



The challenge of keeping dry feet in Limburg

A policy arrangement analysis of the
municipal approach to pluvial
flooding

Pleun Weijers

Master's thesis for the
Environment and Society Studies Program

Nijmegen School of Management

Radboud University

June 2020

Colophon

Title:	The challenge of keeping dry feet in Limburg: A policy arrangement analysis of the municipal approach to pluvial flooding
Author:	Pleun Weijers
Student number:	s4419472
Institution:	Radboud University
Thesis supervisor:	Dr. M. Kaufmann
Internship supervisor:	G. van Melick
Location:	Nijmegen
Date:	June 2020

Master's thesis in completion of the Master's program in Environment and Society Studies, Department of Geography, Planning and Environment at Radboud University Nijmegen.

This research project was carried out at Waterschap Limburg in Roermond, The Netherlands.



Radboud University



Summary

Pluvial flooding forms an increasingly large problem for cities and towns in the Netherlands. As climate change is putting pressure on urban water systems, the need for climate adaptive, collaborative approaches to pluvial flood risk management is acknowledged by academics as well as policy makers. In this context, municipalities play an important role due to their legal responsibility to manage urban waste and storm water. However, despite growing ambitions, many municipalities still seem to experience difficulty implementing more adaptive, collaborative measures in practice. To understand why this is the case, in-depth research on municipal pluvial flood risk management is needed.

Focusing on the Dutch province of Limburg, this research explores how municipalities currently address pluvial flooding and what factors account for differences between them. The municipal approach is mapped by looking at the measures pursued and the extent to which pluvial flood risk management is anchored in the municipal organization. Assuming that this approach is shaped by an institutional context, the Policy Arrangements Approach (Arts & van Tatenhove, 2004) is used to identify and explore links between four contextual dimensions (rules, actors, resources and discourses) and aspects of the municipal approach. To allow for in-depth analysis and comparison, a comparative case study is conducted on four municipalities in Limburg. Data was retrieved by analyzing local and regional policy documents and observing a small number of relevant events. In addition, 22 interviews took place with municipal officials as well as employees of the regional water authority, the latter playing a significant role in municipal pluvial flood risk management in Limburg.

The main conclusion of this research is that Limburg municipalities pursue ambitious policy goals towards collaborative, adaptive pluvial flood risk management, realizing significant measures in this direction. However, pluvial flooding is still predominantly addressed in the traditional context of waste water management. In general, technical measures are integrated well into municipal policy, organization and practical implementation, whereas municipalities seem more hesitant to introduce adaptive, non-technical measures on a large scale. Another important conclusion is that several highly relevant definitions and norms lack concrete descriptions in policy documents, hampering smooth and efficient (collaborative) pluvial flood risk management.

That being said, there are notable differences between municipalities regarding the extent to which more adaptive, integrated measures are realized. A number of factors are strongly related to these differences, such as the size of the municipality, geographical characteristics, and the level of external cooperation. However, identified links are often heavily intertwined with phenomena in other dimensions, making it difficult to claim direct relations. All in all, further research is needed to disentangle this interrelatedness and, in more practical terms, to explore how the barriers municipalities still experience regarding adaptive, collaborative pluvial flood risk management can be addressed.

Preface

Nijmegen, June 7, 2020

Although pluvial flooding is a term unknown to many people, almost everyone in the Netherlands has seen flooded streets (or worse) after heavy thunderstorms. Climate change and continuing urban development are putting more and more pressure on urban water systems, increasing the risk and impacts of pluvial flooding. Believing in the need for more sustainable ways of pluvial flood risk management, I saw a great topic for my master's thesis in the way municipalities deal with this challenge.

Carrying out large parts of my research at the regional water authority in Roermond, this project has certainly opened my eyes to the many aspects of adaptive local water management, as well as the (small) ways in which every member of society can contribute to it. Setting foot in a complicated web of organizations, laws, policies, stakeholders and ideals, I discovered how much effort municipalities in Limburg already put in finding innovative ways to address pluvial flooding, which sets great hope for a climate-proof urban future.

However, municipalities cannot be expected to have all pluvial flooding issues solved by tomorrow. Next to climate change, they are currently faced with many other societal and organizational issues that require their attention. In addition, municipalities are dependent on the behavior of citizens and private stakeholders, a policy domain in which a lot is to yet be achieved. All in all, a shift towards more adaptive, integrated pluvial flood risk management will most likely take years, or even decades. With this thesis, I hope to make a modest contribution to solutions for the challenges that still lie ahead.

This thesis also marks the end of my academic education at Radboud University (at least for now). Besides gaining a lot of knowledge, this project also formed a great personal challenge. One step at the time, I discovered how to deal with the hurdles that came with my first 'real' research project. In the end, I am as happy with the lessons I learned from these challenges as I am with the end product. That being said, I need to thank my supervisor Maria Kaufmann for her guidance and my parents for their unconditional support, as without them I probably would not have made it this far.

Table of contents

Summary.....	3
Preface.....	4
List of figures and tables	7
1. Introduction	8
1.1. Research problem.....	9
1.2. Research aims and research questions	10
1.3. Societal relevance of the research.....	11
1.4. Scientific relevance of the research	11
1.5. Reading guide	12
2. Literature review	13
2.1. Flood risk and the definition of pluvial flooding.....	13
2.2. Measures to tackle pluvial flooding	14
2.3. Legal framework and division of responsibility.....	15
2.4. Trends in Dutch pluvial flood risk management	16
3. Theoretical framework	18
3.1. Theoretical approaches to municipal policy analysis	18
3.2. Defining the municipal approach.....	21
3.2.1. Measures	21
3.2.2. Anchoring.....	21
3.3. Mapping the institutional context	23
3.3.1. Policy Arrangements Approach	23
3.3.2. Framing.....	25
3.4. Operationalization of theoretical concepts	26
3.5. Conceptual model.....	28
4. Methodology	30
4.1. Philosophical assumptions	30
4.2. Research strategy	31
4.3. Case selection	31
4.4. Research methods and data collection.....	33
4.5. Data analysis	36
4.6. Validity, reliability and research ethics	36
5. Case study results	38
5.1. Overview of general policy arrangement.....	38
5.1.1. Rules, actors, resources and discourses in Limburg.....	38

5.1.2.	Frames present at the regional water authority	40
5.2.	General characteristics of the case studies.....	42
5.3.	Case study 1: Meerssen	43
5.3.1.	Measures and level of anchoring.....	43
5.3.2.	Policy arrangement of Meerssen	45
5.3.3.	Case study conclusion.....	50
5.4.	Case study 2: Peel en Maas.....	51
5.4.1.	Measures and anchoring	51
5.4.2.	Policy arrangement of Peel en Maas	53
5.4.3.	Case study conclusion.....	58
5.5.	Case study 3: Sittard-Geleen.....	59
5.5.1.	Measures and anchoring	59
5.5.2.	Policy arrangement of Sittard-Geleen	61
5.5.3.	Case study conclusion.....	67
5.6.	Case study 4: Valkenburg.....	68
5.6.1.	Measures and anchoring	68
5.6.2.	Policy arrangement of Valkenburg.....	70
5.6.3.	Case study conclusion.....	75
6.	Conclusion	77
6.1.	Comparison and discussion of results.....	77
6.2.	Answering the main research question	83
6.3.	Reflections and limitations.....	85
6.4.	Recommendations for further research	87
6.5.	Policy recommendations	87
7.	References	90
Annexes		97

List of figures and tables

Figures

Figure 1: The policy arrangement tetrahedron as presented in Arts et al. (2007).....	25
Figure 2: Conceptual model.....	29
Figure 3: Scheme of the regional cooperative structure in Limburg (Waterpanel Noord, 2018).	39
Figure 4: Images of pluvial flooding in Meerssen, Valkenburg, Sittard-Geleen and Peel en Maas (clockwise).	43
Figure 5: Time path illustration for the Kwistbeek redevelopment project (Heuts, 2019).	52

Tables

Table 1: Categories and examples of measures pursued by municipalities.	21
Table 2: Operationalization table of the concept of anchoring.	27
Table 3: Operationalization table of the policy arrangement dimensions.	28
Table 4: Overview of observation events.....	35
Table 5: Overview of general case study characteristics.....	42
Table 6: Overview of the measures pursued.	77
Table 7: Overview of the achieved level of anchoring.	78

1. Introduction

When long-temporal or highly intense rainfall occurs, failure of natural and artificial drainage systems to process surface water flows can lead to flooding in urban areas (Rosenzweig et al., 2018; Rözer et al., 2016). Such events, also described as ‘pluvial flooding’, can cause great damage to buildings and infrastructure and lead to considerable inconvenience for those affected (Spekkers et al., 2011). In extreme cases, pluvial flooding can even result in loss of life. During the summer of 2007, heavy precipitation caused severe flooding in the United Kingdom, to which 13 deaths were linked (Falconer et al., 2009). Most pluvial floods occur in urban areas due to their “large proportion of impermeable surfaces” (Sörensen et al., 2016, p. 1). In the 21st century, pluvial flooding is “expected to increase in frequency, severity and impact” (Rosenzweig et al., 2018, p. 1) due to worldwide trends of rapid urbanization and intensified precipitation as a result of global warming.

In the Netherlands, pluvial flooding is becoming an urgent issue as well. A 2015 study by Stichting Rioned, in which 71% of Dutch municipalities participated, showed that sewage systems are regularly unable to drain surface water from heavy rainfall. Between 2010 and 2014, the participating municipalities reported 2.915 cases of damage due to pluvial flooding (Kunst, 2015). As the Netherlands is characterized by densely populated urban regions with highly concentrated economic value, pluvial floods can do great damage in relatively small areas (van Riel, 2011). Although the precise economic impact of pluvial flooding in the Netherlands is unknown, Dutch insurance companies claim to compensate “approximately €90 million for damages from pluvial flooding” (Kaufmann et al., 2018, p. 328) every year.

Following the global trend, the risk and impact of pluvial flooding in the Netherlands is expected to grow in the near future. According to the KNMI’14 climate scenarios, Dutch average temperatures will rise with at least 1.0°C by 2050 and precipitation will increase for every scenario, affecting all regions of the country (Klein Tank et al., 2015). In addition, the KNMI predicts that higher temperatures will lead to an increase of the hourly intensity of extreme rain events by around 12 percent per degree of warming. In many Dutch cities, the drainage infrastructure lacks “the capacity to cope with the [predicted] increase of stormwater” (Dai et al., 2018, p. 652). Population levels and urbanization rates are growing as well, which most likely will increase the risk and impact of pluvial flooding (van Riel, 2011). As a result of these trends, pluvial flooding poses an urgent challenge to Dutch cities and towns.

In the Netherlands, the overall responsibility for addressing pluvial flooding is shared between the regional water authority, municipalities, the provincial government, and private land owners such as citizens and agrarians (OECD, 2014). Historically, Dutch flood risk management is carried out by the government and is characterized by the assumption that flood risks “can be managed and controlled” (Wolsink, 2006, p. 474) by means of robust, structural measures. For pluvial flooding, this means the

solution is generally found in expanding the capacity of sewage systems. However, such measures are costly and time-consuming, and cannot keep up with increasing amounts of rainwater. Therefore, governments have started recognizing the need to consider quicker, cheaper, and more adaptive measures to address pluvial flooding, such as separating storm and waste water flows, introducing blue-green infrastructures on public and private land, and promoting damage control (Lennon et al., 2014; Bouwer et al., 2007). In addition, the Dutch water sector is undergoing a shift towards “a new governance paradigm [...] that is oriented towards more close collaboration between public, private and societal actors” (van Buuren et al., 2012, p. 629).

In this context, municipalities are increasingly seen as important actors with regard to tackling pluvial flooding (Termeer et al., 2011). With the introduction of the Dutch Waterwet in 2009, municipalities were given a duty of care to collect and discharge rainwater in urbanized areas (Mols & Schut, 2012). Next to this, they experience the effects of environmental change directly, are in charge of urban spatial planning and stand close to other relevant actors, such as the regional water authorities and citizens (Hughes & Sarzynski, 2015; Runhaar et al., 2012). Traditionally, municipalities mainly rely on sewage systems and retention areas in public space for tackling pluvial flooding. However, many municipalities have expressed the ambition to address the issue in a more adaptive, integrated way, focusing on solutions in spatial planning, and many have started working on policy plans (Dai et al., 2018). In practice, however, there seems to be what Hughes & Sarzynski (2015) call a gap between “the rhetoric and reality” (p. 1), suggesting that municipalities still encounter governance barriers in the process towards more adaptive, collaborative pluvial flood risk management. Therefore, research on the ways in which Dutch municipalities actually address pluvial flooding is needed to investigate why this gap exists. The focus of this research project lies on municipalities in Limburg, the most southern province of the Netherlands, where pluvial flooding regularly occurs and poses an urgent governance challenge.

