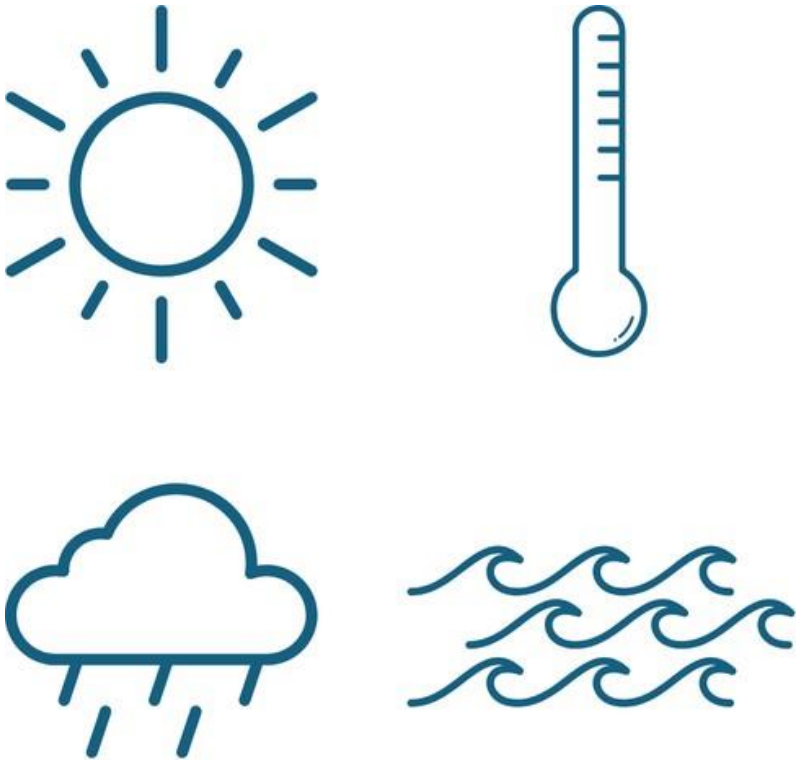

Towards Integrated Climate Adaptation

A Study on the Collaboration between the Water Authority and Municipalities

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Preface

I am pleased to present my master's thesis: "Towards Integrated Climate Adaptation: A Study on the Collaboration between the Water Authority and Municipalities." With this thesis, I conclude my 6.5 years of academic study, of which the last four were dedicated to spatial planning. I switched to this field because, with a growing awareness of climate change, I wanted to contribute to creating a sustainable living environment. Therefore, I enjoyed working on the thesis and have learned a lot about climate adaptation and the role of water authorities and municipalities, something that had not come up before during my studies. Besides learning a lot myself, I also hope that my findings will contribute something to work in practice and better collaboration.

In addition, I would like to thank some people who made the writing process much more enjoyable. First, I am incredibly grateful for the opportunity to write my thesis at the Hoogheemraadschap De Stichtse Rijnlanden—special thanks to Hans Keller for the research question and guidance. I really liked writing my thesis at HDSR, as I could work in the office, engage in discussions with everyone, and feel a genuine interest in my research. Second, thank you to everyone who agreed to be interviewed within HDSR and the municipalities. Your contributions were invaluable to the completion of my thesis.

I also want to thank my thesis supervisor, dr. Patrick Witte, for his support and valuable feedback. His guidance in shaping the theoretical framework when everything was unclear and vague, and his critical perspective on interpreting the results have been immensely valuable to me.

Finally, I would like to thank my family and friends for being there for me during my thesis and my entire study period. In particular, Mom and Dad for trusting that I would make the right decisions, and Sjoerd for always listening to the good and the not-so-good moments and all the feedback you provided.

Enjoy reading!

Annelies van Oostrum

Utrecht, June 27, 2024

Abstract

The success of climate adaptation largely depends on the integration of climate adaptation into other policy domains, what is referred to as climate adaptation mainstreaming. In literature, the role of water authorities in climate adaptation (mainstreaming) has remained underinvestigated. However, given the increasing importance of integrated land and water management in the face of climate change, understanding the dynamics of collaboration between water authorities and municipalities is crucial. Therefore, this study aims to understand better how water authorities and municipalities collaborate for adaptation mainstreaming and how this can be improved. Specifically, the research focuses on the municipal climate adaptation strategy, the process of collaboration, and several policy instruments that water authorities can use to promote climate adaptation further. The theoretical lens combines insights from the literature on mainstreaming, policy integration, multi-level governance, formal and informal stakeholder interaction, and policy instruments. These concepts are used as a guideline for the analysis and expert interviews.

The case study focuses on the Hoogheemraadschap De Stichtse Rijnlanden (HDSR). It employs three data collection methods: desk research, expert interviews with employees from 12 municipalities within HDSR's area, and a reflection session with HDSR's climate adaptation programme team. The results show that the water authority seeks additional collaboration with municipalities to implement necessary climate adaptation measures. Yet, municipalities often view current collaboration levels as sufficient, perceiving the implementation of measures as their responsibility. This can lead to tensions between both executive authorities, making it ambiguous how collaboration should be structured. Despite these challenges, both parties recognise the water authority's expertise in water management and its potential to contribute through knowledge sharing and funding. Knowledge sharing occurs directly between both parties but primarily through the Network Water & Climate, a collaboration involving the water authority, municipalities and the province. For financing, the water authority has an impulse arrangement through which it contributes to climate adaptation measures, among other initiatives. This contribution is appreciated. However, larger municipalities have less need for this support, while smaller municipalities without their own budgets cannot take advantage of this. Additionally, there is a need for support for green/heat measures that municipalities currently cannot access through the water authority. Lastly, municipalities see value in additional regulations for climate adaptation but do not seek these from the water authority. They prioritise alignment between regulations issued by different governmental bodies.

The interactions between both authorities are predominantly informal, personal, and ad hoc. Therefore, the extent to which climate adaptation is considered depends on the individual. Accordingly, mainstreaming climate adaptation can be better ensured through more structured contact, where plans are discussed to identify collaboration opportunities and areas where alignment is needed to avoid misunderstandings. Whether this interaction should become more formal remains questionable, as doing so could hinder further collaboration. Regardless, being informed about each other's plans is crucial for better collaboration and improved mainstreaming of climate adaptation.

Keywords: climate adaptation mainstreaming; policy-integration; multi-level governance; collaboration; water authority; municipalities; policy instruments

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Glossary

Term	Dutch translation	Definition
Environmental and Planning Act	Omgevingswet	National legislation encompassing space, housing, infrastructure, environment, nature, and water within a single legal framework.
Environmental plan	Omgevingsplan	Contains all municipal regulations for the physical living environment.
Environmental regulation	Omgevingsverordening	Contains all provincial regulations for the physical living environment.
Environmental vision	Omgevingsvisie	A coherent, strategic plan concerning the living environment. This plan focuses on the entire physical living environment and takes into account all developments in an area. The national government, the province, and the municipality each establish one environmental vision for their entire territory.
Water assessment	Weging van waterbelang	When establishing the environmental plan, consideration must be given to the implications for the water system Executed by the water authority.
Water authority regulation	Waterschapsverordening	All regulations regarding the physical living environment that the water authority established within its management area.
Water management programme	Waterbeheerprogramma	Outlines the vision and ambitions of the water authority for the long term.

List of abbreviations

HDSR = Hoogheemraadschap De Stichtse Rijnlanden (water authority De Stichtse Rijnlanden)

GRP = Gemeentelijk Rioleringsplan (municipal sewerage plan)

LAS = Lokale Adaptatie Stategie (local adaptation strategy)

RAS = Regionale Adaptatie Strategie (regional adaptation strategy)

WRP = Water- en rioleringsprogramma (water and sewerage programme)

1. Introduction

The Netherlands have a long history of water management. Water has been pumped out to create new land, and dikes have been built to protect against flooding (De Vries & Wolsink, 2009). Today, climate change is posing new challenges to liveability and safety in the Netherlands. So is the likelihood of extreme weather events increasing. There will be more precipitation in winters and less in summers and extreme rainfall will occur more frequently, which will lead to more floods and droughts (KNMI, 2023). Also, the sea level is rising, from 26-73cm in a low-emission scenario, and to 59-124cm in a high-emission scenario (KNMI, 2023). This is a threat, as 26% of the land area is below sea level (PBL, 2013). Additionally, climate change accelerates land subsidence, with significant effects on the building environment (Van Asselen et al., 2019).

Since the 13th century, water management has mainly been carried out by water authorities. They are responsible for protection against flooding, water quantity, water quality, wastewater treatment, and the maintenance of waterways (De Vries & Wolsink, 2009). However, the role of the water authorities is changing as water is increasingly intertwined with other challenges. In addition to traditional tasks, water authorities have also started paying more attention to climate adaptation. Climate adaptation is the process of adapting to the current or expected climate and its effects (IPCC, 2014). To do that, water authorities progressively have a more prominent role in spatial developments and societal challenges by initiating early conversations and working together with stakeholders instead of reviewing plans after they are developed (Lammers, 2023). The transition in the water sector is presented in Table 1.1.

Table 1.1 Transition in the water sector

From…	**To…**
Cautious	Boldness, action, and decisiveness
Neutral and objective	Opinionated and agenda-driven
Following and reactive	Proactive, exerting influence
Accommodating, resolving	Indicating possibilities and boundaries
Addressing symptoms	Addressing root causes
Thematic	Integral
Function-oriented	Area-oriented
Individual tasks	Chain collaboration
Water challenges	Societal challenges

Source: Van Dokkum et al. (2020)

The changing role of the water sector is not specific to the Netherlands. To deal with climate change and water issues, integrated water resources management (IWRM) is internationally one of the most adopted tools for a holistic and collaborative approach to address complex challenges. IWRM is a cross-sectoral policy approach that promotes the coordinated management of water, land, and related resources (Scholten et al., 2020). IWRM is for example applied in China, where a system of river chiefs is implemented. The river chiefs are responsible for the management and protection of rivers, as well as the coordination and collaboration with other stakeholders (Wang & Chen, 2019). However, the integration of land and water management proves difficult to implement in practice because responsibilities are divided, institutions are fragmented, and interactions are complex (Hartmann & Spit, 2015; Scholten et al., 2020).

1.1 Research Aim and Questions

This thesis will focus on the integration of land and water management by looking at the collaboration between a water authority and municipalities, specifically for climate adaptation mainstreaming. Climate adaptation mainstreaming is the integration of climate adaptation into other policy objectives (Uittenbroek, 2014). Water authorities increasingly seek involvement in spatial developments and want to commit to creating a climate-robust living environment due to the pressing context of climate change and other societal challenges (Unie van Waterschappen, 2020). However, this falls outside their formal responsibilities, and they cannot directly influence the living environment for climate adaptation. Therefore, the water authorities have to collaborate with other parties, such as municipalities, because the responsibility for implementing climate adaptive measures lies with the municipality. This could be done through adaptation mainstreaming by integrating the water authorities' climate adaptation objectives into the municipalities' policy objectives. This research, therefore, aims to understand better how water authorities and municipalities collaborate to mainstream adaptation and how this could be improved. The research question is as follows:

How can water authorities and municipalities collaborate to stimulate climate adaptation mainstreaming?

To answer this question, the following sub-questions are formulated:

1. How do municipalities approach climate adaptation?
2. What is the institutional coordination between a water authority and municipalities for climate adaptation mainstreaming?
3. What are the formal and informal stakeholder interactions between a water authority and municipalities for climate adaptation mainstreaming?
4. Which policy instruments are employed in the collaboration?
5. How do municipalities envision the ideal collaboration with the water authority?

The first sub-question focuses on how municipalities approach climate adaptation and whether they seek policy synergies in this process. It relates to the content of the planning issue (the object). To answer the question, desk research is conducted into how municipalities incorporate and implement climate adaptation into their spatial plans. Questions regarding this topic were also asked in the interviews with the municipal employees.

The second and third sub-questions focus on the process of adaptation mainstreaming, examining the collaboration between the water authority and the municipalities. The answer provides insight into what the collaboration looks like. The questions are answered through expert interviews with municipal employees.

The fourth sub-question concerns the policy instruments (communication and cooperation, enforcement, and incentives) that are and could be employed in the collaboration to further promote adaptation mainstreaming. Expert interviews with municipal employees also answer this question.

The fifth sub-question is a reflective question about how the municipalities view collaboration and how they believe it should develop in the future.

1.2 Scientific Relevance

Despite the growing amount of literature on climate adaptation mainstreaming, the implementation remains difficult in practice, also referred to as the implementation gap (Runhaar et al., 2018). Climate adaptation (mainstreaming) involves multiple actors at different governmental levels (vertical dimension) and across different sectors (horizontal dimension), and the success of climate adaptation

therefore depends largely on the interactions between different actors in the multi-level governance network (Ishtiaque, 2021). Research shows that the implementation gap of adaptation mainstreaming is mainly related to a lack of political commitment from higher governmental levels and the lack of effective cooperation and coordination between stakeholders, thus both at the vertical and horizontal levels (Braunschweiger & Pütz, 2021; Runhaar et al., 2018; Widmer, 2018). Van den Ende et al. (2023) conclude that due to a lack of institutions for mainstreaming adaptation, it is uncertain what should be done and who should do it and that more research is needed on how to assign responsibilities. This research adds to the literature by understanding the relationship between a water authority and municipalities regarding climate adaptation in a multi-level governance setting. So far, no study has been conducted on the role of water authorities in climate adaptation mainstreaming, and the changing role of water authorities has not yet been extensively researched. Therefore, it complements previous multi-level governance perspectives and provides new insights into overcoming implementation barriers for adaptation mainstreaming.

1.3 Societal Relevance

Improving collaboration between municipalities and water authorities has several societal benefits. Firstly, it can contribute to accelerating the implementation of climate adaptation measures, thereby mitigating issues such as heat waves and flooding. Looking for synergies in policy objectives, one of the aspects of climate adaptation mainstreaming, is also one of the seven ambitions of the Delta Plan for Spatial Adaptation. This plan describes all the measures to make the Netherlands water-robust and climate-resilient by 2050 (Delta programme, n.d.). It is also part of other policy documents like the *Afspraken klimaatadaptief bouwen Utrecht* (climate adaptive building agreements) (Province of Utrecht, 2021). Improving the understanding of how municipalities and water authorities can work together will assist in achieving these policy goals. Especially because, as stated by the Delta Programme, it is still a difficult process for which few tools are available (Delta Programme, 2021). Secondly, better alignment of investments can lead to more coordinated efforts, reducing disruptions for residents within a given area. For example, the streets only need to be opened once for various tasks rather than spreading the tasks over time.

1.4 Outline

The second chapter comprises the theoretical framework, which discusses the synergies for policy objects, the process which exists of institutional coordination and stakeholder interactions, and the policy instruments. This leads to the conceptual model. The third chapter discusses the research methods and the case study of this research. The fourth chapter presents the findings of the research. Finally, chapter five consists of the discussion and conclusion of the study.

2. Theoretical Framework

The theoretical framework further explores the concept of climate adaptation mainstreaming. It starts with the explanation of climate adaptation mainstreaming, compared to a dedicated approach to climate adaptation. Subsequently, the focus is on the synergies in policy objectives, where the water authority and municipalities can align with each other. Then, for the process, the concept of adaptation mainstreaming is connected to policy integration, multi-level governance and formal and informal stakeholder interaction. Finally, attention is given to the policy instruments that the water authority can employ to further promote adaptation mainstreaming. Together, this leads to the conceptual model.

