minimizing potential for reputational damage due to being connected to the research project. Given the fact this research may gather some confronting personal opinions on governance performance, in which political factors apply, a few choices have been made to safeguard anonymity and protect participants against political retribution. These choices include:

1. Not sharing personal information
2. Not sharing any recordings or interview transcript
3. Not sharing dates of interview

Instead of sharing complete transcripts with direct quotes, the statements being made by participants are outlined in paraphrases which report what the person said. The choice for doing this is made after a participant asked not to be quoted on a few answers. Detailed data with paraphrases of stakeholders is presented in *Appendix 2 – Detailed interview results.*

3.5 DATA ANALYSIS

Data analysis for in-depth and semi-structured interviews is considered highly important. The interviews are richly loaded with data and interpretations. In Nvivo a coding scheme is created, which allows coupling specific information to all 19 governance characteristics. By doing so, information is directly matched to the indicators, which can than later be scored based on the interpretations of the data. Although the policy documents and interviews are analyzed separately, the coding scheme for both is the same, consisting of 4 codes ('effectiveness', 'equitability', 'responsiveness' and 'robustness') and 19 sub-codes. These subcodes entail the governance

characteristics which correspond to the 4 specific governance objectives. These are coupled as is explained in the conceptualization. The data analysis method used for the interview data and policy document data is following the design as provided by Knott et al. (2022) in Figure 4.

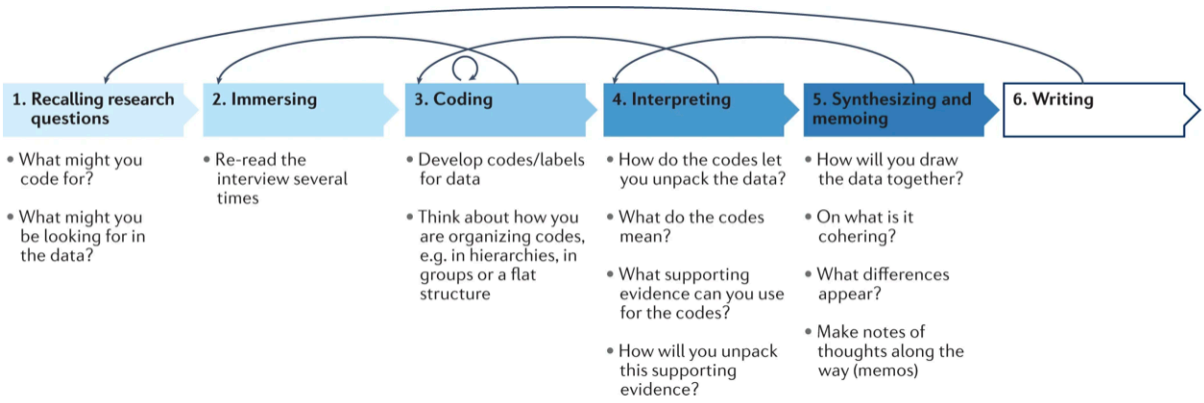

Figure 4: Method of data analysis. Retrieved from Knott et al. (2022).

Knott et al. (2022) state that there will be consensus and dissent on topics of interest to the researcher, which is the strength of qualitative research. The qualitative design allows us to build in these statements rather than aggregating them away conforming quantitative research. These variations and patterns can be discussed in the discussion. Most important for presenting qualitative data from interviews is providing the reader with the base to understand and trace what the statement is based upon (Knott et al., 2022). Moreover, researchers need to think about what variations tell them about the nature of their substantive research interests (Knott et al., 2022). This research looks how a code patterns across different participants. The scores are based on how the researcher interprets the obtained data within each specific code and scored based on the conceptualizations from the analytical framework for each of the specific indicators. The differences and patterns obtained in this scoring across participants will be elaborated upon in the discussion.

Interpretation of the data is based on a projection to the entire governance system. It Is possible that the region puts a lot of effort in a specific governance characteristic, but the result is poor or very poor. This is caused by projecting the answers of the person which is being interviewed on a broader governance system in which all stakeholders and actors take place. This was especially the case for the stakeholder interviews 4 and 6. These stakeholders are located on the regional or sub-regional level of the governance system.

3.6 CONCLUSION

This section has discussed how each of the methods is performed, what implications and limitations the concerned methods (document analysis and interviews) have, and how that was dealt with. In addition, section 3.2 developed a series of indicators for each governance characteristic corresponding to the four objectives of governance, based on the conceptual framework which was presented in the previous chapter. The next chapters will present the results obtained on the effectiveness of the governance system, the equitability of the governance system, the responsiveness of the governance system, and the robustness of the governance system. The data

obtained from the policy documents and stakeholder interviews is analyzed according to the methods which have been explained in this chapter.

4 EFFECTIVENESS

4.1 INTRODUCTION

The governance objective 'effective governance' is operationalized for assessment by making an indicator for each governance characteristic ('direction', 'coordination', 'capacity', 'informed', 'accountable' and 'efficient'), which are outlined in the methods chapter of this research. In this chapter the results which are obtained for the governance objective 'effective governance' are provided in three sections. First the policy document results are displayed in the section *Policy documents*, next the results of the in-depth stakeholder interviews are delivered in the section *Interviews* and finally the patterns and differences between both are discussed in the section *Interpretation of results*. In-depth results of policy documents and paraphrases of stakeholder statements results are outlined in *Appendix 1 – Detailed results document analysis* and *Appendix 2 – Detailed interview results.* For the policy documents, each governance characteristic is presented with short summary on how the score is obtained. For the results of the interviews the appendix gives a better understanding of how the results are obtained. In-depth discussion of the results will happen in the discussion chapter of the research.

4.2 RESULTS

4.2.1 POLICY DOCUMENTS

Table 12 shows the scores of each of the characteristics and an additional average score for the entire governance objective. Short summaries of the results obtained from policy documents are listed underneath for each of the governance characteristics for the governance objective 'effective governance'. The governance objective 'effective governance' obtained a 'good' average score result. If the governance system would function accordingly, this would mean that there is little room for improving the effectiveness of the system. On the individual characteristics; 'direction', 'capacity' and 'accountable' score moderate with a sufficient score. The other characteristics for 'effective governance' received a good or very good score.

Policy documents are increasingly putting attention on the long-term, but somewhat fail to incorporate how they want to achieve such systematic change. Several policy tables have been set-up to improve this in the future. Changes within policy documents over the last years already show that there is an increased interest for improving resilience of the freshwater system, which is considered essential for combatting salinization in the delta region. Yet, there is still little attention for salinization compared to other freshwater-related issues within the policy documents.

Table 12: Indications for the effectiveness of freshwater and salinization governance as found in policy documents

Governance Objective	Governance Characteristic	Idealized output or functioning	Average score
Effective *Supports maintenance of system integrity and functioning.*	Direction	Defines what effective action encompasses and sets milestones for achieving success.	Sufficient
	Coordination	Produces system of rules for use, mechanisms for exclusion, management actions and spatial coverage that are complementary and adequate to achieve objectives. Provides a forum for discussion, debate, negotiating and resolving trade-offs.	Good
	Capacity	Enables successful decision-making and the initiation, organization, implementation and evaluation of actions.	Sufficient
	Informed	Increases the likelihood that management actions will lead to effective outcomes.	Very good
	Accountable	Ensures that governors act on mandated decisions and that effective actions are being taken.	Sufficient
	Efficient	Maximizes the productivity of management actions while minimizing the wasteful use of available resources.	Good
Average result 'Effective governance'			Sufficient

4.2.1.1 DIRECTION

Although several documents including the Delta Program documents clearly communicate aims and scope, long-term and step-by-step considerations on how to deal with the consequences of climate change are still missing. There are clear and comprehensive frameworks on how to deal with salinization issues. But there is a lack of a national vision which looks beyond 2100 and even 2050. Although it has been mentioned, there is no clear demarcation on how to deal with climate change and its consequences on for instance salinization. An integral water vision including all the factors such as sea level rise, climate change, water safety and droughts clearly lacks. Current long-term goals are considered too abstract in previous policy evaluations. There are goals and ambitions, but no clear comprehensive step-by-step frameworks on how to reach them.

Score: Sufficient

4.2.1.2 COORDINATION

It is clear who has the role of authority and who is coordinating which water types. There is active instrument development which improves steering, regulating, stimulating, and connecting. There are governance bodies which provide information based on scientific knowledge to relevant stakeholders. Yet, multi-stakeholder cooperation and consultation structures have difficulties during times of water crises. Several stakeholders have indicated that they missed coordination on policy, responsibilities, and authorities during the 2018 drought. As a result, several measures have been taken to improve this, with amongst others the establishment of the Policy Group Drought (Beleidstafel Droogte).

Score: Good

4.2.1.3 CAPACITY

The current leadership within the governance system of salinization and governance of freshwater in general acknowledges the necessity of making changes to the system because of climate change. Several panels which give recommendations and actively develop knowledge and pathways have been initiated during the last couple of years. Amongst others the Policy Table Drought (Beleidstafel Droogte) and consultation group for sea level rise have been constructed. Lately buffers have been appointed to provide clarity for sectors, users, and co-administrators. Yet, bottlenecks arise concerning timely anticipating to sea level rise and its consequences on salinization situations, freshwater availability, and other issues. Especially governance on groundwater has been indicated as an issue. Moreover, limitations within the executive force of administrators both regionally and nationally have caused bottlenecks for capacity. As such choices are needed for what comes first and what comes later.

Score: Sufficient

4.2.1.4 INFORMED

All documents considered up-to-date information and monitoring as essential for efficient and adequate planning. Within the governance system a lot of effort has been put into gathering the best available information and actively developing new information through consultation and advise groups. These groups consist of multiple stakeholders and include scientific information from non-governmental knowledge institutes and live monitoring by various institutions. During periods of crisis in which bottlenecks arise, new research is initiated to gather information to make better decisions in the future.

Score: Very good

4.2.1.5 ACCOUNTABLE

Rijkswaterstaat and the Inspection for Environment and Transport (ILT) are the head authorities for issues concerning salinization. They have initiated the construction of several policy documents in

which manuals and frameworks lay out norms, rules, objectives, and such. On an annual basis progress on freshwater related issues is discussed with the house of representatives. Yet, within several policy documents it is mentioned that there are issues with shattered organizational structures. These result in unclear responsibilities and authorities. Organizational chaos may cause problems for identifying who is accountable for which issues. Groundwater management has been identified as such issue in which it is unclear which stakeholder should initiate action and monitor the quality. Steps have been taken to improve this in the future, but it is currently unclear whether the problems have been fully resolved.

Score: Sufficient

4.2.1.6 EFFICIENT

Efficiency is mentioned a couple of times in policy documents. Most important is the realization that (social) economic damages are getting higher because of climate change and as such mitigation and adaptation measures are important. Cost-benefit analysis are used for identifying trade-offs and make choices based on efficiency. Also, use of models, tools and data provides higher chances of making the most efficient choices. There still need to be improvements within the system to establish an efficient climate proof freshwater supply. To achieve this, the policy documents mention efficient flushing against salinization and adapting land use to the water availability as two of the most important considerations.

Score: Good

4.2.2 INTERVIEWS

The in-depth stakeholder interviews resulted in six different outcomes per governance characteristic, as visualized in Table 13. There is a wide dispersion between stakeholder scores for several governance characteristics of effective governance. The stakeholder comments and line of reasoning for obtaining specific interview scores can be found in *Appendix 2 – Detailed interview results.* There are no clear patterns between scores for individual governance characteristic scores. Most are varying greatly. There are, however, some patterns within some individual interviews. Interviews 4 and 6 are considered more positive compared to the rest with both average scores of 3.5 (sufficient – good). It is particularly interesting that stakeholders 4 and 6 are considered stakeholders which operate on the regional and sub-regional level of the governance system. Especially interviews 1 and 5 resulted in very low scores with averages of 1.8 (poor) and 1.2 (very poor). Interviews 2 and 3 scored somewhat higher with both scoring 2.5 on average (poor – sufficient). The average score of all six interviews on the entire set of governance characteristics is 2.5. As such the average score of the six interviews on the governance objective 'effective governance' is 2.5 (poor – sufficient). Table 14 shows that, as such, most of the characteristics do not meet their idealized output.

Looking more closely to the explanation of stakeholders for the low scores, there are concerns about goal setting, agenda-setting, and scope. Several participants explained that according to them a lack of urgency limits the ability for visionary goal setting and action. Long-term issues such as salinization are considered difficult for politics and often fail to get the attention they need

according to stakeholders. They argue that there is no visionary leadership with an integrative long-term vision and as such resource allocation is insufficient. In addition, they argue that system knowledge is insufficient within some organizations, holding back systematic change on the freshwater system. Efficiency of resources at hand is also considered poor by most of the participants. Most of the participants indicated that there is inefficient use of information, freshwater and measures.

Table 13: Indications for the effectiveness of freshwater and salinization governance as found in Interviews

Governance characteristic	Interview 1	Interview 2	Interview 3	Interview 4	Interview 5	Interview 6	Average score	Missing scores
	National perspective	National perspective	National perspective	Regional perspective	National perspective	(sub)-Regional perspective	-	-
Direction	2	3	2	5	1	2	2.5 2.5	0
Coordination	2	2	3	4	1	4	2.7	0
Capacity	2	2	1	2	1	2	1.7	0
Informed	2	3	4	5	2	5	3.5 3.5	0
Accountable	-	3	3	2	1	3	2.4	1
Efficient	1	2	2	3	1	5	2.3	0
Average score	1.8	2.5 2.5	2.5 2.5	3.5 3.5	1.2	3.5 3.5	2.5 2.5	-
Missing data points	1	0	0	0	0	0	-	-

Table 14: Indications for the effectiveness of freshwater and salinization governance as found in interviews (average results)

Governance Objective	Governance Characteristic	Idealized output or functioning	Average score	
Effective *Supports maintenance of system integrity and functioning.*	Direction	Defines what effective action encompasses and sets milestones for achieving success.	Poor	Sufficient
	Coordination	Produces system of rules for use, mechanisms for exclusion, management actions and spatial coverage that are complementary and adequate to achieve objectives. Provides a forum for discussion, debate, negotiating and resolving trade-offs.	Sufficient	
	Capacity	Enables successful decision-making and the initiation, organization, implementation, and evaluation of actions.	Poor	
	Informed	Increases the likelihood that management actions will lead to effective outcomes.	Sufficient	Good
	Accountable	Ensures that governors act on mandated decisions and that effective actions are being taken.	Poor	
	Efficient	Maximizes the productivity of management actions while minimizing the wasteful use of available resources.	Poor	
Average result 'Effective governance'			Poor	Sufficient

4.2.3 INTERPRETATION OF RESULTS

Putting the results of both the policy document analysis and average scores of the in-depth interviews next to each other, it shows the deviation between both for each governance characteristic and the governance objective as a whole. The results in Table 15 show that most of the characteristics have a deviation of -1 to -2 between policy documents and stakeholder interviews. The deviation of the average score for the entire governance objective ranges between -2 and -1. There are no scores between, since the framework works with category scores, and as such are not presented in decimal scores.

Table 15: Deviation between document analysis scores and interview scores (effective governance)

Governance Objective	Governance Characteristic	Document analysis score	Average interview score		Deviation between category groups
Effective *Supports maintenance of system integrity and functioning.*	Direction	Sufficient (3)	Poor (2)	Sufficient (3)	-1 / 0
	Coordination	Good (4)	Sufficient (3)		-1
	Capacity	Sufficient (3)	Poor (2)		-1
	Informed	Very good (5)	Sufficient (3)	Good (4)	-2 / -1
	Accountable	Sufficient (3)	Poor (2)		-1
	Efficient	Good (4)	Poor (2)		-2
Governance objective 'effective' average		Good (4)	Poor (2)	Sufficient (3)	-2 / -1

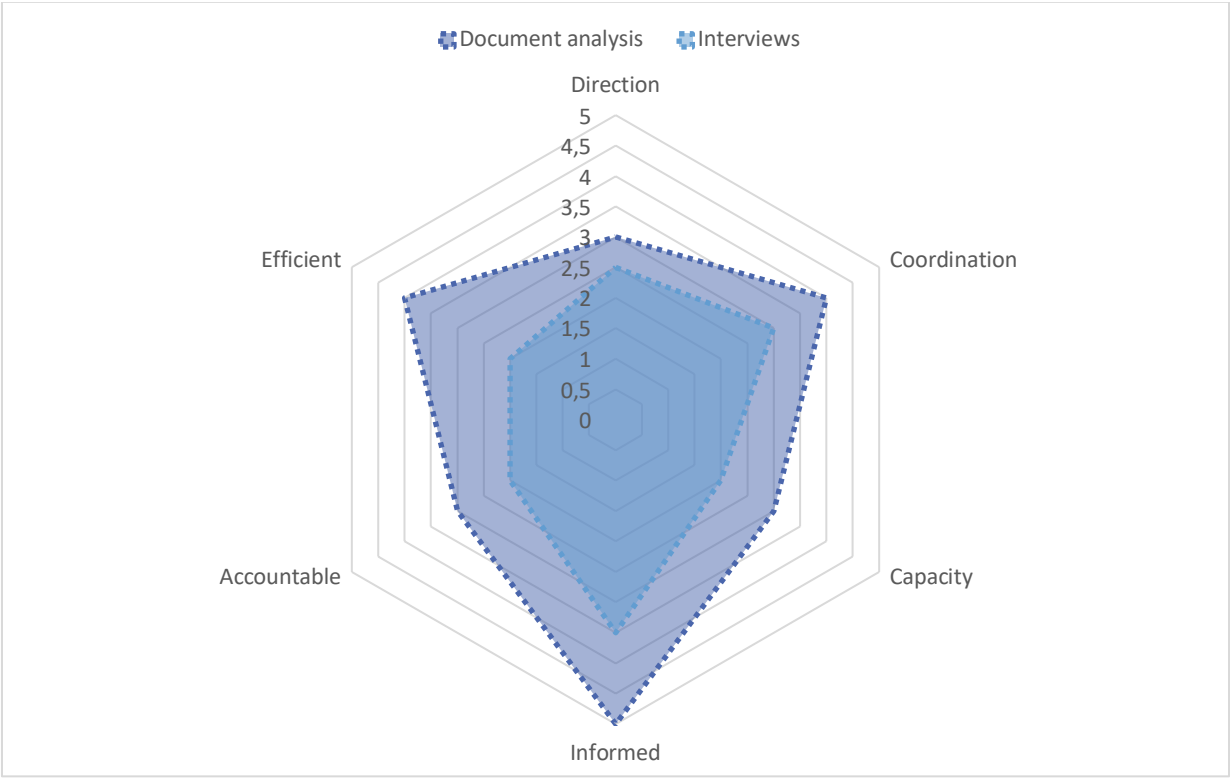

Figure 5: Radar chart of document analysis scores and average interview scores (effective governance)

In order to interpret the results, especially Table 15 and Figure 5 are interesting. Individual interviews do not really give an insight on how the governance system is perceived as a whole and are as such less interesting for drawing conclusions. The results show that stakeholders perceive the governance

objective ‘effective governance’ significantly less compared to what should be the case according to policy documents. For the governance characteristics ‘direction’, ‘capacity’ and ‘accountable’ both the policy documents and the stakeholder interviews indicate that there is room for improvement. Figure 5 shows a quite similar shaped pattern for all characteristic scores, but much lower scores for the interviews. This indicates that there is a lack of implementation from policy to action.

4.3 CONCLUSION

Both policy documents and stakeholder interviews indicated that there is room for improving effectiveness of the governance system. ‘Direction’, ‘capacity’ and ‘accountability’ are considered the lowest scoring governance characteristics in both. In addition, ‘efficiency’ is considered a major point of concern for stakeholders. Overall, the governance objective ‘effective governance’ is perceived poor – sufficient by stakeholders and considered good according to policy documents. This indicates that policy and action do not always align.

5 EQUITABILITY

5.1 INTRODUCTION

The governance objective 'equitable governance' is operationalized for assessment by making an indicator for each governance characteristic ('recognition', 'participation', 'fair' and 'just') in the methods chapter of this research. In the remainder of this chapter the results which are obtained for the governance objective 'effective governance' are provided in three sections. First the policy document analysis results are displayed in the section *Policy documents*, next the results of the in-depth stakeholder interviews are delivered in the section *Interviews* and finally the patterns and differences between both are provided in the section *Interpretation of results.* In-depth results of policy documents and paraphrases of stakeholder statements results are outlined in *Appendix 1 – Detailed results document analysis* and *Appendix 2 – Detailed interview results*. For the policy documents, each governance characteristic is presented in a short summary on how the score is obtained. For the results of the interviews the appendix gives a better understanding of how the results are obtained. In-depth discussion of the results will happen in the discussion chapter of the research.

5.2 RESULTS

5.2.1 POLICY DOCUMENTS

Table 16 shows the scores of each of the characteristics and an additional average score for the entire governance objective. Short summaries of the results obtained within the document analysis are listed underneath for each of the governance characteristics for the objective 'equitable governance'. The governance objective 'equitable governance' obtained a 'sufficient' average score. If the governance system would function accordingly, this would mean that there is some room for improvement. From the individual characteristics, recognition receives a poor score. This indicates that not all needs, and rights are incorporated, and social contexts are not always recognized. Other characteristics score better with good and very good.

Table 16: Indications for the equitability of freshwater and salinization governance as found in policy documents

Governance Objective	Governance Characteristic	Idealized output or functioning	Score on output
Equitable *Employs inclusive processes and produces fair outcomes.*	Recognition	Facilitates socially acceptable governance and perceptions of legitimacy. Aids in the design of management actions that are appropriate to the social context.	Poor
	Participation	Contributes to just power relations and decision-making processes. Leads to plans and actions that represent the interests of different groups. Allows parties to democratically debate decisions and maintain dignity.	Very Good
	Fair	Ensures a fair balance of costs and benefits accrue to different groups.	Good
	Just	Ensures rights (e.g., title, historical tenure, access, use, management) are not undermined and that reparations or compensation are made for past damages.	Inconclusive data
Average result 'equitable governance'			Sufficient

5.2.1.1 RECOGNITION

For this result it is important to consider which groups are considered marginalized and vulnerable groups in this situation. According to Bloem et al. (2007) the most prominent stakeholders which are affected by salinization are farmers, whose crops and land are affected, irrigation and water authorities, who need to take precautionary or remedial action but also stakeholders who have jobs concerning ecosystem services, tourism, and such. Looking to vulnerable stakeholders in a broader sense of the issue, residents are affected by freshwater shortages as well. Water shortage in the region may lead to water use limitations. It is recognized that salinization issues are context- and location-specific, and as such may need customization and deviation from the main guidelines and norms. In addition, the highest governor is aware that current soil and water management is reaching its limits. As such, the governor states that vulnerable groups need to be protected against its impacts by making water and soil leading for spatial planning. Yet, none of the documents actively recognize the need to involve such stakeholders into conversations about direction and capacity. Recognizing the hazard for constituents does not equal recognizing the need to involve perspectives and values.

Score: Poor

5.2.1.2 PARTICIPATION

Participation of both stakeholders and outside actors is mentioned across several documents as very important. Close collaboration and public support are considered key for implementation of measures and planning for large scale transitions. Information provision and consultation of actors outside the governance structure is also considered important. Within the documents there is consensus that sessions and participation programs which involve stakeholders and actors is important for finding creative solutions for upcoming challenges. For instance, the knowledge program sea-level rise has been set up to come up with integrative and out-of-the-box solutions.

Score: Very good

5.2.1.3 FAIR

Although governments and organizations are trying to limit the impacts of salinization and freshwater shortages, it is recognized that in the light of current climate change and sea-level rise projections, damage cannot always be avoided. According to the displacement series of freshwater within the Netherlands, irreversible damage and water safety is considered most important. In the light of safety, this displacement series is considered fair. Adaptation to new circumstances by (spatial) planning is considered important, even if this does not balance social costs and benefits in some cases. Although social-economical costs and benefits are not always shared equally, unequal circumstances are considered within the documents, and they are clearly elaborated upon.

Score: Good

5.2.1.4 JUST

Within the documents there are no specific quotes and statements found which could be directly linked to this governance characteristic. As such, this result remains empty. Implications of this will be discussed within the discussion section.

Score: Inconclusive data

5.2.2 INTERVIEWS

The stakeholder comments and line of reasoning for obtaining specific interview scores can be found in *Appendix 2 – Detailed interview results.* Table 17 shows some clear patterns between scores for individual governance characteristics. For the governance characteristic ‘participation’ all the scores are very good, whereas for recognition 3 out of 4 score poor. For the governance characteristic ‘fair’ 3 out of 5 score very poor. Average scores of the stakeholder interviews on the governance objective ‘equitable governance’ vary from 2.3 to 4.3. Interviews 3, 4 and 5 get a sufficient average score, whereas interview 1 gets a poor average score. Interview 6 results in a good average score. Overall, the system is perceived as sufficient (2.9) by the 6 interviews combined. Table 18 shows that, as

such, most of the characteristics do not meet their idealized output, since only participation receives a good or very good score. Other average scores based on interviews (e.g. 'recognition' (sufficient); 'fair' (poor) and 'just' (poor)) all leave room for improvements.