1.1. Research problem

Many areas of Limburg, especially the most southern parts, are prone to pluvial flooding due to the hilly landscape and the loess soils, which are vulnerable to surface runoff (Winteraeken & Spaan, 2010). Towns and cities situated down a slope flood easily and relatively fast in case of heavy rainfall, with average flood levels of 20 to 60 centimeters and local peaks of more than 1.5 meters (van Riel, 2011). Local residents, company owners and agrarians most directly experience the impact of pluvial floods, often in the shape of property damage, damage to crops and disruption of daily life (Waterschap Limburg, 2019). Due to relatively high flow rates and fast water accumulation, pluvial flooding in Limburg could theoretically lead to dangerous situations and cause serious injuries or even death (van Riel, 2011; Waterschap Limburg, 2019).

As predicted for every Dutch region, precipitation developments are expected to contribute to increased frequency and impact of pluvial flooding in Limburg too (Winteraeken & Spaan, 2010). Whereas high urbanization rates do not necessarily apply in Limburg due to declining population levels, considerable urban development has taken place in areas vulnerable to flooding (Kooiman et al., 2016; Waterschap Limburg, 2019). Although no quantified data are available, pluvial flooding seems to have taken place more regularly in the last ten years, with major events occurring in 2010, 2012, 2014 and 2016 (Waterschap Limburg, 2019). As these events pile up, local and regional authorities have recognized the need to tackle the problem.

In Limburg, most municipalities have expressed the ambition to shift towards a more collaborative, adaptive approach to pluvial flooding (Bestuurlijke Klimaattafel Limburg, 2018). In practice, however, the extent to which progressive measures are realized in practice varies considerably per municipality ('t Lam, 2019; Waterschap Limburg, 2019). Given the growing urgency of tackling pluvial flooding, research is needed to find out how municipalities in Limburg address pluvial flooding in practice and what factors account for possible differences between these approaches.

1.2. Research aims and research questions

The main aims of this research project is to obtain an understanding of the ways in which municipalities in Limburg address pluvial flooding and to determine what factors shape this approach and how. To achieve this, this research will compare pluvial flood risk management in four different municipalities to gain a comprehensive overview of the existing approaches while identifying factors that explain differences and thus shape the municipal approach to pluvial flooding in different ways. By doing so, this thesis aims to formulate useful policy recommendations on what is needed to help overcome problems that municipalities still experience in transitioning to a more adaptive, collaborative approach. Following these research objectives, the following main research question has been formulated:

How do municipalities in Limburg address pluvial flooding and what factors explain the differences between their approaches?

This main research question is answered by breaking it down into three sub-questions, which will be answered for each municipality:

1. *Which measures are pursued by the municipality to tackle pluvial flooding and to what extent are these measures anchored into the municipal organization?*
2. *In which policy arrangement does municipal policy regarding pluvial flooding come into being? Which rules, actors, resources and discourses apply?*

3. *How do the measures pursued and the level of anchoring achieved by the municipality relate to the municipal policy arrangement?*

Research question 1 helps defining the concrete approach taken by the municipality by looking at the measures pursued and the level of policy integration, drawing on the concept of *anchoring* as discussed by Den Exter et al. (2015). Research question 2 is theoretically based on the Policy Arrangements Approach (Arts & van Tatenhove, 2004) and allows for an in-depth analysis of the institutional context in which municipal policy on pluvial flooding emerges. Research question 3 explores the relationship between these actions and the different dimensions of the policy arrangement. Analyzing and comparing the results of these three research questions, factors that explain differences can be identified and the main research question can be answered. In Chapter 3, the theoretical background of these questions is further discussed.

1.3. Societal relevance of the research

The societal relevance of this research most clearly lies in the fact that pluvial flooding causes severe discomfort and damage for the people that live in high-risk areas in Limburg, in some cases even threatening their safety. Limburg forms a unique case in comparison to most other Dutch provinces due to its characteristic landscape and soils, which poses difficulties that are not experienced in other regions. By extension, the societal impacts of flooding in Limburg as well as potential solutions have not been explored very thoroughly. This research hopefully contributes to a better understanding of how municipalities in Limburg can address pluvial flooding in more effective and efficient ways. In addition, this research can help to improve collaboration between Limburg municipalities and other involved parties that share the responsibility for pluvial flood risk management. Lastly, in a broader context, this research could be of use to other municipalities (in Limburg, or beyond) that experience similar problems.

1.4. Scientific relevance of the research

Although pluvial flooding is not a new phenomenon, the issue has only recently emerged on the agenda of academics and policy makers (Kaufmann et al., 2018; Rözer et al., 2016). Whereas the risks and impacts of pluvial flooding in urban areas and the potential of certain measures are increasingly subject to exploration (e.g. Kaspersen et al., 2017; van Riel, 2011; Rosenzweig et al., 2018), relatively few academic studies are dedicated to the specific actions taken by Dutch municipalities, while none were focused on Limburg. The few studies that do exist focus on Dutch pluvial flood risk management in general (e.g. Runhaar et al. 2012) or touch upon specific regions or municipalities (e.g. van den Berg & Coenen, 2012; Dai et al., 2018) and often do not thoroughly investigate *why* municipalities take certain

measures or not. By linking the municipal approach to pluvial flooding to its institutional context, this research project attempts to fill this important literature gap.

In addition, according to Restemeyer et al. (2015), a successful shift towards a collaborative, adaptive approach to water management “requires a new framing of mindsets among both public as well as private stakeholders” (p. 59) and research is needed on how this new mindset can be introduced. This statement follows the general institutionalist assumption that discourses solidify into policy (Hajer & Versteeg, 2005). Yet, although many comprehensive theoretical frameworks meant for analyzing policy processes acknowledge the importance of discourses, they often do not provide the theoretical tools to explore perceptions and ideas and their influence on policy in great detail. This research links policy and substance by operationalizing the discourse dimension of the policy arrangements using framing theory (Snow & Benford, 1988), which allows for a more thorough theoretical understanding of the influence of discourses on the municipal approach. In addition, it contributes to the “need to develop a clearer typology of policy arrangements” (Arts et al., 2006, p. 104) regarding the discourse dimension.

1.5. Reading guide

The research questions presented above will be answered according to the following structure. To start with, Chapter 2 presents a literature review to provide a detailed introduction to the research topic, exploring relevant concepts in the already existing literature. Chapter 3 elaborates on the theoretical framework underpinning the research questions and introduces the conceptual model that forms the basis for data collection and analysis. In Chapter 4, the methodological choices made for this research are explained. Chapter 5 discusses the results of the case studies conducted on four municipalities in Limburg. In the concluding chapter, Chapter 6, case study results are compared and answers to the research questions are provided, also including recommendations for policy and further research.

2. Literature review

This chapter discusses important themes emerging from the existing literature on pluvial flooding that help to get a basic understanding of municipal pluvial flood risk management, which is necessary to come to a solid theoretical and methodological approach to the main research question.

2.1. Flood risk and the definition of pluvial flooding

As pluvial flooding is a phenomenon that occurs under certain circumstances that are not fully predictable, it is necessary to discuss the concept of risk. In general, risks are seen “as a function of a hazard and the vulnerability of the physical and socio-economic system” (Neuvel & van den Brink, 2009, p. 868). Here, the term *hazard* concerns the “events or phenomena that may cause harm to things that human beings value” (p. 868), and *vulnerability* “refers to the susceptibility to damage from a particular disaster hazard” (p. 869). As pointed out by Neuvel & van den Brink (2009), the concept of vulnerability is subject to interpretation. For example, one can lay emphasis on the probability pluvial flooding will occur, the severity of the consequences of flooding, or a society’s capacity to deal with them.

In this thesis, pluvial flooding is seen as a hazard. In short, pluvial flooding occurs when “precipitation intensity exceeds the capacity of natural and engineered drainage systems” (Rosenzweig et al., 2018, p. 1). As the water cannot be processed by these systems, it builds up “on impermeable surfaces and flows overland or into local depressions and topographic lows to create temporary ponds” (Houston et al., 2011, p. 13). Pluvial flooding is sometimes characterized as an “invisible hazard” (p. 13), as they often occur “unexpectedly in locations not obviously prone to flooding and with minimal warning” (p. 13).

Cities are particularly vulnerable to pluvial flooding due to the large percentage of areas covered with impermeable surfaces (Dai et al., 2018). However, pluvial flooding can occur in rural areas as well, and can (partly) originate from riverine and coastal floods (Rosenzweig et al., 2018; Winterraeken & Spaan, 2010). The impact of pluvial flooding can be severe: multiple cases have been identified where pluvial (flash) floods have resulted in injuries and deaths throughout Europe (Falconer et al., 2009; Hofmann & Schüttrumpf, 2019). However, most flooding causes temporary disturbance of daily life, for example if flooded roads prevent someone to drive to work. Still, pluvial floods can cause great financial damage to buildings, private property and crops as well as indirect economic or emotional damage (Dai et al., 2018; Pregnotato et al., 2017, van Riel, 2011; Winterraeken & Spaan, 2010). Lastly, issues such as erosion and biodiversity loss can do damage to the natural environment (Schanze, 2018). Although pluvial flooding can occur without disturbing humans, this thesis focuses on flood events with a direct impact experienced by human society.

Various other terms are used to describe the hazard of pluvial flooding. For example, pluvial flooding and urban flooding are often used interchangeably, as pluvial floods generally hit highly urbanized areas (Rosenzweig et al., 2018; Sörensen et al., 2016). As this research is focused on floods caused by extreme rainfall that predominantly but not solely occur in cities, the more general term pluvial flooding is used.

2.2. Measures to tackle pluvial flooding

The past decade, measures to tackle pluvial flooding have increasingly gained attention from academics and policy makers. Most measures are focused on mitigating pluvial flooding, meaning that they are meant to prevent flooding in the first place. The “traditional engineering approach” (Sörensen et al., 2016, p. 2) concerns the construction and expansion of pipe systems, “dams, levees and other types of storage and detention facilities” (p. 2). Such technical measures are aimed at minimizing the probability of pluvial flooding affecting people and their assets in any way. Although such constructions are robust and can handle large quantities of water, they are also time-consuming and effortful to build, costly to maintain and not flexibly adaptable to altering climate patterns or spatial and economic changes (Rosenzweig et al., 2018).

Another technical but less traditional, more adaptive way to address pluvial flooding is “recalibrating design to facilitate a more flood adapted urban environment” (Lennon et al., 2014, p. 748). This approach involves measures aimed at designing an urban environment in which rainwater is steered or collected throughout the city in such a way that impacts are prevented or minimized. Examples are decoupling of public land to decrease pressure on the sewage system, constructing separate storm water sewage systems or introducing blue-green infrastructure (e.g. green roofs, rain gardens) while getting rid of paved surfaces to restore the area’s “predevelopment hydrologic function” (Rosenzweig et al., 2018, p. 10). Such adaptive measures generally require less financial resources, are more flexible and take less time to implement. In addition, blue-green infrastructures can also contribute to quality of urban life by reducing heat stress and creating a pleasant living environment (Farrugia et al., 2013). That being said, they require a lot of public space and have to be implemented on a large scale to be effective (Staddon et al., 2018). In addition, they requires careful coordination with other spatial measures, which makes practical implementation complicated (Langeveld, 2019).

In this more adaptive category, non-technical measures that go “beyond construction-based interventions” (Lennon et al., 2014, p. 749) are gaining more attention as well (Begg, 2018). Following the shift towards more collaborative pluvial flood risk management, these measures are focused on “changing behavior through government regulation, persuasion, and/or economic instruments” (Douglas et al., 2010, p. 113). For example, a municipality can financially stimulate or even obligate citizens and companies to decouple storm water on their private lands by means of subsidy schemes or municipal regulation (Bor & Mesters, 2018; Kunst, 2015). Such measures are often accompanied by

public information campaigns that promote actions citizens can take to help prevent pluvial flooding. Throughout the Netherlands, well-known campaigns are *Amsterdam Rainproof* and *Operatie Steenbreek* (Bor & Mesters, 2018).