2.1 Climate Adaptation Mainstreaming

Climate adaptation is needed to deal with the consequences of climate change, such as flooding, heat stress and drought. Climate adaptation can be approached in two different ways, either through a dedicated policy approach for climate adaptation or through the integration of climate adaptation into other policy domains. The latter is referred to as climate adaptation mainstreaming. Climate adaptation is then not the main goal of the policy action, but it is embedded into other sectoral goals. (Uittenbroek, 2014; Van den Ende et al., 2023). Table 2.1 shows the differences between the dedicated and the mainstreaming approach. It should be noted, however, that in practice, the distinction between both approaches is not so clear and they may complement or alternate each other. Both approaches also have positive and negative characteristics; the dedicated approach can offer the commitment and resources to raise awareness and urgency for climate adaptation. In contrast, the mainstreaming approach can foster structural integration of climate adaptation (Uittenbroek, 2014). Empirical studies have shown that it is preferred to invest in measures that are more comprehensive than solely for climate adaptation. Consequently, mainstreaming can increase effective and efficient policymaking and the opportunities for innovations. Also, the more climate adaptation is integrated into other policy domains and processes, the higher the chances are of a society becoming climate resilient (Uittenbroek, 2014).

Table 2.1 Characteristics of the dedicated compared to the mainstreaming approach

	Dedicated approach	**Mainstreaming approach**
Objective	Adaption as main objective	Adaptation as one of the objectives
Policy process	Linear	Dynamic
Criterion for evaluation	Conformance	Performance
Framing of adaptation	Main objective (explicit)	Added value (implicit)
Political commitment	Direct	Indirect
Agenda-setting area	New assigned resources supported by new organisational structures	Reallocating resources within existing organisational structures
Policy design	Specific policy	Synergies in policy objectives
Implementation	Fast	Erratic

Source: Uittenbroek (2014)

The remainder of the theoretical framework elaborates on mainstreaming by examining synergies in policy objectives, the process, and policy instruments.

2.2 Synergies in Policy Objectives

Table 2.1 shows that one of the characteristics of climate adaptation mainstreaming is to search for synergies in policy objectives. These are synergies between climate adaptation measures and existing policy objectives and the goal is to combine resources (Uittenbroek, 2014). These synergies are also called linkage or synergistic opportunities. The synergies relate to the policy design and show where climate adaptation measures can be integrated into other policy domains. Possible opportunities for synergies are the energy transition, the construction of new houses, major maintenance of buildings, public space and infrastructure, transition to a circular economy, biodiversity, health, and cultural heritage (Klimaatadaptatie, n.d.-a). Table 2.2 explains the implementation of climate adaptation without synergies and the implementation linked to the energy transition, the construction of new houses and renovation and major maintenance.

Table 2.2 Linkage opportunities in the implementation of climate adaptation

Policy objective	Implications
Climate adaptation measures without policy linkages	▪ Most municipalities have limited resources/budgets for climate measures. ▪ This budget is often used for urgent (water) nuisance and climate adaptation subsidies (e.g. green roofs) for individuals and companies. ▪ The budget is insufficient to make the entire city climate-proof by 2050. ▪ More inconvenience for residents: The need may arise to dig the street open several times for climate, energy, and sewer measures.
Climate adaptation linked to energy transition	▪ Energy transition has the same timeline as climate adaptation: energy consumption must be drastically reduced in the coming 30 years. ▪ Real estate and energy networks in the streets must be adapted. ▪ If the street opens for the energy transition, the street design can be climate-proofed immediately after the energy pipes (e.g., energy grid) are laid.
Climate adaptation linked to the construction of new houses	▪ By setting requirements regarding climate resilience for new construction projects and investing in climate-adaptive outdoor spaces around new building locations, municipalities can ensure that the new building sites become climate-resilient. ▪ Because climate considerations are integrated from the outset of the construction development, the costs are relatively low and the effectiveness is high. ▪ However, new construction accounts for only 10-20% of the urban area in the Netherlands by 2050.
Climate adaptation linked to renovation and major maintenance	▪ Asset management of real estate and outdoor spaces involves major maintenance and renovation of each location in the city once every few decades, depending on the type of asset. ▪ Major maintenance and renovation entail opening streets to replace sewage systems, other pipelines, greenery, and paving, and adapting buildings to the present requirements (insulation, safety, replacement of worn elements such as roofs). ▪ Major maintenance and renovation also mean investing in thoroughly addressing the location, wherein choices for climate-resilient design can be relatively easily and cost-effectively incorporated into the plans. ▪ Greatest opportunity for climate adaptation synergy.

Source: NKWK (2020)

Linkage opportunities for renovation and major maintenance are the greatest opportunities for climate adaptation synergy. Renovations, major maintenance, or new tenants moving in are ideal opportunities to make real estate and surrounding areas more climate-proof. Participation of property owners and users is essential because a large part of real estate is privately owned. The main actors are housing cooperatives, investors and owner-occupants. Regarding public space, the municipality is responsible for the maintenance and management. Large maintenance projects in the public space are a great opportunity for synergies, as the public space is regularly the place where interventions happen as part of asset management and new developments. This leads to each street going open for work once every few years. Most interventions in public spaces provide linkage opportunities for climate adaptation (Table 2.3) because when a street is open for renovation and maintenance there is an opportunity to choose to implement climate adaptative measures as well (NKWK, 2020).

Table 2.3 Interventions in public space

Interventions in public space
▪ Neighbourhood renovation ▪ Major maintenance of sewer/street/greenery ▪ Redesign of public space ▪ Redesign street/greenery ▪ Implementation of energy transition

Source: NKWK (2020)

It is essential to include linkage opportunities early in the process to realise them; otherwise, there will be too many complications. For example, there will not be any money reserved, or it will no longer fit within the budget. An integral approach is needed to implement linkage opportunities successfully, and different departments/organisations must be aware of each other's work and developments in other sectors (NWKW, 2020). Therefore, the following paragraph is about the process surrounding adaptation mainstreaming.

2.3 Process of Climate Adaptation Mainstreaming

For the process of adaptation mainstreaming, three concepts are analysed, and they relate to each other on different layers. The concepts are policy integration, multi-level governance (MLG), and formal/informal stakeholder interaction. It starts with policy integration, which forms the initial layer of the process, where various policies are integrated for adaptation mainstreaming. MLG is the second layer because, in the case of the water authority and municipalities, policy is integrated across different levels of government. Policy integration and MLG together form the institutional coordination. Finally, the third layer is the formal and informal interactions between stakeholders within a multi-level setting, which determine the decision-making process and therefore the success of climate adaptation.

2.3.1 Policy Integration

Traditionally, decisions on land use are often made separately by each sector, which is called sectoral planning. Sectoral planning involves the development of policies that are specific to a particular sector or industry, like transportation, water management, agriculture or water management (Witte & Hartmann, 2022). However, contemporary challenges, like climate change, are cross-cutting the boundaries of sectoral policies, governance levels and established jurisdictions. The governance of cross-cutting issues becomes even more complex because many of them are wicked problems: these issues involve high levels of ambiguity, controversy, and uncertainty. Policy integration of the sectoral policies is therefore often proposed to overcome these challenges (Candel & Biesbroek, 2016). Climate adaptation mainstreaming is considered a specific form of Environmental Policy Integration (EPI), but the scope of mainstreaming is smaller because it primarily focuses on climate change (Uittenbroek,

2014). Meijers and Stead (2004) define policy integration as “the management of cross-cutting issues in policy-making that transcend the boundaries of established policy fields, and which do not correspond to the institutional responsibilities of individual departments” (p. 2). The goal of policy integration is to improve the outcomes and to consider the consequences of policy outside of a specific policy sector (Stead & Meijer, 2009).

Policy integration has a horizontal, vertical and territorial dimension, therefore it is also multi-level. The horizontal dimension involves the integration of departments and/or sectors at the same level. The vertical dimension involves integration across different government levels (Stead & Meijers, 2009). Territorial integration refers to the integration of policy domains among different territorial units, such as neighbouring local governments or regions, with shared interests to overcome cross-border or regional challenges (Duman, 2023). Meijer and Stead have developed a conceptual framework to show the hierarchy between policy integration, coordination and cooperation (Figure 2.1). Cooperation is the bottom layer; it refers to different organisations working together to achieve their own sectoral goals. Coordination, the middle layer, goes a step further, it leads to adjusted and more efficient policies while remaining sectoral separate. Both cooperation and coordination are part of policy integration, however, policy integration leads to joint decisions and/or actions that may differ significantly from the initially preferred (sectoral) results. Policy integration requires more interaction, accessibility and compatibility between organisations, leading to more interdependence between them. Additionally, it requires more formal institutional arrangements and resources. Therefore, it is more demanding in terms of time, space and actors than coordination or cooperation (Meijer & Stead, 2004; Stead & Meijer, 2009).

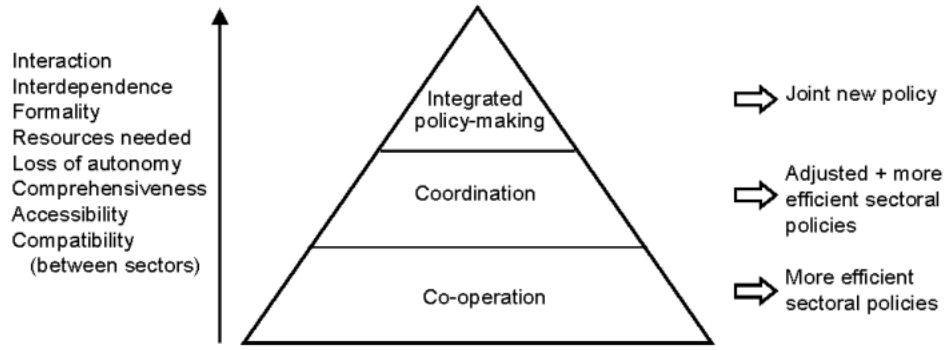

Figure 2.1 Integrated policy-making, policy coordination and co-operation (Meijer & Stead, 2004)

Kivimaa and Mickwitz (2006) have developed four indicators to evaluate whether and to what extent policy is integrated: inclusion, consistency, weighting, and reporting (Table 2.4). Some degree of inclusion is required for the other indicators to exist. These indicators can also be used to evaluate adaptation mainstreaming (Uittenbroek, 2014).

Table 2.4 Policy integration indicators

Indicators	
Inclusion	The issue is included in the policy process by referring to an issue and the related risks.
Consistency	A shared understanding of the issue – both impact and measures – among actors, in policy documents or in policies in general.
Weighting	The priority given to the issue in relation to the other objectives involved.
Reporting	Strategies include specifications ex-ante about how their environmental aspects are to be followed up and reported, and programme/project assessments include environmental aspects ex-post.

Source: Kivimaa & Mickwitz (2006) & Uittenbroek (2014)

2.3.2 Multi-level Governance

Policy integration can thus occur across several dimensions: horizontal, vertical and territorial. However, the decision-making processes to do so are becoming more and more complex in a world that is rapidly changing. It is no longer common for one actor to have all the resources and power to make decisions. Therefore, individual governments increasingly have to work with other government layers, the private sector and civil society to achieve policy outcomes (Daniell & Kay, 2017). Understanding the relationships between different governmental layers and other actors can be done through the conceptual lens of multi-level governance (MLG). MLG refers to "systems of governance where there is a dispersion of authority upwards, downwards and sideways between levels of government – local, regional, national and supra-national – as well as across spheres and sectors, including states, markets and civil society" (Daniell & Kay, 2017, p.4).

MLG is considered by some authors to be a broad concept that refers to the spreading out of government authority over different government layers and non-governmental organisations. However, other authors have defined MLG as a specific configuration of multi-level politics (Caponio, 2021). MLG refers to the interaction and collaborative coordination of relationships between various levels of government, without clear dominance of one level. For this to be effective, there needs to be some convergence between the different levels (Scholten & Penninx, 2016). Caponio (2021) summarises three features that underly the more specific definition of MLG: 1) different levels of government are involved at the same time (vertical dimension), 2) people or groups outside the government are also involved (horizontal dimension), and 3) relationships take the form of networks based on cooperation and consensus building, without clear hierarchy.

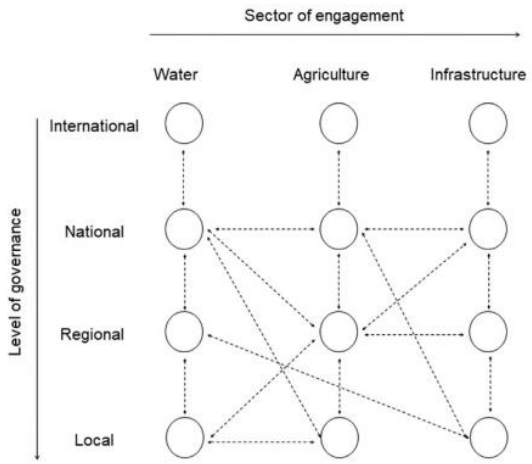

Figure 2.2 Multi-level network of governance (Ishtiaque, 2021)

To address the impact of climate change, actors and organisations at different levels and between different sectors interact with each other and form a multi-level governance network (Figure 2.2). Within such a multi-level network, actors can exert influence based on different resources, such as information, financial resources, expertise and legitimacy. The success of adaptation depends largely on the multi-level interactions that facilitate the governance processes for the implementation of adaptation measures. Therefore, it is important to understand these interactions between different levels, and the concept of MLG can be used for that (Ishtiaque, 2021; Zen et al., 2019).

Climate adaptation mainstreaming has both a vertical and a horizontal approach. On one hand, it is vertical because local decision-making is influenced by delegated influence from higher governmental layers. On the other hand, it is horizontal because mainstreaming requires cooperation and coordination across sectors (Rauken et al., 2015). Both aspects also explain why local governments take part in an MLG network to address climate adaptation: they are under pressure from higher-level governments, but they are also willing to cooperate with other partners to coordinate activities for mainstreaming (Yi et al., 2019).

More specifically, there are six strategies to address climate adaptation mainstreaming, as presented in Table 2.5. The strategies include normative, operational and strategic factors at different policy-making stages and all strategies are needed to achieve a sustainable transformation (Wamsler & Pauleit, 2016). The strategies include both horizontal and vertical approaches. The add-on, programmatic and managerial strategies are important at all governmental layers, but they do not deal with the interaction between levels. The intra- and inter-organisational, regulatory and directed strategy include some level of vertical integration. The inter-organisational strategy covers the interactions between actors on different governmental levels and with non-governmental actors. Regulatory mainstreaming can involve both vertical and horizontal integration, depending on the level of the planning procedures and the scope of the addressed level. Directed mainstreaming focuses specifically on vertical integration (Braunschweiger & Pütz, 2021). Figure 2.3 shows the mainstreaming strategies in a framework where horizontal and vertical integrations are visible.

Table 2.5 Strategies of mainstreaming

Strategies of mainstreaming	
1. **Add-on mainstreaming**	The establishment of specific on-the-ground projects or programmes that are not an integral part of the implementing body's sector work but directly target adaptation or related aspects.
2. Programmatic mainstreaming	The modification of the implementing body's sector work by integrating aspects related to adaptation into on-the-ground operations, projects or programmes.
3. **Managerial mainstreaming**	The modification of managerial and working structures, including internal formal and informal norms and job descriptions, the configuration of sections or departments, as well as personnel and financial assets, to better address and institutionalise aspects related to adaptation.
4. Intra- and inter-organisational mainstreaming	The promotion of collaboration and networking with other departments, individual sections or stakeholders (i.e., other governmental and non-governmental organisations, educational and research bodies and the general public) to generate shared understanding and knowledge, develop competence and steer collective issues of adaptation.
5. Regulatory mainstreaming	The modification of formal and informal planning procedures, including planning strategies and frameworks, regulations, policies and legislation, and related instruments that lead to the integration of adaptation.
6. Directed mainstreaming	Higher-level support is needed to redirect the focus to aspects related to mainstreaming adaptation, such as providing topic-specific funding, promoting new projects, supporting staff education, or directing responsibilities.