Table 17: Indications for the equitability of freshwater and salinization governance as found in interviews

Governance characteristic	Interview 1	Interview 2	Interview 3		Interview 4	Interview 5	Interview 6	Average score	Missing scores
	National perspective	National perspective	National perspective		Regional perspective	National perspective	(sub)-Regional perspective	-	-
Recognition	2	-	-		2	2	5	2.8	2
Participation	5	-	5		5	5	5	5.0	1
Fair	1	-	2		1	1	3	1.6	1
Just	1	-	-		3	-	-	2.0	4
Average score	2.3	-	3.5	3.5	2.8	2.7	4.3	2.9	-
Missing data points	0	4	2		0	1	1	-	-

Table 18: Indications for the equitability of freshwater and salinization governance as found in interviews (average results)

Governance Objective	Governance Characteristic	Idealized output or functioning	Average score
Equitable *Employs inclusive processes and produces fair outcomes.*	Recognition	Facilitates socially acceptable governance and perceptions of legitimacy. Aids in the design of management actions that are appropriate to the social context.	Sufficient
	Participation	Contributes to just power relations and decision-making processes. Leads to plans and actions that represent the interests of different groups. Allows parties to democratically debate decisions and maintain dignity.	Very good
	Fair	Ensures a fair balance of costs and benefits accrue to different groups.	Poor
	Just	Ensures rights (e.g., title, historical tenure, access, use, management) are not undermined and that reparations or compensation are made for past damages.	Poor
Average result 'equitable governance'			Sufficient

5.2.3 INTERPRETATION OF RESULTS

Putting the results of both the policy document analysis and average scores of the in-depth interviews next to each other, shows the deviation between both for each governance characteristic and the governance objective. The results in Table 19 show that most of the characteristics have a deviation of +1 ('recognition'), 0 ('participation') and -2 ('Fair') between policy documents and stakeholder interviews. The deviation of the average score for the entire governance objective is 0. This indicates that for both scores there is some room for improving the governance objective 'equitable governance'.

Table 19: Deviation between document analysis scores and interview scores (equitable governance)

Governance Objective	Governance Characteristic	Document analysis score	Average interview score	Deviation between groups
Equitable *Employs inclusive processes and produces fair outcomes.*	Recognition	Poor (2)	Sufficient (3)	+1
	Participation	Very good (5)	Very good (5)	0
	Fair	Good (4)	Poor (2)	-2
	Just	Inconclusive data	Poor (2)	?
Governance objective 'equitable' average		Sufficient (3)	Sufficient (3)	0

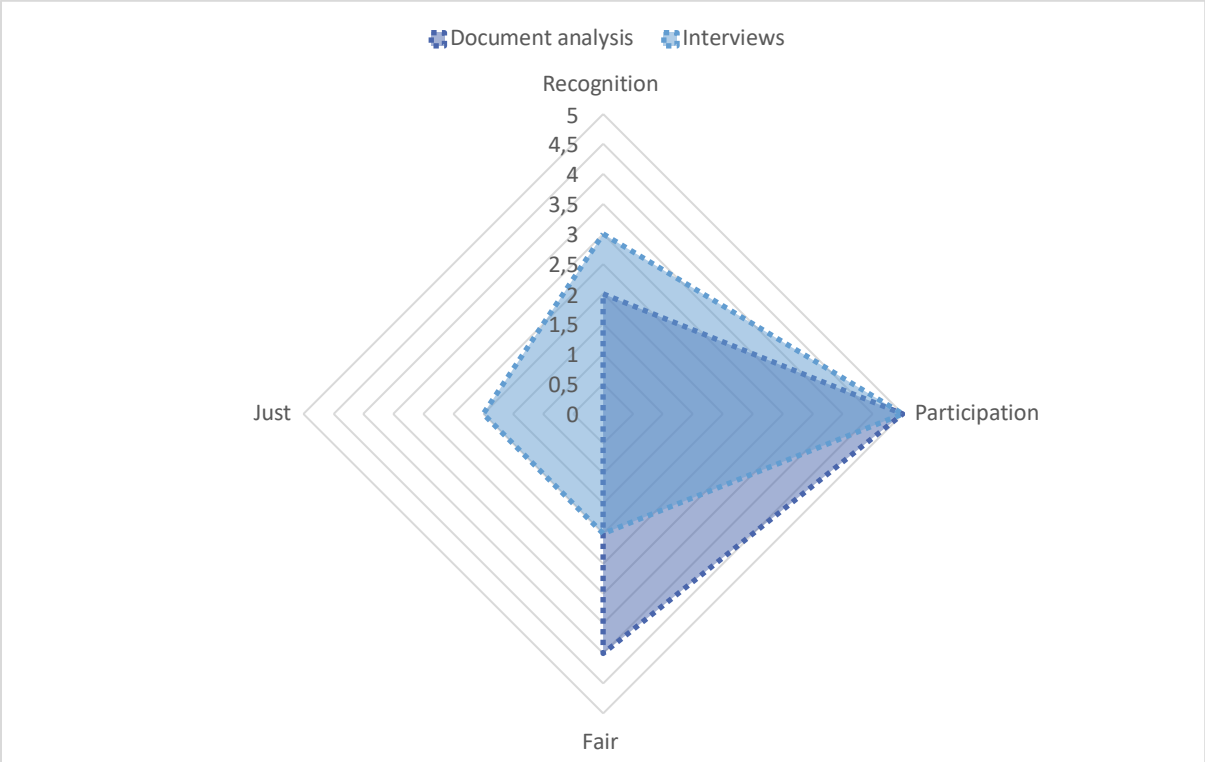

Figure 6: Radar chart of document analysis scores and average interview scores (equitable governance)

In order to interpret the results, especially Table 19 and Figure 6 are interesting. Individual interviews do not really give an insight on how the governance system is perceived as a whole and as such less interesting for drawing conclusions. The result show that stakeholders perceive the governance objective 'effective governance' similarly to what it should be according to the policy documents. Table 19 shows that for the separate governance characteristics, both stakeholder interviews and policy documents score participation equally good and recognition equally poor. For the governance characteristic 'just' there are no scores within the policy documents and as such did

not result in a score. In addition, there are some missing results within the stakeholder interviews, which are as such sometimes based on less results. Especially the result of 'just' is not very strong. The average result of 'just' is only based on 2 out of 6 interviews.

Both policy documents and stakeholder interviews did show that there was a lot of effort for participation. This, however, did according to the analysis of both, not result in better recognition for marginalized groups and the recognition for social contexts. The stakeholder participants of the interviews mentioned that regions which have less inhabitants are often considered less important by governmental stakeholders, which is according to them not fair. Farmers and other agri-businesses have a lot of trouble getting sufficient freshwater of good quality in regions such as Zeeland and Groningen. Food security for a large global population is according to interview 1 being pressured due to such decisions. Both regions play a big role in the global food supply chain due to the cultivation of seed potatoes. Consequences of current policy will according to stakeholder interview 5 be felt by future generations.

Although participation is perceived as good according to the framework, interview participants have commented that there might be too much participation for effective management. Especially interview participant 5 was quite critical on too much participation. According to the participant too much participation from a variety of actors and stakeholders could decrease decision-making speed and as such slow down the transition. Participation is however considered important by the policy documents. In addition, most interviews concluded that costs and benefits are not always distributed fairly, since geographical locations are getting attention based on several factors. They argue that, although costs and benefits cannot always be shared equally due to the system's dependance on climate, there should be more efforts to better distribute costs and benefits.

5.3 CONCLUSION

Although the average document analysis scores and the average interview scores both resulted in a sufficient score for the governance objective 'equitable governance', there are some observed points of concern. Both indicated that 'recognition' is poor. In addition, the characteristic 'fair' is considered poor by stakeholders. Those two have room for improvement and should be taken into consideration for making the system less prone to unfair costs and benefits. The results of this chapter are less reliable because of concerns about the absence of data due to insufficient stakeholder knowledge.

6 RESPONSIVENESS

6.1 INTRODUCTION

The governance objective 'responsive governance' is operationalized for assessment by making an indicator for each governance characteristic ('learning', 'anticipatory', 'adaptive', 'innovation' and 'flexible') in the methods chapter of this research. In the remainder of this chapter the results which are obtained for the governance objective 'responsive governance' are provided in three sections. First the policy document analysis results are displayed in the section *Policy documents*, next the results of the in-depth stakeholder interviews are delivered in the section *Interviews* and finally the patterns and differences between both are discussed in the section *Interpretation of results.* In-depth results of policy documents and paraphrases of stakeholder statements results are outlined in *Appendix 1 – Detailed results document analysis* and *Appendix 2 – Detailed interview results.* For the policy documents, each governance characteristic is presented with a short summary on how the score is obtained. For the results of the interviews the appendix gives a better understanding of how the results are obtained. In-depth discussion of the results will happen in the discussion chapter of the research.

6.2 RESULTS

6.2.1 POLICY DOCUMENTS

Short summaries of the results obtained within the document analysis are listed for each of the governance characteristics for the objective 'responsive governance'. Table 20 shows the scores of each of the characteristics and an additional average score for the entire governance objective. The governance objective 'responsive governance' obtained a 'very good' average score result. If the governance system would function accordingly, this would mean that there is no room for improving the responsiveness of the system. All of the individual characteristic scores received a good or very good score, which indicates that the responsiveness of the governance system functions in a desired way.

Table 20: Indications for the responsiveness of freshwater and salinization governance as found in policy documents

Governance Objective	Governance Characteristic	Idealized output or functioning	Score on output
Responsive *Enables adaptation to diverse contexts and changing conditions.*	Learning	Ensures that information is produced, documented, shared and informs decision-making.	Very good
	Anticipatory	Produces plans and steps to prepare and prevent consequences of unexpected risks. Enhances knowledge, capacity, and flexibility for disturbance.	Good
	Adaptive	Ensures that management plans and actions are being actively adapted to reflect changing social-ecological contexts and new knowledge.	Very good
	Innovative	Allows change to be seen as an opportunity. Enables new and more effective ideas and actions to emerge.	Good
	Flexible	Enables governance systems and management models to be adjusted to better fit with local social, cultural, political, economic, and environmental contexts.	Very good
Average result 'responsive governance'			Very good

6.2.1.1 LEARNING

Monitoring, evaluating, and reflecting are being institutionalized. During crisis years with regards to freshwater availability and droughts, mistakes have been made. This led in various cases to the establishment of new knowledge programs which gather and develop relevant information, evaluate current strategies and measures, and develop net plans, pathways, and long-term solutions. Moreover, pillars containing both technical aspects and more governance and policy related bottlenecks are being actively discussed in order to improve. Learning from past mistakes has become an important part of current practice. Exchange of data is considered very important for effectively addressing newly arising problems. Knowledge gaps are mentioned to increase system knowledge within future research.

Score: Very good

6.2.1.2 ANTICIPATORY

There is a widespread consensus within policy documents that climate change needs a different approach compared to current water and land management. It is acknowledged that large parts of the water and soil systems are so interconnected that there need to be integrative and transformative approaches to adapt to the changing climate. Long-term thinking has been institutionalized during the last couple of years by establishing various knowledge institutes. It is even mentioned that there is a need for step-based transformations rather than incrementally changing within the pace of climate change. The documents however did not propose integrative plans on how to do this. Climate resilience is a goal, but precise and concise strategies are not included. Also, the system has been under pressure in the 2018 drought, which was not anticipated upon. During the upcoming years it will be clear if new visions and strategies have mitigated the effects and there will not be a surprise again.

Average score: Good

6.2.1.3 ADAPTIVE

Adapting to the changing environment is considered key for combatting salinization, drought and water scarcity. Especially during times in which at one hand there can be water nuisance and on the other hand there can be drought. The policy documents state that there need to be new strategies for these extremities, and that we should be able to adapt to it based on real-time information on a national level. Whereas water drainage has been opted for a long time. Currently the main objective mentioned is considered water retainment. Storing water in the region and creating a buffer should improve adaptive power, and as such help combat salinization and freshwater scarcity. Adapting to the changing environment is currently implemented step by step (Climate Proof Freshwater Supply Main Water System). Doing so, leaves room for analysis and research, providing the best possible basis for effective and efficient measures. Yet, only a few years back in 2018, unanticipated drought almost resulted in massive economical and natural damages. Creative use of freshwater and adapting based on real-time information mitigated its effects.

Score: Very good

6.2.1.4 INNOVATIVE

Innovations both on the technical aspect and the governance aspect of freshwater management are mentioned as very important for adapting to the changing circumstances. Pilots are being set up with multiple stakeholders. Preferably these are being initiated by non-governmental stakeholders, according to policy documents. There is monitoring of new measures and strategies, whereby both advantages and disadvantages are considered. Unconventional measures are considered, and measures for which there is no experience are explored upon. The documents do not elaborate upon risk tolerance and how to deal with it. As such questions arise on the feasibility to implement far fetching and large-scale technological innovations.

Score: Good

6.2.1.5 FLEXIBLE

Policy documents recognize the need to incorporate local and regional contexts to measures and strategies. As such, a dynamic and flexible adaptation program is mentioned as urgent. Although national steering Is considered essential, space for solutions in the region is encouraged. Monitoring and smart water management is important to improve flexibility of the current system while keeping room for the accommodation of new developments. Freshwater buffers should be maintained based on real-time data and forecasts and as such keep room for supra-regional and flexible freshwater management. Currently the focus is on working out tailor-fit regional approaches and solutions and local and regional groundwater displacement series to fit with local and regional contexts. In contrast to previous policy, during the last few years the focus has shifted to down-scaling to local and regional realities.

Score: Very good

6.2.2 INTERVIEWS

The in-depth stakeholder interviews resulted in six different outcomes for each governance characteristic, as visualized in Table 21. There is a wide dispersion between stakeholder scores for several governance characteristics of 'responsive governance'. The stakeholder comments and line of reasoning for obtaining specific interview scores can be found in *Appendix 2 – Detailed interview results.* There are almost no clear patterns between scores for individual governance characteristic scores. The only considerable pattern is observed for the characteristic 'adaptive' with 4 out of 6 scores being sufficient. Most others are varying greatly among participants. There are however some patterns on individual interviews. Interviews 4 and 6 are considered more positive compared to the rest with interview 4 scoring an average of 4.8 (very good) and interview 6 scoring an average of 3.6 (good). Especially interviews 1, 2, 3 and 5 resulted in sufficient scores with averages of 3.2 (sufficient), 3.2 (sufficient), 2.8 (sufficient) and 2.6 (sufficient). The average score of all six interviews on the entire set of governance characteristics is 3.4. As such the average score of the six interviews on the governance objective 'responsive governance' is sufficient. Table 22 shows that the average characteristic scores for interviews leave room for improvements for especially 'anticipatory' (2.7) and 'adaptive' (3.2).

Table 21: Indications for the responsiveness of freshwater and salinization governance as found in interviews

Governance characteristic	Interview 1	Interview 2	Interview 3	Interview 4	Interview 5	Interview 6	Average score	Missing scores
	National perspective	National perspective	National perspective	Regional perspective	National perspective	(sub)-Regional perspective	-	-
Learning	3	4	3	5	3	4	3.7	0
Anticipatory	3	3	2	4	1	3	2.7	0
Adaptive	3	3	3	5	3	2	3.2	0
Innovative	4	4	2	5	4	3	3.7	0
Flexible	3	2	4	5	2	5	3.5 3.5	0
Average score	3.2	3.2	2.8	4.8	2.6	3.6	3.4	-
Missing data points	0	0	0	0	0	0	-	-

Table 22: Average interview results responsive governance

Governance Objective	Governance Characteristic	Idealized output or functioning	Score on output	
Responsive *Enables adaptation to diverse contexts and changing conditions.*	Learning	Ensures that information is produced, documented, shared and informs decision-making.	Good	
	Anticipatory	Produces plans and steps to prepare and prevent consequences of unexpected risks. Enhances knowledge, capacity and flexibility for disturbance.	Sufficient	
	Adaptive	Ensures that management plans and actions are being actively adapted to reflect changing social-ecological contexts and new knowledge.	Sufficient	
	Innovative	Allows change to be seen as an opportunity. Enables new and more effective ideas and actions to emerge.	Good	
	Flexible	Enables governance systems and management models to be adjusted to better fit with local social, cultural, political, economic, and environmental contexts.	Sufficient	Good
Average result 'responsive governance'			Sufficient *	

* *Based on decimal places, the average is 3.4 instead of 3.5, as outlined in Table 21.*

6.2.3 INTERPRETATION OF RESULTS

Looking more closely to the results of both the policy document analysis and average scores of the in-depth interviews, it shows the deviation between both for each governance characteristic and the governance objective as a whole. The results in Table 23 show that most of the characteristics have a deviation of -1 or -2 between policy documents and stakeholder interviews. The deviation of the average score for the entire governance objective is -2. This indicates that based on the document analysis results, the system could be considered perfect with an average score of very good. The interviews however indicate that there is some room for improving the objective 'responsive governance'. The results from the document analysis and the in-depth stakeholder interviews are quite different. This indicates that the system is perceived less perfect by stakeholders in practice.

Table 23: Deviation between document analysis scores and interview scores (responsive governance)

Governance Objective	Governance Characteristic	Document analysis score	Average interview score		Deviation between category groups
Responsive *Enables adaptation to diverse contexts and changing conditions.*	Learning	Very good (5)	Good (4)		-1
	Anticipatory	Good (4)	Sufficient (3)		-1
	Adaptive	Very good (5)	Sufficient (3)		-2
	Innovative	Good (4)	Good (4)		0
	Flexible	Very good (5)	Sufficient (3)	Good (4)	-2 / -1
Governance objective 'responsive' average		Very good (5)	Sufficient (3)		-2

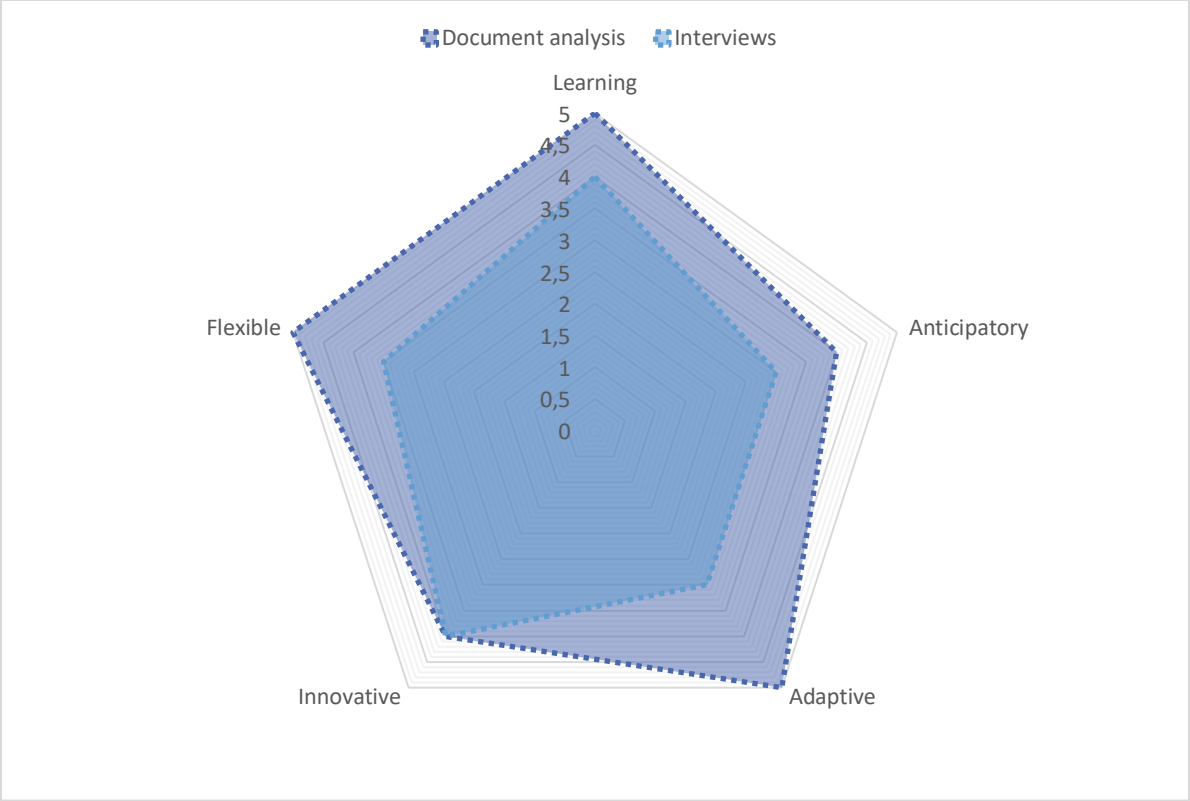

Figure 7: Radar chart of document analysis scores and average interview scores (responsive governance)

To interpret the results, especially Table 23 and Figure 7 are interesting. Individual interviews do not really give an insight on how the governance system is perceived as a whole and are as such less interesting for drawing conclusions. The result show that stakeholders perceive the governance objective 'responsive governance' differently to what it should be according to the policy documents. Table 23 shows that for the separate governance characteristics, both stakeholder interviews and

policy documents score the governance characteristic ‘innovative’ equally good (good). Also, the governance characteristic ‘learning’ is considered good for both. The stakeholder interviews score the latter a good and policy documents a very good. The deviation between document analysis and interviews, for the governance characteristic ‘anticipatory’, is also -1. The document analysis scores this characteristic good, whereas interviews score it with a sufficient. Larger deviations show up for the governance characteristics ‘adaptive’ (-2) and ‘flexible’ (-1 / -2). None of the characteristics have missing data, and as such the results can be considered reliable.

For the governance characteristics ‘anticipatory’, ‘adaptive’ and ‘flexible’ concerns of stakeholders are that vision and actions are not aligning. This concern is be strengthened by the results of the policy documents. These indicate that foresight thinking is institutionalized, and that flexibility of the system is considered essential. Yet, various stakeholders indicate that big decisions for making the Netherlands more resilient against freshwater scarcity, salinization and sea-level rise are not being made because of politics. Locations that are mentioned that back up their claims are the IJsselmeer and the ‘Grevelingen’. Both are mentioned by stakeholders several times for addressing freshwater resilience and according to them are not even considered due to conflicting interests. Also, stakeholders claim that the long-term vision is not integrative enough for combatting all fresh water related issues separately. More integrative policies are considered essential by them. There have been steps for improving freshwater governance, with amongst other policy instruments such as SMART water management. Yet, there is a lot of room for improvement to become completely resilient against the pressures that climate change brings along. Stakeholders argue that there is a lot of innovation through pilots and that evaluation and reflection is happening sufficiently. The information is, however in practice, not always used the best way possible. Bottlenecks which have been mentioned are often location around the political spectrum of anticipatory governance. Short-term issues such as housing are considered more pressing, and get more attention as such, despite plans for looking at spatial planning by making water availability leading.

6.3 CONCLUSION

Overall, the responsiveness of the governance system is performing sufficiently according to key stakeholders and very good according to policy documents. The results indicate that the key stakeholders perceive the governance system as less responsive compared to the policy documents. Consequences for this deviation is most likely caused by the differentiation of how foresight thinking is conceptualized. According to key stakeholders, foresight thinking is insufficient. They argue that flexibility is opted for, whereas a more anticipatory approach is needed.

7 ROBUSTNESS

7.1 INTRODUCTION

The governance objective 'robust governance' is operationalized for assessment by making an indicator for each governance characteristic ('legitimate', 'connected', 'nested' and 'polycentric') in the methods chapter of this research. In the remainder of this chapter the results which are obtained for the governance objective 'robust governance' are provided in three sections. First the policy document analysis results are displayed in the section *Policy documents,* next the results of the in-depth stakeholder interviews are delivered in the section *Interviews* and finally the patterns and differences between both are provided in the section *Interpretation of results*. In-depth results of policy documents and paraphrases of stakeholder statements results are outlined in *Appendix 1 – Detailed results document analysis* and *Appendix 2 – Detailed interview results*. For the policy documents, each governance characteristic is presented with a short summary on how the score is obtained. For the results of the interviews the appendix gives a better understanding of how the results are obtained. In-depth discussion of the results will happen in the discussion chapter of the research.