A third category is solely focused on damage prevention, including measures that aim to minimize the impact of flooding when it does occur. For example, a municipality can invest in risk communication to raise awareness among citizens about the impacts of pluvial flooding, set up warning systems or provide tools (e.g. partitions, sandbags) to protect homes from entering water (Begg, 2018; Rosenzweig et al., 2018; Schmitt & Scheid, 2019; Waterschap Limburg, 2018). Having discussed these different categories, it must be stated that taking measures in one category does not rule out measures from another type. In general, a combination of different types of measures is desirable to come to a robust approach to pluvial flooding (Lennon et al., 2014).

2.3. Legal framework and division of responsibility

Legally, water management in the Netherlands is a “multi-level public responsibility” (OECD, 2014, p. 30). The legal basis for Dutch water management is provided by the Water Act (*Waterwet*), which legislates the management of Dutch water systems by describing the responsibilities of public “water managers” (Gilissen, 2013, p. 115) over different water systems. Municipalities are water managers too, as they have a duty of care for realizing “efficient collection and processing of storm water run-off” (Mols & Schut, 2012, p. 6). This responsibility adds to obligation to collect urban waste water as prescribed by the 1993 Environmental Management Act (*Wet milieubeheer*). In this context, municipalities are subject to an obligation of effort, not of result, and only become liable in case of undisputed negligence (Mols & Schut, 2012).

The Water Act requires the provincial government to legally fix norms for the risk of flooding in water systems in provincial ordinances (Gilissen, 2013). Interestingly, however, storm water run-off is not considered to be part of a water system, meaning that pluvial flood risk management is not legally subject to norms the way the national and regional water system are. This means that involved water managers are highly dependent on each other for “successful execution of their duties of care” (Gilissen, 2013, p. 123). Although there are no legal norms that sewage systems have to meet, the Environmental Management Act also requires municipalities to write a municipal sewage plan (*gemeentelijk rioleringsplan*) on policy for urban waste water management. In this context, municipalities often follow norms proposed by Stichting Rioned, which “provides guidelines for the structure and content of these plans” (Pot, 2019, p. 1301).

Although the “lack of quantified norms” (Gilissen, 2013, p. 123) for pluvial flood risk management allows considerable freedom to adjust policy to regional and local situations, it also causes ambiguity and discussion about how far the obligation of the municipality reaches. A further complicating factor

is that the municipal duty of care is legally excepted from collection and drainage of storm water run-off on private terrain, which is “primarily a responsibility of private land owners” (Gilissen, 2013, p. 123). However, this only applies when abidance can reasonably be expected from citizens, while what is ‘reasonable’ is not further discussed in concrete terms (Gilissen, 2013; Mols & Schut, 2012). In addition, the Water Act does not include a concrete description of ‘efficient collection and processing’, leaving it up to water system managers to decide what is efficient or not. All in all, Dutch national law leaves open a number of important issues that are to be defined regionally or locally.

In this context, the regional water authority is an important collaborative partner for the municipality. With its duty of care for regional water systems and purification of urban waste water, its tasks are inherently related to those of the municipality, and issues of pluvial flooding sometimes overlap with flooding in regional water systems. Officially, the Water Act requires the two water managers to coordinate their policies to achieve efficient, integrated water management (Gilissen, 2013). Although municipalities are the only water managers with a legal obligation to address pluvial flooding, the interrelatedness of systems is indirectly involving the regional water authority in pluvial flood risk management too.

All this being said, the legal framework presented above is about to change slightly in the near future. In 2021, the Environment and Planning Act (*Omgevingswet*) will come into force, bundling all existing environmental and planning laws, including the Water Act, into one. The idea behind this revision is to reduce bureaucracy, “improve links between different projects and activities” (Government of the Netherlands, 2020) and stimulate sustainable initiatives. In this context, governments have to draw up a Strategy on Spatial Planning and the Environment (*Omgevingsvisie*). Although legal responsibilities and norms with regard to water policy will mostly remain the same, the integrated nature of the Environment and Planning Act will require more project-based collaboration from all involved parties, which is a notable shift from the more top-down relationships that exist today (Wensink, 2018).

2.4. Trends in Dutch pluvial flood risk management

Due to the country’s long history of successfully fighting coastal and riverine floods, the Dutch approach to water management is traditionally rather defensive (de Jonge, 2009). Floods are generally regarded as unacceptable, which explains the strong focus on structural, technical measures to mitigate flooding. In this context, the Dutch state set up a robust governance structure to tackle water issues and has therefore “long been perceived as being responsible for the management of floods” (Begg, 2018, p. 384; de Jonge, 2009). As a consequence of this focus on technical and defensive solutions, the potential impacts of flooding generally have not been considered in the fields of spatial planning and construction (Ministerie van Infrastructuur en Waterstaat, 2014). As it becomes clear that the future effects of

climate change will pose enormous challenges to the existing infrastructures and built environment, there is “growing consensus that, in addition to the reduction of the probability of flooding, reduction of flood consequences is needed as well” (Neuvel & van den Brink, 2009, p. 865). In this context, pluvial flood risk management has more and more become an issue of climate adaptation (Termeer et al., 2013). With the so-called Delta decision for Spatial Adaptation of 2015 (*Deltabeslissing Ruimtelijke Adaptatie*), the national government has officially recognized the need for a more adaptive approach to water management in addition to conventional defensive measures (Ministerie van Infrastructuur en Waterstaat, 2014).

At the same time, national budget cuts have caused a different governance shift, oriented “towards more close collaboration between public, private and societal actors” (van Buuren et al, 2012, p. 629). In 2011, five Dutch government authorities signed the *Bestuursakkoord Water*, an administrative agreement emphasizing “the common responsibility to get the water system in order” (OECD, 2014, p. 31), aiming at efficiency gains and “better coordination across authorities” (p. 31). Combined with the increasing number of urban flood events and the shift towards more adaptive measures, this has made pluvial flood risk management significantly more complex. As responsibility no longer lies solely with the traditional government authorities, many new public and private parties (e.g. citizens, companies, housing associations) are now required to take on an active role. All in all, the Dutch water sector has expanded into the private domain and is currently dealing with a number of policy shifts that require the exploration of new measures, policies and collaboration forms.

3. Theoretical framework

Understanding the municipal approach to pluvial flooding requires a comprehensive theoretical framework that underpins the growing complexity of municipal pluvial flood risk management. In this chapter, the theoretical basis of this research is explained, discussing theoretical approaches to policy analysis and explaining choices made for the particular theoretical framework that is used.

3.1. Theoretical approaches to municipal policy analysis

To analyze the municipal approach, it must first be theoretically defined. A logical first step is to look at the policies pursued by a municipality in terms of concrete measures. However, only providing a list of measures would lead to a simplified view, as their effectiveness is strongly determined by the policy conditions in which they are implemented. Looking at theoretical approaches to identify and assess such conditions, a number of relevant frameworks have been used in studies on local pluvial flood risk management. For example, the Governance Capacity Framework by Koop et al. (2017) focuses on the enabling conditions of cities to achieve “effective change” (p. 3430) in addressing urban water and climate challenges. Providing three main dimensions in which these conditions emerge, the framework is helpful to analyze the implementation context in which municipalities take measures. Other relevant studies also tend to take a broad, multi-dimensional approach to enabling conditions, for example focusing on urban resilience or institutional adaptive capacity (Gupta et al., 2016; Restemeyer et al., 2015).

Speaking of enabling conditions, the concept of environmental policy integration, or the “incorporation of environmental concerns in sectoral policies outside the traditional environmental policy domain” (Runhaar et al., 2014, p. 233) deserves special attention. When addressing new policy problems, local governments often introduce specialized measures, undermining the importance of coordination with other policy domains (Tosun & Lang, 2017). With the currently ongoing shift towards more collaborative and adaptive approaches in pluvial flood risk management, new forms of cooperation in various other (external) policy fields have become relevant (van Buuren et al., 2012; Restemeyer et al., 2015). In other words, the level of policy integration of pluvial flood risk management outside the traditional context of waste water management should be considered too.

Although the frameworks discussed above help identify potentially relevant conditions in which measures to address pluvial flooding are taken, they generally take a rather broad approach, including analytical dimensions that do not necessarily apply to the municipal level of analysis. Instead, a more practical approach that allows for concrete comparison between municipal conditions is preferred. In this context, the concept of *anchoring*, defined by Den Exter et al. (2015) as ways in which “climate policy is structurally placed within policy, organization and practical implementation” (p. 1063), is more

helpful. Designed to evaluate the climate strategies of various Dutch municipalities, Den Exter et al. (2015) offer a concrete assessment tool for policy that is directly applicable to municipalities. In addition, the anchoring framework includes clear indicators to assess policy integration of pluvial flood risk management in other domains. Therefore, the anchoring framework will be used in this research to analyze the policy conditions in which different types of measures are implemented.

Apart from defining the municipal approach to pluvial flooding, this research also aims to identify factors that shape it. In this context, this thesis takes an institutional approach to municipal pluvial flood risk management. Although the term 'institution' has been conceptualized many times, North (1990) very basically names it "the humanly devised constraints that shape human interaction" (p. 3). Arts & Leroy (2006) argue institution refers to "the phenomenon whereby over time day to day actors' behavior solidifies into patterns and structures" (p. 7), leading to "the gradual sedimentation of meanings into rules of behavior and organizational structures, that in turn reproduce and recreate these meanings" (p. 7). In this context, Lammers & Garcia (2017) define institutionalization as "a process that begins with the establishment of institutional patterns across organizational fields" (p. 196).

Although institutions should not be confused with organizations, the ways in which organizations develop is "fundamentally influenced by the institutional framework" (North, 1990, p. 5). Applying this view to a policy field in a municipal organization, one can assume that its characteristics are thus determined by sedimented rules and structures, which must be further explored to understand the dynamics between them. Taking this interpretation as a basic theoretical starting point, this thesis assumes the policy field of municipal pluvial flood risk management is subject to constant institutionalization, while the municipal approach to pluvial flooding emerges in this *institutional context*.

In order to unravel the dynamics between the municipal approach and its institutional context, the institutional context must be mapped into more measurable concepts that are theoretically relevant to the research subject. Various theoretical frameworks have been used to analyze the context of local policy, putting emphasis on different analytical domains. For example, the Advocacy Coalition Framework as presented by Sabatier (1998) focuses on actors and agency, stating that policy processes are best analyzed by looking at so-called "advocacy coalitions" (p. 102) in "policy subsystems" (p. 99). While the framework also mentions the importance of exogenous factors that are potentially relevant to local policy-making, its emphasis on advocacy particularly shows potential to study the political aspect of municipal pluvial flood risk management as well as the beliefs that drive the actions of non-political stakeholders.

Another relevant approach is presented by Emerson et al. (2011), who present the Collaborative Governance Framework to analyze a broad variety of governance systems. Assuming the existence of a system context hosting "political, legal, socioeconomic, environmental and other influences" (p. 5), the

framework focuses on practices in a so-called “collaborative governance regime” (p. 5) that influence and are influenced by the system context. As the framework is designed to analyze “policy or program-based intergovernmental cooperation” and “place-based regional collaboration with non-governmental stakeholders” (p. 1), it includes useful components to explore the influence of cooperative aspects in municipal pluvial flood risk management on the municipal approach.

The frameworks discussed above, as well as many other theories (e.g. the Multiple Streams Approach (Knaggård, 2015) or policy network theory (Compston, 2009)), certainly have potential to map specific components of the institutional context of municipal pluvial flood risk management. However, they also take a rather specific domain as a starting point for analysis, including dimensions that do not cover all aspects of municipal pluvial flood risk management or that are not directly relevant. To achieve suitable comprehensiveness, this thesis therefore uses the Policy Arrangements Approach (Arts & Tatenhove, 2004) to map the institutional context. Providing “an excellent basis for an encompassing and dynamic analysis” (Liefferink, 2006, p. 45), the Policy Arrangements Approach seeks to explore “the synthesis of stability and dynamism in environmental policy” (Arts et al., 2006, p. 96), or, in other words, to understand the conditions in which aspects of environmental policy change or stay the same. A policy arrangement can be regarded as a “temporary stabilization in ongoing processes of institutionalization” (Liefferink, 2006, p. 47) and refers to “the ordering of a specific policy field” (Arts & van Tatenhove, 2004, p. 341) in four dimensions in a “bounded time-space context” (p. 341).

The Policy Arrangements Approach is particularly useful to identify links between the municipal approach and the institutional context because it covers the complex character of the municipal pluvial flood risk management while safeguarding a certain flexibility to incorporate insights from four different analytical domains. The framework also emphasizes the interrelatedness of the dimensions, which allows for an analysis of the institutional context as an integrated whole and minimalizes the loss of context. In addition, as this research aims to understand the current *status quo* regarding municipal pluvial flood risk management, viewing the policy arrangement as a temporarily stabilization is helpful to analyze an institutional context that in essence is always evolving. Lastly, the concept of the policy arrangement directly applies to the practical, meso-level of analysis on which municipal policy processes take place (Liefferink, 2006).