Source: Wamsler & Pauleit (2016)

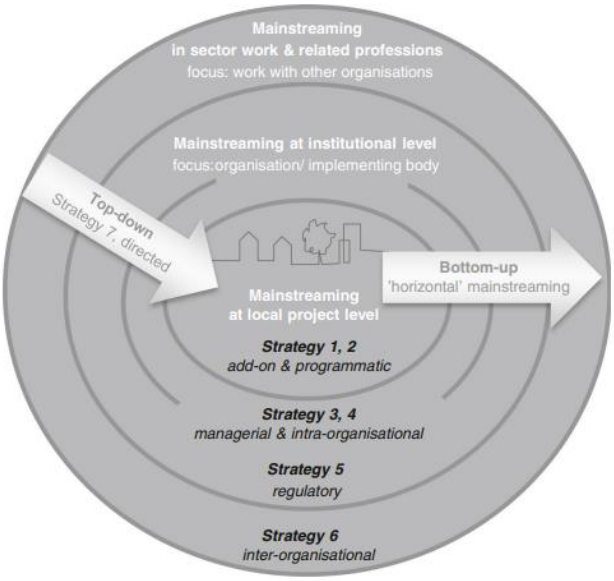

Figure 2.3 Mainstreaming framework (Wamsler & Pauleit, 2016)

Often, adaptation policies and plans do not result in actual outcomes, which is referred to as the implementation gap. The research of Runhaar et al. (2018) shows that the lack of implementation of adaptation mainstreaming mainly arises from an insufficient political commitment from higher policy levels, so vertical integration in the form of directed and regulatory mainstreaming is lacking. It suggests that mainstreaming is often a more informal activity pushed by local needs rather than initiated by higher-level authorities. Also, there is a lack of effective cooperation and coordination between key stakeholders, which results in limited inter-organisational mainstreaming. Therefore, organisational structures, practices, and ways of collaboration, both internally and externally, should be reviewed. Additionally, they suggest that requirements set at the (inter)national level for adaptation mainstreaming should provide an important incentive for local policymakers to implement adaptation measures. This should be combined with allocating resources to overcome implementation barriers (Runhaar et al., 2018). The research of Braunschweiger and Pütz (2021) also shows that the lack of explicit mainstreaming directives from higher jurisdictional levels leads to uncertainty regarding adaptation goals and their implementation at the local level. Additionally, because climate adaptation mainstreaming can have a negative influence on other sectoral interests, Widmer (2018) emphasises that formal requirements are needed for procedures to coordinate sectoral measures to avoid negative influences.

2.3.3 Formal and Informal Stakeholder Interaction

In a multi-level governance setting, the decision-making process consists of interactions between different governmental levels and stakeholders These interactions largely determine the success of climate adaptation (Ishtiaque, 2021). These interactions can either be informal or formal/procedural. Looking at the interplay between them helps to understand the decision-making process (Van Popering-Verkerk & Van Buuren, 2017). Informal interactions arise when actors organise themselves to achieve shared goals. These interactions do not have a strict procedure or follow strict institutional rules. Informal interactions have the benefit that they can cross existing boundaries between government levels. Formal interactions are structured, officially recognised exchanges that proceed according to established protocols, also referred to as procedural interactions (Van Poperink-Verkerk & Van Buuren, 2017). Table 2.6 summarises the differences between both kinds of interactions.

Table 2.6 Comparison of informal and formal interactions

	Informal interactions	**Formal interactions**
Description	Informal structured interactions which arise around a governance issue	System of rules and institutions to structure decision-making
Process	Informal, emerging and nonlinear process of interactions	Formal, standardised process of structured decision-making phases
Participants	Free access for all stakeholders	Access for actors who are allowed to participate
Result of the decision-making process	Decisions supported by all people involved	Decisions based on formal decision rules
Examples	Workshops, discussion meetings, joint visions, and informal networks	Assessment studies, decision-making rules and procedures, and formal terms

Source: Van Popering-Verkerk & Van Buuren (2016).

Actors play a determining role in combining informal and formal interactions because it is important to arrange both ways of working together at the vertical and horizontal levels. Informal interaction strategies are mostly helpful in building consensus, trust, and gathering support, which is important for maintaining networks and cooperation across different levels and actors in mainstreaming processes. Informal interactions are also often used to exchange knowledge for mainstreaming (Tanner et al., 2019; Van Poperink-Verkerk & Van Buuren, 2016). Formal interaction strategies are, on the other hand, more useful in obtaining commitment and resources. The two kinds of interactions support and strengthen each other (Van Popering-Verkerk & Van Buuren, 2016).

Thus, adaptation mainstreaming in a multi-level governance setting exists in informal and formal interactions (Van Poperink-Verkerk & Van Buuren, 2016). Additionally, actors from one level participate in processes at another level, and institutions produced at one level influence processes at another level (Pahl-Wostl, 2009). So, formal and informal exchanges occur for actors and institutions across different levels. The success of adaptation mainstreaming depends on the actor's involvement in both formal and informal interactions at different levels (Tanner et al., 2019).

Whether an actor is involved in adaptation mainstreaming is largely determined by the responsibility that an actor feels (informal) or holds (formal). Van den Ende et al. (2023) have looked at the mechanisms that provide information on why actors do or do not take on responsibility for adaptation mainstreaming. The overarching hampering mechanism they found was the institutional void mechanism, which refers to the lack of rules and institutions for climate adaptation. Because of this, municipalities are uncertain about what should be done and who should do it. They suggest that the crucial route for moving forward is to address the existing institutional void around adaption. This involves state and regional governments developing local policy frameworks, assigning clear responsibilities, and providing additional guidance. This corresponds with the literature on the barriers, which also stated that higher governmental levels should provide guidance, resources, commitment, and formal requirements to overcome the implementation gap (Braunschweiger & Pütz, 2021; Runhaar et al., 2018; Widmer, 2018). These can be referred to as policy instruments, which will be the subject of the next paragraph.

2.4 Policy Instruments

Actors can use instruments to involve other parties in mainstreaming. Instruments are tools that can be used to change the behaviour of other actors who are connected in reaching the goals or to improve problematic conditions (Henstra, 2015). The policy instruments can be divided into categories: communication and cooperation, enforcement, and incentives, see Table 2.7 (Ten Brinke et al., 2022). The division is based on legal (sticks), economic (carrots) and communicative (sermons) instruments (Mees et al., 2013). The instruments can be combined to be as effective as possible in reaching the goals (Henstra, 2015). Communication and cooperation can be considered informal instruments and enforcement and incentives as formal instruments.

Table 2.7 Policy instruments for climate adaptation mainstreaming

Policy instrument	Definition	Examples
Communication & cooperation	Using education and communication to inform adaptation behaviour and cooperating with other actors to enhance mainstreaming	Education, information, partnerships
Enforcement	Using authoritative power to enforce mainstreaming by means of law and regulations	Laws, policies, regulations
Incentives	Using financial incentives for creating additional benefits that induce mainstreaming	Subsidies, financial supports

Source: Ten Brinke et al. (2022)

There are several considerations when selecting the appropriate policy instruments. There are four guidelines to consider when selecting the right instruments: clearly stating what the policy wants to achieve; figuring out what needs to change to reach those goals; understanding why people act the way they do; and thinking about the political and economic situation, which is influenced by the ideological and financial constraints (Henstra, 2015). Additionally, policymakers need to evaluate whether they have the government's capacity to use an instrument, which depends on credibility and legitimacy, and the likelihood that the target will change when the instrument is used (Henstra, 2015). Furthermore, it is important to consider the effects of vertical and horizontal policy when deploying an instrument. A policy instrument can negatively affect other governmental layers or sectors in their ability to adapt to climate adaptation. Therefore, feedback should be collected from implementation actors and target groups (Henstra, 2015).

2.2 Conceptual Model

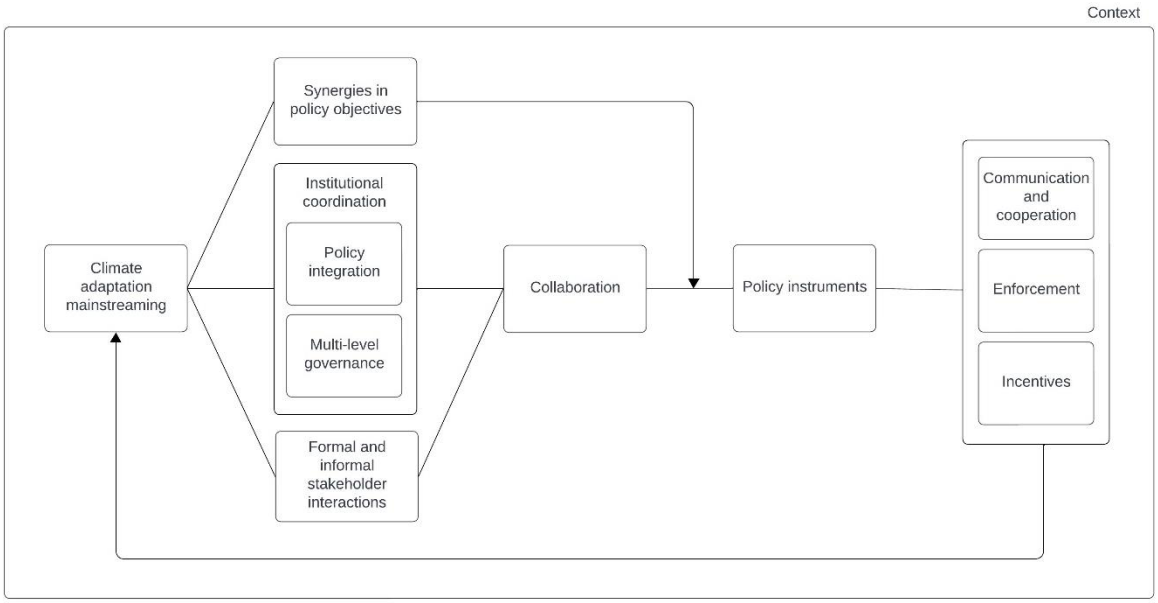

Figure 2.4 Conceptual Model

The conceptual model (Figure 2.4) shows the relationship between the concepts in the theoretical framework. A brief explanation of how the conceptual model is applied to the collaboration between the water authority and municipalities will be provided.

The conceptual model is first divided into synergies in policy objectives, institutional coordination and formal and informal stakeholder interaction. Synergies in policy objectives refer to the policy design of

adaptation mainstreaming (the object). The municipality is responsible for maintaining and redesigning the sewer system, streets and greenery. The water authority cannot carry out these activities itself, but it can contribute when these activities are carried out by the municipality to promote climate adaptation. By seeking synergies in this way, climate adaptation can be implemented.

Institutional coordination and formal and informal stakeholder interaction are about the process of adaptation mainstreaming. Institutional coordination compasses policy integration and multi-level governance. There are different levels of policy integration: cooperation, coordination and integrated policy-making (Meijer & Stead, 2004). The bottom layer, cooperation, means that the organisations collaborate to achieve their own sectoral goals. The middle layer, coordination, means that the sectoral policies are aligned with each other. The highest layer, integrated policy-making, means that there are no longer separate sectoral plans but an integrated, unified policy. This is also most demanding in terms of time, space and actors. The extent of policy integration can be measured based on four indicators: inclusion, consistency, weighting, and reporting (Kivimaa & Mickwitz, 2006). However, in the case of the water authority and municipalities, this happens across different governmental levels, therefore it is also multi-level. There is territorial integration since the parties work in the area. At the same time, they are also linked vertically, and depending on how they collaborate, they are also connected horizontally. Regarding the vertical and horizontal barriers to climate adaptation mainstreaming, the position of the water authority in this multi-level setting could potentially play a role in overcoming those barriers.

The actual decision-making process depends not only on the institutional side but also on stakeholder interactions. These largely determine the success of climate adaptation (Ishtiaque, 2021). The interactions can be informal or formal. Informal interactions do not follow strict rules and are beneficial for building consensus, trust and gathering support. Formal interactions are officially structured and help obtain commitment and resources (Van Popering-Verkerk & Van Buuren, 2016). Thus, the actual implementation of mainstreaming depends on the stakeholder interactions, but in turn, the interactions are also influenced by institutional coordination. So, there is an interplay between both.

This leads to collaboration between the water authority and municipalities. Subsequently, within this collaboration, various policy instruments can be employed. Which instruments are appropriate depends on the object, namely, which synergies are being sought. The instruments can be categorised into communication and cooperation, enforcement and incentives. This, in turn, leads back to adaptation mainstreaming because the goal of the instruments is to further promote adaptation mainstreaming.

The conceptual model serves as a basis and guideline for the empirical research. The following chapter explains the methods that are being used.

3. Methods

This chapter discusses the methods used to answer the research question: How can water authorities and municipalities collaborate to stimulate climate adaptation mainstreaming? First, the research design is described, and a description of the case is given. Second, how the data is collected and analysed is explained, and finally, the validity and reliability of the research are discussed.

3.1 Research Design

This research aims to gain a new and deeper understanding of the collaboration between the water authority and the municipalities for climate adaptation mainstreaming. Given this aim, this research used a qualitative research design because a qualitative approach allows for an in-depth understanding of the research issue (Cresswell & Poth, 2016). For the data collection, desk research is conducted to gain insight into the issue and gather information about the present situation regarding climate adaptation and collaboration between the water authority and municipalities. This was in preparation for the interviews, enabling more targeted questions to be asked as well. The primary data source is interviews conducted with municipalities in the working area of the water authority. Interviews have proven valuable in obtaining a broader understanding of why and how things happen, as well as the perspectives, opinions and motivations of people involved (Jain, 2021). As a final step, a group session was organised with water authority employees to reflect on the outcomes of the interviews with municipalities.

The case for this research is the water authority Stichtse Rijnlanden (HDSR). This water authority aims to take a more prominent role in spatial developments. They want to collaborate with partners to create a climate-resilient, water-robust living environment (HDSR, 2021), making it a suitable case for this research. They are also the host for the Network Water & Climate, fostering collaboration between themselves, municipalities, and other regional partners to enhance climate resilience. The presence of this active network makes it an interesting case to investigate the collaboration among the partners further. After desk research into the ambitions of other water authorities, it appears that other water authorities also aspire to be more proactive, particularly in the field of climate adaptation. Aside from the Network Water & Climate, there are 44 other working regions in the Netherlands where water authorities, municipalities, and other parties collaborate on climate adaptation efforts (Klimaatadaptatie, n.d.-b). These aspects suggest that this case cannot be considered unique beforehand but rather typical, with the potential to provide insights into applicability in other situations as well.

Additionally, the decision to delve deeper into a single case study, as opposed to multiple cases, was made due to the influence of this particular network on the collaboration, a disparity in ambitions among water authorities, leading to a variety of desired forms of collaboration, and the impact that regional agreements may have on collaboration. The next paragraph will further describe the case.

3.2 Case Description

HDSR is one of the 21 water authorities in the Netherlands. Its area covers the southern part of the province of Utrecht and a small part of the province of South Holland. Figure 3.1 shows HDSR's area in the Netherlands. The total area is 82.000 hectares (HDSR, n.d.-a).