7.2 RESULTS

7.2.1 POLICY DOCUMENTS

Short summaries of the results obtained within the document analysis are listed for each of the governance characteristics for the objective 'robust governance'. Table 24 shows the scores of each of the characteristics and an additional average score for the entire governance objective. The governance objective 'robust governance' obtained a good / very good average score result. If the governance system would function accordingly, this would mean that there is none or little room for improving the effectiveness of the system. In addition, the governance characteristics all score good or very good.

Table 24: Indications for the robustness of freshwater and salinization governance as found in policy documents

Governance Objective	Governance Characteristic	Idealized output or functioning	Score on output	
Robust *Ensures functioning institutions persist, maintain performance and cope with perturbations and crises.*	Legitimate	Ascertains that there is support from above and that there is a supportive constituency.	Very good	
	Connected	Helps to bridge between and across scales. Creates supportive community, produces social capital, fosters respect and trust, and builds social memory. Encourages communication, information exchange, enables diffusion of innovations, and facilitates collaboration.	Good	
	Nested	Empowers appropriate entity to take necessary action. Allows also for shaping and adapting institutions and decision-making processes to different local sub-contexts (social circumstances, governance, ecologies) within larger system.	Good	
	Polycentric	Helps to buffer against change in one location. Ensures that the governance system does not collapse when faced with adversity or crises.	Very good	
Average result 'robust governance'			Good	Very good

7.2.1.1 LEGITIMATE

Legitimacy ascertains that there is support from above and that there is a supportive constituency. Within the field of freshwater governance, there are clear, uniform, and transparent guidelines of the collective vision. Throughout various papers the goals and visions of leadership and institutions is clear. Close cooperation is a must and transparency are as such being recognized as a must. Consistent and well-coordinated communication is considered essential to improve support for measures.

Result: Very good

7.2.1.2 CONNECTED

The Dutch water management system is globally often praised for its effectiveness. There are multiple layers with a lot of horizontal connections. Municipalities, provinces, water boards, Rijkswaterstaat and deputy states all have responsibilities. In some cases, this can, during crisis situations, lead to unclear responsibilities. There are a few bridging organizations which develop knowledge and solutions for the future. The Delta Program sets out a vision which is often adopted by the ministry. The institutions which need to execute are following that specific 'direction'. During recent years there is more room for the development of networks, relations and increase mutual learning.

Result: Good

7.2.1.3 NESTED

Management of water bodies is assigned to different levels of governance. Municipalities, water boards, provinces and state all have a shared responsibility for the implementation and execution of regulation, legislation, and vision. All levels are perceived as competent authority. It is recognized that local contexts and regional setting lead to diverse tasks and consequences. It is recognized that for effective freshwater governance, tasks must be conferred to the lowest level as possible. Yet, the scattered structure which is associated with sometimes unclear responsibilities and authorities has led to problems during crisis situations.

Score: Good

7.2.1.4 POLYCENTRIC

The Dutch water governance system is built up to be resilient against crisis situations. As such, decision-making centers are at multiple scales and across multiple jurisdictions. Goal setting is happening at national scale. The common goal often follows from consultation between different institutions such as the Delta Program and Knowledge Program Sea-level Rise. During crisis situations like urgent water scarcity, the LCW is added to the system by giving real-time information and preferred action plans to the authorities which are working on the matter at the same time. This buffers against change and improves resilience.

Score: Very good

7.2.2 INTERVIEWS

The in-depth stakeholder interviews resulted in six different outcomes for each governance characteristic, as presented in Table 25. The first thing that should be mentioned is the absence of sufficient data. The only two governance characteristics with 4 or more results are 'legitimate' (4 scores) and 'connected' (6 scores). The governance characteristic 'nested' only has 2 scores and 'polycentric' has none. As such, it is difficult to draw conclusions upon the latter two within the remainder of this section. The characteristic 'legitimate' received an average score of 2.3 (poor),

whereas ‘connected’ received an average score of 4.7 (very good). The average score of the six interviews combined, on the governance objective ‘robust governance’, is 3.8 (good). As mentioned before, this is however based on little data and therefore is difficult to draw further conclusions upon.

Table 25: Indications for the robustness of freshwater and salinization governance as found in interviews

Governance characteristic	Interview 1	Interview 2	Interview 3	Interview 4	Interview 5	Interview 6	Average score	Missing scores
	National perspective	National perspective	National perspective	Regional perspective	National perspective	(sub)-Regional perspective	-	-
Legitimate	2	2	-	4	1	-	2.3	2
Connected	5	5	4	5	5	4	4.7	0
Nested	-	-	-	5	-	4	4.5 4.5	4
Polycentric	-	-	-	-	-	-	Inconclusive data	6
Average score	3.5 3.5	3.5 3.5	4.0	4.7	3.0	4.0	3.8	0
Missing data points	2	2	3	1	2	2	-	-

Table 26: Indications for the robustness of freshwater and salinization governance as found in policy documents (average)

Governance Objective	Governance Characteristic	Idealized output or functioning	Score on output	
Robust *Ensures functioning institutions persist, maintain performance and cope with perturbations and crises.*	Legitimate	Ascertains that there is support from above and that there is a supportive constituency.	Poor	
	Connected	Helps to bridge between and across scales. Creates supportive community, produces social capital, fosters respect and trust, and builds social memory. Encourages communication, information exchange, enables diffusion of innovations, and facilitates collaboration.	Very good	
	Nested	Empowers appropriate entity to take necessary action. Allows also for shaping and adapting institutions and decision-making processes to different local sub-contexts (social circumstances, governance, ecologies) within larger system.	Good	Very good
	Polycentric	Helps to buffer against change in one location. Ensures that the governance system does not collapse when faced with adversity or crises.	Inconclusive data	
Average result 'robust governance'			Good	

7.2.3 INTERPRETATION OF RESULTS

Putting the results of both the policy document analysis and average scores of the in-depth interviews next to each other, Table 27 shows the deviation between policy documents and stakeholder perceptions for each governance characteristic and the entire governance objective. The results show that there is quite some deviation between the document analysis results and interview results. The governance characteristic 'legitimate' is perceived -3 compared to the document analysis result, indicating that there is a large gap between policy and reality. The governance characteristics 'connected' (+1) and 'nested' (0 / +1) are considered equal or better by stakeholders. The governance characteristic 'polycentric' is missing all 6 scores and as such does not provide more insights on how the situation differs according to stakeholders. The score for the governance characteristic 'nested' should be considered with caution due to the absence of sufficient data. Only 2 out of 6 interviews resulted in a score, which makes it difficult to consider for further analysis. This

also has impact on the average scores for the governance objective 'robust governance'. The deviation between document analysis and stakeholder interviews is 0 / -1 for the entire governance objective. As such, stakeholders perceive the robustness of the governance system less or equal compared to policy documents.

Table 27: Deviation between document analysis scores and interview scores (robust governance)

Governance Objective	Governance Characteristic	Document analysis score	Average interview score	Deviation between category groups
Robust *Ensures functioning institutions persist, maintain performance and cope with perturbations and crises*	Legitimate	Very good (5)	Poor (2)	-3
	Connected	Good (4)	Very good (5)	+1
	Nested	Good (4)	Good (4) / Very good (5)	0 / +1
	Polycentric	Very good (5)	Inconclusive data	-
Governance objective 'robust' average		Very good (5) / Good (4)	Good (4)	0 / -1

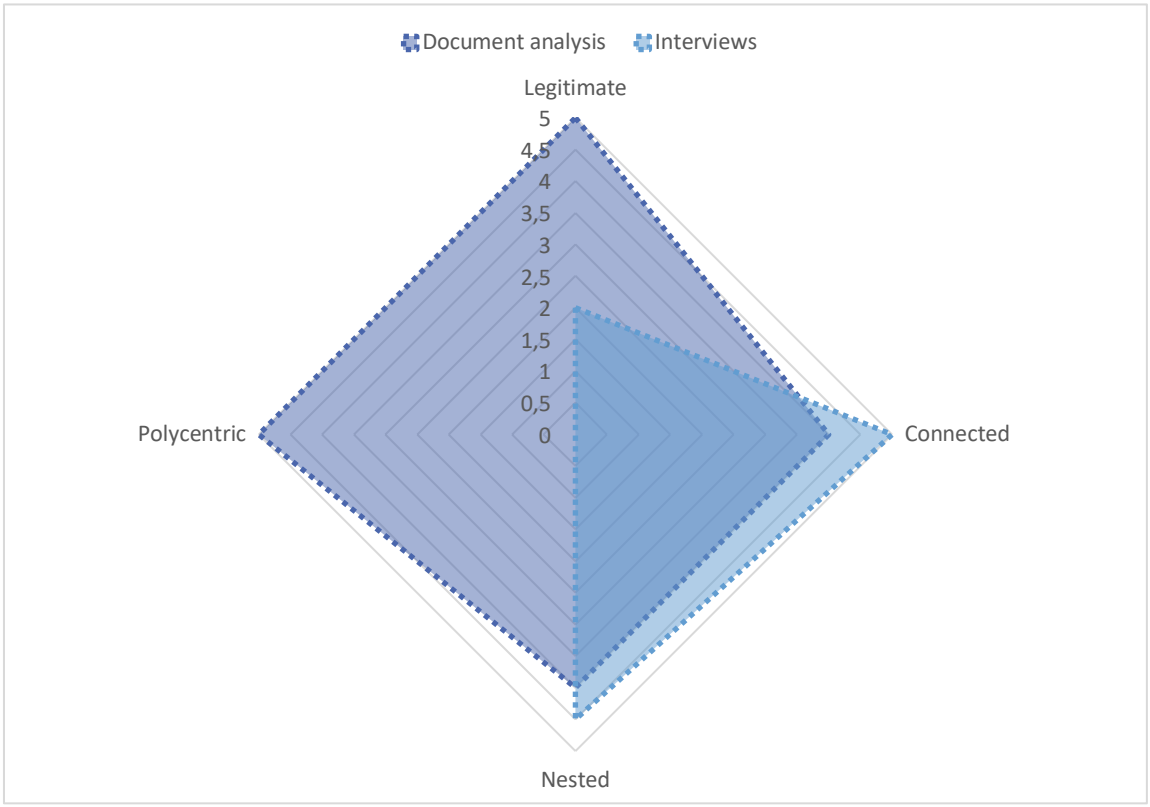

Figure 8: Radar chart of document analysis scores and average interview scores (robust governance)

In order to interpret the results, especially Table 27 and Figure 8 are interesting. Individual interviews do not really give an insight on how the governance system is perceived as a whole and as such less interesting for drawing conclusions. The results show that stakeholders perceive the governance objective 'robust governance' differently to what it should be according to the policy documents. Figure 8 shows that for the separate governance characteristics, both stakeholder interviews and policy documents score the governance characteristic 'nested' good or very good. As discussed in the section above, this result is however not considered very strong due to the lack of sufficient data. More interesting are the results of the governance characteristics 'legitimate' and 'connected'. The characteristic 'legitimate' is perceived much lower (-3) by stakeholders compared to what it should be according to the document analysis (very good). The characteristic 'connected' is perceived better (+1) by the stakeholders compared to the document analysis, being the first result, which shows up better at the in-depth stakeholder interviews compared to the policy documents.

For the governance characteristic 'legitimate' stakeholders addressed concerns entail the absence of consistent policy for all Dutch regions. Regions which are considered less essential for the economy and working population are getting less attention for freshwater- and salinization- related issues. In addition, another stakeholder expressed concerns about the research-agenda and agenda-setting. According to him there are too many conflicting interests for integrative decision-making on salinization related issues. Transparency of decision-making is considered good by all the stakeholders. The governance characteristic 'connected' is perceived very good by stakeholders due to the many institutional layers and cooperation between research institutes and governmental institutions. Network building is happening sufficiently due to participation and involvement of various stakeholders during meetings. The governance characteristics 'nested' and 'polycentric' miss too much data in order to draw any conclusions from stakeholder interviews. Looking to the document analysis results, both seem to be institutionalized good or very good.

7.3 CONCLUSION

There are some concerns for the governance characteristic 'legitimate'. These are mostly related to political choices which are being made. The governance characteristic 'connected' is perceived as very good by the stakeholders and as such is not a point of concern. A lack of data for the governance characteristics 'nested' and 'polycentric' make it difficult to draw conclusions. As such, due to the lack of sufficient data, this also is the case for the robustness of the governance system. According to policy documents, the robustness is good (4) – very good (5). Yet, from previous chapters it became clear that stakeholders consider governance less good compared to the policy documents. As such, it is likely that this is also the case for the robustness of the governance system.

8 DISCUSSION

8.1 INTRODUCTION

The discussion chapter of this thesis aims to discuss the answers to the sub-questions 3, 4 and 5. These aim to answer to what extent Dutch salinization governance can be considered good according to analysis of policy documents (RQ-3); to what extent Dutch salinization governance can be considered good according to key stakeholders (RQ-4) and how those two relate to each other (RQ-5). In the previous 4 chapters, the results for respectively Effectiveness, Equitability, Responsiveness and Robustness was presented systematically for each of the research questions. The section 8.2 of this discussion chapter addresses the strengths and limitations of this research, before the main conclusions on the respective research questions are being discussed in section 8.3. These are then compared to literature in section 8.4, which aims to address considerations and implications of the results. Considerations and implications are considered important for understanding the results and understanding what the implications of these results mean for the governance system. As such, shortcomings on each of the four governance objectives will be mentioned and compared to literature from the OECD report on water governance in the Netherlands.

Next, interviewees have opted some interesting solutions for improved freshwater management. These are being shortly discussed in section 8.5. The conclusion and governance related recommendations are discussed in the conclusion and recommendations chapter (chapter 9). This chapter will also provide recommendations on desired future research.

8.2 STRENGHTS AND LIMITATIONS OF THE RESEARCH

The performance of the salinization governance system is being evaluated by building upon a comprehensive framework by Bennett and Satterfield (2018), which is considered a valuable tool for evaluating governance performance. Looking at both policy documents and stakeholder interpretations, the research adds a level of certainty that the content validity of the research is high. It is not possible to perform statistics with the data, due to the substantive nature of the research. As such, it is not possible to draw any statistical conclusions. There has not been any research on the governance system of salinization in the Netherlands, so there is no way to validate the measurements. This research will as such use the research paper of the OECD (2014) on water governance in the Netherlands in order to compare the results of this research with the conclusions of the OECD. The qualitative nature of the research also has an impact on content validity. The final scores are dependent on personal interpretation of the data and are as such difficult to exactly replicate by other researchers. The analytical framework with the 19 indicators on each governance characteristic does however add a level of certainty that the scores are quite precisive.

The number of interviews was not as high as was hoped for prior to the research. It became clear that finding the right, and enough key stakeholders that were open for in-depth interviews, was lower than expected. Especially the absence of the key stakeholders ‘Rijkswaterstaat’ and ‘Ministery of Infrastructure and Water’ is quite disappointing. These key stakeholders could have pushed the outcomes in a completely different direction, so that is one of the major limitations to take into

consideration. Ideally, the interviews would have incorporated a higher number of interviews from each of the stakeholders which have been mentioned in the methods section of this research.

The strength of this research lies especially within the ability to gather large amounts of contextually rich data from a few stakeholders. In more quantitative research designs, such data, which is highly valuable for system understanding, is often diminished by the necessity to eliminate outliers. As such, this research aims to work with the context-rich comments of the key stakeholders. The stakeholder's expert opinions are being used for scoring the indicators, but also for understanding the deeper meaning behind the data. Future research may opt for a more quantitative design which may receive much more data that is less rich. By doing so, such research may find whether the conclusion of this research is representative for a larger group of stakeholders within the governance system of freshwater and salinization.

Last, this research was designed for exclusively looking into salinization governance. It became clear during the conversations with stakeholders that it is impossible to only gather information on the governance of salinization, because the systems of freshwater (quantity) governance and salinization governance are so highly intertwined. This has also implications for the reliability of the data because some stakeholders might have answered the questions based on their freshwater system knowledge, whereas others might have done the same based on their salinization system knowledge. It is extremely difficult to discuss the same questions with stakeholders from different institutional layers and non-governmental stakeholders. All of these have different world views on what is part of the governance system and how this performs. Yet, the variety of answers has led to some very interesting data and more than enough knowledge to think about for future research. This research has underlined that the issue of salinization cannot be looked upon separately. It showed that both the issue itself and the governance regime for addressing the issue are completely dependent on each other.

8.3 IS THE GOVERNANCE SYSTEM CONSIDERED GOOD?

From the document analysis, it can be concluded that the governance system is performing good. Figure 9 indicates that governance is effective (good – 4), governance is moderately equitable (sufficient – 3), governance is very responsive (very good – 5) and that governance is very robust (good – 4 / very good – 5). The only governance characteristic which scores poor or lower, is 'recognition' (Figure 10). Considering these high scores, it may be concluded that the governance of salinization and freshwater is good and needs little reconstruction according to the policy documents. 'Effective governance' is considered the only objective that needs some attention for better governance.

Yet, the interview results draw another picture. Figure 9 shows that the scores provided by the six stakeholder interviews resulted in average scores significantly lower compared to the policy documents. Governance is perceived as partly ineffective (poor – 2 / Sufficient – 3), governance is perceived moderately equitable (sufficient – 3), governance is perceived moderately responsive (sufficient – 3) and governance is perceived robust (good – 4). Looking more closely to the separate governance characteristics 'direction', 'capacity', 'accountable', 'efficient', 'fair', 'just' and 'legitimate' all scored below sufficient (Figure 10). The governance system overall is considered sufficient the six

stakeholders (average result), but 7 out of 19 governance characteristics have received a poor score. As such, it can be concluded that there is room for improving the governance system.

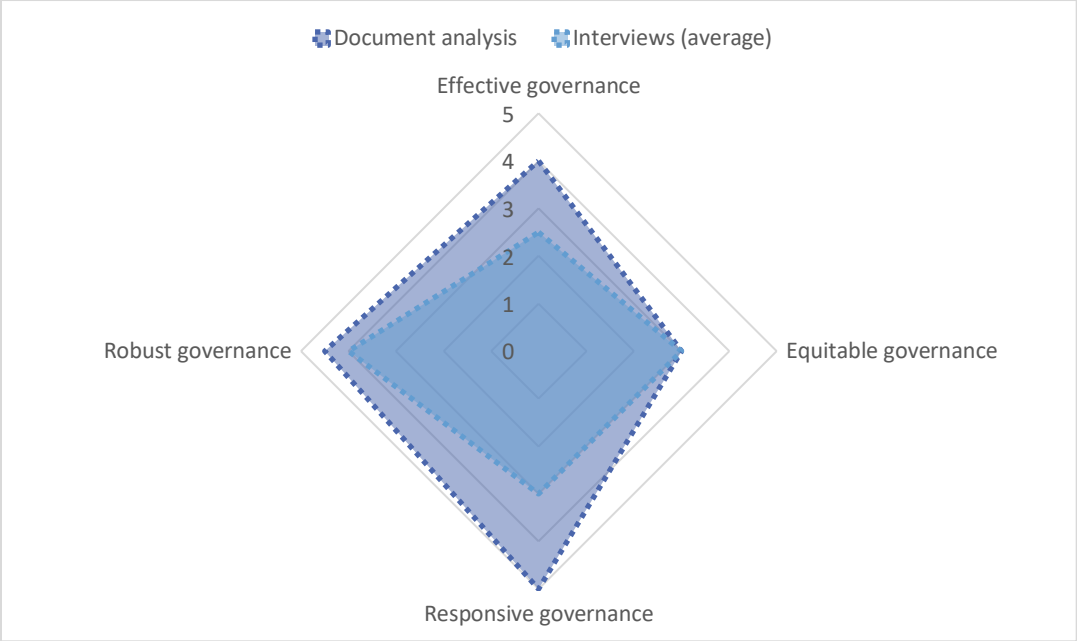

Figure 9: Governance objective average scores (document analysis versus interviews)

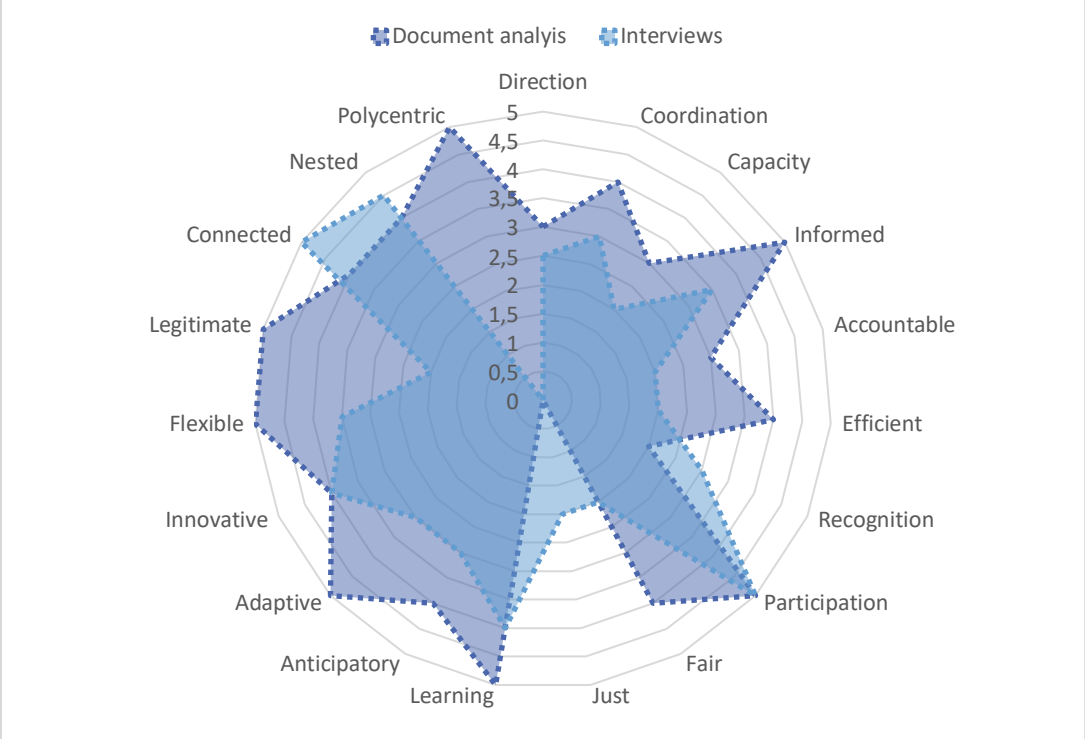

Figure 10: Governance characteristics average scores (document analysis versus interviews)

Overall, this indicates that stakeholders perceive the governance system differently compared to what it should be the case according to policy documents. For 12 out of 19 governance characteristics (indicators), the stakeholders score worse compared to the policy documents. Figure 9 shows that the effectiveness of the governance system scores -1.5 (category) points lower for

stakeholders compared to the policy documents. Equitability is perceived similarly. Responsiveness of the governance system scores 2.0 points lower for stakeholders compared to policy documents. And finally, robustness of the governance system scores 0.5 points lower for stakeholders compared to policy documents. From this it can be concluded that the largest bottlenecks for the governance system are situated around the effectiveness and responsiveness of the governance system. These two are in literature considered highly important for addressing environmental issues that are impacted by climate change. Moreover, more attention is needed for equitability, since both policy documents and stakeholders indicate that there is a lack of recognition and fairness within the governance system. As such, the implications of these results will be discussed in detail in the *Considerations and implications of results* section.

Looking more closely to Figure 10 it seems that there is a pattern within scores for both policy documents and stakeholder interviews. Various governance characteristics show similar shaped scores. From this it seems plausible to conclude that policy and action do not align, or at least implementation does not follow timely. Although policy documents seem to be integrative and discuss governance quite elaborately, stakeholders do not agree on most characteristics and objectives. Most important, is the consideration that stakeholders think that the governance system for freshwater and salinization is not future proof. There are large steps needed for transformative change, as is opted in policy documents. It is interesting to see the shifts which have already been made in the last couple of years. From memos, which are delivered within several policy documents, it becomes clear that administrators such as the Minister of Infrastructure and Water are aware of the necessity for a large-scale transition to more effective and more inclusive water management. The big question is: 'how?'. During this research, new information is coming in rapid pace. Just before finishing this research, the Minister of Infrastructure and Water (Mark Harbers) and the State Secretary of Infrastructure and Water (V.L.W.A. Heijnen) have sent an urgent policy letter to the House of Representatives to inform them on how water and soil need to become leading for spatial planning. This has already been discussed for a longer period, but not implemented yet. The new policy letter is hopefully a starting signal for new policy development to take the steps which are so urgently needed.