That being said, the four dimensions are broad and interpretable in many different ways, making them difficult to measure. Therefore, they have to be clearly operationalized to become useful as tools for comparative analysis. Whereas practical indicators for the first three dimensions emerge rather straightforwardly from the literature (see section 3.4 for a full discussion), the discourse dimension deserves special attention. Discourses are often expressed informally and are generally not explicitly formulated in official policy documents, which makes them difficult to identify. In this context, framing theory, or, more specifically, three types of frames presented by Snow & Benford (1988) are used to

give more structure to the operationalization of the discourse dimension. Section 3.3.2 elaborates further on the concept of framing.

3.2. Defining the municipal approach

3.2.1. Measures

The literature review already distinguishes three types of measures to address pluvial flooding: technical, non-technical and damage prevention measures. In this research, these types are used to identify, categorize and compare the specific measures that are pursued by the municipalities. Table 1 shows an overview of the types of measures and a number of examples per category, including references to literature that discusses them. Focus lies on measures that can be taken by the municipality, meaning that it must somehow be involved. In addition, not all possible indicators are included in this scheme. For example, flood insurance is a well-known damage prevention measure, but is not considered here because citizens so far can only get it privately. Although public flood insurance has been subject to academic discussion for some time (e.g. Bouwer et al., 2007; Hudson et al., 2019), it is not (yet) available in the Netherlands.

	Variables	Indicators	Relation to literature
<i>Measures</i>	Technical measures	• Sewage capacity enlargement • Retention areas • Separating storm and waste water sewage infrastructures • Decoupling storm water from the sewage system in public space • Blue-green infrastructures (e.g. green roofs, natural infiltration facilities, etc.)	Kunst (2015) Langeveld (2019) Lennon et al. (2014) Rosenzweig et al. (2018) Sørensen et al. (2016) Staddon et al. (2018)
	Non-technical measures	• Subsidy schemes • Governmental regulations • Encouraging private decoupling measures • Citizen engagement (e.g. public awareness campaigns, information meetings)	Begg (2018) Bor & Mesters (2018) Brockhoff et al. (2019) Douglas et al. (2010) Kunst (2015) Langeveld (2019) Montalto et al. (2012)
	Damage prevention measures	• Advanced warning systems • Risk communication • Flood defense barriers on private lands • Distribution of sand bags	Begg (2018) Rosenzweig et al. (2018) Rözer et al. (2016) Schmitt & Scheid (2019) Waterschap Limburg (2018)

Table 1: Categories and examples of measures pursued by municipalities.

3.2.2. Anchoring

As discussed earlier, Den Exter et al. (2015) designed a framework to analyze the ways in which climate policy is anchored in the municipal organization, presenting three anchoring categories. First, *anchoring in organization* concerns the position of climate policy in the context of the general organizational structure of the municipality. Secondly, *anchoring in policy* refers to the extent to which climate policy is officially fixed in policy documents, agreements and strategies. Third, *anchoring in practical*

implementation relates to the ways in which processes of practical implementation are designed and carried out. Having reviewed the literature on local policy integration to identify relevant factors, Den Exter et al. (2015) present a number of indicators for each category by which the level of integration can be assessed.

Although Den Exter et al.'s framework is focused on the broader concept of local climate adaptation policy, the framework is useful to analyze pluvial flood risk management because its challenges are similar to those in the policy field of climate adaptation. However, some of the variables presented by Den Exter et al. (2015) focus on a broader, bigger scale of policy-making that does not directly relate to pluvial flooding (e.g. the presence of an internal steering committee to coordinate the climate policy anchoring process in the entire municipality). Therefore, only those indicators that are relevant to pluvial flood risk management are included:

1. Anchoring in organization:

- the *organizational structure*, which influences the way in which measures or policy instruments are integrated. If a municipal organization is hierarchical, the integration of policy has to occur on many different management levels, which can hamper the anchoring process. In a "flat network structure" (p. 1064) in which "actors openly cooperate" (p. 1064), it is argued that measures can be implemented more easily throughout the entire organization;
- a *clear division of responsibility*. Den Exter et al. (2015) argue that clarity and consensus within the municipality about who is responsible for specific tasks regarding policy design and implementation is highly important for smooth policy processes;
- the pursuit of *co-benefits* through the integration of policy throughout the entire municipality. As discussed, some particular measures addressing pluvial flooding also have potentially positive impacts in other municipal departments or can be combined in terms of practical implementation. The extent to which a municipality achieves such co-benefits shows how policy is integrated into the municipal organization.

2. Anchoring in policy:

- *fixation in (overarching) policy documents* of measures and policy, so that the municipality "feels ownership and responsibility" (p. 1064) to actually implement them. In this context, it is also of interest whether these policy documents include ambitions or hard agreements;
- *integration at the strategic level*, for example in long-term policy visions or climate adaptation strategies, to ensure pluvial flood risk management will be continued and further developed in the future;

- *integration at the operational level*, which relates to the extent to which the implementation and enforcement of policies are worked out in, for example, operational plans and checklists.

3. Anchoring in practical implementation:

- a formal organization of *external cooperation with key stakeholders*, meaning that there is regular contact with parties outside of the municipality to address issues that cannot be dealt with by the municipality alone;
- the availability of sufficient *capacity and resources*, including manpower, knowledge, skills and financial means to carry out policy;
- *monitoring* to keep track of progress in policy processes. For municipalities, this could mean the presence of supervising mechanisms, progress indicators or evaluation reports that ensure regular assessment of the extent to which goals are reached.

Den Exter et al. (2015) explicitly focus on the visible *output* of measures being taken. For a lack of (comparable) data on the effects of climate measures taken by Dutch municipalities, they argue it is difficult to analyze and compare the *outcome*, or the results of the output. As such data was not sufficiently available for municipalities in Limburg either, this research is focused on the output performance, meaning that the actual effectiveness of measures is not directly considered. In addition, it must be noted that the framework is meant to measure the performance of a municipality, while not elaborating on the extent to which indicators must be present for a municipality to perform well. However, this does not form a direct, as this thesis aims to create a general overview of municipal pluvial flood risk management; not to distinguish ‘good’ from ‘bad’ municipalities.

3.3. Mapping the institutional context

3.3.1. Policy Arrangements Approach

According to Arts & van Tatenhove (2004) and Arts et al. (2006), the Policy Arrangements Approach aims to analyze stability and change in environmental policy by looking at so-called policy arrangements, which consist of four dimensions:

1. *Actors and coalitions*

This dimension refers to the “players” (Arts & van Tatenhove, 2004, p. 342) that shape a specific policy arrangement with their ideas about what it should look like. Actors can act as individuals or form so-called policy coalitions that “share resources and/or interpretations of a policy

discourse” (p. 342). In a policy arrangement, actors and coalitions can challenge each other by supporting different discourses or policy goals. Although individual actors within one organization often share ideas about policy discourses, they do not necessarily belong to the same policy coalition, as these can transcend organizational borders.

2. *Rules of the game*

In a policy domain, certain rules determine “which norms are legitimate, how issues might be raised, agendas set, [...] policies formulated, decisions made and measures implemented” (p. 342). These rules can be *formal*; which means they are fixed in legislation, regulations or official procedures, or *informal*, meaning that they are unofficially or silently practiced. Generally, these rules decide what is the “appropriate” (p. 342) way to act within the policy arrangement.

3. *Resources*

This dimension concerns the “division of power and influence” (Arts et al., 2006, p. 99) between actors and coalitions. Here, *power* is regarded as the ability to mobilize, divide and deploy certain resources, whereas *influence* refers to “who determines policy outcomes and how” (p. 99). Resources can be ‘hard’ or physical resources, such as financial reserves or certain tools. There are also ‘soft’ resources, such as knowledge, access to important information or the ability to attend important meetings.

4. *Discourses*

Policy discourses are “dominant interpretive schemes” (Arts & van Tatenhove, 2004, p. 343) that actors and coalitions use to give meaning to reality. They consist of the “norms and values, definitions of problems and approaches to solutions” (p. 99) that actors or coalitions maintain when they attempt to influence policy outcomes within the policy arrangement.

Although presented separately, the four dimensions are inherently interrelated (Arts et al., 2006; Liefferink, 2006). These relations are visualized in figure 1, displaying a “tetrahedron as symbol for the connections between the dimensions” (Arts et al., 2006, p. 99). For example, actors are restricted by certain rules of the game, but can simultaneously create or alter them. In addition, the availability of resources can be influenced by dominant discourses that determine how urgently a certain policy issue needs to be addressed. Therefore, all four dimensions are to be regarded as an integrated whole.

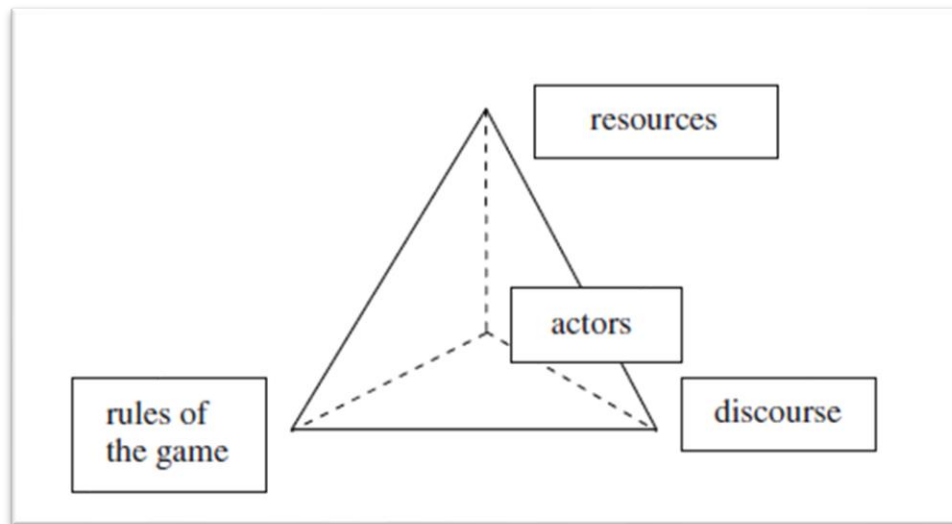


Figure 1: The policy arrangement tetrahedron as presented in Arts et al. (2007).

However, the starting point for analysis can be one of the four dimensions, each dimension representing a different approach to a research subject (Lieberink, 2006).

Building on earlier assumptions made regarding institutional theory, this thesis sees the municipal approach to pluvial flooding as a temporarily stable policy arrangement, while sedimented rules and organizational structures of its institutional context are analyzed through the four dimensions. The bounded time-space context maintained is approximately 10 years, meaning that data generated in the past decade will be considered in order to explain the current status quo. Starting point for analysis will be the rules of the game, as (formal) rules are relatively easily identified and provide a general view of the situation in which resources, actors and discourses emerge. However, no extra weight will be prematurely assigned to this dimension in terms of influence on the municipal approach.

3.3.2. Framing

According to Snow & Benford (1988), framing is "to assign meaning to and interpret relevant events and conditions in ways that are intended to mobilize potential adherents and constituents, to garner bystander support, and to demobilize antagonists" (p. 198). Snow & Benford (1988) aim their theory at the mobilization of social movements and name three important framing tasks in this process:

- *Diagnostic framing*, referring to the identification of the problem that needs to be tackled, and the factors that cause this problem. In practice, parties often agree on what the problem is, but can differ in opinion with regard to its causes.
- *Prognostic framing*, referring to the identification of the ways in which someone believes the problem should be tackled. These solutions do not necessary correspond with the diagnostic

frame, as it is possible that the causer of the problem is not perceived as the one that has to solve it.

- *Motivational framing*, referring to the identification of motivational factors that drive actors to tackle the problem in a specific way. Consensus on the problem, its causes and solutions does not necessarily mean people will actually take action, as there must be a motivational reason that drives the actor to act. For example, someone can be forced by a the legal responsibility to act, *feel* like they have the responsibility to act, or expect a financial advantage.

Although this research is not directly focused on social movements, these framing types are useful variables through which ideas, perceptions and ambitions of different actors within the municipal policy arrangement can be identified. Assuming that discourses institutionalize into policy, these frames can help identify links between discourses in a municipality and its practical approach to pluvial flooding (Hajer & Versteeg, 2005).