Figure 3.1 Area boundaries of HDSR (data source: Het Waterschapshuis, 2024)

The water system in the area of HDSR can be divided into three regions with their own characteristics (Figure 3.2). Each area has its specific challenges for climate adaptation. The western region consists of polders that are below sea level. Without pumping stations, this area would be permanently submerged in water. The main water issue in this region is limiting land subsidence while simultaneously preventing waterlogging. The eastern region is situated at a higher and drier elevation because of the Utrechtse Heuvelrug. Dams are employed to retain water for a longer period because, naturally, it flows to the lowest point. A significant challenge in this area is, therefore, retaining rainwater and seepage. The middle region is the urban area in which the city of Utrecht is located. The water supply in this region is regulated by three waterways: the Kromme Rijn, the Vaartsche Rijn, and the Noordergemaal. An important issue in the urban area is the management of rainwater (HDSR, n.d.-b).

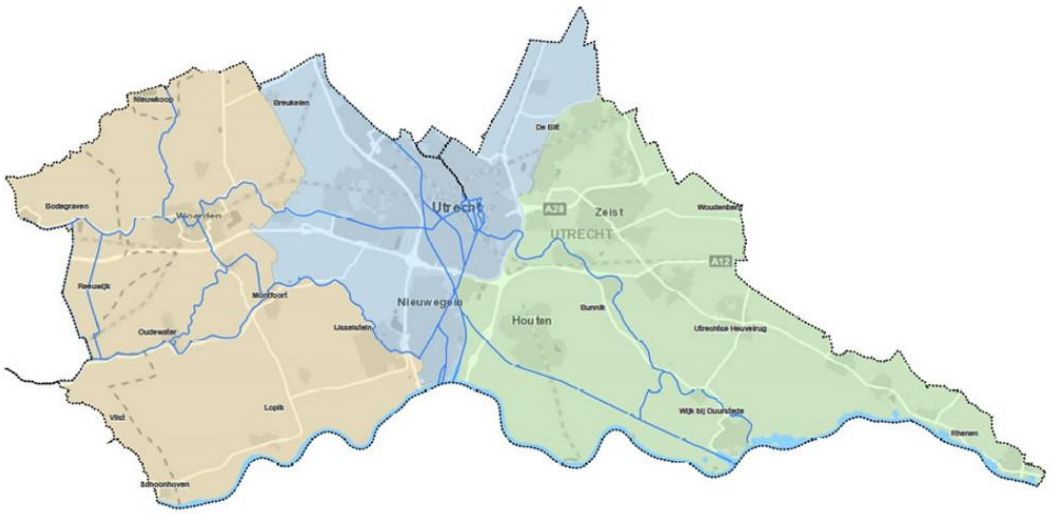

Figure 3.2 Three regions in the area of HDSR (HDSR, n.d.-b)

There are 20 municipalities that fall under the working area of HDSR, as listed in Table 3.1. Figure 3.3 shows the municipalities and the area boundaries of HDSR. Some municipalities only partially fall within the working area of HDSR and partly fall under other water authorities (HDSR, n.d.-a).

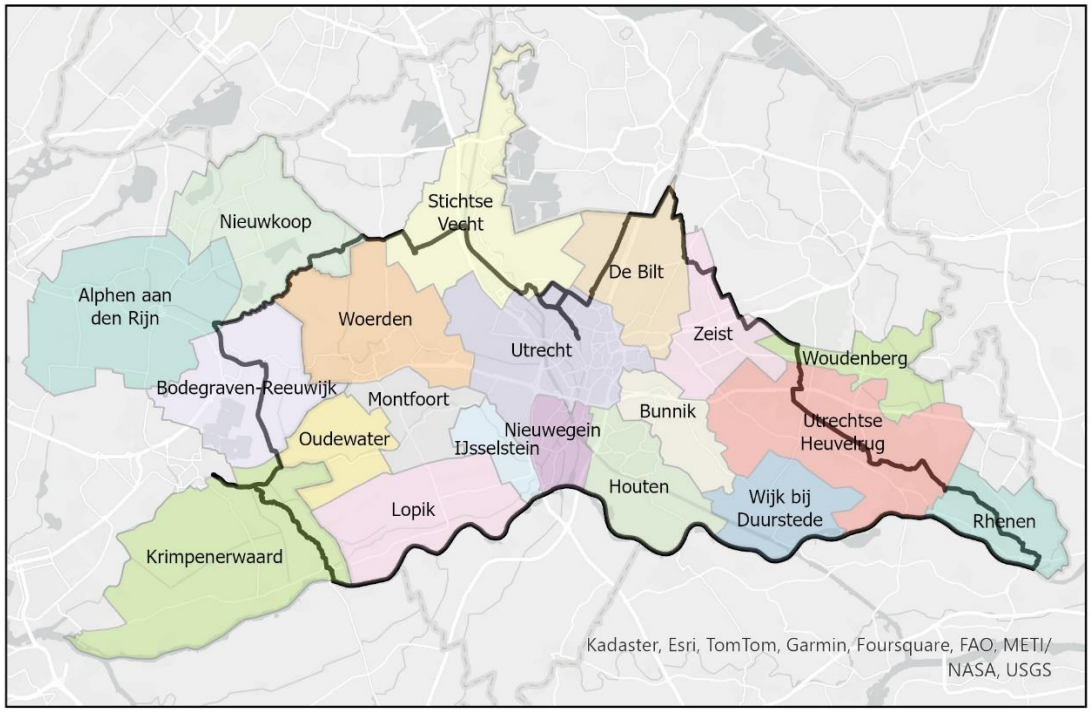

Figure 3.3 Municipalities in the area of HDSR (data source: CBS, 2024; Het Waterschapshuis, 2024)

An existing collaboration between HDSR and 14 municipalities takes place within the network Water & Climate, together with the province of Utrecht, Veiligheidsregio Utrecht and GGD Utrecht. Table 3.1 also shows which municipalities are part of this network. The goal of the network is to make the region water and climate-resilient by 2050 and to ensure its resistance to the consequences of climate change, such as flooding, drought, and heat waves (Water & Klimaat, n.d.).

Table 3.1 Municipalities in the working area of HDSR

Municipality	Number of inhabitants	Area size (in km²)	Also falls in the working area of the regional water authority	Part of Network Water & Climate	Included in research
Alphen aan den Rijn	114 182	132.5	Rijnland		
De Bilt	43 884	67.13	Amstel, Gooi en Vecht & Vallei en Veluwe	X	
Bodegraven-Reeuwijk	36 308	88.64	Rijnland		X
Bunnik	16 026	37.57		X	X
Houten	50 581	58.99		X	X
IJsselstein	33 492	21.68		X	X
Krimpenerwaard	57 700	161.31	Rijnland & Schieland en de Krimpenerwaard		
Lopik	14 704	78.98		X	
Montfoort	13 929	38.2		X	X
Nieuwegein	65 426	25.65		X	X
Nieuwkoop	29 463	91.16	Amstel, Gooi en Vecht & Rijnland		
Oudewater	10 232	40.1		X	X
Rhenen	20 329	43.76	Vallei en Veluwe		X
Stichtse Vecht	65 771	10.82	Amstel, Gooi en Vecht	X	X
Utrecht	367 947	99.21	Amstel, Gooi en Vecht	X	X
Utrechtse Heuvelrug	50 429	133.94	Vallei en Veluwe	X	
Wijk bij Duurstede	23 995	50.4		X	X
Woerden	53 244	92.92	Rijnland	X	X
Woudenberg	14 358	36.82	Vallei en Veluwe		
Zeist	66 629	48.65	Vallei en Veluwe	X	X

Source: CBS Statline, 2023; HDSR, n.d.-b

The first selection of municipalities to include in this research is based on whether they participate in the Network Water & Climate, which are 14 municipalities (Table 3.1). The reason for this selection is that these municipalities are already open to collaboration with the water authority for climate adaptation, which becomes clear through their participation in the network. These are also the municipalities whose boundaries correspond to HDSR or still have a significant overlap (see Figure 3.3). Woerden and Oudewater share their administrative apparatus, which means that for these municipalities, only one person was interviewed. However, in this interview, the focus was on Woerden and not on Oudewater, but both have been included in the desk research. De Bilt, Lopik and Utrechtse Heuvelrug have indicated that they do not have time to participate in the research. Therefore, it was decided to invite Bodegraven-Reeuwijk and Rhenen to join to represent the smaller municipalities more. Krimpenerwaard, Nieuwkoop, Alphen aan den Rijn and Woudenberg have not been considered because their territory only partially overlaps with HDSR (see Figure 3.3), which makes collaboration less appealing and obvious.

3.3 Data Collection and Analysis

Data is collected via desk research, expert interviews, and a group session with water authority employees to answer the research question. This paragraph elaborates on this.

3.3.1 Desk Research

Qualitative desk research has been conducted in various ways to prepare for the expert interviews with the municipalities. First, exploratory interviews were held with employees of HDSR to gain a clearer understanding of the research question from the perspective of the water authority. Several individuals with different roles were interviewed, including climate adaptation advisors, a climate adaptation coordinator, a risk dialogue advisor, and an area manager. There was no topic list for these explorative interviews; the respondents were asked for their perspectives on the topic. These interviews were not recorded, but notes have been made by the researcher. The information gathered from the exploratory interviews also assisted in formulating the in-depth interview questions later.

Secondly, for each municipality included in the research, a climate vision and water and sewerage plan (WRP) have been reviewed. The climate vision describes the vision and ambitions for climate adaptation. The WRP describes the municipal water tasks, which include the collection and transportation of urban wastewater, stormwater management and groundwater management. Before the introduction of the Environmental Act on January 1, 2024, it was called the municipal sewerage plan (GRP). It used to be a mandatory plan for municipalities, but under the Environmental Act, this obligation has been abolished. Municipalities can now choose to establish a WRP themselves. Figure 3.4 shows how the GRP has been incorporated into the new instruments of the Environmental Act. Figure 3.5 shows the relations between the different instruments at the regional and local levels.

In the WRP, the policy and implementation of various water management tasks are documented. The reason that the WRP is reviewed is that, often, the consequences of a climate vision and the measures for climate adaptation are elaborated on in the WRP. Climate adaptation measures in the municipality mostly relate to water and are often funded through the sewerage charge. Consequently, the WRP outlines the municipality's objectives, strategies to accomplish them, responsibilities of each party involved, the current status of the municipality, upcoming actions to be taken, and the necessary resources—both personnel and financial—to achieve these goals (Dekker & van Esch, 2023). Other measures, like greenery, are more difficult to finance and, therefore, are less frequently detailed in plans, although the ambitions may be described in a climate vision.

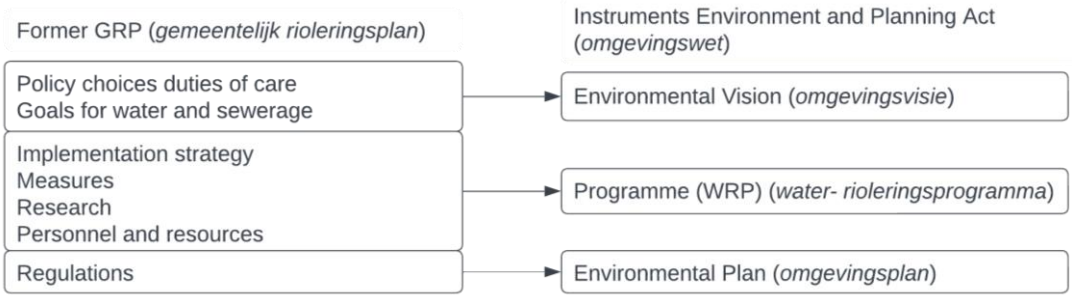

Figure 3.4 From GRP to WRP (translated from Dekker & van Esch, 2023)

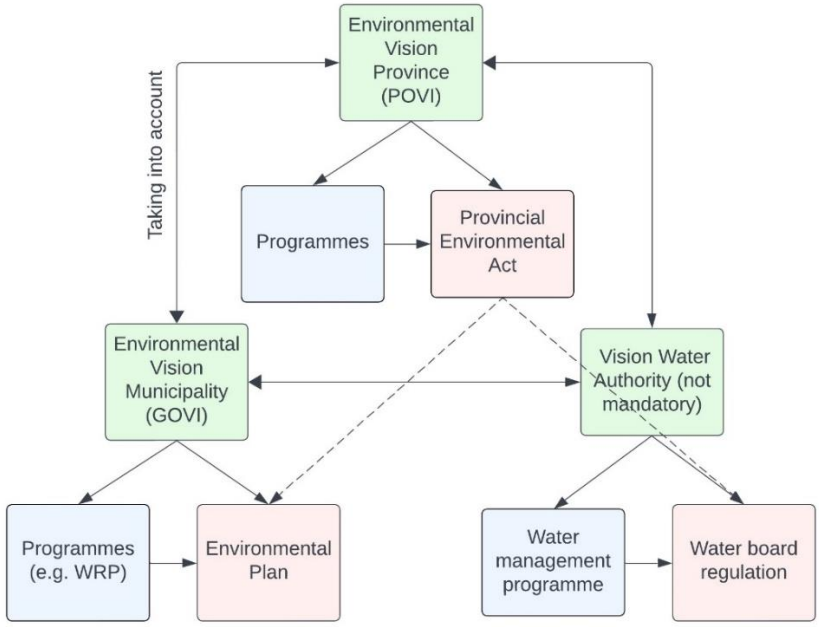

Figure 3.5 The interplay between instruments at the local and regional levels (translated from IenW, 2021)

The documents are openly published on the websites of the municipalities and obtained in that manner. Appendix B shows which documents have been reviewed. The content of both the climate vision and WRP, however, may vary from municipality to municipality. Additionally, not all municipalities have a climate vision or a current WRP. Also, the duration of the WRP is not the same for all municipalities, there may be differences in the periods during which the plans are current. For that reason, it was chosen not to conduct an extensive document analysis since the outcomes are not comparable. Hence, a deductive approach is also not suitable, and therefore, it has been approached inductively. The desk research serves as background information on the current status of climate adaptation in the municipalities. The plans are examined on municipalities' ambitions regarding climate adaptation, the measures they are implementing, the budgets allocated for them, and whether there is a dedicated or mainstreaming approach to climate adaptation.

The third part of the desk research involved asking the municipal employees to provide information on measures and budgets for climate adaptation in their municipalities in preparation for the interview. However, this did not yield much new information compared to the climate vision and WRP.

3.3.2 Expert Interviews

The main method of data collection is through expert interviews with the municipalities. Experts can be defined as "persons who are responsible for the development, implementation, or control of a solution, or persons who have privileged access to people or decision-making processes" (Meuser & Nagel, as cited in Döringer, 2021, p.266). The interviews are employed to talk to experts and gather information from them about their knowledge, as a result of expertise in a certain working area, that cannot be obtained through other means. Therefore, the person who is being interviewed can be considered as the "provider of data" (Cochrane, 2020, p. 42).

Interviews are chosen because they are particularly suitable for researching personal experiences, viewpoints, and thoughts. There is also room for the respondents' interpretations and the possibility of asking follow-up questions (De la Croix et al., 2018). Quantitative research is not appropriate in this research because the research question cannot be answered in that manner since collaboration involves expectations, opinions, and experiences. Qualitative surveys miss the possibility of asking

follow-up questions and, therefore, may lack the depth that can be achieved during an interview. Another qualitative research manner is group interviews or focus groups. However, this requires specific skills of the researcher, who has no experience with this type of research so far, making it less suitable. Additionally, it is not relevant to the research question of how the respondents perceive each other and how they react to that, but rather how they relate to the water authority. An additional disadvantage is that respondents can influence each other's opinions, which is not the case in one-to-one interviews. This leads to the decision to opt for individual interviews (De la Croix et al., 2018).