8.4 CONSIDERATIONS AND IMPLICATIONS OF RESULTS

This section compares the results, discussed in the section above, with existing literature and the OECD report on water governance in the Netherlands. First, the implications of low governance effectiveness will be discussed. In literature some interesting findings correspond with the findings of the stakeholder interviews. The OECD report on water governance in the Netherlands states that *''certain structural measures to address water shortage may be cost effective in the short run, but they may, in fact, increase vulnerability to shortage over the long term''* (OECD, 2014; p166). The solutions which are considered for combatting salinization and freshwater quantity are often too much focused on the short term, rather than looking further to the future. This is in line with the argument of several stakeholders that there is insufficient foresight thinking. As such, it seems that the effectiveness and responsiveness of the governance system are highly intertwined and have a lot of effect on each other. The governance characteristics 'direction', 'capacity' and 'efficient' seem to be dependent on whether there is sufficient anticipatory thinking and adaptation policies.

In addition, the report questions the equitability of priority regimes, which are currently being followed and which is called the displacement series for freshwater in the Netherlands. The report argues that the introduction of a ban is often sudden, and users in the priority category are being treated the same ''*despite having significant differences in their water needs, the value they assign to water or their risk preferences''* (OECD, 2014; p167). Priority bans ought to be satisfactory when dealing with droughts once in a long time. Yet, increased drought risk makes limitations of current approaches become more evident. Looking back to the governance characteristic indicators, these arguments correspond with the characteristics; 'direction' (insufficient decision-making), 'efficient' (inefficient use of resources), 'recognition' (insufficient recognition for social contexts and values) and 'fair' (unfair allocation of costs and benefits). Introducing a new scarcity pricing principle could help to improve this according to the OECD paper. The issues the Netherlands is currently facing, looks quite like the situation in the United Kingdom, where regions with lowest rainfall are also the regions with the highest water consumption. The system was considered too inflexible to cope with changes in demand and availability. As such reforms were proposed for a reformed regulatory system to improve flexibility and to allow for a transition to a more dynamic governance regime. According to Ian Barker; head of Water, Land and Biodiversity from the UK environment agency sustainable water management demands an inter-generational approach with the use scenario planning (OECD, 2014). According to the stakeholders in this research, this is currently insufficiently happening within the Netherlands. Other issues get more attention during agenda setting and the research agenda, and such embedded foresight planning is missing. For this case, the equitability of the governance system is also dependent on the responsiveness of the system. Intergenerational thinking is part of both 'anticipatory', 'recognition', 'fair' and 'just'. It becomes clear that improved governance for specific governance characteristics and objectives can seriously improve the governance system as a whole.

There has been increased attention to more responsive policies, by for instance flexible allocation of freshwater through SMART water management, which is mentioned as the primary instrument for more flexible use of water during droughts and times of freshwater scarcity. This new management strategy is being adopted during the last couple of years following the report of the OECD. This new strategy is a good first step for more flexible freshwater use, but insufficient to deal with the emergent issues of salinization, insufficient freshwater, and sea-level rise. The OECD report mentions several recommendations for managing freshwater shortages (OECD, 2014):

1. Create incentives for water users to improve efficiency and establish clear boundaries in the roles of public authorities and private actors in managing risk shortage. Use economic instruments such as abstraction charges and provide financing for measures related to water supply.
2. Improve monitoring and sanctions for non-compliance for water extractions. This would be a basic step towards managing the risk of water shortage more effectively.
3. Introduce a licensing system that is associated with the 'user pay principle'. Progressive water-sharing agreements would increase flexibility and efficiency. These provide incentives for more efficient water use and lower the overall costs of managing shortage risk, spur innovation and provide a more equitable distribution of risk shortage across water users.
4. Introduce comprehensive drought planning which ensures all major water users to be aware of risks, have action plans in place and know how to work together to conserve resources.

5. Introduce a long-term approach to manage risks of freshwater shortage. The short term solutions will become increasingly costly, increase path dependency and increase vulnerability on the long run. There are adaptive policy pathways developed by Deltares which could help to transition between acceptable and unacceptable strategies. Adjusting response accordingly would become easier.

Both the policy documents and stakeholder interviews indicate that, on some points such as recommendations 1, 4 and 5, there have been some improvements. Flexibility is being improved by using SMART water management, whereas long-term approaches are being constructed in policy documents. Yet, most stakeholders argue that there is too little implementation of such policies of addressing the emerging issues timely. The user pay principle is being mentioned by the employee of the water board and employee of the province Zeeland but is not introduced yet. Such large-scale policy revisions are according to most of the stakeholders not introduced timely due to conflicting interests within the political domain of governance. One of the major shifts in policy documents, is that water and soil should become leading for spatial planning. Yet, spatial planning is according to the stakeholder from the water board still not adjusted to the water availability. Regions which are selected for major housing constructions are according to him not always able to provide much more freshwater. As such, it seems that policy-making and legislative anchoring in law is not aligning, or at least not following timely on one other. The in-depth conversations with multiple stakeholders strengthened the idea that words and actions are not aligning. According to Kirchhoff and Dilling (2016) worldwide there are many complex water governance systems that experience failures that undermine effective water management under uncertainty and change. More adaptive and resilient approaches are needed, but many are failing to be implemented. Following from the results from this research, it can be concluded that these implementation failures are also present in the Dutch freshwater governance system. There is a lot of attention to the concepts of resilience, flexibility and adaptivity in policy documents whereas stakeholders argue that the implantation is not following timely, or not following at all. Adger et al. (2011) argue that policy objectives for stresses that affect social-ecological systems are focusing narrowly on effectiveness, because of the desire for readily observable metrics, political and election structures. It is as such a real challenge to make use of the issue of climate change to find opportunities to transform social-ecological system, such as the management of freshwater, into development pathways that may improve human conditions. Moreover, this required a systematic change of thinking in which there is willingness to devolve influence and authority for decision-making that constitutes adaptive capacity (Adger et al., 2011). These statements are in line with what has become clear from the in-depth stakeholder interviews. There is a big dependency on what happens in the political landscape, whereas the country is seeing more and more of the impacts of salinization and freshwater scarcity.

Some other concerns from the interviews with stakeholders can be directly linked to the science-policy interface. The science-policy interface has been an interest of academics for a few decades already. Stakeholders from both knowledge institutes have indicated that there is a gap between science and policy for salinization and freshwater related issues. Comments from stakeholders on this matter include: *''not all administrators have sufficient system knowledge in order to understand co-workers and researchers which are included in policy tables or knowledge programs (stakeholder interview 1)''* and *''policy making is not bending along with the pace of new pilots, as such innovation is being limited by policymaking (stakeholder interview 2)''.* In addition, both stakeholders have indicated that they feel like the knowledge which is being produced is not always effectively used by

administrators and policy makers. These concerns can be traced back to the governance objectives robustness and responsiveness. Environmental management is an area where policy making, and implementation is extremely complex and dynamic (Bracken & Oughton, 2013). It involves a system which is dependent on the engagement of a wide range of practitioners with overlapping and conflicting objectives. According to Wessink et al. (2013) ''*the use of scientific knowledge by policy makers is not a linear process of one-directional knowledge transfer from science to policy''.* A good understanding of the relation between science and policy is crucial for scientists to inform policy debates and policymaking (Wessink et al., 2013). Recognizing the politics behind the works researchers produce, can enhance quality and relevance because they do not de-couple, but instead highlight the values and power relations that are at stake in the policy making domain (Wessink et al., 2013). Step-by-step considerations adopted from the executive summary for improving the science-policy interface by the United Nations Environment Program (2017) include:

1. *''Improving the understanding of gaps and capacities within the system''*: understand links in the chain by which evidence could impact the outcomes, determine which policy processes are relevant, map key players in those policy processes and map what their viewpoints are and what evidence they need.
2. *''Build partnerships to grow your capacity to act''*: gain access to complementary expertise, sectoral and geographic networks, and access to important decision makers by forming partnerships with external organizations with shared interests. Use ongoing partnerships to promote learning for academic and governmental participants. As explained, the science-policy interface works both ways and is not one-directional.
3. *''Fill gaps in available evidence''*: stimulate funding for monitoring and reporting. Data should be openly accessible by decision makers. In addition, built statistical capacities and promote standardization of methods to deliver reliable and timely statistics that can stimulate and inform policy debates.
4. ''Built the capacities of other participants'': increase professional rewards for science-policy participants through changes in funding metric and built capacities to engage in trans-disciplinary, multi-stakeholder science-policy processes. Promote changes to decision-making cultures to move to evidence-based policy making. In addition, design the participatory processes within the science-policy interface so that all participants deliver more effective science-policy activity and improve institutional learning.
5. *''Create practices for the effective exchange of evidence''*: move away from dissemination and outreach to improve productive exchange and learning. Redesign participation processes for more productive exchange and plan activity around the needs of decision-makers and intermediates. In addition, produce tailor-fit output which suit the stakeholders' or participant's need and various contexts. Increase transparency and support legitimacy in evidence by comprehensive review processes.

It becomes clear that it is impossible to improve the governance objectives 'effectiveness', 'equitability', 'responsiveness' and 'robustness' separate from each other. In practice, a lot of governance characteristics seem to have a large impact on one other and governance improvements are only possible when looking at them more interactively. As discussed in this section, a lot of governance characteristics can be tackled at once by more integrative governance solutions. The largest bottlenecks seem to have a lot of impact on various governance characteristics that belong to two or more governance objectives. New approaches should therefore not only focus on improving

separate governance characteristics or objectives, but merely focus on holistic approaches and solutions.

8.5 SOLUTIONS SUGGESTED BY THE INTERVIEWEES

Various stakeholders have shared some interesting thoughts on how freshwater management could be transformed to adequately and timely address the issue of salinization. These recommendations vary from more integrative solutions to water management, to more specific governance instruments for more efficiently addressing water use.

8.5.1 THE 'HAAKSE ZEEDIJK' – AN INTEGRATIVE SOLUTION

Currently, approximately 70% of the water during low river discharges is being used to combat salinization. Stakeholder 5 had a very interesting suggestion for addressing a multitude of water related issues at once, including freshwater availability and salinization protection. Person X has the visionary idea to build a wall in sea, approximately 25 kilometers from the coast. Person X is working on this project for a long time already and has shared these ideas with the Delta Commissioner. The so called 'second coastline' has two entry points for boats at Rotterdam and IJmuiden. The three basins all have a water level which is kept on 0 NAP. The rivers discharge into the lakes, whereas the water is being discharged into the sea, on the long run after some significant sea-level rise mostly by pumping excess water into the sea. By keeping the water in the so-called lakes at 0 NAP, the rivers need significantly less efforts in terms of maintenance. In addition, these measures result in a fresh-sweet water basin with an enormous capacity, right in front of the regions that have the largest water consumption. Moreover, the region of Zeeland, which is mentioned several times in this research as a freshwater bottleneck, is provided with sufficient amounts of freshwater in order to save agriculture in the region. Most important, is the ability of phased implementation of the measures. The second coastline should be extended to Germany, Denmark, and Sweden later to adjust for the expected sea level rise in the future. Yet, the phased implementation creates the possibility to first adapt the regions around the big rivers and the inland basins at Zeeland, providing effective and efficient protection against salinization and freshwater scarcity on the shorter term. The additional space the second coastline generates is also interesting for nature, fisheries, and spatial planning.

The solution also has some downsides, since the costs are extremely high, nature will change significantly and fisheries that work within the borders of the second coastline need to rethink their business plans. The costs of the entire project (only the Dutch part of the second coastline) is estimated on 90 billion euros. The costs are however much lower compared to some other solutions which are considered, such as rebuilding cities. Also, the additional freshwater availability saves money on the long run, which is otherwise needed for harvest failures due to saline soils and droughts.

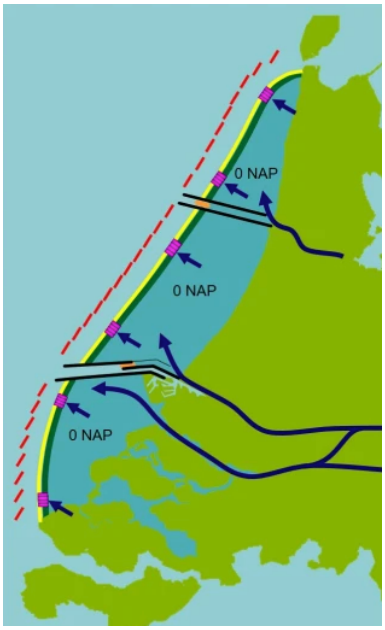

Figure 11: the 'Haakse Zeedijk' (retrieved from Haaksezeedijk.com)

8.5.2 TOPPING UP THE WATER LEVEL OF THE 'IJSSELMEER' AND 'MARKERMEER' – IMPROVED RESILIENCE AGAINST DROUGHTS

Although the bandwidth of the IJsselmeer has increased after the implementation of the new flexible water level directive for the IJsselmeer in 2018, a stakeholder stated that this is not even near enough to combat salinization and freshwater scarcity in the future. The stakeholder has indicated that there have been proposals for topping up the water level with almost 1 meter, making it a basin with a water level +NAP. The Delta commission has recommended that the IJsselmeer could be topped up with an extra layer in the future, whereas the Markermeer water level is kept steady. There have been various experts which have critique on these decisions, including water engineer Dirk van Schrier. Also, Deltares has rapported that an uncoupled water level of both lakes is impossible in the future under the projections of climate change (Kramer & Meurs, 2010). This is only possible with large interventions in the Dutch water system.

There are some good arguments for not topping up the water level above NAP. Flood risk significantly increases, even when adapting to the situation with new dikes. It also has large impact on the cities and towns near the 'IJsselmeer' and 'Markermeer'. Yet, the impacts of recent droughts have made clear that there is an urgent need for more radical decisions to make the Netherlands more resilient against water scarcity and salinization.

8.5.3 SCARCITY PRICING – IMPROVED EFFICIENCY OF FRESHWATER USE

Stakeholders 4 and 6 have mentioned the concept of scarcity pricing for freshwater. Scarcity pricing during times of drought has serious benefits. Scarcity pricing is considered an economic tool for addressing shortages, without banning use of the product. Under normal conditions, water is not

considered a scarce product. During droughts, bans on freshwater use for agriculture and horticulture can have major implications such as declining crop yields or total harvest failures. By adding costs for the use of freshwater during droughts, business owners can make their own decision on whether they want to add substantial amounts of freshwater to their crops. As such, they can make their own consideration whether their crops are worth the current price of freshwater. Especially for cost-intensive crops this may be the case. In addition, both stakeholders mention that such costs also improve both innovation and efficiency of water use. Literature suggests the same. In the section considerations and implications, the paper by the OECD (2018) already opted for plans to introduce scarcity pricing instead of banning fresh water use for specific sectors.

9 CONCLUSION AND RECOMMENDATIONS

9.1 CONCLUSION

The literature indicated that there was a knowledge gap on how salinization should be governed. It became clear that salinization governance cannot be decoupled from freshwater governance, and as such the research scope became somewhat broader to find recommendations for salinization and freshwater governance. This research contributed to the field of freshwater governance by looking deeper into context-rich information from qualitative research. It emphasized the necessity for more foresight thinking in freshwater governance and better understanding of the close interaction between science and policy. Moreover, it shed light on the fact that system understanding is a very important concept in the broader field of governance, to establish more effective and timely action or management. By establishing more effective and timely action, incorporating foresight thinking and improving goal- and agenda-setting, the governance system for salinization and freshwater is better fit-for-the-future.

This research aimed to find out to what extent Dutch salinization governance can be characterized as good and what lessons can be learned for the future. Based on a qualitative research design it can be concluded that there are discrepancies on how the governance system is perceived by stakeholders in comparison to what is expected by the assessment of policy documents. According to the policy documents, the governance system of salinization and freshwater could be characterized as good. Yet, key stakeholders perceive the governance system significantly worse compared to the policy documents. This indicates that there is a lack of implementation, and that action does not align with policy. Stakeholders especially perceive the effectiveness and responsiveness, two key elements for adequately addressing salinization and freshwater related issues, significantly lower. From the in-depth interviews with stakeholders, some interesting findings provided insights on what aspects of the governance system are failing. More specifically, this indicated that politics (conflicting interests), a flawed science-policy interface and the too much flexible-based approach to freshwater management are holding back timely and effective action on the issues such as salinization. In addition, the governance system cannot be improved sufficiently when solutions are not looked upon more holistically. The results and existing literature together suggest that various governance characteristics are highly dependent on each other. Addressing them simultaneously, instead of separately, brings a lot of advantages. As such, this research proposes a series of recommendations on how to address governance-related issues that are found in this research more integrative and holistically. Although it can be concluded that the governance system for salinization and freshwater is not performing very poor, there is room for improvement by incorporating the recommendations that will be proposed in the recommendations section of this chapter.

Due to limited data and time, this research should be followed up by future studies. Practitioners should consider follow-up research on the three recommendations to find out whether they are feasible and how they should be implemented as effective as possible. Moreover, future research should consider looking more specifically into the two governance objectives that are perceived significantly lower by stakeholders: effective governance and responsive governance. Looking more closely to these two could improve the understanding on how to deal with freshwater governance more effective, more responsive, and more integrative in the future. It could be

interesting to find out how certain governance characteristics are correlating to each other, and which should be considered important to address multiple governance bottlenecks simultaneously. A more quantitative research approach is as such desired for better understanding of interactions within the governance system of freshwater.

9.2 RECOMMENDATIONS

The results from the policy documents and stakeholder interviews have indicated that there is some room for improvement within the governance system for freshwater and salinization. A more integrative and holistic approach for making improvements in the governance system is desired. As such, I propose three recommendations which can improve the output of the entire governance system. I consider these essential for more timely and effective action on salinization and freshwater related challenges. The following three recommendations are directly linked to the bottlenecks which have been discussed in the *Considerations and implications of results* section of the discussion chapter.

9.2.1 DE-POLITICALIZATION OF FRESHWATER GOVERNANCE

Almost all the stakeholders have shared that they feel like politics has a major impact on the governance system of freshwater. The Netherlands is densely populated and as such there is limited space. Currently decisions for spatial planning and economic growth are sometimes made before considering the presence of sufficient water with the right quality. Moreover, major decisions are being postponed. Foresight thinking is extremely difficult to incorporate in adaptation strategies due to conflicting interests. First, I emphasize that I do not think that politicians are not working for the interest of the general public. Yet, it has been discussed by several political and social scientists that the current difficulties we face, not aways align with the capabilities of the political system of various western countries. Various economic, social, political, cultural, and psychological ramifications potentially give rise to social disputes in society. As discussed in the introduction, climate change related issues are considered 'wicked' problems, which are (almost) impossible to solve without adverse effects on other systems. The complexity of such issues is one of the prime reasons why democracies are failing to adequately deal with such issues. 'Wicked' problems can according to Lindvall (2021) trigger difficulties in democratic processes. Politicians cannot push for sub-optimal solutions in their progressive political agenda (Lindvall, 2021). Ambiguity of the outcomes in combination with incomplete and contradictory information are difficult for voters to understand. These can have serious consequences on the agenda-setting process, which is also mentioned by the stakeholders and discussed in the *Considerations and implications of results* section of the discussion. As such, I propose to decouple freshwater management from politics, and to introduce a new overarching organization which is filled with multidisciplinary expertise, policymakers, and a civilian panel, to speed up the transition to a safe and livable Netherlands.

There are various possibilities how such an organization could function. There is more research necessary before such a far-fetching idea can be implemented. I am aware that most certainly, the current laws, do not allow such an organization which does not have oversight from the

House of Representatives. Yet, difficult transitions needed within such a short time span, ask for innovative and far-reaching solutions. The Delta Program / Delta commission could function as the starting point. It can be transformed into a new organization filled with expertise from multiple disciplines, since not only water related subjects are being of concern for the difficulties we face. In addition, there should be a lot of attention to the science-policy interface, which makes sure that communication between scientists and policy makers of the organization is efficient and effective. Last, a representative panel of civilians should hold oversight on the decisions which are being made. The policy makers should address their plans, which are being translated by people active within the science-policy interface to the civilian panel so that they understand why, how and for what the decisions is needed. Ultimately, the panel with civilians makes the decision. How this process should be addressed and implemented, in addition to how such a panel of civilians needs to function is a question for future multi-disciplinary research by social, environmental, and political scientists.

9.2.2 IMPROVING THE SCIENCE-POLICY INTERFACE

Within the second stakeholder interview, the participant emphasized the difficulties policymakers are facing when constructing all-encompassing policy which is durable and integrative enough for all the different aspects of freshwater governance. Research by Bracken and Oughton (2013) has demonstrated that the strategic intermediary role of experts in making something happen is very important. A knowledge broker is considered of importance for drawing conclusions on expertise and making sense of the multiplicity of data and recommendations from the scientific domain. Such a professional draws on formal and tacit expertise to interpret and judge in relation to decision-making, so that evidence can be acted upon or rejected for further use (Bracken & Oughton, 2013). This already happened by the implementations of the Delta Commission and advisory groups but is according to the stakeholder interviews still insufficient for all-encompassing and foresight policymaking. Innovative behavior that creates new structures and institutions, is becoming a key part of delivering good management of land, water, and biodiversity (Bracken & Oughton, 2013). The complexity of the issue of freshwater scarcity and salinization and its appurtenant; breadth and complex evidence, speed of legislative change, and complex governance; means that there is an important role for grouping expertise together in multidisciplinary organizations or groups. Governance characteristics such as ‘direction’, ‘capacity’, ‘adaptive’, ‘anticipatory’, ‘innovation’, ‘legitimacy’ and ‘connected’ could have significant benefits from better system understanding at all administrative levels, and better implementation of science into policy. Coupling the environmental issue, the policy context, the physical location, the relevant organizations, and the individuals involved during the correct point in time stands central for effectively addressing issue of freshwater scarcity and salinization. Step by step considerations for improving the science-policy interface have been mentioned in the *Considerations and implications of results* section of the discussion. These are in line with what I consider worthy steps for improving the science-policy interface of the governance system for freshwater and salinization. During the last years there has been effort for improving these matters by the introduction of various knowledge programs and the Delta Programs. Yet, interactions can be reshaped by using these step-by-step recommendations in order to make sure that the system incorporates all the relevant information and recommendations provided by the multiplicity of stakeholders present within the governance system.

9.2.3 FROM A FLEXIBLE APPROACH TOWARDS AN ANTICIPATORY APPROACH

Various key stakeholders have indicated that the limits of the freshwater system are in sight, and new approaches are needed to adequately address freshwater related issues. During recent years, a flexible approach has been opted for, including the introduction of SMART water management. In policy related documents, more and more emphasis is being put on the necessity for foresight thinking. It became clear during this research that it is difficult to institutionalize such foresight thinking into anticipatory approaches. It seems that flexibility makes systems look adaptive, whereas in fact the issues are just being pushed on to future generations. Eventually, big transformative decisions are needed in order to adapt to the changing climate and environment. Institutionalizing anticipatory thinking could seriously benefit both the resilience against water and provide benefits for our economy. The first step to improve foresight thinking, is improving horizontal collaboration and co-creation.

A horizontal approach is an ideal first step for improving internal foresight capabilities. Selecting co-workers who worked in different institutional levels across an organization or system and provide them with the training to incorporate foresight thinking is a simple first step that can lead to better system understanding and scenario development. A systematic approach, incorporating these trainings and workshops, will embed foresight thinking in organizations and give the tools to navigate uncertain futures. Finally, community network building with like-minded organizations, having a co-collaborative approach to foresight, will improve organizations or system to look beyond the operational environments. In fact, the knowledge program on sea-level rise is such a foresight thinking community. Stakeholder 5 mentioned that there is a lot of expertise within the group, but that most of them are unpaid. The fact that unpaid workers must work on such extremely difficult issues on free will, does not give feeling that the urgency of the issue is taken seriously.

I propose to start off with building a network with foresight experts from various organizations which work on managing and governing freshwater. The first step is to provide those experts with the capabilities and resources for embedding scenario thinking and pathways construction. Such experts can come from all levels of governance and include non-governmental stakeholders as well as policy makers. Together, they can work on constructing pathways for future challenges and discuss these with their co-workers on all levels. Input from these can then be taken to next meetings to shape and change.

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APPENDICES

APPENDIX 1 – DETAILED RESULTS DOCUMENT ANALYSIS

Below all detailed results from the document analysis are presented. The number between brackets (e.g. (1)) correspond to the reference in the most left column (document No.). These results are based on interpretation and translation of quotes in the corresponding resource(s). It is possible to get the exact quotes (translated to English). If needed, anyone can contact me for these more detailed results by sending an e-mail to c.kats@students.uu.nl.