The different frames also help identifying impactful differences between ideas of relevant actors. As Dutch pluvial flood risk management involves many actors and is subject to risk, uncertainty and legal interpretation, the emergence of different perceptions and disagreement is likely. Snow & Benford (1988) argue that the likelihood of a specific action being taken depends on the extent to which ideas of different actors about the issue correspond. They stress the importance of creating a “linkage” (p. 198) between these ideas, a practice they call *frame alignment*. Although frame alignment in itself is not a goal of this research, the concept leads to the idea that the level of correspondence between the perceptions of different actors influences the way in which municipalities approach pluvial flooding. If cooperative partners maintain significantly different frames on, for example, solutions, such *ideational incongruity* can hamper successful collaboration and slow down policy processes.

The level of ideational congruity in the context of pluvial flood risk management by Limburg municipalities is relevant internally as well as externally. Within municipalities, employees can maintain different diagnostic, prognostic and motivational frames with regard to pluvial flooding. In addition, the diagnostic, prognostic and motivational frames of external partners are of interest as well. As municipalities in Limburg work most directly with the regional water authority and their responsibilities overlap regularly in the field, the ideational congruity between these organizations will be analyzed in detail.

3.4. Operationalization of theoretical concepts

Having identified relevant theoretical concepts, this section defines them into measurable variables and indicators, so they can be used to analyze and compare the municipal approaches. The concept of

measures is already operationalized by defining three types of measures and listing examples based on existing literature (see table 1). Regarding the concept of anchoring, Den Exter et al. (2015) effectively provide a set of concrete variables with measurable indicators that directly apply to the municipal organization, which are schematically presented in table 2. The list of indicators mentioned in the figure is not exhaustive, but provides a solid basis for determining the level of anchoring in a municipality. As Den Exter et al. (2015) have already based their selection of variables on a thorough literature review, further elaboration on the relation to the literature is unnecessary. After discussing the results, the different anchoring aspects of each municipality are given a score of insufficient (-), sufficient (0) or good (+) to allow for visual comparison in a table.

Regarding the Policy Arrangements Approach, the four different dimensions do require to be operationalized further. Table 3 lists the variables and indicators that define the four dimensions, including sources that discuss their relevance in relation to local pluvial flood risk management (or climate adaptation policy). Here, a number of additional remarks must be made. In the resources dimension, focus lies on *power* in terms of the access actors have to three types of hard and soft resources (the concept of *influence* is already covered by the operationalization of the actor dimension). In addition, regarding resources, there is some overlap with the operationalization of anchoring in practical implementation. While the discussion of resources in the context of anchoring is merely descriptive, the resource *dimension* elaborates on the broader context in which access to such resources emerges. Lastly, the three framing types of Snow & Benford (1988) are used to operationalize the discourse dimension.

	Variables	Indicators
<i>Anchoring in organization</i>	Organizational structure	A (flat) organizational structure to enable smooth internal policy design and implementation
	Division of responsibility	Consensus on responsibility for different tasks
	Pursuit of co-benefits	Combining practical implementation of measures in different policy domains, realizing positive side effects
<i>Anchoring in policy</i>	Fixation in policy documents	Description of policy goals in policy documents Detailedness of described policy goals Nature of policy goals (binding or non-binding)
	Integration at the strategic level	Long-term strategic plans for pluvial flood risk management Presence of climate adaptation or sustainability strategies (that include water)
	Integration at the operational level	List of specific projects, including operational plans, financial paragraphs, time paths
<i>Anchoring in practical implementation</i>	External cooperation	Structural cooperation and involvement of relevant governmental institutions, private land owners, citizens, companies, etc.
	Capacity and resources	Access to financial resources, human capacity, knowledge and expertise
	Monitoring	Supervising mechanisms, progress indicators, evaluation reports

Table 2: Operationalization table of the concept of anchoring. Source: Den Exter et al. (2018).

	Variables	Indicators (examples)	Relation to literature
<i>Rules of the game</i>	Formal rules	Norms and standards Formal policy procedures Policy documents (e.g. the municipal sewage plan)	Gilissen (2013) Mols & Schut (2012) OECD (2014) Runhaar et al. (2012)
	Informal rules	Informal procedures (e.g. organizational, political)	
<i>Actors and coalitions</i>	Internal actors	The role of internal actors (e.g. employees working on water management, municipality council, aldermen)	Begg (2018) Bulti et al. (2019) van Buuren et al. (2012) Sörensen et al. (2016)
	External actors	The role of public and private external actors (e.g. regional water authority, other municipalities, private land owners, citizens)	
	Cooperation	Extent to which integrated policy-making takes place Communication Smoothness in cooperative processes	
<i>Resources</i>	Financial resources	Municipal budgets External subsidies	Dai et al. (2018) 't Lam (2019) Neuvel & van den Brink (2009) Runhaar et al. (2012)
	Human capacity	Number of employees working or available to work on pluvial flooding (e.g. in terms of fte)	
	Knowledge and expertise	Variety of expertise	
<i>Discourses</i>	Diagnostic frames	Perceptions of the definition of the problem Perceptions of causal factors	Neuvel & Den Brink (2009) Runhaar et al. (2012) Snow & Benford (1988)
	Prognostic frames	Preferred solutions	
	Motivational frames	Driving factors that lead to actions (e.g. responsibility, political urgency)	

Table 3: Operationalization table of the policy arrangement dimensions.

3.5. Conceptual model

The conceptual model visible in figure 2 combines all relevant theoretical concepts and their variables to create an analytical framework for answering the main research question. For the sake of clarity, indicators of the variables have been left out.

In the conceptual model, different components are used to answer the three research sub-questions. As explained previously, this thesis assumes that the municipal approach to pluvial flooding is shaped by an institutional context (the encompassing dark blue framework). The light blue framework represents the municipal approach to pluvial flooding, defined as the type of measures pursued and the level of anchoring achieved, which relates to sub-question 1. The green framework relates to sub-question 2, presenting the policy arrangement of municipal pluvial flood risk management as a temporary stabilization of the institutional context. As certain phenomena in all four dimensions are expected to shape the municipal approach to pluvial flooding, the four arrows represent the relation between the dimension variables and the municipal approach. Following this assumption, sub-question 3 explores which of these factors can be linked to (specific aspects of) the municipal approach and how. That being said, it is expected that the interrelatedness of the dimensions of the policy arrangement makes it difficult to come to solid conclusions about concrete individual links. In other words, the model is not designed to prove direct causality between the factors, but merely aims to identify complex relations to get an overall view of the policy arrangement.

After applying the conceptual model to each case study municipality, results can be compared to answer the main research question of how municipalities in Limburg approach pluvial flooding. By identifying patterns in the emergence of links in the individual policy arrangements, factors that explain differences between the municipal approaches are expected to come forward.

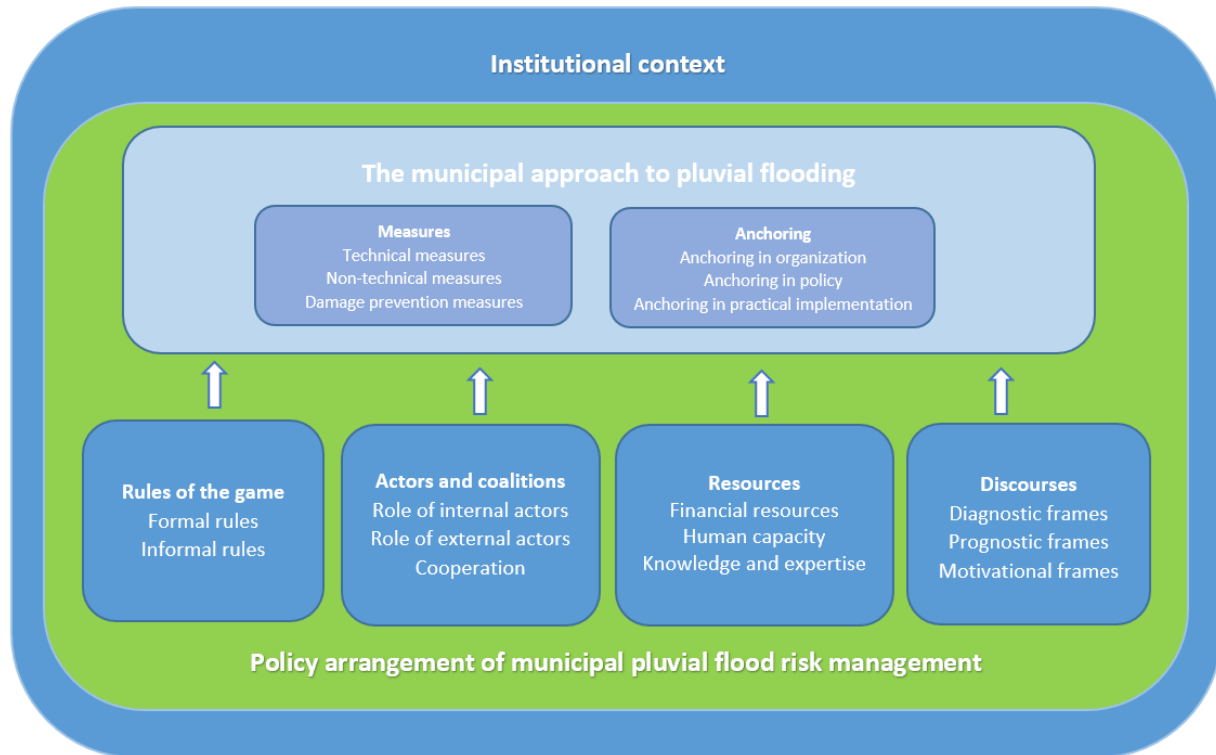


Figure 2: Conceptual model.

4. Methodology

4.1. Philosophical assumptions

As argued by Guba & Lincoln (1994), research is heavily shaped by paradigms, or “basic beliefs systems” (p. 107), which define the way in which an individual views the world and “the range of possible relationships” (p. 107) within it. Paradigms are based on “ontological, epistemological and methodological assumptions” (p. 107) that are subjective and cannot be proven truthful; they can only be accepted on the basis of belief. In other words, personal philosophical assumptions have a substantial influence on the way in which research is approached, making their disclosure important to help the reader understand the methodological choices made and illustrate how the meaning of data and results is to be interpreted.

This research is underpinned by a number of philosophical assumptions. To start with the *ontological question*, which concerns the “form and nature of reality and [...] what is there that can be known about it” (Guba & Lincoln, 1994, p. 108), this research follows the critical realist assumption that there is an objective reality, in which concepts and relations exist objectively. However, the critical realist assumption assumes that reality can never be perfectly observed due to human constraints. Therefore, “reality must be subjected to the widest possible critical examination” (p. 110) to ensure an as a truthful as possible account of reality.

Here, constructivist relativist ontology is a welcome addition, stressing the importance of *individual constructions* of the observed reality. Although, unlike constructivism, this research assumes there is an objective and often physical reality to the variables researched (e.g. measures taken, the availability of resources), this reality can only be *observed* by means of the behavior, observations and spoken or written accounts of the people working on pluvial flooding, resulting in individual constructions that are “socially and experientially based” (p. 110) and “local and specific in nature” (p. 110). In other words, it is impossible to determine with absolute certainty which of the many constructions represents the objective reality.

With regard to the *epistemological question*, or the nature of the relationship between the researcher and “what can be known” (p. 108), this research puts emphasis on the constructivist paradigm. Taking the *observed* reality as a starting point, it sees this relationship as “transactional and subjectivist” (p. 108), assuming that findings are generated through the interaction between the researcher and the object of investigation, who both are subject to constructions of reality based on local, social and experiential circumstances. Regarding the *methodological question* of how the researcher can best succeed in knowing what can be known, this research assumes that the more sophisticated and informed the researcher’s constructions are, the closer findings get to the objective

reality (Guba & Lincoln, 1994). Such sophistication can be achieved by distilling a “consensus construction” (p. 111) from the constructions of the researcher and the objects of investigation.

4.2. Research strategy

In order to achieve a solid consensus construction, a broad, in-depth analysis of the municipal approach and policy arrangement is necessary. In this context, a qualitative approach is most appropriate because it allows for a highly detailed analysis of the phenomenon within its context. In comparison, a quantitative analysis focuses on a limited number of variables, largely ignores relations to contextual factors and excludes the “discovery dimension in inquiry” (Guba & Lincoln, 1994, p. 106), affecting the validity of the research outcomes. Therefore, small-scale, qualitative methods are used that limit generalizability, but “minimize the risk of uncertainties” (Verschuren & Doorewaard, 2010, p. 155) by achieving a high level of detail.