The interviews were semi-structured, meaning there is a prepared interview guide with a set of questions and topics to be addressed, see Appendix A. The guide provides a structure and ensures that all key points are covered during the interview (Newing et al., 2011). The interview guide is based on the conceptual model. Its four main components align with the sub-questions: climate adaptation/policy synergies, institutional coordination, stakeholder interactions and policy instruments. At the end of the interview, respondents were also asked to address additional topics related to the research question that they perceived as important. Semi-structured interviews are most suitable when the topics are identified but when the researcher does not have sufficient knowledge about potential responses to formulate a set of specific questions required for a questionnaire. Another advantage is that there is more room for the respondent's interpretations and thoughts and the flexibility to ask follow-up questions while still being able to compare the results with each other (Dunn, 2021; De la Croix et al., 2018). Additionally, semi-structured interviews prove beneficial when time is limited, ensuring that the key aspects are addressed. This was useful in some interviews, as some respondents only had half an hour available (Cochrane, 2020; Newing et al., 2021).

The interviewees are municipal employees of the municipalities checked under 'included in research' in Table 3.2. They are selected based on their knowledge and position relevant to the research questions. The respondents' functions include advisors for public space, climate adaptation, water and sewerage, sustainability, and climate. The municipal employees are recruited via connections with HDSR employees and contacted through email or phone. One interview was conducted with two respondents; therefore, the results refer to respondents 1a and 1b for this municipality.

Before the interviews, the respondents were asked permission to record them, to which they all agreed. It was also agreed that respondents' answers would remain anonymous. The researcher has transcribed all the interviews.

3.3.3 Group Session with Water Authority Employees

The last part of the data collection involved organising a group session with four HDSR employees in the climate adaptation field. Their functions are the programme manager for climate adaptation, risk dialogue and impulse arrangement advisor, peatland water management advisor, and water system advisor. This was done after the results were compiled, and the researcher presented five outcomes to which the participants were allowed to respond. The purpose of this group session was for the participants to evaluate the outcomes and make a translation for HDSR what it means for their role. In the introduction, the changing role of water authorities was outlined, and this evaluation of the outcomes from the municipalities allows for a better reflection on this changing role within this research.

3.3.4 Data Analysis

The transcripts of the expert interviews with municipal employees have been coded post-transcription. This is done to reduce, organise and analyse the data (Cope, 2021). The themes that emerged during the interview did not completely align with the operationalisation of the interview guide. For example,

in response to question 3a, which inquired about the current state of collaboration, participants often mentioned the network or the impulse arrangement, which were operationalised under the policy instruments in question 5. This indicates that there is much coherence between the themes. Therefore, it was decided to abandon the interview guide during coding and opt for an inductive approach.

With inductive coding, the codes derive from the data, unlike deductive coding, where you start with a set of codes beforehand. The first step is open coding, marking specific parts of the data with a code that shows where that part is about. These open codes stay closely tied to the text. The second step is combining similar open codes into bigger categories. The third step is to organise these bigger categories into a structure, which forms the basis for formulating the results (Chandra & Shang, 2019). This structure is the coding scheme presented in Appendix C. Although the approach was inductive, the final categories in the coding scheme essentially correspond with the topics in the conceptual model. This is because these ultimately are the themes that have been discussed, whether or not in response to a different question than initially operationalised.

3.4 Validity and Reliability

Validity and reliability should be part of any research, as both make up the rigour of a study, which is the quality of being thorough and accurate). Validity refers to whether the findings of the research are an accurate and trustful presentation of the issue they are intended to represent (Cypress, 2017). With expert interviews, the validity of the information relies on the quality of the experts; therefore, respondents who have a deep understanding of the issue are selected (Dorussen et al., 2005). However, challenges might still arise. During an interview, an expert can either respond as an individual (personal opinion), an organisation representative or a strategist. Experts are not neutral but influenced by interests, trust, and power. Another challenge that may arise is that municipal employees may have different opinions than the municipal government, which may result in interview outcomes not aligning with the decisions made by the governing body (Abels & Behrens, 2009). The findings are also evaluated by employees of HDSR, thereby avoiding a perspective limited solely to the municipalities and the analysis from the researcher's viewpoint. However, this can also create researcher bias towards the perspective of HDSR, which requires careful and critical consideration (Abels & Behrens, 2009).

Reliability refers to the consistency and stability of the data; in other words, the research at another time provides the same results (Anderson, 2010; Cypress, 2017). To ensure this, efforts were made to establish coherence between the various components of the research, such as the interview questions being based on the conceptual model. The use of an interview guide ensures that all respondents were asked the same questions, albeit possibly in a different order based on the respondent's input. The interview guide and coding scheme are also provided in the appendix, allowing the research to be replicated. At the end of the study, the results were compared with those of another student researching the same topic. The comparison showed consistent results, and no significant differences were observed.

Furthermore, this research was conducted alongside an internship at HDSR, and the research question was formulated together with HDSR. This entails the risk that the researcher may be overly influenced by HDSR's perspective, which may hinder the ability to maintain a critical perspective. To address this, the thesis is regularly discussed with a university supervisor and fellow students, who provided a neutral and critical perspective on the study.

4. Results

This chapter discusses the research results. It is divided into four paragraphs: first, the municipalities' approach to climate adaptation; second, institutional coordination; third, the interactions between both organisations; and fourth, the policy instruments that the water authority utilises or can utilise to promote climate adaptation are discussed. For each theme, both the current situation and the desired collaboration according to the municipalities are included. The chapter concludes with a reflection from the water authority on the key findings from the interviews with the municipalities.

4.1 Climate Adaptation in Municipalities

This section describes how municipalities are addressing climate adaptation. It is relevant to the research question because the municipality's approach to climate adaptation forms the basis for collaboration with the water authority on this topic. It will cover the implemented measures, the approach and planning, the financial aspects, and some limitations.

All municipalities are, to some extent, working on climate adaptation. Nine of thirteen municipalities have a local adaptation strategy (LAS) describing how they proceed with adaptation. Most of the measures in all municipalities focus on exploiting policy synergies, usually related to road, sewer, or greenery management. So, they choose the mainstreaming approach over the dedicated approach. Respondent 4 explains what he wants to do with a project that originally entails sewer replacement: *"So what I want to do in that project is to regreen, construct swales, disconnect the roofs from the sewer system as much as possible, and also simultaneously install a separate sewer system*" (Interview 4). This project entails many measures at the same time. However, even when not much money is available, efforts are still made to 'do something smart' during reconstruction, such as introducing elevation changes when repaving. The strategy of exploiting policy synergies means that the management disciplines are leading and that the work is not always focused on the locations with the highest climate-related risk, as said by respondent 1a: *"You know, there might be some waterlogging somewhere, but if the sewer system is still in good condition, then you won't do anything unless it's very extreme. Then you might have to take some action."* In the case of interview 1, it depends on the politics that have chosen the strategy of leveraging policy synergies, not another strategy. It also relates to the budget a municipality has and the costs and benefits of a project, as explained in interview 8: *"You're not going to throw everything out while it's still good. There's no need for that. Then the potential damage caused by waterlogging isn't significant enough yet."* As a result, climate adaptation measures often get deferred until major maintenance occurs. New construction is also encouraged to be climate-adaptative. Municipalities use other governments' standards, with the province's policy being important, with regional performance requirements, as explained in interview 9: "*We've set ambitions for what we want to see in every existing building, in reconstructions and renovations. And what we want to see in new projects. And that aligns with, for example, the national standards or the climate-resilient building covenant."*

Although policy synergies are the main strategy, municipalities take other measures for climate adaptation. All municipalities have measures targeting citizens, such as installing green roofs and rain barrels or removing paving tiles. Depending on the municipalities, other measures exist, like additional improvements in public spaces, high-risk locations, stress tests, risk dialogues, and studies. Municipalities' plans are not publicly transparent, except for the programmes and projects established by the council, which are published online.

The sewerage charge mostly funds the adaptation measures in all municipalities except Nieuwegein. Nieuwegein has separate budgets for climate adaptation because they consider it an important theme

and believe that the sewerage charge is intended for the sewer system. A condition for accessing sewerage charge funding is that the measure is related to sewerage, as explained in interview 8: *"From the sewerage charge, you can pay for all sorts of things that benefit the sewer system. And you can interpret that quite broadly. So, it's also the communication around it. It's also about increasing infiltration capacity, disconnecting sewerage, and reducing pavement. But I'm not allowed to plant trees. Because that's not allowed from the sewerage charge."* Municipalities' funds are divided into various pots, which cannot be mixed. Water and sewerage measures are easier to realise because of the specific tax for that. Other measures for greenery and heat stress are more challenging: "*When it comes to trees, there may be ambitions, but there's no funding attached to it. Having an ambition without funding makes it difficult"* (Interview 12). It will be even more challenging in 2026, the year in which shortages will arise at municipalities due to reorganisations, as explained in interview 6: "*Soon, when that chasm year approaches, 2026, there won't be any trimming on the sewerage charges, which most people use to finance it. But there will be cuts to all the funds for more greenery and more trees. And to convert grey to green. That's where the nibbling will occur."* Additionally, subsidies are available from other governments for climate adaptation. However, the budgets are often insufficient, even in the area of water and sewerage. The smaller municipalities especially mention this.

Thus, the budgets are a limitation for climate adaptation. Particularly in the areas of greenery and heat. There are also other limitations: *"All medium-sized and small municipalities lack expertise. Not only in content but also in manpower to do that. And they will never get that manpower"* (Respondent 8). The result is that the measures stay incidental; only what is important at that moment gets done: *"And if the space isn't available, then you simply don't address it. You just stick to the peripheral issues, the emails, the brief advice. And it never becomes structural"* (Interview 5). Respondent 8 indicates that this issue occurs in small and middle-sized municipalities. Larger municipalities have more capacity and expertise on board to make a structural programme. It is also the smaller municipalities that do not have a LAS and implementation programme for climate adaptation. Additionally, the amount of attention given to climate adaptation also depends on the political orientation. The larger municipalities generally have more of a left-leaning government, where climate adaptation is considered more important. This could be explained by the younger and more diverse population, higher education levels, progressive values, and/or urban issues. They often prioritise environmental policies and allocate more resources towards addressing climate change issues. The way municipalities work on climate adaptation and the limitations they face influence their collaboration with the water authority. This will be discussed in the following paragraphs.

4.2 Institutional Coordination

This section discusses the institutional coordination between the water authority and the municipalities. It delves into the current collaboration, the added value, the responsibilities, the desired collaboration, and some challenges.

All municipalities indicate that they have some form of collaboration with HDSR. Depending on the role of the respondent, the following points emerged: collaboration in drafting a climate or environmental vision and implementation programme, preparing the GRP/WRP, addressing culverts, tackling high-risk areas, water level decisions, water quality, evaluating plans, research pilots, wastewater treatment, groundwater levels, and during reconstructions. Respondent 10 explains why they collaborate: "*We seek coordination with and expertise from the water authority […] It is often a matter of reaching out to each other to coordinate, exchange information, or answer any questions you might have.*" The collaboration is primarily at the project level or focused on a specific theme, where climate adaptation is part of it. There is less to no specific collaboration for climate adaptation itself, as explained in interview 12 *"It is somewhat questionable whether it can be considered a*

collaboration [for climate adaptation] […] we simply know how to reach to each other when there's a specific case" and in interview 9 *"We collaborate on many points. If you ask, we have a cooperation programme established with an agreement specifically for climate adaptation, we do not."*

However, the Network Water & Climate, or the similar network for Rhenen, fulfils that role. The collaboration for climate adaptation aligns with the network (Interviews 3, 4, 5, 7, 8, 11, 12), as explained in interview 12: *"I think the collaboration with the network, where the water authority also plays a crucial role, is more important, where you have those connections with other municipalities and can learn from each other. Developing a joint strategy, forming a regional adaptation strategy, and then furthering it locally."* The respondents emphasise that the network is important for sharing experiences and knowledge with the water authority and other municipalities, building a network, sharing solutions and challenges, applying for subsidies together, and determining a joint strategy for climate adaptation.

Most respondents indicate that this way of collaborating for climate adaptation is fine and sufficient because they know how to reach each other (Interview 1, 3, 4, 5, 6, 7, 10, 12). More collaboration is only desirable if it adds value and when you can strengthen each other, not just for having more meetings. Where they see the added value depends on the municipality. Utrecht indicates that they would like to establish goals, actions, and financing for climate adaptation in a cooperation agreement. This is the only municipality specifically mentioning a cooperation agreement. The other municipalities see the collaboration primarily at the project level, as said in interview 4: "*Especially I think in projects in public spaces. I see it mainly as them being able to support us. Both in terms of knowledge and finances.*" One explanation for this could be that Utrecht is the largest municipality and has enough capacity to focus on the long term, whereas smaller municipalities lack the capacity for that. An alternative explanation is that Utrecht has many projects, making it more efficient to approach them through a programme rather than individually. This is not the case in municipalities with few projects where the water authority must be involved.

Most municipalities see the added value of collaborating with the water authority primarily for knowledge sharing or the water authority's specific expertise on certain themes or the bigger picture (Interviews 3, 4, 5, 6, 7, 8, 10, 11). IJsselstein, Montfoort and Stichtse Vecht indicate that they would like to work on projects together specifically for this aspect of knowledge sharing. Both Montfoort and Stichtse Vecht said that they do not have the expertise and capacity to tackle projects and see a role for the water authority there, as explained in interview 5: "*HDSR can provide input and expertise on what the solutions should be. And where they can further assist is to assess whether HDSR also considers it important for us to address those kinds of issues and then arrange for some support*."

Another added value of collaboration with the water authority is the financial contribution to climate adaptive measures (Interviews 1, 3, 4, 5, 9, 11, 12). This can involve contributing to projects, such as a research pilot, where a municipality lacks funds. This helps accelerate climate adaptation. However, some municipalities indicate that they do not need financial contributions from the water authority and have the resources for climate adaptation (Interviews 3, 6, 9, 11). Nevertheless, these municipalities also benefit from contributing to measures for which they do not have their own programmes or fixed income. The smaller municipalities depend on funding from other governments since they do not have sufficient budgets.

Also, the joint evaluation of new construction or reconstruction plans is an added value (Interview 1, 6): "*You don't see everything, you don't hear everything. And then it's just very nice that we can inform each other like, hey, watch out, this is coming, this is how things are going. I tried this, but it didn't work. Can you do something else?"* (Respondent 1a).