DIRECTION

Document No.	Reference	Results	Score
1	Twynstra Gudde. (2019). Handreiking Verzilting: In opdracht van Rijkswaterstaat.	- Working processes, norms, principles and chloride concentrations are specified. (1) - Boundaries exist. For instance, the document recognizes the need for local customization and as such does not propose a step-by-step consideration for measures. It does however include a step-by-step consideration for planning. (1) - Three important goals are communicated: water safety (resilient), freshwater (sufficient and at the right location) and spatial adaptation and planning (effect mitigation of nuisances and shortages). (3,4) - Goals include ambitions for 2050 and 2100. Revision of strategies is considered every 6 years. (3) - Main water goals short term: <> Improve water retainment and storage <> Smart division of water resources <> Accept (residual)damage and prepare for it (3,4) - Administrative Platform Freshwater (bestuurlijk platform zoetwater) decided on reconnaissance to ensure more concrete freshwater goals. Making these SMART on both regional and national scale is part of the ambition. SMART consists of Specific,	Sufficient
3	Rijksoverheid. (2022). Nationaal Delta Programma 2023: Versnellen, Verbinden, Verbouwen.		
4	Rijksoverheid. (2020). Synthese Document Deltaprogramma Zoetwater.		
7	Rijkswaterstaat. (2020). Klimaatbestendige zoetwatervoorziening hoofdwatersysteem.		

		Measurable, Acceptable, Realistic and Timely. (3) - Resilience goals for 2050 are too abstract. (3) - Concerns on the side effects of policies, function of the strategy, time planning, content and governance have been expressed. The new Delta Agreement therefore includes stepped decision-making and proposes new strategies such as shared knowledge development, implementing while learning and joint-fact finding. (7)	

COORDINATION

Document No.	Reference	Results	Score
1	Twynstra Gudde. (2019). Handreiking Verzilting: In opdracht van Rijkswaterstaat.	- It is clear who has the role of authority within the field of water governance. (1,3,5,7) - Salinization experts of Rijkswaterstaat or WVL can coordinate within projects if salinization issues arise (1) - Instruments and methods are being developed which can improve steering, regulating, stimulating and connecting. (1,3,5) - There are governance bodies which provide recommendations in order to improve multi-stakeholder cooperation and direction setting. (3,5) - During the 2018 drought diverse stakeholders missed coordination on policy, responsibilities, and authorities. (5)	Good
3	Rijksoverheid. (2022). Nationaal Delta Programma 2023: Versnellen, Verbinden, Verbouwen.		
5	Ministerie van Infrastructuur en Waterstaat. (2019). Nederland beter weerbaar tegen droogte : Eindrapportage Beleidstafel Droogte.		
7	Rijkswaterstaat. (2020). Klimaatbestendige zoetwatervoorziening hoofdwatersysteem.		

8	Rijksoverheid. (2018). *Werkprogramma, Tijdschema en Belangrijke waterbeheerkwesties voor de stroomgebiedbeheerplannen 2022 – 2027 Kaderrichtlijn Water*.	- Scattered organizational structures have led to unclear responsibilities and organizational chaos (5,7,8) - The drought policy table (beleidstafel droogte) recommended that current administrative cooperation and consultation structures need revision in order to provide guidance on division of roles, composition and cohesion. Such revisions lead to improved efficiency for cooperation and consultation between stakeholders. (5)	

CAPACITY

Document No.	Reference	Results	Score
1	Twynstra Gudde. (2019). Handreiking Verzilting: In opdracht van Rijkswaterstaat.	- There are tools and calculation methods for point dischargement of chloride. Such tools help with providing clarity of there is an active salinization issue. (1) - Leadership understands the necessity of transitions and understands water and soil need to become leading for spatial planning. (3) - There are bottlenecks within capacity, knowhow, skill, space and time for cooperation. Limitations in the executive force regionally and nationally results in difficult regional choices. As such choices need to be made on what comes first and what comes later. (3,4) - There are capacity questions on the implementation of delta strategies concerning governance and transition. These can cause bottlenecks for timely anticipating to sea level rise and its consequences on salinization , water safety and freshwater availability. (4) - Appointing strategic buffers has created clarity for sectors, users and	Sufficient
3	Rijksoverheid. (2022). Nationaal Delta Programma 2023: Versnellen, Verbinden, Verbouwen.		
4	Rijksoverheid. (2020). Synthese Document Deltaprogramma Zoetwater.		
5	Ministerie van Infrastrucuur en Waterstaat. (2019). Nederland beter weerbaar tegen droogte : Eindrapportage Beleidstafel Droogte.		

		co-managing water administrators. As such, operational water crisis situations are thought to become less common. (4) - Policy documents have indicated that governance arrangements for groundwater need to be looked to be revised. This may lead to increased knowhow and occupation for stakeholders. (4) - In order to actively develop capacity several consultation groups have been developed such as the Policy Table Drought (Beleidstafel Droogte) (5) - No mention on how to resolve conflicts	

INFORMED

Document No.	Reference	Results	Score
1	Twynstra Gudde. (2019). Handreiking Verzilting: In opdracht van Rijkswaterstaat.	- There is actual information on salinization for times of freshwater scarcity for the National Water Distribution Coordination Committee (LCW). (1) - There is active knowledge development on different issues concerning freshwater. (1,3,5) - Signaling changes within systems is being actively used for evaluating the extensibility of the current Delta decisions and strategies (salinization is actively mentioned) (3) - Monitoring plays a big role in making decisions. From 2006 onwards the WFD requires members states to obtain coherent overall pictures of the water status within each river basin district. (3,9) - Several advise and consultations groups constantly give actual relevant information on issues that	Very Good
3	Rijksoverheid. (2022). Nationaal Delta Programma 2023: Versnellen, Verbinden, Verbouwen.		
4	Rijksoverheid. (2020). Synthese Document Deltaprogramma Zoetwater.		
5	Ministerie van Infrastructuur en Waterstaat. (2019). Nederland beter weerbaar tegen droogte: Eindrapportage Beleidstafel Droogte.		
6	Twynstra Gudde, Witteveel+Bos, RoyalHaskoningDHV, & Colibrie Advies. (2018). Handreiking KRW doelen (978.90.5773.787.9).		

	Stichting Toegepast Onderzoek Waterbeheer.	arise concerning freshwater. (3,4,5) - Long-term planning is actively mentioned and considered essential for making decisions. (3,5) - Participation of different stakeholders and different knowledge types is considered important for making decisions. (3) - Essential bottlenecks are actively mentioned, and research is initiated on subjects which are uncertain. (4) - Hotspot analysis mapped out several geographical bottlenecks for distribution and supply of sufficient freshwater. These locations are actively discussed during working sessions with multiple stakeholders. Potential choices concerning these issues are being mapped and discussed (for instance acceptance of salinization). (4) - Knowledge institutes and experts give advice in working sessions and policy advise groups. (4,5) - Exchange of data and information between stakeholders such as water managers, water users and knowledge institutes is considered essential for understanding the water system and making the most efficient decisions. (5,6) - Uniform and unambigious data access is being developed after recommendations. (5) - Solutions and measures to combat salinization are mentioned in a factsheet for administrators. (10)	
9	Ministerie van Infrastructuur en Waterstaat. (2022a). *Stroomgebiedbeheerplannen Rijn, Maas, Schelde en Eems 2022 – 2027.*		
10	Friocourt, Y., Kuijper, K., & Leung, N. (2014). Deltafact zoutindringing.		

ACCOUNTABLE

Document No.	Reference	Results	Score
1	Twynstra Gudde. (2019). Handreiking Verzilting: In opdracht van Rijkswaterstaat.	- Framework of rules and direction is present. (1) - Head authority for stakeholders is clear concerning salinization (Rijkswaterstaat). (1) - Head authority for projects within Rijkswaterstaat Jurisdiction is the inspection for the environment and transport (ILT). (1) - Manual with explanation and steps to be taken is present. (1) - Assessment framework for whether there is a necessity for external experts is present. (1) - Legislation is traceable to national norms (1). - Voluntary agreements for cross-border water bodies are possible but not initiated by the authority Rijkswaterstaat (1,3). - Prestation Indicators (PINS) developed by Rijkswaterstaat provide waterbody and unit specific performance requirements. An outside organization can however not derive rights from them. (1) - There are too little governance -, policy- and content-related frameworks for groundwater management. Different stakeholders have therefore different interpretations. (3) - The MTW (management team watertekorten) concluded that during the 2018 drought, several issues concerning authority and responsibilities occurred. As such the highest governor (Minister) decided with stakeholders to start a new organization which gives recommendations: Policy Table Drought (Beleidstafel Droogte) (5) - The multitude of consultation structures within a - or between	Sufficient
3	Rijksoverheid. (2022). Nationaal Delta Programma 2023: Versnellen, Verbinden, Verbouwen.		
5	Ministerie van Infrastrucuur en Waterstaat. (2019). Nederland beter weerbaar tegen droogte : Eindrapportage Beleidstafel Droogte.		
6	Twynstra Gudde, Witteveel+Bos, RoyalHaskoningDHV, & Colibrie Advies. (2018). Handreiking KRW doelen (978.90.5773.787.9). Stichting Toegepast Onderzoek Waterbeheer.		
7	Rijkswaterstaat. (2020). Klimaatbestendige zoetwatervoorziening hoofdwatersysteem.		
9	Ministerie van Infrastructuur en Waterstaat. (2022a). *Stroomgebiedbeheerplannen Rijn, Maas, Schelde en Eems 2022 – 2027.*		

		different governance levels – leads to shattered organizational structures with unclear responsibilities and organizational chaos. (5) - Progress on measures is reported annually to the House of Representatives (Tweede Kamer) (3,5) - Responsibilities for different water bodies is clear, but extremely scattered. As said before, this may lead to unclear responsibilities on specific matters such as groundwater. (6,7,9)	

EFFICIENT

Document No.	Reference	Results	Score
1	Twynstra Gudde. (2019). Handreiking Verzilting: In opdracht van Rijkswaterstaat.	- Working methods for salinization issues and corresponding process approaches and tools are present in order to efficiently tackle such issues. Expertise from regional services from Rijkswaterstaat and WVL should be involved for improved efficiency. (1) - Models and codes developed by Rijkswaterstaat and knowledge institutes like Deltares provide data and system knowledge for improved efficiency. (1) - Efficient water use is considered important for the system in order to efficiently tackle freshwater scarcity. (3,5,7) - Investment readiness is being actively discussed (time, cost, damage). 3 - Translating limitations to opportunities is considered important for efficiently tackling freshwater related issues. (3,5,7) - SMART water management is considered an important strategy for efficient use of resources and time. (3,5,7)	Good
2	Ministerie van Infrastructuur en Waterstaat. (2022). *Handreiking beheer van grondwaterkwaliteit onder de omgevingswet* (No. 22405158).		
3	Rijksoverheid. (2022). Nationaal Delta Programma 2023: Versnellen, Verbinden, Verbouwen.		
5	Ministerie van Infrastrucuur en Waterstaat. (2019). Nederland beter weerbaar tegen		

	droogte : Eindrapportage Beleidstafel Droogte.	- Retainment of water and building buffers is considered important for combatting salinization and freshwater scarcity during dry periods. Using freshwater as efficient as possible has become more important during the last couple of years, and will be even more so in the future. (3,5,7,10) - Knowledge is present that extreme weather costs are getting higher and as such will have big economic impact. Adaptation and mitigation is considered important and most likely even cheaper. (3,5,7) - Cost-benefit analysis (also social cost-benefit analysis) is considered important for identifying trade-offs and making choices based on efficiency. (2) - Climate proof freshwater supply is mentioned as an important tool for distribution of freshwater during water scarce periods. Water flushing for combatting salinization needs to be more efficient in order to improve this strategy. Also, land use needs to be more adapted to freshwater availability in order to improve efficiency of the freshwater system. (7)	
7	Rijkswaterstaat. (2020). Klimaatbestendige zoetwatervoorziening hoofdwatersysteem.		
10	Friocourt, Y., Kuijper, K., & Leung, N. (2014). Deltafact zoutindringing.		

RECOGNITION

Document No.	Reference	Results	Score
1	Twynstra Gudde. (2019). Handreiking Verzilting: In opdracht van Rijkswaterstaat.	- It is recognized that deviation to the rules is sometimes possible and needed. Most important is describing why it is necessary to deviate from the rules and processes and what impacts this has. Consultation with the content manager of policy documents involved is important because it might be a reason to improve the guidelines. (1)	Poor
2	Ministerie van Infrastructuur en Waterstaat. (2022). *Handreiking beheer van grondwaterkwaliteit onder de omgevingswet* (No. 22405158).		

9	Ministerie van Infrastructuur en Waterstaat. (2022a). *Stroomgebiedbeheerplannen Rijn, Maas, Schelde en Eems 2022 – 2027.*	- A deviation from the law is not possible (1) - It is recognized that salinization issues are often content- and location-specific. Customization is sometimes required for best practice. (1) - It is recognized by the highest governor (the minister) that soil and water management has reached its limits. Climate change is already adding stress to the system and will be even more so in the future. As such, it is recognized that water and soil need to become leading for spatial planning in order to protect the vulnerable groups. For this case vulnerable groups entail farmers, industries and inhabitants who are feeling the impacts of salinization and droughts. (3) - The WFD (Water Framework Directive) consists of the benefits society derives from improved natural conditions. Yet, it is recognized that it is difficult or maybe even impossible to put a value on the most important 'good' the WFD delivers: improved natural conditions and its benefits for society. (9) - There is no/little acknowledgement for the governance characteristic recognition (all documents)	

PARTICIPATION

Document No.	Reference	Results	Score
2	Ministerie van Infrastructuur en Waterstaat. (2022). *Handreiking beheer van grondwaterkwaliteit*	- Close cooperation between government and users is considered essential for resilience	Very Good

	onder de omgevingswet (No. 22405158).	against freshwater scarcity and its consequences on salinization (2,3) - Implementation issues are currently being tackled by improving communication between stakeholders and actors. Sessions and participation programs are being set up in order to include different stakeholders into goal setting and creating solution pathways. (3) - Participation is considered an important pillar of the Delta Program. The tasks which lay ahead require participation and ideas from amongst others government, entrepreneurs, citizens, knowledge institutes, citizens and interest parties. (3) - Active involvement through information provision and consultation of the public, civil society organizations and citizens on national, regional and local scale is considered important. (3,9) - Active involvement of different stakeholders and actors generates support for implementation of measures. Collaboration is considered more important than ever in a planning period for large scale transitions. (9) - Consultation of interested parties and residents is obligatory under the national water act. (2,9)	
3	Rijksoverheid. (2022). Nationaal Delta Programma 2023: Versnellen, Verbinden, Verbouwen.		
9	Ministerie van Infrastructuur en Waterstaat. (2022a). *Stroomgebiedbeheerplannen Rijn, Maas, Schelde en Eems 2022 – 2027.*		

FAIR

Document No.	Reference	Results	Score
2	Ministerie van Infrastructuur en Waterstaat. (2022). *Handreiking beheer van grondwaterkwaliteit onder de*	- A safe and livable country is considered fair and just within the Netherlands. This document recognizes that in the light of climate change and its effects on freshwater availability, these principles cannot be guaranteed anymore. (2)	Good

	omgevingswet (No. 22405158).	- Current measures in the water system alone are not sufficient to prevent damage of drought, salinization and water nuisance in the future. Sufficient freshwater of good quality cannot everywhere be guaranteed in all sectors and for all water users. Adaptation of land use and a new vision on spatial planning based on soil and water is required and regional tailor-made plans need to be developed as such. (5) - Avoiding economic damage of droughts cannot always be avoided. As such we need to accept damage if social costs and benefits of measures cannot be balanced. (5) - Transparency is considered important, so that sectors and users can prepare for the consequences. (5,7) - In times of water scarcity there is a displacement policy on who is getting water and which sectors and users don't. This displacement series is as follows: 1. Water safety and preventing irreversible damage 2. Utilities (drinking water and electricity) 3. Small-scale high-quality use (process water, capital-intensive crops) 4. Other use (agriculture, shipping, other) (5,7)	
5	Ministerie van Infrastrucuur en Waterstaat. (2019). Nederland beter weerbaar tegen droogte : Eindrapportage Beleidstafel Droogte.		
7	Rijkswaterstaat. (2020). Klimaatbestendige zoetwatervoorziening hoofdwatersysteem.		

LEARNING

Document No.	Reference	Results	Score
2	Ministerie van Infrastructuur en Waterstaat. (2022). *Handreiking beheer van grondwaterkwaliteit onder de*	- Several experimental pilots are being used to gather information on feasibility and usefulness of strategies and innovations. (2) - There are several knowledge programs programs present, sometimes with close collaboration between them.	Very Good

	omgevingswet (No. 22405158).	Although the scope of such programs is often specifically ment for a topic (such as the Knowledge Program on Sealevel Rise and Drought Policy Table), they co-produce knowledge and information on more integrative solutions. For instance, interventions are being developed together with their implications on several system levels. (3) - Interventions and implications are addressed on scenario, principle, innovation, practical, education, policy and research level. (3,4,5) - Monitoring and evaluation are institutionalized. (2,4,5) - Interventions and strategies go hand in hand with knowledge development - Bottleneck analysis for the Delta Program Freshwater provides insights in current and future bottlenecks for geographical bottlenecks and policy-based bottlenecks. (4) - Evaluating various issues concerning drought, salinization and freshwater on an administrative level is institutionalized. Failures in the past are being utilized by adding new knowledge programs in order to learn from past mistakes. (7,10) - Standardizing, opening up and exchanging data and information between stakeholders and actors is considered a must for effective water policy and management. (5) - Unlocking, developing and bringing together knowledge is considered key for climate-proof water and land use. (5) - New tech-instruments such as remote sensing and advanced models are being used to learn and improve. (5) - Knowledge gaps are actively mentioned in order to identify research topics for improved system knowledge. (5)	
4	Rijksoverheid. (2020). Synthese Document Deltaprogramma Zoetwater.		
5	Ministerie van Infrastrucuur en Waterstaat. (2019). Nederland beter weerbaar tegen droogte : Eindrapportage Beleidstafel Droogte.		
7	Rijkswaterstaat. (2020). Klimaatbestendige zoetwatervoorziening hoofdwatersysteem.		
10	Friocourt, Y., Kuijper, K., & Leung, N. (2014). Deltafact zoutindringing.		

ANTICIPATORY

Document No.	Reference	Results	Score
1	Twynstra Gudde. (2019). Handreiking Verzilting: In opdracht van Rijkswaterstaat.	- There is knowledge that future climate change and corresponding sea-level rise will put more pressure on issues such as salinization, freshwater safety and droughts. It is already anticipated upon that sea-level rise will cause a land-inward shift of the sweet-salt border within the Rhine-Meuse estuary. (1) - Various pilots are started in order to evaluate new and innovative ideas of improving freshwater safety during crisis periods. (2,3) - Climate resilience is a term which comes back a lot within various documents (3) - Short-term and long-term goals need to align better according to the Delta Program. Boundaries within the current system are already crossed and will become even harder to manage in the future. (3,4) - Long-term thinking is institutionalized by various knowledge programs which prepare long-term strategies. (3,4,5) - The Delta Program used to work according to an adaptive method, which focused on adaptation at the pace of climate change. As the speed of climate change is accelerating, it is recognized that there is a need for more transformative approaches which focus on step-based system changes. (3,4) - Steps to be taken in order to take bigger steps within this strategy are already mentioned. (3) - Trans- and multidisciplinary knowledge programs such as Redesigning Deltas (RDD) are developing long-term visions and strategies for sustainable and safe planning. (3,4) - Transformative spatial planning is being mentioned as essential for climate resilient land and water use. Yet, no clear guidelines on how to do this is currently mentioned. (5)	Good
2	Ministerie van Infrastructuur en Waterstaat. (2022). *Handreiking beheer van grondwaterkwaliteit onder de omgevingswet* (No. 22405158).		
3	Rijksoverheid. (2022). Nationaal Delta Programma 2023: Versnellen, Verbinden, Verbouwen.		
4	Rijksoverheid. (2020). Synthese Document Deltaprogramma Zoetwater.		
5	Ministerie van Infrastrucuur en Waterstaat. (2019). Nederland beter weerbaar tegen droogte : Eindrapportage Beleidstafel Droogte.		
7	Rijkswaterstaat. (2020). Klimaatbestendige zoetwatervoorziening hoofdwatersysteem.		

		- Regional and local customization are considered important to adapt to regional consequences of salinization , freshwater availability and droughts. (3,5) - In 2018 the Dutch water system was under pressure do to unanticipated drought. (5) - Adaptations in the main water system is not always sufficient. Redesigning soil and water use is also considered important for adaptation in the future. (5,7)	

ADAPTIVE

Document No.	Reference	Results	Score
1	Twynstra Gudde. (2019). Handreiking Verzilting: In opdracht van Rijkswaterstaat.	- Salinization situations can be very context- and location-specific. Such differences ask for different approaches and methods. Adapting to location and context is as such important and careful involvement of stakeholders and experts is therefore key for efficient and effective measures. (1) - First concepts of various policy documents have been revised based on reactions. Reactions included concerns on time planning, content and governance. As a result, a new proposal for stepped-decision-making has been made. The new vision is based on dialogue, joint-factfinding. Focus should also not be only on the physical aspect, but also on governance and situational steering. (7) - Previous crisis situations have led to new adaptations. For a long time, the focus has been solely on water drainage instead of retainment. Under current conditions water retainment is considered most important. Such water can, during dry period, be used for combatting salinization and freshwater scarcity. (4,5)	Very Good
4	Rijksoverheid. (2020). Synthese Document Deltaprogramma Zoetwater.		
5	Ministerie van Infrastrucuur en Waterstaat. (2019). Nederland beter weerbaar tegen droogte : Eindrapportage Beleidstafel Droogte.		
7	Rijkswaterstaat. (2020). Klimaatbestendige zoetwatervoorziening hoofdwatersysteem.		

		- The Climate-Proof Freshwater Supply Main Water System Strategy will be implemented step by step. In order to sufficiently adapt to the changing environment, it is necessary to analyze and evaluate before taking the next steps. By doing so, decisions are taken based on experience and insights gathered in research and practice. (7) - During the 2018 drought, the extent and duration of the drought were unanticipated upon. Yet, creative use of available water was just enough to mitigate economical damage. (5) - Learning implementation is considered important for adaptive governance. Especially situational management based on a national overview based on real-time information is considered key for making changes within the system on the moment something is failing. As such, damages can be avoided as much as possible. (7)	

INNOVATIVE

Document No.	Reference	Results	Score
2	Ministerie van Infrastructuur en Waterstaat. (2022). *Handreiking beheer van grondwaterkwaliteit onder de omgevingswet* (No. 22405158).	- Several innovative pilots are set up with amongst others an underground drinking storage in Hoorn and a project which is focusing on desalinization of brackish groundwater in the dunes. (2) - Alternative visions on protecting the Netherlands against sea-level rise are created in design studios. The link between spatial designs and their mutual dependencies is part of the project. (2) - Future images, scenarios, design principles and innovations are important parts of various interventions and adaptation strategies. (2,4,5,7) - Possible future innovations mentioned are: 1. Water conservation in the soil (2)	Good
4	Rijksoverheid. (2020). Synthese Document Deltaprogramma Zoetwater.		
5	Ministerie van Infrastrucuur en Waterstaat.		

	(2019). Nederland beter weerbaar tegen droogte : Eindrapportage Beleidstafel Droogte.	2. More efficient use of the precipitation surplus (4,5) 3. Making freshwater lenses more robust (4, 5) 4. Research into the reuse of water (5) - Users are encouraged to take initiative for innovations, preferably together with local and regional authorities and knowledge institutions. - Both advantages and disadvantages are considered for new strategies. (2,4,5,7) - Testing and trial are giving insight in what works and what don't work. (2,4,5,7) - The Delta Program works via a process of funneling. It considers promising and preferential measures while also include unconventional measures in considerations. (4,5) - Measures for which there is no experiences are explored upon. (7) - There are no mentions of risk tolerance (all documents)	
7	Rijkswaterstaat. (2020). Klimaatbestendige zoetwatervoorziening hoofdwatersysteem.		
10	Friocourt, Y., Kuijper, K., & Leung, N. (2014). Deltafact zoutindringing.		