With regard to the research strategy, this research uses case studies. Cases studies are an appropriate strategy because the aim is to explore and explain (instead of predict) a certain phenomenon (Yin, 1981). According to Yin (1981), case studies are suitable if “an empirical inquiry must examine a contemporary phenomenon in its real-life context, especially when the boundaries between phenomenon and context are not clearly evident” (p. 98). For the phenomenon researched in this thesis, the municipal approach to pluvial flooding, the real-life context is essential (as explained in Chapter 3). As determining where the municipal approach ends and the context starts can be difficult, case studies help in this process by focusing on comprehensiveness and detail. Case studies also offer the possibility to conduct a detailed analysis that is not limited to one type of data. By analyzing (e.g.) policy documents as well as interviewing relevant actors, a more sophisticated consensus construction is achieved.

To keep this research project achievable and deliver concrete results in the relatively short amount of time available, this thesis takes a deductive research approach, meaning that it develops a theory that is subsequently tested through observation (Bryman, 2012). However, as this increases the chance of missing important unexpected results, room is allowed for new patterns and insights to emerge by, if relevant, occasionally analyzing beyond the variables in the conceptual model in the process of data collection and analysis. This way, theoretical tunnel vision is (at least partly) avoided and unaccounted results are not ignored.

4.3. Case selection

As the real-life context can differ significantly between municipalities, a collective case study of four representative municipalities in the province of Limburg was conducted to “show different perspectives” (Creswell & Poth, 2018, p.99) and see if any patterns can be identified. To “maximize the

utility of information” (Flyvbjerg, 2006, p. 230) from a small number of cases, information-oriented selection was used as a case selection strategy. As this research is interested in factors that explain differences between municipal approaches, the principle of maximum variation was followed to select cases in order to “obtain information about the significance of various circumstances” (Flyvbjerg, 2006, p. 230). Based on desk research and exploratory interviews with employees at the regional water authority, four municipalities; Meerssen, Peel en Maas, Sittard-Geleen and Valkenburg aan de Geul¹; were selected. All four municipalities have experienced serious pluvial flooding in the past five years (Waterschap Limburg, 2019). However, they differ significantly in a number of dimensions:

1. Participation in the *Water in Balans* program

In 2018, the regional water authority launched a program called *Water in Balans* to realize collaboration between public and private stakeholders to create one robust, climate-proof water system in Limburg. The program is characterized by project-based management, presenting a list of bottleneck locations where pluvial flooding forms an urgent issue that are to be solved in a collaborative, integrated project (Waterschap Limburg, 2019). Two of the selected municipalities, Meerssen and Peel en Maas, are part of a pilot project and have been actively involved in cooperation with Waterschap Limburg and other relevant parties. Participation suggests that there is an active will to address pluvial flooding in an integrated, collaborative manner. In addition, the program also offers extra resources, most notably in terms of capacity (Waterschap Limburg, 2019). To account for differences between pilot and non-pilot municipalities, Sittard-Geleen and Valkenburg were deliberately selected for not being part of the program.

2. Size of the municipality

In exploratory interviews, the (population) size of the municipality came forward as an important influential factor on the availability of resources. Smaller municipalities generally have lower budgets and therefore less financial freedom to invest in measures or hire employees. The fewer employees a municipality has, the more vulnerable it becomes as an organization. Meanwhile, given the local and unpredictable character of pluvial flooding, incidents can be just as impactful as cases of pluvial flooding in larger municipalities. Therefore, Sittard-Geleen and Peel en Maas are both relatively large municipalities for the Province of Limburg, whereas Meerssen and Valkenburg are much smaller (Central Bureau for Statistics, 2020).

¹ From now on in this research, Valkenburg aan de Geul will be shortened to Valkenburg.

3. Geographical location

As stated in the introduction, flooding mechanisms work differently in the northern and southern part of the province, with the southern municipalities facing extra difficulties due to hilly landscapes and soils that allow significantly less infiltration (Winteraeken & Spaan, 2010). To see if there are any striking differences in their approach to pluvial flooding, two municipalities located in the south of Limburg (Meerssen, Valkenburg) and one relatively northern municipality (Peel en Maas) were selected, as well as one that lies somewhat in between (Sittard-Geleen).

In Chapter 5, an overview of the general characteristics of the municipalities is schematically provided. The three factors discussed above emerged most unanimously from preliminary investigation as potential explanations for differences, which is why they were used for case selection. However, it is expected that there are other influential factors that were not considered during case selection. Although such factors could still emerge from the data, it is possible that some have not because they were not consciously selected upon, which is a shortcoming that must be acknowledged.

4.4. Research methods and data collection

When conducting case studies, using “multiple sources of information” (Creswell & Poth, 2018, p. 96) is important to get a complete picture of the case. According to Verschuren & Doorewaard (2010), depth is achieved through data triangulation, which is why multiple methods of data collection were used:

- **Desk research**

To get a first impression of the way in which municipalities address pluvial flooding, all publically available policy documents, reports and other, less traditional sources (e.g. newspaper articles) were consulted, including documents on national water policy, coalition agreements, municipal sewage plans, local climate adaptation strategies, regional wastewater plans, and many more. See Annex A for a full overview of these documents.

- **Interviews**

In order to study the policy context in more detail and carefully reconstruct the discourses present in Limburg municipalities, multiple in-depth interviews were held with officials of the case study municipalities as well as staff members of the regional water authority. Below, the interviewees are discussed briefly per organization. For a detailed overview, including function titles, see Annex B.

- Meerssen

At the municipality of Meerssen, three officials were interviewed: the waste water policy advisor, a communication advisor involved in the *Water in Balans* program, and the Head of the Department of Public Space (of which the water expert is also part). A fourth interview was arranged with the alderman responsible for, among other topics, waste water management and urban planning. Unfortunately, this meeting was cancelled by the alderman at the last moment and there was no opportunity to reschedule.

- Peel en Maas

At the municipality of Peel en Maas, interviews took place with a water policy advisor, an advisor on environmental development, a communication advisor involved in the *Water in Balans* pilot project, and a landscape, nature and neighborhood policy advisor. Efforts were made to speak with the alderman responsible for management of public space, but this turned out impossible due to his busy schedule.

- Sittard-Geleen

Two municipal employees were interviewed at the municipality of Sittard-Geleen: the waste water policy advisor and the alderman responsible for, among others, the living environment. Despite the fact that Sittard-Geleen is a relatively big municipality, it was difficult to identify who to interview apart from the individuals above. The policy advisor stated to be the only municipal official with a direct influence on policy design and could not think of any colleagues that could provide helpful insights.

- Valkenburg

For Valkenburg, two employees were interviewed: the civil engineering officer at the Department of Public Space Management, who is responsible for urban waste water management as well as road construction, and the alderman responsible for management of public space.

- Waterschap Limburg

At the regional water authority, Waterschap Limburg, interviews were held with 11 employees. Many were part of the team that operates the *Water in Balans* program, for example as a program manager or communication advisor. However, a number of employees from other departments were interviewed as well (e.g. account managers, a legal expert, a license authority worker, etc.).

All interviewees were held individually. Most interviews took place at the municipality in question or the regional water authority, although three municipal interviews were held by phone.² As suggested by Saunders et al. (2009), the interviews were semi-structured: several important themes were discussed during every interview, but there was always room for flexibility in terms of the questions asked to ensure that new themes were not ignored. For municipal employees and employees of Waterschap Limburg, where interviews were more exploratory, a separate list of questions was set up (see Annex C and D for the full set of documents). All interviews were recorded and literally transcribed.³

- **Observations**

Participant observations of certain events can help enrich the data gathered during interviews, and allow to discover in greater detail the “meanings” (Saunders et al., 2009, p. 345) that municipalities assign to their actions. For this research, a number of relevant events were visited to which the researcher had access as an intern at Waterschap Limburg. Given the fact that these events presented themselves as opportunities rather than being part of a structurally planned method of data collection, the observations are difficult to generalize and depend highly on personal

	Event	Date	Relevance	Observation product	Validated
1	<i>Meeting between a Water in Balans program manager and two municipality employees (Meerssen, Beekdaelen) on the role of municipalities and the regional water authority in pilot projects</i>	March 21, 2019	Case study: Meerssen	Minutes, notes (paraphrased)	Yes, minutes were sent for approval to all attendees
2	<i>Meeting of the platform Bestuurlijke Klimaattafel Limburg (BKL) on regional developments regarding climate adaptation in the water chain</i>	April 5, 2019	General institutional context of pluvial flood risk management in Limburg	Report	Partly, report was sent to attendees from Waterschap Limburg
3	<i>Public information meeting on developments regarding the Kwistbeek project</i>	April 18, 2019	Case study: Peel en Maas	Report	No

Table 4: Overview of observation events.

² Phone interviews took place with the aldermen of Sittard-Geleen (P20) and Valkenburg (P22) and the Head of the Department of Public Space in Meerssen (P12).

³ Due to some technical problems, the first 15 minutes of the interview with the waste water policy advisor of Sittard-Geleen [P19] were not recorded. As this part mostly included trivial questions for which the answers could eventually be found in policy documents, it did not cause problems.

interpretations. In addition, it was not always possible to confirm these interpretations with the attendees of the event. Therefore, observations are regarded as complementary to the conclusions emerging from the policy document analysis and semi-structured interviews, instead of as independent facts.

4.5. Data analysis

Gathered data need to be analyzed in a careful and structured manner in order to draw solid conclusions. Therefore, all data were coded using Atlas.ti in order to identify patterns and track the analytical process of this research (Creswell & Poth, 2018; Verschuren & Doorewaard, 2010). The data was analyzed means of a mix of deductive as well as inductive coding. As recommended by Creswell & Poth (2018), a codebook in which the boundaries of the codes are delimited is included in the annexes (see Annex E). The number of codes referred to in this codebook was minimized to 20 in order to keep the coding process organized and manageable (Creswell & Poth, 2018).

In principle, the coding method was deductive, meaning that patterns were intentionally sought for following the conceptual model. However, if important data came up that was not easily categorized according to the codebook, these pieces of information were coded separately to ensure they were not lost. The codes emerging from this process were analyzed to see to what extent they represented themes matching, complementary or contradictory to the conceptual model.

4.6. Validity, reliability and research ethics

Internal validity

To ensure that the results of this research are valid in the sense that the research questions are truly answered, various efforts were made. To start with, the research project is carefully delineated by means of the conceptual model and the operationalization of the theoretical concepts, which is crucial to “make any valid statements” (Verschuren & Doorewaard, 2010, p. 135). Next, the comprehensiveness of the conceptual model combined with a comparative case study approach matches the broad scope and comparative nature of the main research question. In addition, applying data triangulation allows for cross-checking data from different sources (Creswell & Poth, 2018).

As interviews are subject to a lot of personal interpretation by the researcher, during the interview as well as analysis, “seeking participant feedback” (Creswell & Poth, 2018, p. 260) is important to see if statements were correctly interpreted. Therefore, interviewees were sent the transcript and a summary of the conclusions derived from the interview, to which they were invited to make adjustments. Although not every interviewee responded, a majority sent back feedback. Preliminary results were also discussed with the team of the *Water in Balans* program during a formal presentation, after which feedback was taken into account.

External validity

An often mentioned disadvantage of case studies is that the external validity is “under pressure” (Verschuren & Doorewaard, 2010, p. 185), meaning it is difficult to generalize case study results due to the generally small number of cases and the fact that institutional contexts can differ greatly. Given the lack of prior research on the subject, however, conducting four in-depth case studies at least creates a solid, general impression of the municipal approach to pluvial flooding under certain circumstances. Here, generalization is not per se the main goal, as the research outcomes are merely meant to serve as guidance for further (possibly quantitative) research. Still, the results of the case studies must be interpreted and used with care, as the analyzed municipalities are not per se representative for all municipalities in Limburg (or other Dutch provinces).

Reliability

A reliability issue with qualitative case studies is that data collection and analysis requires a lot of personal interpretation from the researcher, which – if not structured adequately – might lead to different outcomes if the research is repeated. Although the outcomes of repeated research will never be exactly the same, efforts have been made to structure the research process so that a repetition would become more reliable. For example, the interview questionnaires and list of consulted documents are all included as appendices, so they can be used by researchers to guide their data collection process. In addition, a description of the interviewees is included so researchers can easily identify similar interviewees for a new case study. Next to this, the codebook made to structure the coding process allows for “inter-rater reliability among multiple coders” (Creswell & Poth, 2018, p. 190).