The municipalities consider collaborating with the water authority essential where their work areas overlap, as indicated in interview 10: "*Water is of course an important part of climate adaptation. Whether it's about too much or too little, or about securing, buffering, or draining. So, you can't avoid working together on that. So yes, it's essential to do that together.*" In many of these cases, it is also obligatory to involve the water authority. Nevertheless, there are differences in opinion regarding the role the water authority should take in climate adaptation. Respondent 8 is open to a more advisory role from the water authority: "*While the water authority could also say, this is what you should do. And I understand why they don't. Because, of course, it's a bit like taking over the municipality's role. I wouldn't mind*" (Interview 8). On the other hand, respondent 12 wonders if the water authority might be exceeding its role: "*I often notice that the water authority wants to have a lot of influence in urban areas. I strongly wonder, is this within your authority? Are you entitled to this?"* (Interview 12). This difference could be explained by the variance in internal capacity that a municipality has to handle things on its own. It can also be explained at the personal level, such as to what extent an employee of the water authority proactively engages with the issue, potentially overlapping with the municipality's jurisdiction. Ultimately, the municipalities agree that it is up to them to decide what happens in the urban area, as explained in interview 4: "*We are primarily locally responsible for being active in this area and for developing our own policies locally.*" Several interviews have stated that the water authority is about water, so they cannot turn to the water authority for all climate adaptation measures (Interviews 1, 2, 6, 8, 9). This is explained in interview 2: *"The water authority is simply a different type of organisation; it serves different interests than what the municipality does […] Very specifically for the municipality, for example, there's also greening, well, that's a whole issue in itself. As a municipality, you have relatively little to do with HDSR."*

However, more collaboration or involvement from the water authority is desired on some topics. Respondent 6 mentioned that he would like the water authority to also address the theme of heat, so that the issue is viewed more holistically, and because that theme is difficult for many municipalities. Respondent 10 also said that he would appreciate it if there was more focus on greenery, but he understands that it is not part of the water tax of the water authority. Additionally, he would like to see the water authority communicate a long-term vision to the municipalities: "*I miss a longer-term perspective of where we are heading. And I would really like to see the water authority take on an important role in that. As an expert in water … where do we want to be by 2050? What does it look like now? And what are the things we need to do now to work towards that?"*

So, the municipalities collaborate with the water authority on many fronts, specifically for climate adaptation, mainly through the network, and they find this sufficient. The reason for this is that the municipalities remain responsible for climate adaptation in the urban areas, even though this is also the ambition of the water authority, as explained in interview 12: "*Yes, it's a shared goal. But I don't know if you could call it a shared task, I think. Because it will mainly be the urban area that the municipality is responsible for."* He does not see a role for the water authority in municipal tasks such as disconnection sewerage or engaging citizens. Generally, there is no desire for increased collaboration; most municipalities have their own budgets and implementation programmes, so they may not find it necessary to seek collaboration everywhere. However, the respondents see added value in the support of the water authority at the project level, mostly through knowledge and finances. In response to the question of how this should be addressed, it is said that the municipalities are responsible for sharing the information with the water authority about their plans (Interviews 3, 4, 5), as explained in interview 3: "*Well, maybe we can just inform the water authority about the climate adaptation projects we will be working on in the near future. And then they can see where they might be able to give an extra boost.*" Respondent 8 looks at it differently: "*So, it's also an invitation to the water authority: if you have a good idea, try to convince us that it should be at the top of our*

priority list" (Interview 8). Informing and coordinating each other about projects is seen as challenging to achieve. Municipalities often do not have a clear overview of upcoming projects, which is subject to significant changes, as explained in interview 7: "*I also think that's difficult. Because you notice that the multi-year planning is reassessed every year to see if the distribution of priorities still makes sense. And that can shift again.*"

Besides sharing information, there are additional other challenges indicated by the respondents that occur in the collaboration. Climate adaptation is a broad challenge, so it is sometimes unclear what falls under it and who is responsible for addressing it. Respondent 2 says, "*Yes, I always have the question with the water authority: What do they then understand in their terminology about climate adaptation? Actually, it is primarily reasoned from a water perspective.*" If there are different interests or opinions, it can also be difficult to collaborate: "*But when one government wants something and the other doesn't see it, and vice versa, then it becomes difficult to accomplish things*" (Respondent 2). This becomes clear, for example, with heat, which is a big challenge for the municipality but less of a concern for the water authority. Respondent 6 says the following about collaborating with the water authority: "*It's a very appreciative partner because they naturally always find the subject interesting. Except when you talk about heat, then they don't find it interesting anymore.*" Additionally, respondent 6 mentions that conflicting interests can also exist, for example, between water quality and climate adaptation. Because of this, the municipality is also hesitant about further collaboration because it can also cause delays: "*They are sometimes also a bit of an obstructive force and are sometimes perceived as such. So, the more we collaborate, the more influence they have. And it can also work against us. It sounds a bit silly, but primarily, we really benefit a lot from collaboration, but it's also not the case that everyone is on the same page*" (Respondent 6).

In conclusion, the municipalities see additional collaboration for climate adaptation goals mainly at the project level, where the water authority can support them. This enables acceleration, and tasks for which municipalities lack capacity can still be carried out. There are significant differences in how capable a municipality is of implementing measures itself in terms of resources or whether an external party, such as the water authority, is needed and, therefore, desired. Another exception is the municipality of Utrecht, which would like to establish a cooperation agreement beyond the project level. The following paragraph discusses the type of interaction between both parties and how it influences collaboration.

4.3 Interactions

This section goes a step further than the institutional coordination between the organisations and examines the interactions within the collaboration discussed in the previous section. First, it addresses the current interactions, and then it discusses some desired developments regarding these interactions.

Because municipalities collaborate with the water authority on many different topics, there are numerous connections between both organisations (Interviews 1, 2, 3, 4, 5, 7, 9, 10, 11, 12). In two cases, the interaction occurs primarily through the network (Interviews 8, 12). The number of contacts municipal employees have with HDSR depends on their role. Someone with a broad function spanning multiple areas will have more connections than someone focusing on a specific theme. For example, someone responsible for sewerage in their role will have contact with HDSR for this. In contrast, someone who does not have those responsibilities will not have any contact about sewerage.

From HDSR, each subarea has an area manager who serves as a primary contact for the municipality. In seven interviews (1, 2, 5, 6, 9, 11, 12), it is indicated that there is contact with the area managers, as explained in Interview 6: "*We have regular meetings with the water authority, which occur monthly.*

These meetings include the area managers from the water authority. The topics mainly revolve around water quality and the resilience of the existing water system. Climate adaptation is rarely discussed, and I have separate contact with the people involved in climate adaptation. Often, there is little awareness of each other's activities." Respondent 2 indicates that it is an easy way of working because he has one main point of contact at HDSR, which is the area manager. However, he also indicates that the information does not automatically reach the right person within the water authority: "*So if you have someone there, you should not assume that the information that person has automatically reached the person who might practically work with it. And vice versa*" (Interview 2). As mentioned in interview 6, contact with the area managers primarily focuses on current water management. Separate channels are used for other topics, such as climate adaptation. This indicates that climate adaptation is not included in every interaction between the water authority and the municipalities. Despite the water authority's intention to collaborate on climate adaptation, not all opportunities to do so are being utilised. Additionally, within HDSR, information does not automatically reach the appropriate person, which can also result in climate adaptation being overlooked. It comes down to the fact that it is very dependent on the individual employees at HDSR and the municipality whether climate adaptation is considered important and incorporated into their work.

The fact that it depends on the individual is also evident from the observation that most interactions are informal. Regular meetings are scheduled in some municipalities with the water authority (Interview 1, 6, 9). Still, it is mostly ad hoc, personal, and project-based, as said in Interview 12: *"Then it's just a matter of giving them a call. Hey, we're encountering this issue here. How could we tackle this together*?" The mode of communication is via email or phone, and most respondents are satisfied with this mode of communication; it works well (Interviews 1, 2, 5, 9, 10, 12), as said in interview 5: "*It's actually always very constructive. Very helpful. So, if we want to know something, then it's always possible. Everyone is approachable, so to speak. So, it always goes very well.*" An explanation for why these respondents are satisfied in this manner is because they know whom to reach out to for a specific issue: "*I think I have a pretty good understanding of what HDSR does, who works there, and what expertise they have*" (Respondent 5). It was also mentioned that having many different contacts is the only way to collaborate because these are two large organisations, and the collaboration varies for each theme.

Other respondents are more critical of this approach, like respondent 11: *"We have a lot of connections with HDSR, I think. There are just many areas where we collaborate. Many points where we have ambitions together to ensure that we are not working against each other or in conflict […] There needs to be an overview of what are doing and where we can help each other.*" The difference between the more positive and critical respondents may be because the positive respondents know the employees of HDSR and, therefore, know who to contact. If you do not know the employees, for example, because you have not been with the municipality for long, it will be much more difficult to get in touch with the right person. To address this issue, he would like to have regular appointments with the water authority, for example, every month. Respondent 10 also believes that more structured appointments would be a good idea to be better informed about each other's plans and potentially coordinate them. This is not because he does not know whom to approach, but because without structured meetings, there is a risk of not being aware of each other, which he has experienced before: *"Maybe regular meetings, once or twice a year. Mainly about what's on the agenda, back and forth, and how it all fits together. That has been the intention for a long time, and we also talk to each other regularly, but maybe it needs to be more formalised […] To see what's happening in the municipality, what's happening in the water authority, and how it fits together or not, but that you know about each other's activities"* (Respondent 10).

An example of structured meetings that work well is in the municipality of Bodegraven-Reeuwijk, where both water authorities have a water consultation hour (*waterspreekuur*) with the municipality every six weeks. During this water consultation hour, project leaders from construction and redevelopment projects can schedule items for discussion and stakeholders from the municipality and water authorities can respond to those items. It works because it is practical and structured, as said by respondent 1a: "*So, I just find it very practical. And also, having a fixed structure is reassuring. Because otherwise, out of sight, out of mind. If you don't see each other, you also think about each other less. At least, that's how it works for me*." To potentially align plans and make interests clear to the other authority, it is also considered important that council members of both authorities regularly meet: "*Because it's just important that they know each other and can quickly find each other if something comes up. You need to ensure that they don't only speak to each other when something is going on and trouble, but also just when there's no trouble"* (Respondent 9). This is mentioned by respondent 10 as well, namely that the water authority's officials need to continue communicating their interests to the aldermen, so it's not just from the civil servants upward but also between the officials of different authorities: "*Climate adaptation is a process of change that also requires people, society. And behavioural change is very difficult to achieve. You can't approach it from enough angles. So, I think it would also help if it were prioritised by politicians and administrators*" (Respondent 10).

To conclude, the interactions are primarily informal and depend on the individual's ambition for climate adaptation. This can lead to missed opportunities for climate adaptation. Regular meetings would help ensure that civil service colleagues and officials know each other and stay connected while also structurally incorporating climate adaptation.

4.4 Policy Instruments

Despite municipalities generally indicating a reluctance to increase collaboration on climate adaptation, certain policy instruments that the water authority employs are helpful to the municipalities and lead to contentment among them. Additionally, the water authority is exploring how the policy instruments can be utilised even more effectively to promote climate adaptation further. This section, therefore, discusses three policy instruments that are also part of collaboration and influence collaboration.

4.4.1 Communication and Cooperation

One form of communication and cooperation is the Network Water & Climate. This is where knowledge sharing and collaboration for climate adaptation primarily occur. The goal of the network is to make the region water and climate-resilient by 2050 and to ensure its resistance to the consequences of climate change, such as flooding, drought and heat waves (Water & Klimaat, n.d.). The communication and knowledge sharing from the water authority in the network are perceived positively: "*Yes, I think they already do that very well through the network*" (Respondent 4). Respondent 8 mentions that the water authority should be a regional knowledge broker. However, all respondents feel this is already being done sufficiently: "*I think, in any case, that they could be a knowledge broker in the area, in the region. Or already are*" (Respondent 8). Another highly appreciated aspect of the network is the collaboration between municipalities: "*I also find it highly valuable to sit together with that group of municipalities*" (Respondent 7). In the network, working groups are also set up around a particular theme to work on, for example, the sustainability of industrial estates: "*It is the place for sharing what challenges we see as a municipality, what solutions are, and starting working groups*" (Respondent 10).

The municipalities that have been working on the topic of climate adaptation for a longer time need the network less for knowledge exchange: "*If you've been working on the topic for eight years, at a*

certain point it runs itself, right? Then you need that support much less" (Respondent 6). Respondent 11 mentions that if the water authority wants to expand the collaboration for climate adaption, it needs to align well with the network; there is already so much going on: "*I think it's important that it aligns well with what's happening within the network and how things are progressing with the province. There are a lot of working groups or sessions, as well as knowledge-sharing sessions on all these themes. And sometimes, it's almost hard to see the forest for the trees.*" Additionally, respondent 9 mentions that it would be useful if the Network Water & Climate would align more with the province and other regional networks. Climate adaptation has to become integrated into all policy domains. However, it now remains separated from other discussions about, for example, housing construction: "*We really should be much better at connecting these discussions*" (Respondent 9). Respondent 4 also expresses a need for connections between different themes in the public space: "*I sometimes think about the mix of different policy fields. The network focuses very well on climate adaptation, but climate adaptation is not everything, of course. When you're working in the public space, you also encounter sustainability, and you encounter a lot of other management aspects as well, I sometimes miss those connections a bit."*

The network is thus very important for the municipalities, and the water authority plays a crucial role with their expertise in the field of water. For municipalities that have been working on the topic for a longer time, participating is less interesting because they already have enough internal knowledge. There is still a gap in the connection between policy fields and other regional networks. Respondent 10 offers an additional suggestion: he would like to see a directory of employees at the municipalities and water authority: *"It's beneficial to have some understanding of each other, knowing how to approach for what*." The network would be a good place to initiate this.

4.4.2 Enforcement

The respondents were asked whether additional regulations from the water authority would aid in climate adaptation. The water authority established regulations within its management area for the physical living environment and imposed requirements on new construction and redevelopment projects. The respondents' opinions on this matter vary.

It can be challenging for municipalities to mandate climate adaptation; therefore, additional regulations from the water authority can help (Interviews 1, 7). Respondent 1a indicates: "*Yes, if it's clearly stated in the water authority regulation, then it's settled. Then we [the municipality] have less debate*." Other respondents are more critical and indicate that the water authority regulation must align with the municipal and provincial rules. It is perceived as confusing and inconvenient when the regulations of various authorities diverge: "*Project developers typically engage with municipalities. They hear the municipality's stance. Then the water authority expresses a different view. That's very inconvenient*" (Respondent 6). There are also concerns that the water authority imposes such high requirements that it becomes unfeasible for projects to proceed: "*I believe the water authority tends to push further than the municipality. However, it has to be feasible. We need to work within practical limits, especially considering our need to convince developers to build homes. Imposing excessively stringent requirements will undoubtedly complicate matters significantly*" (Respondent 3). Respondent 9 emphasises that the water authority must ensure that the requirements they set are legally well-established: "*Well, I found it complicated with Rijnenburg that higher demands were made than what was stated in the regulations of HDSR. I think if you're going to set higher standards, make sure they are also reflected in your regulations*." Respondent 4 opposes additional regulations from the water authority and believes that such matters should be addressed at the local level. Respondent 10 sees additional regulation from the water authority primarily for rural areas, as the local adaptation strategy for climate adaptation is not focused there, so the water authority could fill that gap. The difference in

opinion can be explained by the varying levels of ambition per municipality and how they have formalised it.

Thus, in general, the municipalities are not opposed to more regulations, as long as they overlap with the regulations of other authorities. When the rules are aligned with those of the province, it also prevents inconsistencies in the regulations across different water authorities in a municipality with multiple water authorities (Interview 1). The alignment of rules is seen as a significant collaborative task (Interview 9), and the municipality would like to engage in discussions with the water authority if they amend the rules (Interview 3).

4.4.3 Incentives

To collaborate with municipalities on water management in urban areas, HDSR provides municipalities with a financial impulse to stimulate their projects to realise climate-resilient areas. This is called the impulse arrangement of water in the living environment (*Impulsregeling Water in de Leefomgeving*). Every year, funds are available. The focus is on collaboration, and with this impulse arrangement, HDSR works with municipalities by discussing and financing municipal implementation measures, multi-year plans, and studies. For several municipalities, the coordination process occurs through municipal water plans and for others via the Network Water & Climate (HDSR, n.d.-c). Examples of measures for which the impulse arrangement can be used are the implementation of green parking spaces, the creation of nature-friendly riverbanks or wadis, and the separation of rainwater from wastewater (HDSR, n.d.-c).