FLEXIBLE

Document No.	Reference	Results	Score
1	Twynstra Gudde. (2019). Handreiking Verzilting: In opdracht van Rijkswaterstaat.	- National steering on the one hand and space for solutions in the region on the other hand is mentioned as important for flexible governance of freshwater and salinization. (3) - The implementation of a dynamic and flexible adaptation program has become urgent. (3,4) - The Delta Program is searching for a transformative approach that fits the proposed adaptation paths and long-term scenarios while systematically testing for feasibility. (3,4) - It is recognized that salinization tasks are very content- and location-specific. As such, local fits can differ from the guidelines and norms. (1,3)	Very Good
3	Rijksoverheid. (2022). Nationaal Delta Programma 2023: Versnellen, Verbinden, Verbouwen.		
4	Rijksoverheid. (2020). Synthese Document Deltaprogramma Zoetwater.		
5	Ministerie van Infrastrucuur en		

	Waterstaat. (2019). Nederland beter weerbaar tegen droogte : Eindrapportage Beleidstafel Droogte.	-	Optimizing the current system of freshwater supply to the western part of the Netherlands remains sufficient. Optimizing the current system by improved monitoring and incorporating smart water management is considered sufficient and remains flexible enough to accommodate new developments such as the decision for a fresh or salt Volkerak-Zoommeer. (3,5) - Maintaining the freshwater buffers as sustainably as possible on the basis of real-time data, forecasts (6-8 weeks in advance) and a decision-support system for (supra)-regional water management is considered innovative. (4) - Many recommendations are being worked out regionally because regional differences require administrative tailor-fit approaches and solutions. (5) - There is a need for local and regional groundwater displacement series. A national displacement series for this matter is not useful nor workable according to the policy documents. Extractions and local evaporation cause local and regional differences and bottlenecks. (7) - SMART Water management is being used as a flexible instrument to steer water to places based on real-time data (3,4)	
7	Rijkswaterstaat. (2020). Klimaatbestendige zoetwatervoorziening hoofdwatersysteem.			

LEGITIMATE

Document No.	Reference	Results	Score
1	Twynstra Gudde. (2019). Handreiking Verzilting: In opdracht van Rijkswaterstaat.	- The salinization guide should provide uniform and transparent guidelines of the vision on salinization. (1) - Resilience to water shortages and expanding capacity of climate-proof water management is considered the main vision to deal with freshwater related issues. (3) - Inter-administrative cooperation is considered an important vision for	Very Good
3	Rijksoverheid. (2022). Nationaal Delta Programma 2023: Versnellen, Verbinden, Verbouwen.		

5	Ministerie van Infrastrucuur en Waterstaat. (2019). Nederland beter weerbaar tegen droogte : Eindrapportage Beleidstafel Droogte.	dealing with the environmental tasks which lay ahead. Water and soil need to become leading in spatial planning. It is mentioned that all measures need to be adjusted to this matter and that close cooperation is a must. (3) - The underlying lines of thought are communicated and transparent within the policy documents. (1,3,5,7) - Clear, consistent, and well-coordinated communication is considered essential. It offers perspectives for water users, increase water awareness, and improves support for measures in cold and warm phases. (5)	
7	Rijkswaterstaat. (2020). Klimaatbestendige zoetwatervoorziening hoofdwatersysteem.		

CONNECTED

Document No.	Reference	Results	Score
2	Ministerie van Infrastructuur en Waterstaat. (2022). *Handreiking beheer van grondwaterkwaliteit onder de omgevingswet* (No. 22405158).	- The Delta Program is established in order to provide national direction. The program considers national control with room for solutions in the regions as important. A new governance structure is as such needed. Although the organization is not perceived as the main authority for water governance, it helps various actors within their jurisdictions to efficiently develop measures and pathways against drought, salinization , and freshwater scarcity. (3) - There are several programs which work on gathering knowledge and information through participation. These also contribute to network development. (2,3,5) - The governance system has network features that are both horizontal and vertical. Yet, there are some concerns	Good
3	Rijksoverheid. (2022). Nationaal Delta Programma 2023: Versnellen, Verbinden, Verbouwen.		
5	Ministerie van Infrastrucuur en Waterstaat. (2019). Nederland beter weerbaar tegen		

	droogte : Eindrapportage Beleidstafel Droogte.	about the scattered structures with unclear responsibilities. There are various institutions such as municipalities, provinces, water boards, Rijkswaterstaat and deputy states which all have jurisdictions and responsibilities for different water bodies. (5) - Mutual learning is considered a key objective in multiple documents. (2,3,5)	

NESTED

Document No.	Reference	Results	Score
2	Ministerie van Infrastructuur en Waterstaat. (2022). *Handreiking beheer van grondwaterkwaliteit onder de omgevingswet* (No. 22405158).	- The Delta Program has executive organizations in the regions. The Delta Program provides coordination for the regions. The organization is aware that there are several layers and systems which are linked within the entire governance system. (2,3) - The regions have an important role for creating cohesion and connection between various transitions and goals of the Delta Program. (3) - The program focuses on long-term goals in order not to limit possible solutions and identify where	Good
3	Rijksoverheid. (2022). Nationaal Delta Programma 2023: Versnellen, Verbinden, Verbouwen.		

5	Ministerie van Infrastrucuur en Waterstaat. (2019). Nederland beter weerbaar tegen droogte : Eindrapportage Beleidstafel Droogte.	(potential) tasks for other policy areas conflict with the goals of the program. - The provinces have supervision on regional water authorities. There is co-ordination and conferral dependency among provinces and municipalities, and municipalities and regional water authorities. (3,5) - Many recommendations from the Delta Program need to be worked out regionally because regional setting and context need administrative tailor-made approaches and solutions. It is recognized that freshwater governance should be conferred to the lowest level possible in order to improve efficiency. (5) - Municipalities, water boards, provinces and the state all have a shared responsibility for the implementation and execution of regulation, legislation, and national vision. All levels of government are as such competent authority. Each level has its own responsibilities. (9) - The state is responsible for national policy (highest level). Implementation of KRW has been entrusted to the ministry of infrastructure and water management. The minister of infrastructure and water management is considered the executive authority for water extraction within state waters. In addition, the minister is responsible for the goals of such waters. The provinces are responsible for goals of regional surface waters, groundwater aquifers and monitor groundwater quality. In addition, they are responsible for strategic groundwater management. The Deputy states (gedeputeerde staten) are responsible for industrial water extractions exceeding 150.000m3 annually, water extractions for drinking water and extractions for subsurface energy systems. Provinces provide rules for water extraction	
9	Ministerie van Infrastructuur en Waterstaat. (2022a). *Stroomgebiedbeheerplannen Rijn, Maas, Schelde en Eems 2022 – 2027.*		

		areas within the provincial environmental ordinance (provinciale milieuverordering). Water boards are administrator of regional surface waters and monitor its state. In addition, the water boards are executive administrator for groundwater extractions for areas which are not considered state or province. Also, they are considered executive administrator for operational groundwater management and purification management. In times of water scarcity, they have the executive power to stop water extractions for which they are responsible. (9) - Tasks are conferred to lower levels but scattered and in various cases unclear. It has been mentioned that this has led to unclear responsibilities and authorities during crisis situations. (5,9)	

POLYCENTRIC

Document No.	Reference	Results	Score
2	Ministerie van Infrastructuur en Waterstaat. (2022). *Handreiking beheer van grondwaterkwaliteit onder de omgevingswet* (No. 22405158).	- Decisions-making takes place at multiple scales. Municipalities, water boards, provinces and the state all have a shared responsibility for the implementation and execution of legislation and vision. All have different jurisdictional regions and waters. All interact and cohere towards a common goal, often presented by the Delta Commissioner and the Minister. (5,9) - Regions have the freedom to come up with tailor-fit approaches for context- and location-specific issues. The main goal or vision is	Very good
3	Rijksoverheid. (2022). Nationaal Delta Programma 2023: Versnellen, Verbinden, Verbouwen.		
5	Ministerie van Infrastrucuur en Waterstaat. (2019). Nederland beter weerbaar tegen droogte : Eindrapportage Beleidstafel Droogte.		

9	Ministerie van Infrastructuur en Waterstaat. (2022a). *Stroomgebiedbeheerplannen Rijn, Maas, Schelde en Eems 2022 – 2027.*	often established nation-wide. (2,3) - During crisis periods the LCW provides real-time information to water authorities in order to improve resilience during crisis situations. (5) - Multiple institutions and programs are simultaneously working on diverse multidisciplinary topics and water management programs. For instance, knowledge program sea-level rise and the Delta Program freshwater are working on similar topics, while sharing information. (3,5)	

APPENDIX 2 – DETAILED INTERVIEW RESULTS

INTERVIEW 1 – EMPLOYEE KNOWLEDGE INSTITUTE DELTARES

Governance characteristic	Results	Interpretation of results	Score
Direction	- Person X mentions that salinization is invisible and therefore difficult for policymakers. Sea level rise is also a slow process and therefore feels less urgent. Despite this fact they try to boost awareness by initiating and participation with several programs (kennisprogramma zeespiegelstijging and Delta programma) - The goals and ambitions of various freshwater related issues should be coupled more. - A clear and concise top-down long-term vision is not sufficiently present. Lobbying for own interests still happens,	The scope and aims are often limited to looking to the problem through a single lens instead of coupling them. A lack of urgency limits visionary goals and action.	Poor

	whereas the issue requires timely addressing with adequate resources.		
Coordination	- Person X points out that conflicts of interest result in lobbying for own benefits. Whereas the issue requires local customization, there is a need for a more top-down vision which steers governance. A better and more integrative visions should improve coordination as well.	There is coordination, but due to lobbying for own benefits this is rather ineffective. The functions and mandates of different organizations are coordinated but lack direction.	Poor
Capacity	- There should be more focus on grouping information based on their dimensions location, time, costs, quality and quantity. Governance is very important for that. This needs improvement. - The issue of salinization and freshwater availability asks for higher resource allocation. - The skills and information for adequate decision-making are present.	The skills and information to tackle the issue of salinization and freshwater availability are at hand and actively being developed. Capable leadership is however not present and resource allocation is not sufficient.	Poor
Informed	- Person X states that there are organizations such as Deltares which have the knowhow to make accurate projections and calculations for at-risk regions. Yet, local governments are lagging behind and struggle to directly transform such projections and calculations into policy and hand-on management strategies. - Person X mentions that the knowledge base of governors not always is sufficient. Meetings point out that governors seem	There is good information at hand. Planning and management are however not always following the information which is at hand. Better integration of the knowledge types and making the right decisions based on the information is considered insufficient.	Poor

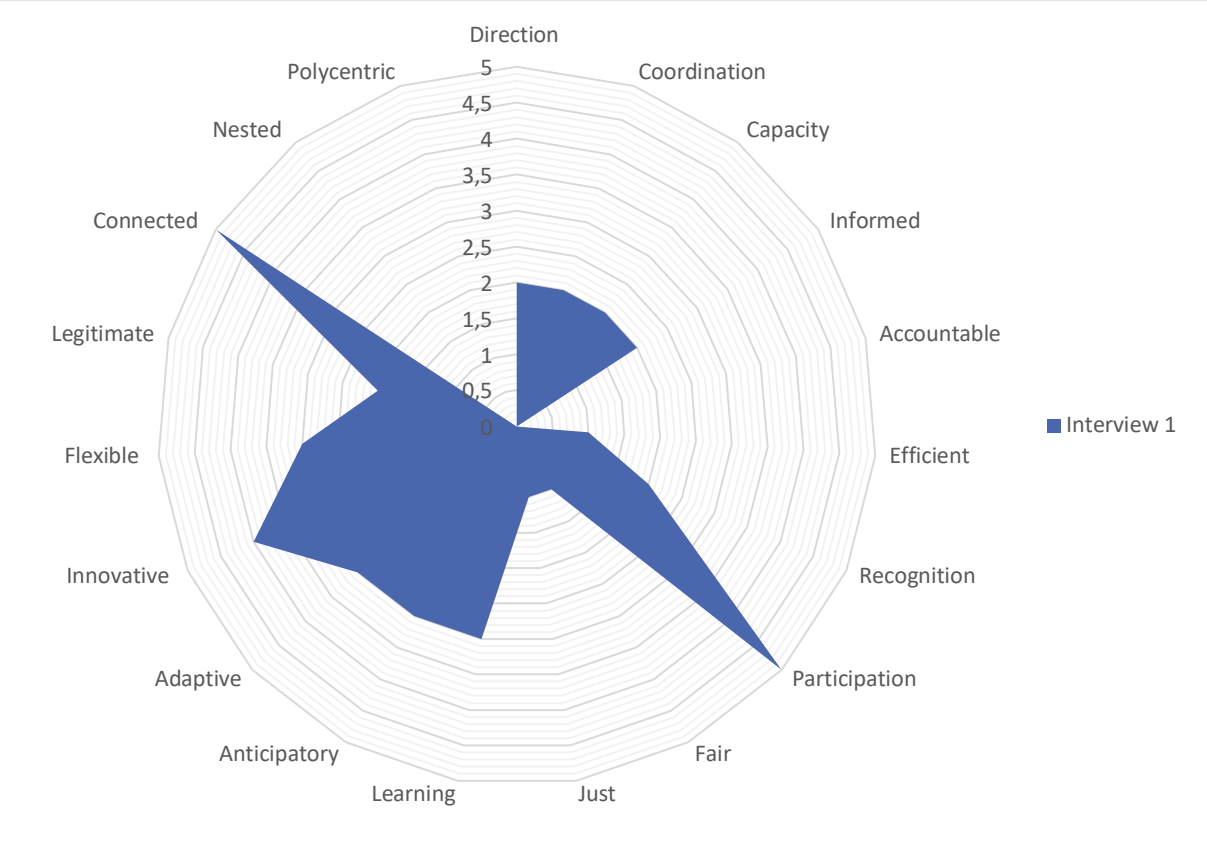
	to think that sea-level rise is the one and only cause of salinization. Yet, the most common reason for salinization is the extraction of freshwater. - Person X points out that governors seem to think that, based on regional extraction calculations, there is no issue. Yet, locally extraction can lead to serious damages and as such 20% percent of freshwater extraction wells is getting too saline. This is all part of system knowledge.		
Accountable	- Person X thinks that politicians do not understand the urgency of salinization. Integrative solutions are not being considered enough.	Insufficient information to provide a score	Inconclusive data
Efficient	- Person X points out that salinization is a 'slow disaster'. The media and politicians have a tunnel vision on droughts. Yet, both for global food supply and the Dutch economy, salinization can have serious consequences. Drought, salinization, and freshwater supply are all coupled and should be tackled as such. - There is inefficient use of information at hand. Coupling dimensions of issues and coupling freshwater related issues such as water availability, salinization and droughts should improve efficiency.	Deployment of resources is inefficient or insufficient due inefficient use of knowledge. The costs of salinization will become enormous, while income will decrease due to decreasing crop output caused by salty soils.	Very poor
Recognition	- Person X points out that the issue already is important. Seed potatoes	There is too little recognition that the global food security is at risk due to salinization in	Poor

		within the northern part of the Netherlands feed roughout 700 million people globally. This system is under pressure by salinization. Supplying increasing amounts of freshwater under more dry circumstances will in the future be impossible. The Northern part of the Netherlands often gets less attention.	the Netherlands. The Norther parts of the Netherlands do not get enough attention. Diverse perspectives are insufficiently incorporated.	
Participation	-	There are knowledge programs which incorporate participation. Also person X states that the knowledge institute he works at, Deltares, is asked to think on several matters concerning freshwater and salinization.	There is participation and there are places and processes that enable participation and collective choice.	Very good
Fair	-	Person X points out that the issue already is important. Seed potatoes within the northern part of the Netherlands feed roughout 700 million people globally. This system is under pressure by salinization. Supplying increasing amounts of freshwater under more dry circumstances will in the future be impossible. The Northern part of the Netherlands often gets less attention just like Zeeland.	There are insufficient mechanisms in place to ensure fairly and just distribution of costs and benefits. This counts for both national and global scale. Food security of already marginalized groups in developing countries are at risk because of salinization in the Netherlands.	Very poor
Just	-	Insufficient attention to northern parts of the Netherlands and Zeeland in terms of salinization related issues, is putting pressure on the world food security. These regions are important producers of seed	Local rights (in this case regional rights) are not considered sufficiently. Less densely populated regions seem to have less priority compared to densely populated regions. Yet, those regions are important for both	Very poor

	potatoes for 700 million people globally. The region of Zeeland is not even suitable for potatoes and unions anymore.	national and regional food supply.	
Learning	- Adequately addressing the issue is not happening enough. We have already seen the consequences on agriculture in Zeeland. Now, the situation in the North is also critical. Too little is happening, and the same mistakes will be made again. Learning should be institutionalized. Yet, Person X thinks that the information is at hand, but governors and politicians fail to act upon the information. - There are large amounts of platforms for co-production of knowledge, think about knowledge program on sea-level rise and Delta Program freshwater.	According to person X learning isn't sufficiently institutionalized. There is information and there have been events that provided the information on urgency, but too little is being done to prevent past mistakes from happening again. There are platforms for co-production of knowledge.	Sufficient
Anticipatory	- Person X mentions that (local) governments are slowly starting to work on safe-guarding fresh-water supplies now that it becomes clear that salinization is threatening drinking water supply. - Person X points out that the urgency is most likely to go up enormously during the coming decades. Salinization is according to person X more of a freshwater issue. The abundance (or absence) of freshwater is the main driver of salinization since freshwater is used to flush out salt. Person X shows	Although long-term planning and foresight thinking are institutionalized, the consideration of effects in the future is insufficient. The risks are considered but anticipatory planning lacks. Yet, recently more efforts are being made.	Sufficient

	on a graph that a 3m sealevel rise would result in 8 times more freshwater use for flushing out salt. According to person X this is impossible. Foresight system thinking is as such very important, and not happening enough.		
Adaptive	- Person X thinks we are adapting, but not at the right pace. It's responsive instead of anticipatory. Adaptations are only planned for with the information obtained, instead of sufficiently using long-term models and foresight thinking.	Adaptation happens and there are spaces for reflection. Processes exist to evolve policies and institutions but adapting actions to the information goes to slowly. Foresight thinking is not incorporated within the adaptive capacity.	Sufficient
Innovative	- Person X points out that experimentation and initiating pilots is important. Both failures and successes give valuable insights. Those are happening more and more. Yet, it is still initiated bottom-up rather dan top-down	There are innovations. Pilots are being started and failures and successes provide valuable information. Initiation of top-down innovations is partly missing.	Good
Flexible	- Person X points out that it doesn't necessarily mean that there is not too little information, but grouping the information together is more important. Every location needs a different approach. Its important that the dimension location, time, quality, quantity and costs are grouped and the issue is tackled locally. Governance is very important for that.	Downscaling environmental policy happens. Understanding the system can however be better. Mapping diverse context and mapping them together should improve.	Sufficient
Legitimate	- Person X mentions that the knowledge base of governors not always is	Integrity of governors is being questioned by person X. Seems like the planning is not	Poor

	sufficient. Meetings point out that governors seem to think that sealevel rise is the one and only cause of salinization. He finds it stunning that they do not have the knowledge, since it is at hand.	being done by the best information at hand.	
Connected	- There are knowledge programs and there is connection between multiple levels of governance. The Dutch system has a good network for addressing water issues.	There are vertical and horizontal dimensions within the network. There are processes and places for network development and mutual learning is happening.	Very good
Nested	- No data	No data	Inconclusive data
Polycentric	- No data	No data	Inconclusive data



INTERVIEW 2 – EMPLOYEE KWR WATER

Governance Characteristic	Results	Interpretation of interview comments	Score
Direction	- Local solutions are considered important by both the governments and us according to Person X - There are political choices. We can do more, but those choices are highly dependent on the political landscape. Large water consumers which have a lot of jobs, are prioritized over others. - Goals for salinization are not always clear in all regions. Some regions have more communication and as such more insight in goals and interests of all stakeholders. - The knowledge agenda is not drafted correctly. Person X has his doubts on how this happens. - Not everyone needs to have the same goals. Open communication on stakeholder goals and interests is important so that there is a good picture of all the interests.	Scope, goals and aims are articulated and communicated to stakeholders. There is however a lot of room for improvement. Agenda setting is considered a bottleneck which holds back systematic change.	Sufficient
Coordination	- The IJsselmeer is important for flushing South- and North-Holland and Friesland. There are a lot of stakeholders involved for making decisions for this water. Division of freshwater from the IJsselmeer is arranged. - Some regions have a lot of communication with stakeholders. Those regions have good cooperation, and all	Coordination is considered insufficient. It is unclear which organizations is considered the executive administrator and authority in some cases. The organizational structure is somewhat scattered. Person X considers visionary leadership more important than coordination.	Poor

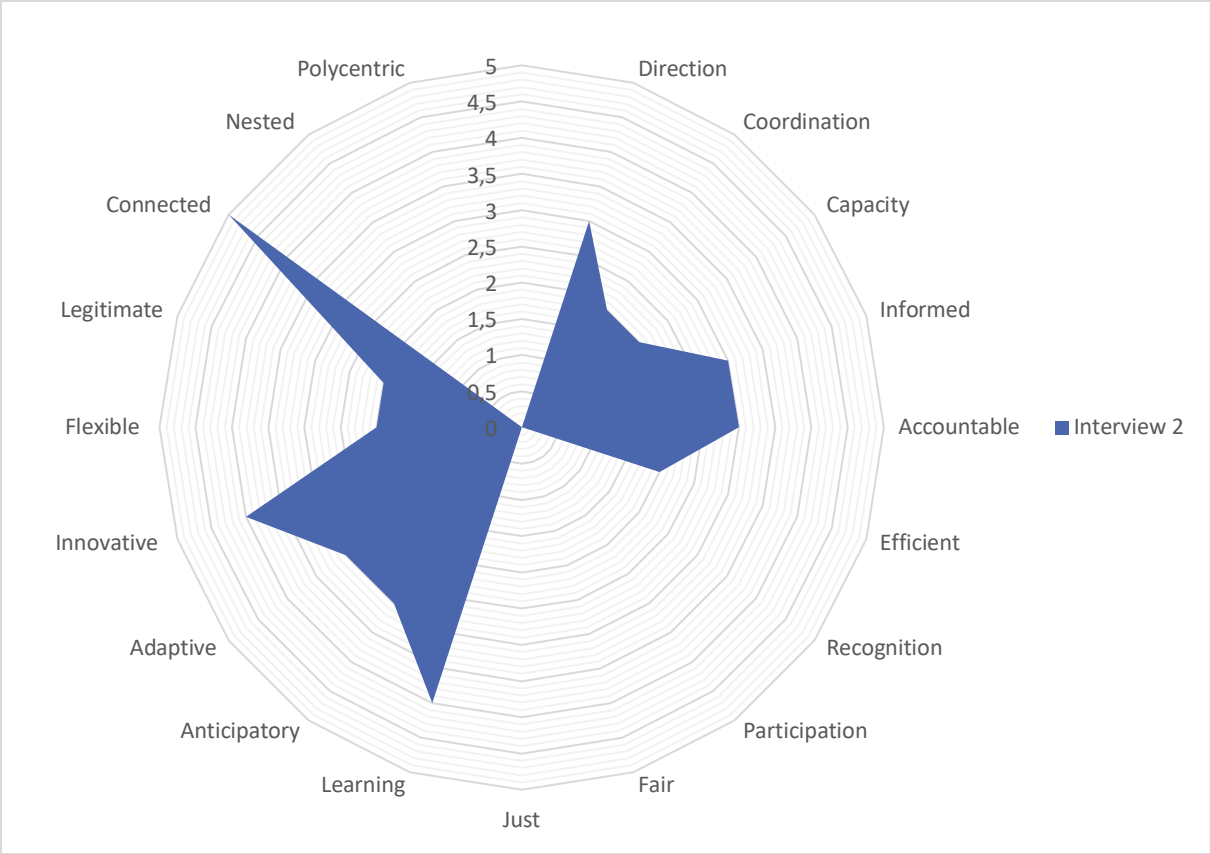
	interests are clear. Other regions have more difficulties. - Person X thinks that there is too little coordination. Legislation and policy can hold back change under current circumstances. The executive administrators are extremely shattered. It is unclear where you need to go to get a permit for innovations. - Who initiates? And it is unclear who is the authority. Sometimes it overlaps. - A strong visionary leader is missing. This can have a crucial impact on the system. Even more than good coordination.		
Capacity	- System knowledge is sometimes insufficient. Not everyone has sufficient system knowledge during meetings. - Capacity is highly dependent on the knowledge agenda and corresponding resource allocation. - There is no visionary leadership.	There is a lot of knowledge in some organizations. Yet, there is insufficient system knowledge within some organizations. Meetings are as such not always efficient. The knowledge agenda is insufficient and as such resource allocation could be better. There is no visionary leadership.	Poor
Informed	- Saltwater infiltrates during low river discharges. Underneath the saltwater infiltrates far land-inwards. This endangers drinking water .. points. - Demographic drivers put pressure on freshwater from wells. There is increased consumption, decreased availability and more people. - Agriculture at Zeeland and the Kop van Holland have	There is a lot of knowledge production. Institutional knowledge is considered important for this matter according to person X. This could be improved in the future. Data is missing for some things, such as small groundwater extractions. As such, not all decisions are based on sufficient information.	Sufficient

	difficulties getting sufficient freshwater. - Some stakeholders have insufficient system knowledge. - Institutional memory is really important. We can make steps to improve this. We are currently working on improving a knowledge network. - Water boards have no idea how much small groundwater extractions there are. This is monitored insufficiently. Improving such systems is very difficult.		
Accountable	- It is sometimes unclear who are executive administrators for specific situations. Who is accountable for what under innovative circumstances? Who initiates? - For inside stakeholders it is clear how decisions are made. Person X states that he does not know if this is the case for people outside the system.	Decision-making is transparent for people within the system. For outside the system person X does not know. There are uncertainties on authority. Who is the executive administrator for some cases and who initiates? This affects accountability.	Sufficient
Efficient	- A lot of the solutions are not technical. Boundary conditions are more important. Policy can hold back change. It is difficult to make policy which incorporates innovation. Knowledge, innovation, and policy should be coupled together to make inclusive and integral policy. By doing so we can improve efficiency in the future. - Meetings are sometimes inefficient due to insufficient system knowledge.	There are several factors which hold back efficient use of resources. Policy, agenda setting, and system knowledge are three points of concern for effective and efficient management.	Poor