Research ethics

Municipalities and water authorities are politically driven institutions, which means that officials often lie under scrutiny of colleagues and/or the public. It is important to realize that the research results might be perceived as negative by specific parties, be subject to disagreement, or potentially have an impact on the collaboration between individuals and/or organizations. Therefore, interviewees were well-informed about the purpose of the research and the way in which their statements were going to be used by means of an information letter. In addition, important privacy issues (e.g. permission to record, anonymity agreements) were discussed at the start of every interview. If requested, the interviewees received the list of questions beforehand, so they could prepare for the interview if desired. This list was simplified, meaning that they did not include particular probing questions in order to make sure interviewees would come up with their own answers and prevent being suggestive as much as possible. In order to avoid recognition and enable interviewees to be critical if desired, all quotes in this thesis as well as the interview transcripts have been anonymized.

5. Case study results

In this chapter, the results of the four case studies are presented. As certain circumstances apply to all four case studies, a brief overview of the general policy arrangement of pluvial flood risk management by Limburg municipalities is provided first. Next, the results for each case study are discussed in separate sections. First, the specific measures pursued and the level of anchoring are described. Then the specific policy arrangement is mapped, starting with the *rules* dimension (as explained in Chapter 3). These sections are followed by a discussion and conclusion on the relationship between these factors and the policy arrangement.

5.1. Overview of general policy arrangement

In the following sections, the most important contextual factors as well as their potential influence on the municipality's approach to pluvial flooding are discussed. In addition, the discourses present at the regional water authority are summarized, discussing the frames maintained by employees from the regional water authority so they can later be compared to municipal frames to see if ideational congruity appears.

5.1.1. Rules, actors, resources and discourses in Limburg

The past decade, several general trends have characterized pluvial flood risk management in Limburg. For example, cooperation between actors in the Limburg water sector has been strengthened noticeably. Following the *Bestuursakkoord Water* (2011), all water managers of Limburg signed a vision document on improving cooperation in 2015, stressing the importance of bundling tasks and sharing knowledge. Since then, collaboration between municipalities has further intensified, with more and more tasks being dealt with in the context of regional partnerships.

Another trend is the increased attention for climate adaptation as a framework through which pluvial flooding should be addressed. In 2018, the climate adaptation platform called *Bestuurlijke Klimaattafel Limburg* was created, in which all government institutions with a role in water management as well as private actors take part. The goal of the platform is to set up a common climate policy agenda, but specific policies, ideas and experiences are also discussed (observation, April 5, 2019). On a municipal scale, (light versions of) climate stress tests have been performed by all municipalities in Limburg, leading to the identification of areas vulnerable to pluvial flooding. Despite these efforts, however, concrete regional strategies with binding goals, targets and policy instruments are still lacking.

In terms of local formal rules, a number of regulations are relevant to municipalities in Limburg, also revealing the external actors they work together with. As explained in the literature review, the provincial government has set norms for the frequency with which "regional water nuisance" (Provinciale Staten van Limburg, 2015, p. 8) can occur. Although these do not apply to urban waste

water management, they are worth mentioning because they do play a role where municipalities and the regional water authority have overlapping responsibilities. The provincial norms require regional water systems to handle a 1:100 rain incident for urbanized areas, although some areas near creeks and in valleys in South Limburg have a 1:25 norm (a higher norm is not deemed feasible). In addition, the regional water authority maintains a document of regulations (the *Keur*) to ensure developments do not affect the functioning of the regional water system, for example requiring municipalities to obtain permits for all its spatial projects.

Drawing on national, provincial and regional policy, Limburg municipalities develop concrete policy on urban waste and storm water management. Every four years, these policies are fixed in the municipal sewage plan, which is to be presented and approved by the municipality council. Often, this process is overseen by the alderman responsible for issues of spatial planning and/or public space. Regarding the necessary financial resources, citizens directly finance urban waste water management through the *rioolheffing*, or sewage charge, which (largely) covers the necessary budgets.

Limburg municipalities also take part in other forms of external cooperation. Every municipality is part of a regional partnership, in which a number of municipalities, the regional water authority and the provincial government work together to realize more efficient water management (see figure 3⁴ for an overview of the partnerships in Dutch). Issues with regard to pluvial flooding are discussed from a broader, more regional perspective, in which the interrelatedness of local and regional water systems is taken into account. Members of regional partnerships set common policy objectives, share knowledge and make agreements about the distribution of regional tasks (including costs) to increase efficiency and reduce the vulnerability of small organizations. Such objectives and agreements are then fixed in *regional* (waste) water plans, which serve as a basis for the municipal versions each individual

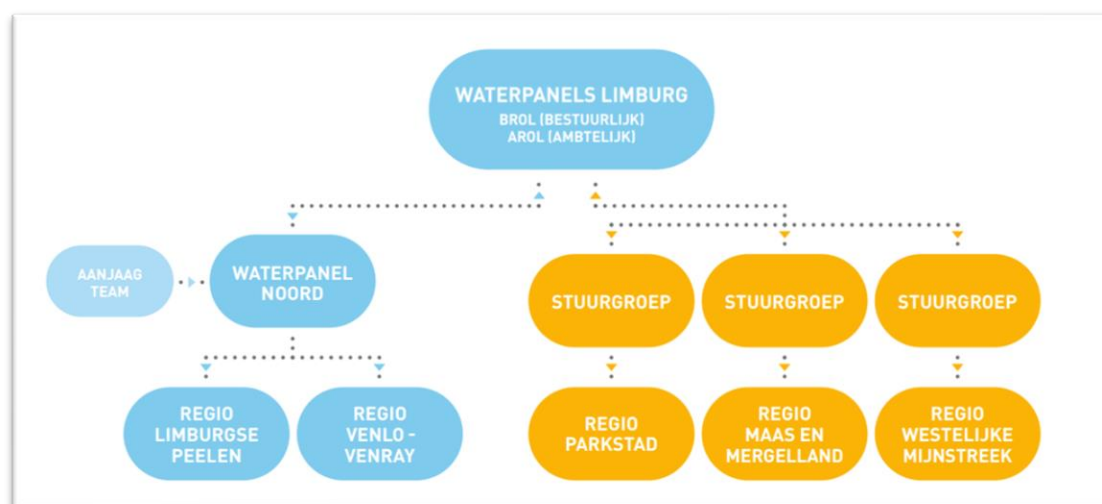


Figure 3: Scheme of the regional cooperative structure in Limburg (Waterpanel Noord, 2018).

⁴⁴ Some important Dutch-English translations: 'stuurgroep' means steering committee, 'regio' means region.

municipality writes. To every regional partnership, the regional water authority has assigned an account manager to stay in touch with the municipalities and oversee regional developments.

As visible in figure 3, an organizational division between North and South Limburg exists. The two northern regional partnerships are led together by one steering group, Waterpanel Noord, while the southern partnership each have their own. This division can also be recognized in specific regional initiatives, such as the public awareness campaign *Waterklaar* (meaning *water ready*). Launched in 2017, the *Waterklaar* campaign promotes actions to make private property flood-proof, while also regulating subsidy schemes for participating municipalities. *Waterklaar* is an example of advanced regional cooperation in North Limburg, although it has recently also been extended into the southern partnerships.

Municipalities are also involved in the *Water in Balans* program initiated by the regional water authority. As of 2019, six bottleneck locations were addressed in pilot projects, in which stakeholders are working towards a collaboration agreement with common goals and specific binding targets defined for each party. Currently, the regional water authority takes up a leading role in this process. Meerssen and Peel en Maas are part of a pilot project, the first already having signed a collaboration agreement in Fall 2018. For these municipalities, the program is also a source of various resources, as they benefit from extra budgets as well as knowledge and human capacity.

5.1.2. Frames present at the regional water authority

At the regional water authority, eleven employees from various different departments were interviewed about their views on pluvial flood risk management. Although generally speaking, most interviewees agreed on the problem statement as well as ideal solutions and share similar driving factors, several significant differences emerge. Starting with the dominant *diagnostic frame*, climate change in combination with risky land use are seen as the two main factors causing pluvial flooding. Concerning the definition of the problem, almost all interviewees make a distinction between ‘hindrance’ and ‘damage’. Here, the general consensus is that pluvial flooding should be allowed on streets even if it causes hindrance, as long as serious financial and emotional damage and life-threatening situations are avoided. Interestingly, however, most interviewees cannot provide an exact definition of what ‘damage’ means, because this term is not coined in any policy document. Some interviewees ([P8], [P6]) particularly stress the uncertainty this causes for government organizations as well as citizens regarding the question of when to take action or not, and are actively lobbying for the development of a clear and workable cost-efficiency norm.

The dominant *prognostic frame*, concerning preferred solutions, is clearly centered around adaptive measures in spatial planning. According to most interviewees, measures should be visible, adapted to nature and contributive to a pleasant living environment (e.g. decoupling of storm water, small technical

adaptations in urban design). The importance of damage prevention is mentioned as well, although opinions differ on the extent to which their facilitation is the responsibility of the citizen or government. Although the importance of considering climate change in pluvial flood risk management is recognized by all interviewees, some stress that the domain should be integrated entirely into the domain of climate adaptation. However, other interviewees, for example the account manager involved in a *Water in Balans* pilot project [P1], struggle with the fact that such an integrated, collaborative approach is hampering efficient and quick actions.

Most notable differences emerge when observing *motivational frames*, especially with regard to responsibility. Urgency of the problem is deemed high by all interviewees, who especially stress the emotional impact on affected citizens. That being said, interviewees also acknowledge that there are other problems Limburg is facing in the context of climate change (e.g. droughts, heat stress). Responsibility seems the most intrinsic driving factor for most interviewees, however. All interviewees feel their organization has a major responsibility to address pluvial flooding, although opinions differ on where this responsibility ends. Some believe the regional water authority sometimes goes too far beyond its legal tasks by interfering in municipal or private responsibilities (e.g. with the *Water in Balans* program) and by getting involved in climate adaptation policy (e.g. [P4], [P8]). Others praise the more cooperative, integrated attitude that has been introduced with *Water in Balans* and believe it is the job of the regional water authority to promote this new mindset (e.g. [P5], [P9]).

Another important observation is that interviewees unanimously see a bigger role for private actors, believing that citizens must accept that governments cannot prevent every case of pluvial flooding. To promote self-sufficiency, private actions must therefore be stimulated. Yet some interviewees, mainly the account managers who work most closely with water policy officials at municipalities, point at several barriers. According to them, most citizens do not feel the urgency of the problem unless it affects them directly, do not possess the knowledge to take efficient action, or believe it is not their responsibility. Therefore, these interviewees believe governmental organizations should first raise awareness and provide guidance to overcome such barriers. Almost all interviewees believe municipalities are responsible for this task, while the regional water authority is to provide advice to municipalities in this process.

On balance, most internal frames are congruent, although the responsibility question implies some differences between prevailing motivational frames. Interestingly, although interviewed employees generally agree on most ideational aspects, their frames do not always correspond with the policies pursued by the regional water authority, implying that ideational incongruity is present among different organizational levels or between different departments. This is relevant for municipalities, as they work with the regional water authority in different contexts (e.g. obtaining permits, *Water in Balans*, regional partnerships, etc.) and can thus encounter different discourses in the cooperative process.

5.2. General characteristics of the case studies

Providing a brief overview of the basic characteristics of the case studies, table 5 shows important demographic, geographical and geological specifications for each municipality.⁵ Although all municipalities have experienced significant pluvial flooding in recent years, the current situation differs for each municipality. In Peel en Maas and Sittard-Geleen, both characterized by a (relatively) flat landscape in which water infiltrates easily, most bottlenecks have been solved and pluvial flooding only occurs locally. In Peel en Maas, for example, this concerns the areas surrounding a small creek called the Kwistbeek, which are vulnerable to flooding after heavy rainfall. In Meerssen and Valkenburg, however, pluvial flooding occurs on a more structural basis and a larger scale. Here, the hilly landscape and loess soils hardly allow water to infiltrate, causing storm water to accumulate at the top of surrounding hills and form mud streams that flow down to the urbanized areas. Especially in Meerssen, the impacts are high due to its situation in a narrow valley and the densely built historic city center.