Municipalities are allowed to submit projects for financial contributions every year. Some municipalities take full advantage of this opportunity and, as a result, can add value to their projects. However, the opinions on the impulse arrangement approach are divided. Respondent 3 is positive about the arrangement and views the contribution as an extra for their projects, which the municipality would carry out anyway: "*We just see it as a windfall. Yes, we had already reserved that money for those measures. Then we can simply do more later. Maybe additional measures*." Respondent 1b mentioned that he also finds it a pleasant and practical scheme, appreciating that preparatory costs can be included. However, he does not make much use of it because he does not have many projects within the HDSR area. Respondent 12 mentions that the impulse arrangement is a great way to encourage municipalities further: "*It can something provide that extra push, like, hey, take those climate-adaptive measures. And then you'll also get some funding from us. So, that's definitely a very nice aspect."*

Utrecht and Nieuwegein appreciate the impulse arrangement, particularly for water quality. However, they indicate they do not need the money for climate adaptation because they already generate enough funds for it: "*It's great that it exists, but if you don't need it yourself, then it doesn't really matter*" (Respondent 6). Despite Utrecht not necessarily needing it, the respondent indicates that they would appreciate proactively working together rather than HDSR reviewing plans reactively. The respondent does indicate that for initiatives coming from society, impulse arrangement is a significant contribution because otherwise, those projects would not be able to proceed: *"Where I do see the added value of the impulse arrangement at the moment is with initiatives that arise where we as a municipality don't really have a programme for. In such cases, it helps enormously if other parties are willing to invest to get such a project off the ground. All those little bits together are often just enough to make these kinds of projects happen*" (Respondent 9). Examples are schools that want to green their playground or residents that want to implement water and greening measures.

In addition to Utrecht's desire to proactively collaborate on setting an agenda, more respondents have remarked about the impulse arrangement process (Interviews 2, 4, 7, 11, 12). On the one hand,

because municipalities sometimes do not know yet which projects they will execute and still need to submit them much earlier to secure funding: "*I think it would really help if it were a multi-year programme. Then you could also organise it more structurally. Right now, it's incidental money. So, I have to figure out by the end of May what I want to do in 2025 and then apply for it. Then the question arises again: How much money will I get? I often hear about it somewhere in the fall. And then I still have to quickly arrange everything to make it happen*" (Respondent 12). In Woerden, HDSR co-finances the construction of culverts, and the respondent also believes that a multi-year collaboration would be more efficient because if you have to wait each time before a new project can be applied for, you miss out on opportunities (Respondent 11). On the other hand, some see the application process as disproportionate to the amount received (Interview 2, 4): "*If it's a small amount, like 10,000 euros or less, then it's not proportional to the amount of time and energy I have to invest in it myself. Then it actually costs us as a municipality more money to apply for it*" (Respondent 4). Respondent 2 mentions that despite it being a relatively small amount, it still needs to go through the municipal council, and that takes time: "*Especially with those kinds of preparations, which are relatively burdensome compared to the amount involved, then I can certainly imagine that you wouldn't do that for just one year, but rather extend it for a slightly longer period.*"

Finally, some respondents lack the internal capacity to apply for and work with the financing (Interviews 5, 7, 8). For the impulse arrangement, you can get funding for half of the total project amount, and the municipality itself must pay the other half. Respondents 7 and 8 indicate that this is a problem: "*Often it's the case that they reimburse 50%, and then you still have to put in 50% yourself. Well, in my case, there are actually 0 euros. So yeah, then you can't put in that 50% yourself either*" (Respondent 7). Respondent 5 indicates that he can apply for financing. However, no one within the municipality can take on the project, so applying for the subsidy does not make sense.

Thus, the municipalities could be divided into three levels. First, some municipalities already implement climate adaptation measures and can achieve additional benefits with the impulse arrangement but are not dependent on it. These municipalities receive the most funding because they can apply for it and know which projects they will execute in the coming years. Second, there are the municipalities for which the impulse arrangement is a welcome contribution, enabling measures that would otherwise not be possible. However, it takes time and effort, so it is not always applied. Finally, some municipalities lack the capacity and budget to apply for the impulse arrangement in the first place. These are, again, the smaller municipalities with little to no capacity for climate adaptation.

4.5 Reflection from the Water Authority

The HDSR climate adaptation programme team members reflected upon the research outcomes and their views on collaboration. They indicate that HDSR would like to collaborate more with the municipalities for two reasons. Firstly, for substantive reasons, due to the water system in and around the city. The measures taken by the municipalities impact the water system, which is the responsibility of the water authority. They also see bottlenecks. Therefore, they would like to find common ground with what the municipality does and approach the tasks more integrally. Secondly, it was discussed in the coalition agreement that HDSR wants to move from yearly impulse arrangements to a multi-year collaboration. However, what this means and how it can be implemented is still being explored.

They primarily see the water authority's role in the urban area as a collaborative partner, contributing where necessary. The water authority also has tasks in the urban areas, which intersect. Therefore, it starts by bringing together the public space and the water system and then determining who does what. This is because a water system approach is important; what you change in water management in one place affects another, so you need to consider the system and measures collectively.

Additionally, the water authority can outline the bigger picture spatially (the city is just a small spot on the map) and temporally, using scenarios. It depends on what the municipality does and which substantive role HDSR takes. However, the current situation is that if the municipalities do not invest anything, you cannot jointly tackle anything either. This leads to the situation where collaboration is primarily with municipalities with their own climate adaptation plans.

They find it logical for the municipality to implement measures because it is their responsibility. However, if there are potential gains to be made, then HDSR might intervene. Also, from a concern that if municipalities do not implement climate adaptation measures, the goals for climate resilience will not be achieved. Thus, it is fine if municipalities manage it themselves; otherwise, HDSR and the municipalities can also try to find solutions together. Therefore, the collaboration aims primarily to prevent municipalities from making mistakes or missing opportunities in the domain of climate adaptation/water. If smaller municipalities lack the capacity to address the issue, HDSR can step in to provide support and facilitation. This works best on the initiative of the municipalities, but they could also proactively raise the issue themselves. Also, they would like to allocate their resources to prevent as much damage as possible, which is often in urban areas. However, if this support is not accepted, further action becomes impractical.

How HDSR can assist smaller municipalities remains difficult, primarily because the current impulse arrangement requires municipalities to contribute half of the finances. Capacity constraints within these municipalities also pose significant obstacles. Changing the impulse arrangement may imply that other, larger municipalities receive fewer contributions. Regarding capacity, HDSR or the network could play a role by, for instance, detaching someone. They could also contribute to green measures in the impulse arrangement, which are currently challenging for municipalities to secure funding for. Another option is to intensify contact with these municipalities and make it more personal by having a single point of contact from HDSR. So that both organisations get to know each other better and can align earlier on challenges and solutions.

From this reflection, it is evident that the water authority is eager to collaborate with municipalities. However, their primary focus seems to be solving the water problem rather than fostering collaboration itself because they are concerned that municipalities might otherwise mismanage the issue. Consequently, the water authority is increasingly positioning itself as a higher level of government compared to municipalities in the field of climate adaptation, despite both being executive authorities. These changing government roles create tensions, leading to remaining questions about how the collaboration should evolve.

5. Conclusion and Discussion

This thesis's research question is: How can water authorities and municipalities collaborate to stimulate climate adaptation mainstreaming? To answer this question, desk research is conducted by explorative interviews with the water authorities' employees and by studying municipal documents on climate adaptation and water and sewerage plans. The primary data collection source was expert interviews with municipal employees working in climate adaptation, public space, water and sewerage. Finally, a reflective session was organised with water authorities' employees working on climate adaptation. In this chapter, the sub-questions are answers, and a discussion of the results will be provided. In the discussion, the results are linked to the literature, the theoretical and social implications are discussed, and the limitations of the research are discussed.

5.1 Conclusion

Five sub-questions have been formulated to answer the main question. The first sub-question is: *How do municipalities approach climate adaptation?* The desk research and interviews show that the mainstreaming approach to climate adaptation is the most commonly chosen strategy by the municipalities. Depending on the budget, this is done on a large or small scale; innovative solutions are sought that do not cost as much. Depending on the municipality, additional measures are implemented, which can be seen as a dedicated approach to climate adaptation. This is mainly done by medium-sized and large municipalities, which have prioritised and allocated budgets for climate adaptation. Smaller municipalities indicate that there is little capacity in budget and workforce to make significant progress in climate adaptation. Additionally, the funds allocated for water management are relatively secure, even with the upcoming government budget cuts in 2026, because the revenue from sewerage charges is generally well-organised. Green spaces and heat management costs are more at risk, as municipalities do not have dedicated income streams for these areas.

The second sub-question is: *What is the institutional coordination between a water authority and municipalities for climate adaptation mainstreaming?* To answer this question, respondents were asked about the current state of collaboration during the interview. From this, it appears municipalities collaborate with the water authority on many fronts, including climate adaptation. However, there is no collaboration dedicated explicitly to climate adaptation. This suggests that the collaboration primarily focuses on climate adaptation mainstreaming. For example, discussions revolve around making the sewer system climate-adaptive or incorporating climate adaption in reconstruction or new construction projects. The specific collaboration for climate adaptation occurs within the Network Water & Climate. The water authority hosts this network, but there is also a strong emphasis on cooperation between the municipalities. This mode of collaboration is considered sufficient. Nonetheless, the municipalities see value in additional support from the water authority, particularly in funding and expertise, with expertise being the most commonly mentioned. Municipalities with well-developed climate adaptation plans need less knowledge support and already have budgets. Conversely, other, smaller municipalities heavily look to the water authority for expertise and capacity because they lack it internally.

The third sub-question is: *What are the formal and informal stakeholder interactions between a water authority and municipalities for climate adaptation mainstreaming?* There are some formal interactions when a municipality must involve the water authority. However, for climate adaptation, it mainly involves informal interactions, and the extent to which it is incorporated depends on the person. It is a matter of contacting each other via email or phone when you have questions or need to coordinate something. Some respondents have many different connections, while others have fewer, depending on their role and years of experience. Respondents with many connections rate this as a

positive, inevitable approach. Reaching the right people for a particular issue can be challenging for others who do not have these connections. This informal way of working also results in missed opportunities for climate adaptation, as the amount of attention given to it depends on the individual. In cases where there is structured, regular contact with the water authority, it is positively assessed. This helps them stay informed about each other, not overlook each other, and assist each other where necessary.

The fourth sub-question is: *Which policy instruments are employed in the collaboration?* The policy instruments were categorised into three categories: communication and cooperation, enforcement and incentives (Ten Brinke et al., 2022). For the category communication and cooperation, this happens through the Network Water & Climate. The respondents are highly satisfied with the knowledge-sharing from the water authority through the network. Municipalities with limited internal knowledge make full use of this. Regarding enforcement, the respondents were asked if they saw value in the water authority implementing additional regulations for climate adaptation. The main takeaway is that these regulations should align with municipal and provincial regulations because otherwise, it would be difficult to work, and different things would be said to project developers from various sides. Finally, for incentives, the water authority has an impulse arrangement, which municipalities can request to cover half of the costs of their climate adaptation projects. Larger municipalities that actively engage in climate adaptation make the most use of the impulse arrangement but are least dependent on it to implement measures. For the average municipality, it can ensure the continuation of a project, but the application takes time and effort. Small municipalities with little or no budget for climate adaptation hardly use the impulse arrangement because they cannot afford the other half themselves.

The fifth sub-question is: *How do municipalities envision the ideal collaboration with the water authority?* The municipalities are generally satisfied with the current collaboration with the water authority. They are not looking for more collaboration but indicate that the water authority can further support them with knowledge and funds on a project basis. The downside is that more collaboration can also lead to conflicts if the interests diverge. Additionally, municipalities indicate that the responsibility for climate adaptation in the urban area is theirs and that the water authority should not have more say in it. The overall response is that if the municipality wants more support, it is up to them to indicate that. However, the water authority may take the lead in the field of water within its own responsibilities, for example, by raising issues or communicating what the future water system should look like. Municipalities generally do not have a clear overview of their plans for the coming years. Therefore, most respondents indicate that (more) structural, regular contact would be good to see if there are opportunities for collaboration or at least to prevent working alongside each other.

The main question is: *How can water authorities and municipalities collaborate to stimulate climate adaptation mainstreaming?* Due to climate change and other societal challenges, increasing integrated approaches from both the public space (municipality) and the water system (water authority) are necessary. Consequently, water authorities' roles are in transition. They are increasingly involved early on and taking a proactive stance. Additionally, they have shifted from neutral and objective to opinionated and agenda-driven. Because they see challenges ahead, they want to collaborate with municipalities to ensure the implementation of appropriate measures. However, this remains ambiguous, as municipalities generally perceive the current level of collaboration as sufficient. They see the implementation of measures as their responsibility and sometimes feel that the water authority oversteps its jurisdiction or that of the provinces. Thus, a certain tension between the two executive authorities remains unresolved, leading to ambiguity regarding how the collaboration should be structured.

However, there are also similarities in how the collaboration should develop; municipalities recognise the added value of the water authority due to their expertise in water management and their understanding of the broader picture of the water system. The water authority also believes it can contribute to this by knowledge sharing. Additionally, smaller municipalities, due to limited capacity and budgets, often look to the water authority for support at the project level. The water authority is eager to assist but is still figuring out the best way to do so, as currently, larger municipalities receive the most funding. This calls for a change in the current approach. Both authorities also indicate that more regular contact can help them align better and collaborate more effectively. This contact can be made more formal to ensure commitment, but relying more on formal modes of interaction can also hinder collaboration. Therefore, it is essential to carefully balance more targeted informal collaboration and increased formalisation to ensure future collaboration.

5.2 Discussion

The theoretical framework started by explaining the difference between the dedicated and mainstreaming approaches to climate adaptation (Uittenbroek, 2014). From the interviews, it appears that climate adaptation in municipalities is mainly executed using the mainstreaming approach, complemented by some measures that can be categorised under the dedicated approach. This mostly happens by linking climate adaptation to renovation and major maintenance. The extent to which climate adaptation is implemented in a municipality, which depends on capacity and budget, largely determines how the municipality views the role of the water authority. Municipalities that have this well-established expect less from the water authority. Municipalities for whom this is a challenge see a more significant role for the water authority, especially regarding knowledge sharing and capacity.

The process of mainstreaming climate adaptation between the water authority and municipalities was divided into policy integration, multi-level governance, and formal/informal stakeholder interactions (see the conceptual model, figure 2.4). When looking at the pyramid of policy integration (Meijer & Stead, 2004), it can be concluded that there is now mainly cooperation, the bottom layer, in which parties work together to achieve their own sectoral goals. Most respondents would like to see this move towards coordination so that greater efficiency can be achieved. Only the largest municipality, Utrecht, would like to see policy integration by jointly drawing up a policy with goals, tasks and an implementation programme. This difference can be explained by Utrecht's capacity to look towards the long term or by the fact that combining many projects into one programme is more efficient. Other municipalities also indicate that there is not necessarily a joint task and that the work in the urban area lies with the municipality. This also makes it unnecessary to establish an integrated policy.