	- The knowledge agenda holds back efficient resource allocation and transformative change.		
Recognition	- No data	No data	Inconclusive data
Participation	- No data	No data	Inconclusive data
Fair	- No data	No data	Inconclusive data
Just	- No data	No data	Inconclusive data
Learning	- Delta Program works well. Initiates a lot of knowledge production. - Working on pilots and managing contact afterwards is considered very important for knowledge production according to Person X. Networks really enhance knowledge transfer. We can still make a lot of improvements on this matter. - Institutional memory is considered a key element for enhancing efficiency and effectiveness of the system according to person X. There could be improvements on this matter according to person X. - Reflection and monitoring is considered important. For projects we initiated we have measurement obligations, and we need to transfer this to the authorities.	Monitoring, evaluation and reflection are considered important for learning and are partly institutionalized according to person X. Co-production of knowledge and institutional memory are considered important for the system. These are not perfect and could be improved in the future.	Good
Anticipatory	- The future will become problematic. - We need increased amounts of water to flush out saltwater in the future	Person X has a lot of questions on how to deal with the future. Knowledge is considered very important for this matter and programs are working on that.	Sufficient

	while there is less freshwater available. - Should we keep surface water as fresh as possible in the future? - A lot of organizations are struggling on how to deal with the future. Foresight thinking to 2050 and 2100 is difficult because of uncertainties. There are a few knowledge programs working on that.	How to deal with foresight thinking is difficult. They are however considered and planned for. Person X questions if this is happening sufficiently.	
Adaptive	- There are a lot of knowledge platforms and programs, and innovations are considered important. Revisions on policy are however not happening at the same pace as innovations.	Effective adaptation strategies which make use of innovations are not happening at the same pace as policy making. As such, adaptations are not as effective as they could be.	Sufficient
Innovative	- In Dinteloord there is a large greenhouse horticulture region. There were boundary conditions however for freshwater before construction by the initiator could be started. No surface or groundwater could be used for this. The sector looked for local alternatives. Suikerunie is located in the region. Freshwater from sugar production is used for the greenhouse horticulture. - Translating innovations to policy is difficult. - There is a good environment for knowledge programs and innovations. Initiating such programs is nationally coordinated.	Boundary conditions are considered extremely important for initiating experimentation and innovations. There is a good environment for innovations. Person X initiates a lot of pilots and is optimistic. Translating such innovations to new policy is difficult. As such, higher risk tolerance is not sufficiently incorporated.	Good
Flexible	- Flexible water use could be improved. Legislation and policy are holding back innovations for	The system has difficulties with being as flexible as possible. It is recognized that downscaling to local contexts is a key aim. Yet, policy has no one-size-fits-all	Poor

	storing groundwater underground. - Local contexts are considered important. Legislation which involves local contexts is difficult. A one-size-fits-all is difficult.	vision, and this makes it difficult to downscale to local needs.	
Legitimate	- Institutions are transparent. - A collective vision could be improved. Downscaling to local contexts is also very difficult and holds back change. Policymaking could be improved although person X recognizes that it is incredibly difficult to make coherent and integrative policy for such difficult systems. - Politics and agenda setting has a large impact on the system and is considered poor by person X.	There is a collective vision, but this could be improved. Institutional legitimacy is conferred but policymaking and agenda setting needs to improve in order to improve the system. The political landscape can also hold back change, and this affects legitimacy.	Poor
Connected	- Networks are important for co-production of knowledge. This improves institutional knowledge. - There are vertical and horizontal layers.	Network building is considered important and happening within the system. The system has both horizontal and vertical layers.	Very good
Nested	- No data	No data	Inconclusive data
Polycentric	- No data	No data	Inconclusive data



INTERVIEW 3 – EMPLOYEE SMWO

Governance characteristic	Results	Interpretation of interview comments	Score
Direction	- The regions are steering for low chloride concentrations - The displacement series is the main legislative framework we use during times of drought and water scarcity. - Salinization is not specifically mentioned in the displacement series. But it is used a lot for issues which deal with salinization. - In some nature regions policy changed and it is desired that there is exchange of fresh and salt water.	There are insufficient boundaries on scope and action. Big decisions are not being made because of conflicting interests. Scope, goals and aims are sufficient but could improve a lot by more foresight thinking and goal-setting.	Poor

	- We have boundaries for drinking water intake locations. When chloride concentrations are too high, they are closing. - There are various protocols for specific locations which have measures such as sluices. - There are especially procedural agreements instead of hard legislative norms. - During low river discharges we opt for replacing water to open connections with sea. As such we can flush out saltwater. - There are procedures for closing sluices in certain situations. - It's difficult to find a balance between nature and social-economic preferences. - Water agreements can mention salinization specifically, but this does not happen a lot according to person X. - There is insufficient knowledge in politics on how pressing the salinization situation is. There are economical costs when boats cannot go through sluices. But we have to make that choice because of insufficient freshwater during times of low river discharge. - The boundaries for the system are not always clear. We are working in the unknown margins of the system. - Restrictive measures are only being taken when the situation is already critical. For example, when we start buffering in the		

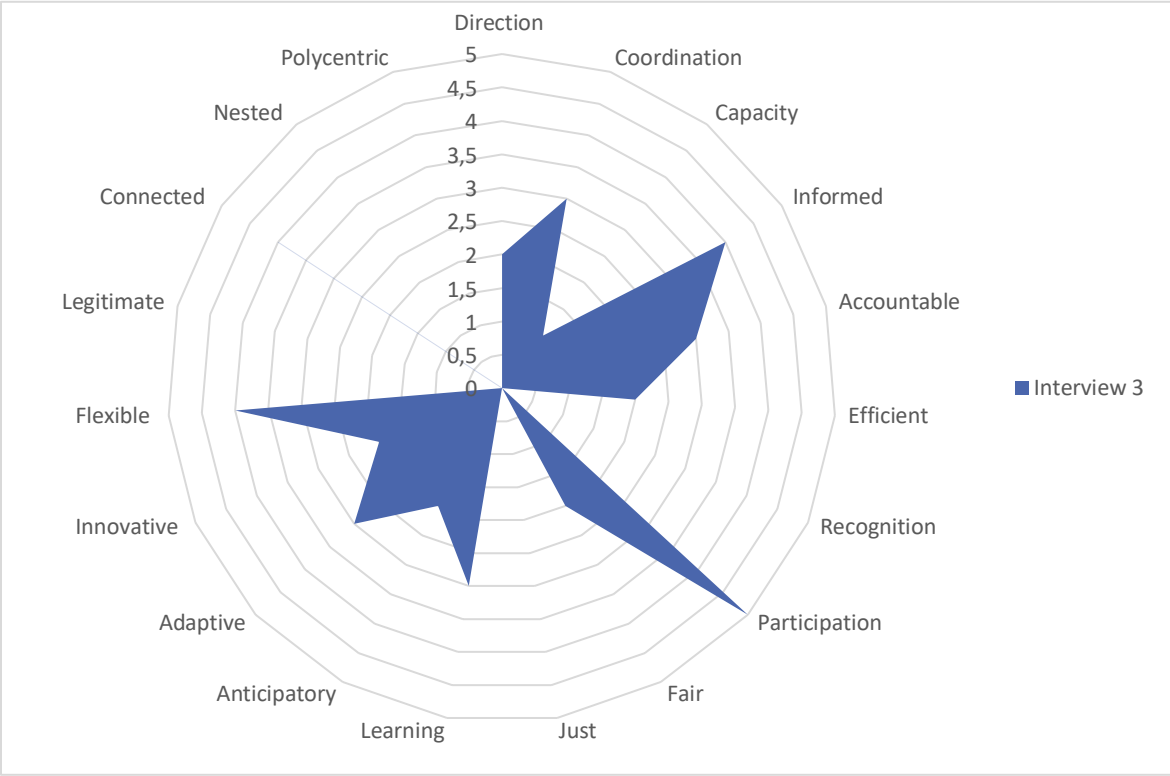
	IJsselmeer a month prior, we could avoid a lot of salinization issues. These choices are not being made. - There were ideas for increasing the water table of the IJsselmeer with 1 meter. After a long discussion nothing happened. Only a larger bandwidth. - Person x argues that salinization should not be looked upon separately, but as a freshwater quantity issue.		
Coordination	- The water management centre Netherlands coordinates during water crisis such as droughts and water scarcity. - Crisis management coordinates between a lot of stakeholders. - We give recommendations on how to deal with salinization in regions. These recommendations are often used. - The state makes water agreements with regions and water authorities. It doesn't make water agreements with itself, while this would be an option to improve situations within certain regions. - Policy innovation should come from higher institutional levels. - Restrictive measures are only being taken when the situation is already critical.	The roles, functions and mandates of different governments, agencies and organizations are coordinated but often only when the situation is quite critical. Could be improved by institutionalizing foresight thinking.	Sufficient
Capacity	- Sometimes it is desired to make new measures to protect regions against salinization.	There are insufficient resources at hand to make big changes in the system. Instruments are considered insufficient for	Very poor

	- Sluices are being built but measures against salinization are not incorporated. The costs of not incorporating such measures are higher than incorporating measures during the construction of sluices. - There are insufficient resources for maintenance of measures against salinization. - Foresight thinking is very important for making the right decisions. This already should happen when new measures for shipping are considered. Now the costs are much higher because measures have to be incorporated after building sluices. - New measures and innovation are not always priority because of insufficient capacity. It is already difficult to maintain the situation with the resources at hand. - Existing instruments are not functioning correctly.	current management. There is no clear vision on how to deal with this.	
Informed	- At certain regions water boards have to deal with uprising brackish water in the polder. - Evaluation is institutionalized and measures are being developed according the information at hand.		Good
Accountable	- The SMWO is accountable for freshwater supply during droughts. - When the WMCN gives code orange. The MTW can force measures. Rijkswaterstaat and water authorities can then not	It is clear who is accountable in which cases according to person X. Local water authorities can get court cases when during crisis situations the recommendation of the MTW is not being used. Unclear who is being held responsible when	Sufficient

	make decisions on their own. Accountability is for the corresponding regional water authorities. - Rijkswaterstaat is the executive authority for water supply.	water policy or resources are being insufficiently developed.	
Efficient	- Smart water management is an important tool to efficiently divide freshwater. - The sluices are sometimes inefficient. Costs of salinization are higher than incorporating new measures. - Situational decisions are being considered inefficient by person X. Foresight thinking should be improved in order to prevent damages and costs.	Efficacy does not clearly guide decisions regarding deployment of resources. Decisions are happening situationally while damages and costs could have been avoided by making decisions weeks/months or years upfront.	Poor
Recognition	- No data.	No data	Inconclusive data
Participation	- Participation from stakeholders is possible for various regional water agreements.	There are structures that enable participation and representation and engagement.	Very good
Fair	- We have to make choices between shipping and salinization, while this should not be the case when during construction of measures the issue of salinization is being incorporated.	Costs and benefits are not always shared equally. Costs for specific groups could have been avoided by incorporating measures upfront.	Poor
Just	- No data	No data	Inconclusive data
Learning	- Evaluation and monitoring is an important tool for which measures are needed to combat salinization. - Evaluating is considered a key tool for revising policy.	Although monitoring and evaluating are institutionalized, the knowledge is insufficiently being operationalized.	Sufficient

	- Learning from the past happens insufficiently. Hard choices on increasing water quantity are not being made.		
Anticipatory	- There issue of salinization is insufficiently being thought of when new constructions are being considered. Foresight thinking should improve. - We are often situationally steering, while this could have been avoided by increasing the water table of the IJsselmeer for instance.	Foresight thinking is insufficient. Information at hand does not always lead to the big decisions that need to be made. Opportunities are not being considered and planned.	Poor
Adaptive	- Adaptation measures are insufficiently being incorporated in planning. For instance a large sluice construction in Amsterdam did not include any measures against salinization while this was a pressing issue. - Adapting to the situation happens with the resources at hand.	Adapting management happens mostly with situational steering with resources at hand. New innovations are not incorporated because of uncertainty.	Sufficient
Innovative	- Innovations need to prove themselves. Person X states that they must make decisions based on what they have.	There are no time and resources for incorporating new innovations. A higher risk tolerance is as such not embodied.	Poor
Flexible	- We try to be flexible. But sometimes hard choices are necessary to ensure water supply for at-risk regions. - Downscaling measures to local contexts is happening. - Efforts are taken to understand what needs to happen in order to prevent salinization and droughts in their local context.	Flexible management is considered important for situational steering. Smart water management is considered a tool for this. There are efforts to understand local contexts.	Good

Legitimate	- No data	No data	Inconclusive data
Connected	- There is a lot of connection vertically. Also, through water agreements. Horizontally there are no water agreements for state jurisdiction water. - Mutual learning is institutionalized.	There is a strong vertical connection. Also, horizontally there are water agreements between water authorities. There are however no water agreements for state waters, which might be a solution for water supply to certain regions. Mutual learning is institutionalized.	Good
Nested	- No data	No data	Inconclusive data
Polycentric	- No data	No data	Inconclusive data



INTERVIEW 4 – POLICY EMPLOYEE OF PROVINCE ZEELAND FOR WATER RELATED TOPICS

Governance Characteristic	Results	Interpretation of interview comments	Score
Direction	- Person x states that we should focus on water retention. The province is also focussing on that. Also, the water board within the province is changing from drainage to water retention of freshwater in order to combat salinization. Zeeland does not have water supply from the big rivers and as such this is very important. - The main goal is clear. Keeping subsurface soils and water fresh is the main goal. Every stakeholder wants to do this and the goal of the province is clear. - Improving nature quality is also a concern of the province. - A balance between supply and demand is the most important aspect of freshwater. There are several ways this can be accomplished. - Trying to help stakeholders with financing and knowledge is part of the vision within the province. - It is inevitable that choices on land use need rethinking due to the changing climate. - It is opted to let go the chloride norm and have a larger band-with of 300 to 800 mg/l.	The direction is in line with the national vision on salinization and freshwater. There should be more focus on retaining the water in the region instead of draining it. Improving nature quality is also considered a national and regional vision. In addition, the comments made on adapting through spatial planning is mentioned by national policies as well.	Very good
Coordination	- Execution of policy and measures from higher governance levels is happening.	Coordination for the region is well-established. There are national sessions which	Good

	- There is national coordination. - There are national meetings with persons from the region (water board, province etc.)	include the province and water board.	
Capacity	- We have planned the Netherlands in such a way that there is room for water drainage. - Measures have costs. The province and stakeholders have funding issues. One of such measures, building a big pipe system is considered too expensive by the national government. As such there is no funding. - Measures and policy are being implemented regionally. Funding can be a bottleneck. - The province is trying to help stakeholders with subsidies and knowledge so that they can take measures bottom-up. - There is capable leadership within the region. - Current models for calculating effects from changing water quality and quantity are not fit for the changing climate.	Although the region provides the resources to stakeholders through funding and knowledge, the national capacity to help the region is significantly worse. The bad water supply to the region is not something that is being improved. All water supply should come from the region itself except for the North-Eastern part.	Poor
Informed	- Person x states that system knowledge is very important. Especially the geo-physical part of water systems is according to him very important. - Drought is less of a problem because of sub-surface soils. - There are regional meetings for knowledge exchange.	Both on regional and national scale, there is knowledge. New knowledge is actively being developed. There is both system and policy knowledge.	Very good

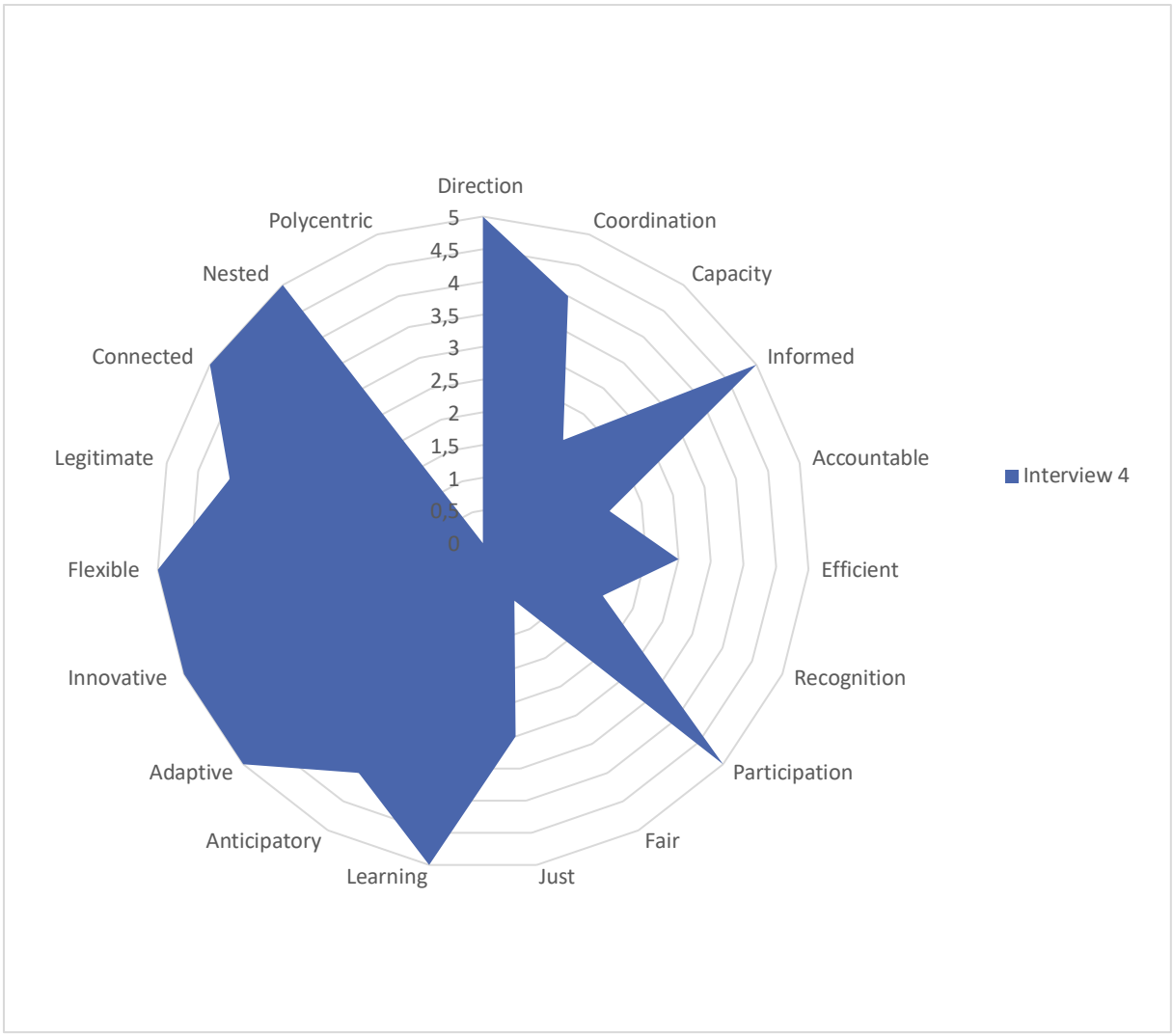
Accountable	- Transparency is considered important. Sometimes more informal conversations help to understand the point of view of farmers and other water consumers. - Who is however accountable for the bad situation in Zeeland? Zeeland is considered a bottleneck for salinization related issues due to the absence of river discharge in the region. Yet, there is no willingness to make big spendings in order to improve the situation. Person X states that if the national government wants to have food supply from farmers in the region, something needs to be done in order to improve freshwater security.	It is unclear who is accountable for the bad situation on freshwater and salinization more specifically. Although governors in Zeeland do as much they can to adapt and mitigate, the situation is likely to become worse in the near future. It does not become clear from the interview who should be considered accountable for the bad situation.	Poor
Efficient	- Efficiency can be improved due to system knowledge and the recognition that differences are location- and context specific. - Person x states that efficiency is a difficult concept to measure. The province is trying to help stakeholders as much as possible through funding and sharing knowledge. - Person x states that the working community on this matter really works together on the matter of salinization and freshwater. He thinks that this is very important for improving efficiency.	Efficiency is basically working as efficient as possible with the resources at hand. More resources allocation from the national government could improve the efficiency of combatting salinization and freshwater scarcity. The region is working with the resources at hand. Resource allocation from a national perspective could have been better to improve efficiency.	Sufficient
Recognition	- Province and farmers recognized that at some	The region recognizes the need for improvement for	Poor

	regions there is no chance to really improve the situation. As such, agricultural lands have been closed as such. Change of functions is in some cases desired. - There is too little recognition that the region is important. No efforts are made from a national perspective to improve the situation. Regionally there is a lot of recognition for the local citizens.	local businesses. In some cases they together conclude that there is no future for agriculture due to the salty subsoils. From a national perspective there is too little recognition that the region is important despite its food supply for the Dutch food system. The region can be considered marginalized, as national resources are allocated to other regions which are considered more important.	
Participation	- The point of view of farmers and other stakeholders are included in decision-making. Pilots are encouraged which include multiple stakeholders. Engagement with different stakeholders in the region is considered important.	Participation is considered very important, which is in line with national policy. Stakeholders are included in decision-making and bottom-up initiatives are considered important.	Very good
Fair	- Person x does not want the issue to be managed to be too formal. In this way he can meet farmers informally and see what is desired and what is fair. - There is a salt-sweet two-day conference in which stakeholders can discuss various things related to salinization - Bottom-up initiatives are getting funding in order to spread costs for adaptation. In that way costs and benefits are shared more equally among the regional governments and businesses.	Locally the distribution of costs and benefits are shared equally, but looking to the situation from a national perspective, the costs are for the farmers and regional authorities, whereas nationally the region is not a point of concern. Looking from that perspective there is a lot of room for improvement. Having a farm in a different region does decrease the damages caused by salinization. The costs and benefits are not shared equally.	Very poor
Just	- Within Zeeland there are somewhat informal	Laws and policies are not present to protect local rights	Sufficient

	policies to help local businesses cope with the consequences of salinization. Especially to do help them diversify and increase water security.	on a national scale. Regionally much effort is being put in providing businesses with aid in order to adapt themselves to the situation.	
Learning	- Monitoring and evaluation is institutionalized. It is obligated by the deputy states. - Active knowledge development is encouraged. Multiple projects try to improve adaptation and mitigation.	The region is working hard to learn about new experiments and methods and monitor the state of water bodies (sub-surface and surface). Active knowledge development is encouraged both on a national and region scale.	Very good
Anticipatory	- We have planned the Netherlands in such a way that there is room for water drainage. - Future changes are considered and acted upon. Especially sea-level rise and droughts are mentioned as factors that will cause problems in the future. Water retention is mentioned as a key objective to deal with those future changes. Also adaptation through pilots is considered a key objective for dealing with the future. - Person x states that he is surprised by the acceleration of climate impacts. Both droughts and the sea-level rise has much more increased than the region has expected, although there has always been much interest on that matter.	Extreme scenarios are considered for dealing with unforeseen consequences of climate change. Despite this, the speed of acceleration of climate change still surprised person X. As such there is room for improving anticipatory thinking within the governance system.	Good
Adaptive	- Both anticipatory thinking and innovative thinking	Adaptation to the consequences of climate	Very good

	are part of policy of the region. Pilots and evaluating are both considered important for dealing with unforeseen consequences and adapting to the changing climate is considered important. - Spatial planning is focussing on water availability and salinization. The relocation of farmlands is discussed by person X as one of the possibilities.	change is considered important within the governance system. This can lead to relocation of agriculture and other changes in spatial planning.	
Innovative	- Pilots and knowledge programs are part of the strategy of Zeeland. A special program called 'de proeftuin zoetwater Zeeland' there are several practical research projects on the freshwater situation.	Innovations are considered essential for system understanding and adaptation and mitigation strategies.	Very good
Flexible	- It is considered important to work on freshwater and salinization related issues locally due to the context- and location specific problems it creates.	Diverse contexts are being actively discussed and acted upon. Necessary adjustments are being taken in order to improve the situation. Local contexts are considered essential for understanding the system and adapting to new situations.	Very good
Legitimate	- The collective vision which is explained in the direction is being followed by governors and stakeholders. Transparency is important and an informal setting is considered key for improving the situation in the region.	Regional governors act with integrity and consistency. Yet, on a broader scale, the region is not getting enough attention. transparency is considered important and as such it is communicated thoroughly that water supply should increase, and water demand should decrease in the region.	Good
Connected	- Network building Is very important. There are regional meetings, but	There is a lot of connection between stakeholders in the region. Active knowledge	Very Good

	also informal conversations are of great importance to combat salinization and improve freshwater safety in the region. The regional meetings give great insight on what happens and what is needed. Knowledge exchange during these meetings is important. - Active discussions at the salt-sweet two-day conference in Zeeland provides opportunities for network building. - Farmers started conversations with water boards themselves in order to find solutions for the freshwater issues. They discussed pricing of freshwater.	development is considered essential for the future. Stakeholders are sometimes initiating meet-ups on their own.	
Nested	- Self-organization is encouraged by the region. - There is political will to help stakeholders and work together on the issue. - The region feels responsible to help businesses cope with the consequences of the changing climate.	Self-organization is encouraged and happening, as explained at 'connected'. The region feels responsible for providing knowledge and platforms for cooperation. The region is part of a nation-wide network.	
Polycentric	- No clear results. The conversation was focussed more on the regional aspect of the governance system, rather than national.		Inconclusive data



INTERVIEW 5 – PARTICIPANT KNOWLEDGE PROGRAM ON SEA-LEVEL RISE

Governance Characteristic	Results	Interpretation of results	Score
Direction	- Economy should work with the direction of nature, which the Delta Comission also understands. This is part of the Delta Program. Soil and water should become leading for spatial planning. - Person X states that the direction is insufficiently being articulated. There is a need for a dot on the horizon in order to	The scope, goals and aims are not sufficiently articulated. The dot on the horizon is missing. The is no comprehensive long-term vision to adequately address the consequences of climate change. There is knowledge within the Dutch system. Yet, the knowhow and expertise are missing within the government related bodies. Especially the 'how' is missing in strategies.	Very poor

	come with more integrative solutions for the long-term due to sea-level rise, droughts and salinization. - There are still no plans which are finished. Such gigantic projects ask for foresight thinking and step-by-step implementation. If we need measures within these 50 years, we already need to start working on that now. It's too slow. - Preferentially a second coastline is being opted for. This project can be implemented step-by-step and focus on the most vulnerable regions first (such as Zeeland). The plans are being made now, but not even calculated for feasibility and costs. As such we are lagging behind. The integrative vision on freshwater is insufficiently being articulated. - The knowledge is there, but policy is not following timely. - It is communicated that things need to change but the 'how' is missing for long-term issues.		
Coordination	- The political inability to make larger steps in the transition holds back change and results in increasingly larger issues. - It is important to consider that in the future (300 years) there is much more technological knowhow. We should focus on	There is too little coordination for dealing with these long-term issues. The political system is considered inable to work on such long-term transitions which need fast implementation (step-by-step implementation). The development of a new crisis team consisting of experts from multiple disciplines. Such a	Very poor

	keeping the country liveable and sustainable within a long-term vision which exceeds much larger periods than currently being discussed. - Coordination is not good enough. There should be a new committee with expertise. This also happened after the large flood in Zeeland. They could work effectively because there was capacity and knowhow. Currently this is insufficient. - A lot of knowhow has flowed away from Rijkswaterstaat due to outsourcing projects. Also, there is insufficient knowhow on water related matters in our government. These two stakeholders are most important for coordination and lack the knowhow on how to do so. - Person X states that developing a team such as the corona management team, which incorporate experts from multiple disciplines for a freshwater transition, should be the main objective for improving direction, capacity and coordination. - Managing is happening, but only with current policies.	coordinating body could really improve the ability to cope.	
Capacity	- Farmers had to bring water from outside the region with big tanks due to the salt	Capacity, skills and resources are insufficiently allocated to the right places. Visionary leadership which thinks inter-generational is not present. The	Very poor

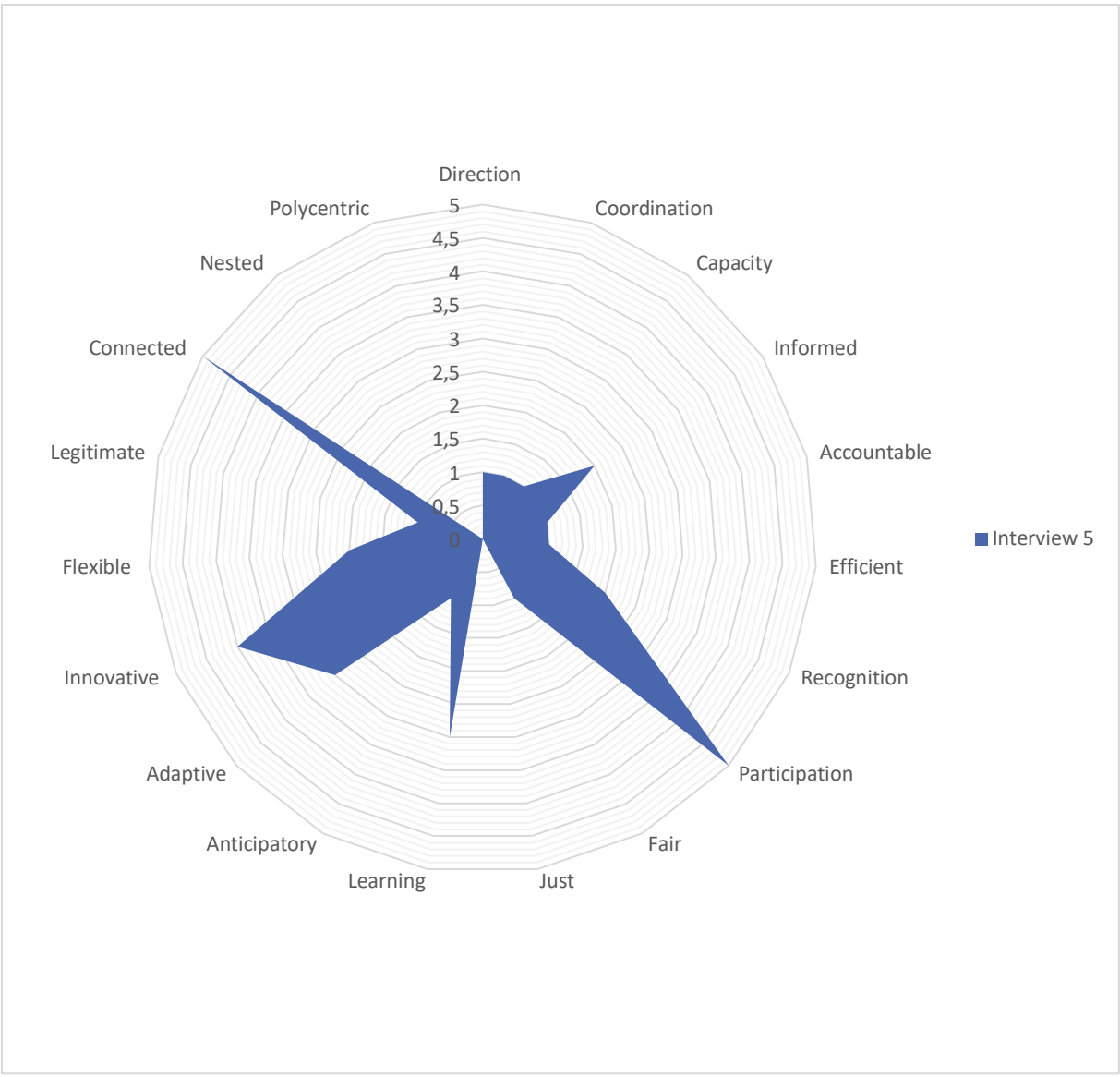
	concentrations in waters within Zeeland. - Politics is inable to deal with societal disagreements which belong to such large-scale transitions. - Person X states that they work as fast as possible at the knowledge program on sea-level rise. But this is insufficient for the size of the problem. - There are always complaints about the costs and resources needed for such big projects. Yet, the costs of salinization and freshwater scarcity are much higher in the long run.	size of this task asks for more. In the long run costs of salinization and freshwater scarcity will be much higher than the costs of adaptation measures.	
Informed	- There is knowledge that something needs to change. All the Dutch freshwater is drained and most of it is not even used. - Salinization is part of a larger issue. Climate change is affecting precipitation and sea-level rise. - There are multiple projects on freshwater and sea-level rise of which person X is part. - Developing integrative solutions from the information at hand is the biggest issue according to person X	There is a good understanding of water systems in the Netherlands. The information to increase effectiveness and efficiency of the system is present, but insufficiently used. There is active knowledge development throughout several institutes and programs.	
Accountable	- Accountability is really bad because of laws and policy. There are so many rules and points of view on such transitions, that it is incredibly difficult to manage. All	Existing laws and policies are holding back transformative change. The number of rules and incorporation of the multiplicity of points of view makes it incredibly difficult to manage. If we find out on the	

	the rules and visions hold back change. And as such change is not going fast enough. But who is accountable? Politics is pointing to each other, but at the end the big decisions are postponed and postponed.	long run that we cannot cope with the consequences, who is accountable?	
Efficient	- Water is being inefficiently used. There is a lot of water within the Netherlands. Almost all the available freshwater is needed for flushing out saltwater. - A more efficient and integrative solution for combatting salinization would be to build a sea dike or at least close the estuaries in Zeeland. By doing so, you create freshwater resources and have an integrative solution for salinization, droughts, and sea-level rise in one. - According to person x the Dutch government is responsible for wasting freshwater. He even calls them the world-champion in freshwater-wasting. - The south-west delta region developed a vision on freshwater but failed to incorporate a more inter-regional approach.	Water is being inefficiently used. This is already being acknowledged by water managing parties and slowly changing. More effort is put in retaining, but still insufficiently. Also, the knowhow and information provided by experts and visionaries is insufficiently being used.	Very poor
Recognition	- There is not enough recognition for the Dutch inhabitants and farmers in salinization prone regions. - The next generation will get the consequences of inconclusive policy-		Poor

	making and a defective long-term vision.		
Participation	- Person X is part of the sea-level knowledge program as a volunteer. Participation to projects and knowledge programs is good according to him. - There is a bit too much participation. There are so many suggestions that it holds back timely addressing such pressing issues. Politics and the inhabitants of the Netherlands should give the trust to a group of experts.		Very good
Fair	- There is not enough recognition for the Dutch inhabitants and farmers in salinization prone regions. Also, the next generation will get the consequences of inconclusive policymaking and a defective long-term vision.		Very poor
Just	- No data		Inconclusive data
Learning	- Knowledge development is present. There is a lot of system knowledge due to evaluation and experimentation. - Learning from past mistakes is not good enough. We already know that the sea-level will rise a lot. Yet, we do not have plans for adapting ourselves to the consequences on the long-term.	Knowhow is present and there is a lot of evaluation and experimentation. Insufficient institutional memory.	Sufficient

Anticipatory	- According to person x the current national vision is lacking an anticipatory vision. According to him they think that there is a long-term vision, but action is not aligning with that. We need to think eras upfront instead of a few decades to keep ourselves resilient against sea-level rise, droughts and salinization. Integrative solutions ask for large-scale transitions and changed system-thinking.	Long-term planning is poor. There is insufficient policy-making for long-term adaptation to sea-level rise and its consequences. Long-term planning and foresight thinking is considered very poor by person X.	Very poor
Adaptive	- The Dutch water system has enough space for reflection and deliberation. There is enough expertise for evaluating and scenario-building. We have the capacity to realize such projects, but currently we are not able to do it because of inconclusive decision-making.	The system has adaptive capacity. There is sufficient space for reflection and deliberation, but the information at hand is insufficiently used by policy makers according to person X	Sufficient
Innovative	- There are projects which work on pumping away saltwater from the bottom and input of freshwater to the upper layer. This will increase more efficient use of subsurface freshwater aquifers. - We proposed an innovative solution for integrative freshwater management. The Haakse Zeedijk.	There are sufficient innovative solutions being presented. It is encouraged to come up with innovative solutions to freshwater related issues. Higher risk tolerance is partly embodied.	Good
Flexible	- There is insufficient realization that we need to downscale	Policymakers are aware of the need to downscale management to local realities.	Poor

		management to the local realities. Although we already know that we can use the Grevelingen for keeping the agricultural lands fresh and providing sufficient freshwater for other means, it is still not happening because politics does not dare to make such drastic decisions.	Yet, big decisions on measures are not being made and postponed. Adjustments to current policy is insufficiently made.	
Legitimate	-	Decision-making is not credible because they do not act upon the information on hand. A collective vision is not present for the long term. They think they have a long-term vision, but a plausible long-term strategy is not present. There is no consistency in decision-making.	Governors are not acting consistently. Policy and vision are not aligning with action.	Very poor
Connected	-	There is a good network between governmental and non-governmental organizations. There are institutions and organizations which work on freshwater related topics. There is mutual learning and knowhow is present.	There are vertical and horizontal connections. Bridging organizations are present and there is co-production of knowledge.	Very good
Nested	-	No data		Inconclusive data
Polycentric	-	No data		Inconclusive data



INTERVIEW 6 – EMPLOYEE WATER BOARD DELFLAND

Governance Characteristic	Results	Interpretation of results	Score
Direction	- Climate mitigation is the most important direction. - Sustainable and just division of freshwater is a key goal. - In our region we cannot built a buffer because of space	There is direction on the micro-level of the governance system. It is sometimes difficult to set boundaries due to various interests of stakeholders. On the top-levels of the governance system sometimes ambiguous	Poor

	- The primary goals on small-scale water management are clear. We do not want saltwater in our systems and stakeholders understand that. - The quantification of our goals is less clear. We have a lot of glass horticulture. They need extremely freshwater. It is difficult to have clear goals because different consumers need different water qualities. - We are really dependant on the political choices on the top of the governance system. - There are discrepancies between choices within politics. Spatial planning would according to policy documents be adapted to water and soil. We in the region will probably get a lot of new housing. At the same time, we cannot guarantee more water if there will not be more water supply. - Maybe the state needs to get a larger role in creating a uniform long-term vision which is also acted upon.	decisions are being made, which the water board needs to execute. This leads to direction-related issues.	
Coordination	- There is coordination from above. We try to coordinate towards our consumers and coordinate	The roles and functions of different governments, agencies and organizations are coordinated.	Good

	horizontally between water boards. - Rijkswaterstaat has the most important role in coordination. It is the vertical layer. We are the link between the stakeholders and Rijkswaterstaat. - Very specific interests can lead to discussions during inter-regional meetings.	Rijkswaterstaat is the coordinating body. Yet, mismatches in meetings can lead to ineffective cooperation.	
Capacity	- There is no space for building a freshwater buffer. - Knowledge institutes play an important role for us. They are a large knowledge source. - We have to work with the resources at hand. - Technically a lot is possible, but everything is really expensive. - Leadership is sometimes ambigious. They want housing on the one hand and spatial planning based on water and soil on the other. This sometimes doesn't match.	There is the knowledge to act upon changes within the system. Making big interventions in the system is difficult due to the lack of money and space. A lot is possible, but sometimes the resources are not in place. There is leadership but without a clear vision.	Poor
Informed	- We are aware that climate change is affecting our region. Lower river discharge, increased salinization and droughts are consequences we see increasingly more. - We work with knowledge institutes and actively develop information	Planning and management decisions are based on the best available information. There is coorperation with knowledge institutes. There is information from a diversity of knowledge types.	Very good

	- Water pressure from sea-level rise and land subsidence will create increasingly more problems for us in the future.		
Accountable	- Decisions are transparent. It is possible for water boards to ask for Rijkswaterstaat research on knowledge hiates. - We try to make rationales between decision-making as transparent as possible. - Unclear who is accountable. Did not become clear from conversation with person X	Means and rationales for decision-making are present and transparent. It is unclear if there are procedures that hold governors accountable.	Sufficient
Efficient	- Efficiency of meetings can be lower due to very specific interests. Sometimes the main topics of such meetings are as such not discussed sufficiently. - We efficiently divide water among water boards. Good communication is key to do this. We have a great network for doing so. - We need to use the water we get efficiently to combat salinization and freshwater scarcity. Sometimes this means making choices on water use which can have impact on sectors.	Efficacy guides decision-making. Economic costs and actions are commensurate with the effectiveness of the system.	Very good

Recognition	- It is difficult to incorporate fair rules for all stakeholders. For instance, we needed to start protection regulations during the drought in order to stop salinization. As such skippers could not pass sluices as much anymore. - We try to have as much contact with stakeholders as possible.	There are policies and processes that acknowledge the need to incorporate diverse perspectives. Having close contact with stakeholders is considered important in order to understand the needs.	Very good
Participation	- We have quite some participations on the policy procedures. - The sluices which closed resulted in a policy document and we discussed in with the municipality and stakeholders. We try to include participation as much as possible. This leads to close connections, which increases connectivity. - It is time consuming but helps us with making the right decisions.	There are processes that enable participation. There is engagement of different stakeholder groups, and their input is considered important for making the right choices.	Very good
Fair	- We try to equal social-economic benefits and costs for stakeholders and consumers. Yet sometimes we need to make changes which can cost a lot for a specific group. This happened when we had to close sluices due to water scarcity and salinization. Skippers could not pass through as fast as	Social-economic benefits and costs are being fairly distributed as much as possible. Yet, the stress on the water system results in hard choices which can lead to unequal circumstances. These are considered by the water board. The pressure on freshwater is considered unfair.	Sufficient

	possible, which resulted in increased costs for them.	Person X states that despite there is a national vision on sustainable spatial planning, they have to deal with increased pressure on freshwater due to housing plans.	
Just	- No data	No data	Inconclusive data
Learning	- Evaluating and modelling are being important pillars of our policy. - What could have been better is one of the important questions we ask ourselves. - We need to improve governance in order to adapt to the situation that there are much more droughts. During last 4 years we had 2 droughts and we needed to work crisis management both times. In the future this is not maintainable. - There are meetings with knowledge institutes and stakeholders to improve knowledge production.	Learning from the past needs to be institutionalized more. Monitoring and evaluation are considered important. There are processes that ensure co-production of knowledge and enhance social and institutional memory.	Good
Anticipatory	- We work with a lot of evaluation to anticipate to system changes. Evaluation should however not limit experimentation. Failures also provide knowledge. - Unknown risks and opportunities are considered and being actively discussed	Long-term planning and foresight thinking are considered. Evaluation is considered an important tool but should not limit experimentation. A better long-term vision is desirable.	Sufficient

	during meetings with stakeholders. - Long-term consequences of climate change are considered (sea-level rise, salinization, droughts and water nuisance). - Improved long-term thinking by the state is considered important by person X		
Adaptive	- Adaptation is important. Yet, in some cases we just have to do what is told from above. Spatial adaptation is considered important in the policy documents, but still there will be a lot of new houses in the region whereas we do not have the amounts of water to do so. At the very least prices of water will go up.	There is space for reflection and deliberation. Processes that revisit and evolve policies are insufficiently being used due to political decisions.	Poor
Innovative	- We have an innovation fund. We are using pilots to gather information. But it is difficult to move from pilot to actualization. Policy is often not ready for new solutions. The pace of innovation is sometimes exceeding policy development. - We should dare to focus on experimentation and innovation. It is important that error will not result in fear to try out new innovations and policies.	Innovation and experimentation is encouraged. There is an innovation fund from the water board. A higher risk-tolerance is considered important. Moving from pilot-phase to actualization-phase is difficult due to policy.	Sufficient

Flexible	- During crisis situations we work closely together with other water boards. We try to understand what happens and how we need to steer and change policy at that very moment.	There are policies that recognize the need to downscale environmental management to local realities. Understanding and documenting are considered important so that adjustments can be made.	Very good
Legitimate	- No data	No data	Inconclusive data
Connected	- We work closely together with other water boards. We have division contracts among water boards. - It is helpful that I have contact with both Rijkswaterstaat and stakeholders in the region such as glass horticulture businesses. Short linkages between different stakeholders and good communication increases the effectiveness of output. - Mutual learning is a challenge. There are 21 water boards, sharing the right information to increase mutual learning is sometimes difficult. Making the same mistakes over and over again is very costly.	There are strong connections both horizontally and vertically. There are processes in place to develop social relations and support mutual learning. Yet, person X mentions that mutual learning could be more effective. Making the same mistakes as other water boards would be very inefficient and costly.	Good
Nested	- Self-organization is encouraged and supported. We do that with water	Self-organization is encouraged and supported. There are voluntary agreements and communication	Good

	agreements between water boards. - There is adequate state support from Rijkswaterstaat. There is time commitment from Rijkswaterstaat to do new research on implications of policy for the region. Political will to put the issue of freshwater scarcity in the region above issues such as housing is however missing.	between stakeholders. There is state support from vertical authority and there is will to help. Yet, political will to put the issue of freshwater scarcity above housing issues seems to be missing.	
Polycentric	- No data	No data	Inconclusive data

APPENDIX 3 - TOPIC LIST FOR IN-DEPTH SEMI-STRUCTURED INTERVIEWS (DUTCH)

Introductie

- Achtergrondinformatie interviewer
- Doel van interview
    - Inzicht krijgen in de effectiviteit van het huidige beleid om het probleem van verziliting adequaat aan te pakken
    - Beste strategieën om verzilting aan te pakken: voorkomen of aanpassen
    - Beter inzicht krijgen in de oorzaak-effect relatie tussen beleid en sociale en ecologische prestaties
- Uitleg opzet van interview
- Anonimiteit van respondent en toestemming vragen voor audio-opname

Introductie respondent

- Achtergrond
- Huidige werkzaamheden

Verzilting managementstrategieën en ervaringen

- Huidige doelen
- Huidige strategieën
- Betrokken partijen
- Knelpunten van huidig beleid
- Toekomst
- Klimaatverandering
- Belangrijkste aandachtspunten

Beleid karakteristieken van waterbeheer om verzilting tegen te gaan

- Zijn de doelen met betrekking tot het beheer/ management van verzilting duidelijk voor alle stakeholders?
- Zijn de rollen en functies van verschillende betrokken organisaties gecoördineerd? Hoe is dit gecoördineerd?
- Hoe worden vaardigheden en bronnen verder ontwikkeld indien er nieuwe informatie beschikbaar is met betrekking tot het probleem?
- Worden de planning en het beheer actief aangepast op verschillende informatie types? Welke informatie wordt er gebruikt?
- Zijn de beslissingen die genomen worden met betrekking tot het beheer van verzilting transparant? Indien er fouten gemaakt worden, welke mechanismes zijn er om ervoor te zorgen dat dit in de toekomst verbeterd wordt?
- Hoe wordt ervoor gezorgd dat het probleem zo efficiënt mogelijk gemanaged wordt?

- Hoe wordt ervoor gezorgd dat het managementproces zo eerlijk mogelijk verloopt? Welke actoren en belanghebbenden mogen meebeslissen?
- Zijn er mechanismes die voor evaluatie en reflectie zorgen? Op welke manier wordt ervoor gezorgd dat er nieuwe informatie beschikbaar is voor alle belanghebbenden om te zorgen voor de best mogelijke informatie met betrekking tot het probleem?
- Zijn er lange termijn plannen om ervoor te zorgen dat ook onvoorziene risico's en mogelijkheden makkelijker kunnen worden meegenomen in de besluitvorming?
- Worden innovatie en experimenten aangemoedigd? Worden successen en mislukkingen met betrekking tot het beleid gemonitord?
- Wordt er in het beleid rekening gehouden met de lokale context (indien er op lokaal niveau andere beheers- en conservatie belangen spelen)?
- Is er een collectieve visie die ervoor zorgt dat acties met betrekking tot verzilting op alle niveaus begeleid worden (bijvoorbeeld door een bestuursorgaan)?
- Is er een sterk netwerk dat ervoor zorgt dat het probleem zowel verticaal als horizontaal gemanaged wordt? In andere woorden: wordt ervoor gezorgd dat processen en informatie op verschillende beleid niveaus niet langs elkaar heen lopen?
- Hebben alle betrokken partijen dezelfde doelen? Als dit niet het geval is, hoe wordt ervoor gezorgd dat de doelen elkaar niet in de weg gaan zitten?

Afsluiten interview

- Wilt u nog iets belangrijks wat niet aan bot is gekomen melden over verzilting?
- Verbeterpunten voor interview
- Melden hoe de informatie gebruikt gaat worden en wat voor terugkoppeling respondent kan verwachten
- Bedanken voor tijd en moeite