Looking at Wamsler and Pauleit's (2016) mainstreaming strategies, this collaboration primarily involves inter-organisational mainstreaming, i.e. cooperation and networking between different parties to share knowledge and a common understanding of the issue. This happens through the Network Water & Climate. The specific collaboration for climate adaptation, in the form of knowledge sharing, thus goes through this network and not directly. This is received positively by the municipalities. There is also, to a lesser extent, regulatory and directed mainstreaming. Literature shows an implementation gap that arises from insufficient regulatory and directed mainstreaming, meaning that it is more often initiated by local governments than pushed by higher-level authorities (Runhaar et al., 2018). However, this research shows that municipalities feel that the collaboration with the water authority is already sufficient and do not expect more from the water authority. Some municipalities even believe that the water authority is intruding too much on the municipality’s responsibilities in the urban areas, which is undesirable. More regulatory mainstreaming, in the form of more regulations from the water authority, is not desirable or should at least align with the regulations from other government bodies. Thus, regarding regulation, the focus is primarily on the province and national government. This study

demonstrates that it can lead to more resistance if the water authority assumes too much authority resembling that of a higher government level. This can result in additional friction between the two executive authorities rather than fostering improved collaboration.

The water authority can, however, provide additional support through directed mainstreaming by offering extra subsidies, initiating projects, or making capacity available. This should primarily be aimed at municipalities that lack the internal capacity to implement climate adaptation measures. Larger municipalities, which currently use programmes like the impulse arrangement, do not need this support to carry out their projects. An additional observation is that the water authority can primarily support climate adaptation measures related to water. At the same time, municipalities often have their own funding well-arranged for this through the sewerage charge. It is more challenging to allocate budgets for measures related to greenery and heat stress, and municipalities can turn to the water authority to a lesser extent for these. This indicates that green spaces are considered for mitigating heat stress, but water (blue spaces) is not yet considered, despite their potential to provide cooling effects (Zeeshan & Ali, 2023). Given that this is related to water management, the water authority could play a role in contributing to these efforts. This way, the heat theme can also be approached more integrally, focusing on greenery and water.

The interactions between both parties also influence the process. The interviews show that these interactions are primarily informal. The advantage of this communication is that you can quickly find each other, ask questions, and coordinate something. The disadvantage is that it is very person-dependent; you might not know whom to contact, and you can forget about each other. As also described in the literature, more formal interactions can help counteract these disadvantages and thus promote commitment to each other (Van Poperink-Verkerk & van Buuren, 2016). However, more formalisation of contacts does not always automatically lead to improved collaboration. It can even provoke a counter-reaction, meaning that collaboration can be hindered rather than strengthened. For instance, when the municipality perceives the water authority excessively encroaches on the municipality or province's jurisdiction. This study also highlights the role of individuals in climate adaptation mainstreaming, who can be referred to as policy entrepreneurs. They are actively involved in promoting or implementing specific policy initiatives. The extent to which climate adaptation is integrated depends on these policy entrepreneurs, both at the water authority and municipalities, since the contact between both is very informal and personal.

The introduction described the changing role of water authorities, from reactive to proactive. Both the water authority and municipalities are executive authorities, and due to climate change, there is increasing overlap in their tasks, affecting their collaboration. Van den Ende et al. (2022) described in their research that there is ambiguity regarding the responsibilities surrounding the implementation of climate adaptation. Therefore, this study has examined the role of the water authority and its relationship with municipalities, which has not been studied before. This research shows that neither authority has fully resolved this issue and that there are consistently conflicting opinions about who should do what. Thus, there is no clear answer to how responsibilities should be divided. However, findings have been made on how the collaboration between the water authority and municipalities can further develop to overcome the implementation barriers for adaptation mainstreaming increasingly.

5.3 Suggestions for Future Research

The research has shown that collaboration with the municipality depends on the municipality (size, capacity, ambition) and the individuals involved. The contact is mainly informal; consequently, the collaboration is primarily determined by actors' actions rather than established structures. Therefore,

the first suggestion for further research is a single case study within one municipality, in which the actual collaboration is analysed. This allows for studying how the collaboration actually functions rather than relying on the perspective of municipal employees per municipality. To do this, all connections between both organisations will be mapped out to examine how the contact unfolds and which strategies are used to implement climate adaptation. Here, a policy entrepreneurship perspective could also be adopted. Policy entrepreneurs are actors who promote and drive policy change and, in this case, have a crucial role in implementing climate adaptation policies. They employ specific strategies to achieve their goals, and studying these strategies can provide valuable insights into how to promote climate adaptation further (Petridou & Mintrom, 2021). Thus, this entails an actor approach and can, for instance, be carried out through participant observation or "fly on the wall" techniques.

The second suggestion is to conduct a sentiment analysis with the transcripts of this research. This analysis examines whether people have a positive, negative, or neutral stance on an issue. This method would be an addition because it goes beyond surface-level responses and uncovers respondents' underlying emotions and attitudes. It helps identify the overall tone and sentiment of the respondents (positive, negative, or neutral), which might not be immediately apparent through coding alone.

The final suggestion is to include other actors contributing to the collaboration for climate adaptation in the research, like the province and national government. The water authority and municipality are just two actors in the multi-level governance, and it was indicated during the interviews that the province and, to a lesser extent, the national government also play significant roles. Thus, these governments should also be included to provide a more comprehensive understanding of the issue.

5.4 Policy Implications

Several policy recommendations are proposed to enhance the collaboration between the water authority and municipalities. Firstly, additional research into the distinct responsibilities of both the water authority and municipalities is necessary to mitigate potential conflicts that could impede project implementation. This can be done through further discussions between both authorities and seeking areas where reinforcement is possible rather than hindering each other. HDSR can enhance its role as a water expert by actively communicating its vision for the future water system and providing advisory support to municipalities, particularly on underrepresented climate adaptation issues. Secondly, establishing regular structured communication between HDSR and municipalities is essential for exploring collaboration opportunities and informing each other of developments and plans. Fixed appointments should be scheduled to facilitate this exchange, considering that multi-year plans are often not well-known or subject to change; thus, only exchanging that information is less effective. Implementing concrete tools such as a directory listing individuals responsible for specific topics can improve contact between both organisations. Additionally, integrating climate adaptation as an integral part of all topics and workflows within both organisations is crucial to ensure its effective incorporation. Furthermore, revising the current impulse arrangement to accommodate municipalities without dedicated budgets for climate adaptation is necessary to ensure equitable project initiation. Implementing financial multi-year collaborations on a project basis can help transition some municipalities from ad hoc to more structural climate adaptation measures. Lastly, the Network Water & Climate could broaden its focus to encompass synergies with other challenges like housing and energy transition while strengthening ties with regional collaborations to integrate climate adaptation into all activities truly.

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Appendix A. Interview Guide

Introduction

- Introducing the interviewer and the research
- Explaining the interview setup
- Requesting permission to record

Middle section

1. Interviewee Information
    - Municipality, position, responsibilities.

2. Climate Adaptation/policy synergies
    - What does CA mean for your municipality and how are you addressing it concretely?
    - The upcoming questions are about policy synergies, do you understand what this entails?
    - To what extent is CA considered as a policy synergy in long-term plans?
    - In what areas is this happening/not happening?
    - How do you believe this aligns with the goals of the water authority?

3. Institutional Coordination
    - How is the collaboration with HDSR for CA currently progressing?
    - To what extent is a multi-year collaboration for CA with HDSR desired? And why?
    - If yes, how can the multi-year collaboration with HDSR be strengthened?

4. Formal and Informal Stakeholder Interactions
    - In what ways do you currently interact with HDSR? Through which channels?
    - Do you believe the manner of communication/type of interaction/frequency has an impact on the collaboration?

5. Policy Instruments
    - What should HDSR do to promote collaboration for CA (expectations)? And why?
    - What is the added value for the municipality by collaborating with HDSR?
    - To what extent does the municipality need collaboration with HDSR for climate adaptation?

Closing question (ask if needed):

- Could you, in a few sentences, summarise how you believe the collaboration between the municipalities and HDSR for climate adaptation could be improved, and what is required for that improvement, both from the municipality and HDSR?

Closing

- Any remaining remarks or questions that have not been discussed?
- Thank you.

Appendix B. Documents

Municipality	Document GRP/WRP	Reference
Bodegraven-Reeuwijk	Gemeentelijk Rioleringsplan 2022-20251	Gemeente Bodegraven-Reeuwijk (2021). *Gemeentelijk Rioleringsplan Bodegraven-Reeuwijk 2022-2025*. https://repository.officiele-overheidspublicaties.nl/externebijlagen/exb-2022-605/1/bijlage/exb-2022-605.pdf
Bunnik	Programma Water & Riolering 2024-2028	Gemeente Bunnik (2023). *Programma Water & Riolering Bunnik 2024-2028.* https://bunnik.bestuurlijkeinformatie.nl/Agenda/Document/bb00b0a3-a5bf-47d3-94b9-c7a024d2f426?documentId=be96788a-c172-4279-9a56-a35345306ea7&agendaItemId=7343fa1c-fd82-4a92-bdee-27fbb0e6e8b0
Houten	Water en rioleringsplan 2024-2027	Gemeente Houten (2023). *Water en rioleringsplan 2024-2027*. https://houten.bestuurlijkeinformatie.nl/Agenda/Document/baa8783c-10b8-4dce-8f15-467c28ddeada?documentId=f3311e64-80a9-4707-9a0a-0df58cbf7db9&agendaItemId=7be40628-cbe4-4092-8284-326d84630092
IJsselstein		
Montfoort		
Nieuwegein	Gemeentelijk Rioleringsplan 2024-2027	Gemeente Nieuwegein (2023). *Gemeentelijk Rioleringsplan 2024-2027.* https://www.nieuwegein.nl/fileadmin/gemeente_nieuwegein/Nieuws/2023/12-december/GRP_Nieuwegein_2024-2027_DT.pdf
Oudewater	Gemeentelijk Waterbeleidsplan 2020-2024	Gemeente Oudewater (2019). *Ambitieus en schoon: Gemeentelijk Waterbeleidsplan 2020-2024.* https://gemeenteraad.oudewater.nl/Vergaderingen/Gemeenteraad/2019/11-juli/16:00/raadsvoorstel-gemeentelijk-waterbeleidsplan-2020-2024-bijlage-2-gemeentelijk-waterbeleidsplan-2020-2024-2.pdf
Rhenen	Water Riool Plan gemeente Rhenen 2023-2027	Gemeente Rhenen (2022). *Water Riool Plan gemeente Rhenen 2023-2027*. https://rhenen.raadsinformatie.nl/document/11757337/1#search=%22Waterrioolplan%202023-2027%22
Stichtse Vecht	Gemeentelijk Rioleringsplan 2022-2026	Gemeente Stichtse Vecht (2022). *Gemeentelijk Rioleringsplan Stichtse Vecht 2022-2026*. https://raadsinformatie.stichtsevecht.nl/Vergaderingen/Raad/2022/08-maart/19:30/1-Gemeentelijk-Rioleringsplan-Stichtse-Vecht-2022-2026-aangepast-nav-cie-Fysiek-Domein-8-2-2022.pdf
Utrecht	Programma water en riolering 2024-2028	Gemeente Utrecht (2023). *Programma water en riolering Utrecht 2024-2028.* https://utrecht.bestuurlijkeinformatie.nl/Agenda/Document/9c5e952d-8bc4-4a61-a75e-44d4629c5949?documentId=1c9a5619-c52f-4d72-880d-9b9ede8b4112&agendaItemId=57bcee59-4684-4b9c-b1ec-858388209343
Wijk bij Duurstede	Water- en rioleringsplan 2020-2024	Gemeente Wijk bij Duurstede (2019). *Water- en rioleringsplan 2020-2024.* https://repository.officiele-overheidspublicaties.nl/externebijlagen/exb-2019-62908/1/bijlage/exb-2019-62908.pdf
Woerden	Beleidsplan gemeentelijk water en klimaatbestendig 2023-2027	Gemeente Woerden (2022). *Beleidsplan gemeentelijk water en klimaatbestendig 2023-2027*. https://www.woerden.nl/Klimaat/Klimaatbestendig_beleid
Zeist	Verbreed Gemeentelijk Rioleringsplan 2022-2024	Gemeente Zeist (2021). *Verbreed Gemeentelijk Rioleringsplan Zeist 2022-2026.* https://zeist.notubiz.nl/document/10712705/1/01-21RV066+Bijlage+1+Verbreed+Gemeentelijk+Rioleringsplan+2022-2026

Municipality	Document climate vision	Reference
Bodegraven-Reeuwijk	Klimaatadaptatie strategie en scenario's	Gemeente Bodegraven-Reeuwijk (2020). *Klimaatadaptatiestrategie en scenario's.* https://www.bodegraven-reeuwijk.nl/klimaatadaptatie
Bunnik		
Houten	Klimaatadaptatie plan Houten 2022-2027	Gemeente Houten (2021). *Klimaatadaptatieplan Houten 2022-2027*. https://www.houten.nl/fileadmin/user_upload/Thema/Groen__water_en_duurzaamheid/Klimaatverandering/Klimaatadaptatieplan_Houten_2022-2027_def__december_2022_.pdf
IJsselstein	Klimaatadaptatie Visie en Uitvoeringsprogramma 2023-2028	Gemeente IJsselstein (2023). *Klimaatadaptatie Visie Uitvoeringsprogramma 2023-2028*. https://ijsselstein.raadsinformatie.nl/document/13358398/1/Bijlage+1+-+Visie+en+uitvoeringsprogramma+Klimaatadaptatie+IJsselstein+2023-2028___133336__
Montfoort		
Nieuwegein	Omgevingsprogramma Klimaatadaptatie 2023-2026	Gemeente Nieuwegein (2023). *Omgevingsprogramma Klimaatadaptatie 2023-2026.* https://www.nieuwegein.nl/fileadmin/gemeente_nieuwegein/Wonen_en_leefomgeving/Duurzaamheid/Omgevingsprogramma-Klimaatadaptatie-2023.pdf
Oudewater	Beleid Klimaatbestendig Oudewater 2050	Gemeente Oudewater (2021). *Beleid Klimaatbestendig Oudewater 2050.* https://indd.adobe.com/view/5e645b76-ecc5-443b-91c2-1ec0dd77fd51
Rhenen	Beleidsplan Ruimtelijke Adaptatie 2022-2027	Gemeente Rhenen (n.d.). *Beleidsplan Ruimtelijke Adaptatie 2022-2027*. https://rhenen.raadsinformatie.nl/document/10776716/2#search=%22Beleidsplan%20Ruimtelijke%20%20Adaptatie%202022%20%202027%22
Stichtse Vecht		
Utrecht	Visie Klimaatadaptatie Utrecht	Gemeente Utrecht (2022). *Visie Klimaatadaptatie Utrecht*. https://utrecht.bestuurlijkeinformatie.nl/Agenda/Document/ebb7f1bd-9bf4-4352-81e0-5427789933d1?documentId=8d32abf9-1f7f-4b2c-a60d-fa7008a85e77&agendaItemId=d20aa079-76be-47c9-b6eb-8aead379abff
Wijk bij Duurstede		
Woerden	Beleidsplan gemeentelijk water en klimaatbestendig 2023-2027	Gemeente Woerden (2022). *Beleidsplan gemeentelijk water en klimaatbestendig 2023-2027*. https://www.woerden.nl/Klimaat/Klimaatbestendig_beleid
Zeist	Klimaatbestendig Zeist	Gemeente Zeist (2021). *Klimaatbestendig Zeist*. https://www.zeist.nl/fileadmin/bestanden/Open_gemeenten_nieuwe_bestandenboom/Afval__groen_en_water/Water/Klimaatbestendig_gemeente_Zeist.pdf

Appendix C. Coding Scheme