To indicate the seriousness of flooding problems, all municipalities apart from Valkenburg include the number of reports made about pluvial flooding and failure of the sewage system in general. For example, in Meerssen, the municipal sewage plan (2017) lists 74 reports of water entering houses received between May 2014 and July 2016. In 2015, Peel en Maas received 197 complaints related to water and flooding, although this number includes local functional issues with the sewage system as

	Meerssen	Peel en Maas	Sittard-Geleen	Valkenburg
<i>Population</i>	19.072	43.347	93.319	16.440
<i>Location</i>	South Limburg	North Limburg	South Limburg	South Limburg
<i>Landscape</i>	Hilly	Flat	Mostly flat, but partly hilly	Hilly
<i>Soil type</i>	Loam, with loess sediments	Sand	Loam, with loess sediments	Loam, with loess sediments
<i>Risk of flooding</i>	High, many vulnerable locations	Low, with local exceptions (e.g. Kwistbeek)	Medium, several important bottlenecks	High, many vulnerable locations
<i>Impact</i>	Flooded streets, mud streams, loose manhole covers, floating cars, water entering houses	Flooded streets, water incidentally entering houses	Flooded streets, flooded basements, flooded houses	Flooded streets, mud streams, water entering houses

Table 5: Overview of general case study characteristics.

⁵ The population numbers are of the year 2017 (CBS, 2020) and the soil type was retrieved from online data made available by the Province of Limburg (Provincie Limburg, 2020).

well. All in all, these numbers imply that the damage must be considerable. That being said, municipalities could not provide a complete picture of the damage due to pluvial flooding (in either financial or emotional terms). Based on interviews, policy documents and news articles, the column *Impact* in table 5 therefore lists the physical effects that were reported during periods of flooding. The images in figure 4 give an impression of the flooding situation in the case study municipalities.



*Figure 4: Images of pluvial flooding in Meerssen, Valkenburg, Sittard-Geleen and Peel en Maas (clockwise).
Sources (also clockwise): ANP (2014), Nifoma (2018), 1Limburg (2018), Koopmans (2018).*

5.3. Case study 1: Meerssen

5.3.1. Measures and level of anchoring

Although the municipality of Meerssen is taking a mix of measures to tackle pluvial flooding, its focus lies on technical measures. Following the official guidelines of Stichting Rioned, the sewage system is the main system to process rainfall and is designed to process an incident that occurs once every two years (1:2). However, flooding still occurs on several locations during 1:2 events. In case of more extreme events, the municipality states it is technically and financially impossible to meet this norm, due to extreme pressure on the (waste) water system in low-lying urban centers. However, sewage capacity is enlarged wherever possible, while smaller technical measures have been introduced to lead

away surface water in a controlled manner. With the help of the regional water authority, the municipality has also started constructing large retention areas in the rural environment to temporarily store storm water. Since 2018, the municipality also counts 15 kilometers of separated storm water sewage pipes and 3 large infiltration systems on public grounds.

Non-technical measures have gained more momentum in recent years too. Since the most recent municipal sewage plan (2018), storm water drainage is considered in new public development plans, ensuring new constructions are flood-proof and have sufficient infiltration facilities. In addition, private land owners are obliged to ensure storm water drainage for small construction projects (1-2 houses). To further stimulate decoupling of storm water run-off from the sewage system, the municipality also maintains a subsidy scheme, currently offering citizens €9 euros per decoupled square meter. Ambitions to introduce *Operatie Steenbreek*, a national public initiative to make private gardens greener, are expressed in the municipal sewage plan as well, although a concrete plan of action is not discussed.

To stimulate damage prevention, the municipality has set up a public campaign to raise awareness about citizens' own responsibility and discuss measures they can take themselves. The campaign consists of information meetings, a Water Information Point, special brochures, a newsletter and publications in local newspapers, while specifically stressing the limits of the municipal's ability to prevent pluvial flooding. To prepare citizens for new flood events, free sand bags have been made available to use in emergencies. Lastly, the municipality is currently looking into options to collective purchase automated flood barriers, so citizens can buy them at a reduced price.

Looking at how pluvial flood risk management is integrated in the municipality, anchoring in organization seems to be reasonably well-secured. Being incorporated in the Department of Public Space, pluvial flooding is addressed mostly in the context of waste water management. Municipal interviewees indicate that responsibilities within the municipality are clearly divided and that all involved parties cooperate well. That being said, co-benefits are not actively pursued. Although some coordination takes place within the department itself, the main goal is to save costs (for example when road construction can be combined with the enlargement of sewage pipes). Other benefits, e.g. in the domain of sustainability or improvement of the living environment, are mentioned as ambitions in policy documents, but according to interviewees are not structurally realized in practice.

As for anchoring in policy, the general direction of policy is determined by a number of ambitions fixed in the regional water plan (2018) of the partnership Maas en Merelland. Concrete measures are described in the municipal sewage plan written for 2018-2022. In this plan, technical measures are discussed in most detail, including time paths and specific locations. An investment scheme is included for all types of measures, although non-technical projects are generally described more briefly (e.g. simply as "measures pluvial flooding"), without elaborating on what measures the project specifically entails. In addition, integration at the operational level seems to be lacking, for concrete checklists, plans

of action and more detailed timelines are not (publicly) present for any measure. That being said, the municipality is working on integration at the strategic level, with the collaboration agreement signed in the context of the *Water in Balans* pilot listing long-term targets for every participating party to be achieved by 2035. For the municipality, this includes the goal to decouple 50% of all public grounds from the sewage system (although a study on feasibility is still running).

Regarding anchoring in practical implementation, Meerssen is experiencing issues, particularly in terms of resources. Although enough financial resources are available to follow the municipal sewage plan, the municipality lacks the human capacity and, to a certain extent, knowledge to carry out the policy tasks that accompany them. According to interviewees, integrated collaboration outside of the *Water in Balans* project and regional partnership is not running smoothly. All this results in difficulty appropriately investing the financial resources in measures and other policy actions, leading to delays in practical implementation. Progress over the past few years is standardly reviewed in the municipal sewage plan, but there is no monitoring program to check whether measures are taken effectively in between and municipal interviewees indicate that not all necessary checks on storm water drainage in private construction projects are carried out due to a lack of time.

5.3.2. Policy arrangement of Meerssen

Rules of the game

In Meerssen, a number of formal and informal rules apply. In terms of *formal* rules, organizational characteristics play an important role. The municipal organization is relatively small, consisting of approximately 100 employees and only three civil departments. Due to significant financial problems threatening the existence of Meerssen as an independent municipality, the main goal of the Coalition Agreement (2018-2020) is to realize a stable organizational structure. Therefore, the municipality is in the process of becoming a so-called ‘regiegemeente’; a compact managing organization; meaning that it has minimized the number of employees while outsourcing as many tasks as possible. These developments are an important reason for the current lack of sufficient human capacity, which will be further discussed in the resources dimension.

Existing policy and policy ambitions are also formal rules that shape the municipal approach. As discussed, Meerssen is dependent on the regional water plan set up by the regional partnership Maas en Mergelland for the years 2018-2022. This water plan mentions four policy themes that are to be commonly achieved: climate adaptation, sustainability, achieving a good living environment⁶ and efficient collaboration. Regional ambitions are thus quite progressive, although the main focus lies on

⁶ Although the meaning of a ‘good living environment’ is not specified, the document suggests that the partnership aims for regional water management to be better integrated into society, which is to be achieved by formulating tasks and responsibilities more clearly for all involved parties.

cost reduction and minimizing vulnerability. In addition, the ambitions are not worked out into concrete plans. A yearly common budget of 200 000 euros is available for their realization, but the plan does not elaborate on concrete projects or which party is responsible for taking them up.

The municipal sewage plan of Meerssen (2018-2022) follows the ambitions of the regional water plan closely. It acknowledges that the “interests of the regional water system are above those of individual participants” (p. 19) and stresses the importance of close collaboration to reduce costs. It also states that climate change makes involving disciplines such as spatial planning necessary, followed by explicit emphasis on taking more measures above ground. Lastly, the plan includes definitions of responsibility for the municipality as well as citizens and aims to encourage citizen participation. All in all, the fact that the municipality has largely taken over regional ambitions implies a strong link between fixed regional policy and the municipal approach in terms of measures and anchoring in policy. However, constant emphasis on cooperation for the sake of cost reduction also reveals how much the municipality depends on others to sufficiently address pluvial flooding.

An influential *informal rule* is that politics in Meerssen are highly localized and politicians base their actions strongly on public opinion. All three municipal interviewees state that council members tend to focus on small details instead of the bigger picture, which sometimes causes frustrations. For example, the alderman is determined to introduce *Operatie Steenbreek* as a public statement, whereas the waste water expert doubts the efficiency of this measure. Municipal sovereignty is another controversial theme: whereas the waste water expert would be prepared to give up some authority to increase the capacity to address pluvial flooding properly, the municipality council structurally blocks merger initiatives to ensure local politics can continue to be practiced. In other words, informal rules such as political agendas can influence the types of measures pursued, as well as anchoring in policy and implementation.

Actors and coalitions

In Meerssen, pluvial flooding falls under the Department of Public Space, where the issue is approached from a traditional waste water perspective. In this context, one waste water policy advisor [P13] is currently overseeing the entire policy process regarding storm and waste water management. With a background in civil engineering, he sets up the municipal sewage plan and decides which practical solutions for particular bottlenecks will be realized. The waste water policy advisor sometimes works together with other colleagues on spatial planning or greenery projects for which construction work can be combined. In addition, the communication department is involved when policy needs to be practiced towards the public, e.g. in the shape of public awareness campaigns. Lastly, the alderman ensures pluvial flooding is put on the municipal agenda and presents new policy to the municipality council.

Municipal interviewees indicate that cooperation among colleagues generally goes well. Interviewees know when and where to find colleagues in the small municipal organization and feel their expertise is trusted upon. Ties with the alderman are close, although his interferences are sometimes experienced as hindering. Yet, despite close internal cooperation, pluvial flood risk management still seems largely limited to the domain of waste water management, with little structural cooperation in other fields. For example, there seem to be no overarching initiatives in the field of climate adaptation, spatial planning or sustainability in which pluvial flooding is involved. Priorities currently lie with keeping the municipality running, which might explain why co-benefits are not actively pursued (unless it regards cost reduction).

In terms of external cooperation, the municipality works together with many external parties. As discussed, the regional partnership forms the main context for collaborative policy-making, with which the waste water policy advisor indicates to be content, stating that Meerssen benefits greatly from joint projects that it cannot carry out alone. On a local, more practical level, the regional water authority is the most notable cooperative partner. Traditionally, this cooperation has been taking place at the 'end' of projects, with the municipality mainly contacting the water authority to gain permits. Meerssen's participation in the *Water in Balans* program marks a change to this tradition as the pilot project involves the water authority and many other external actors in the entire policy process.

In Meerssen, the *Water in Balans* pilot project is generally received with great enthusiasm. However, it is unclear whether this enthusiasm is fueled by an intrinsic motivation to work together, or by the fact that the municipality is simply unable to effectively carry out its tasks. The municipal interviewees admit that the municipality so far has not contributed much in terms of project management, with the regional water authority still taking the lead in, for example, organizing public information meetings. All in all, this implies that the regional water authority plays a large role in Meerssen's collaborative approach to pluvial flooding.

Resources

As already discussed, the municipality is experiencing several issues with regard to resources, although financial resources are not a direct problem. The fixed sewage charge guarantees the supply of financial resources necessary to practically implement measures, while a subsidy grant of 3 million euros to finance the *Water in Balans* pilot project was successfully lobbied for at the national government. However, the municipality lacks human capacity. Officially, three employees are working full-time on water management (3,6 fte are officially needed), but due to personal circumstances two employees have fallen away. Budget cuts and the transformation to a more compact organization have led to a vacancy stop. As a result, the waste water policy advisor is currently the only employee working on water management, making his position highly vulnerable. With the *Water in Balans* pilot project and

the busy aftermath of the 2018 floods coming on top of this, the workload becomes extremely high. By extension, internal and external colleagues are confronted with delays when they need his input.

Interviewees of the municipality state that the knowledge and expertise available generally is sufficient to perform their tasks. The waste water policy advisor is praised by his colleagues for his expertise and vast knowledge of the area. That being said, the Head of the Department of Public Space indicates that the newly pursued collaborative approach to waste water policy requires management qualities that most highly specialized employees do not automatically possess (e.g. in terms of stakeholder management). This sometimes causes problems, for example in the shape of disagreements with other parties (internally and externally) or the inability to be flexible in the face of unforeseen circumstances.

Discourses

This section explores the dominant discourses present among the municipal interviewees, starting with the dominant *diagnostic frames*. When asked what the problem of pluvial flooding exactly was, interviewees unanimously spoke of ‘water hindrance’ when water temporarily floods streets and ‘water nuisance’ when floods enter homes, causing financial and emotional damage. The municipal interviewees all state that hindrance is acceptable, while nuisance should be avoided as much as possible. Safety threats due to high-speed water flows in the street are particularly emphasized as unacceptable. When asking about the causes of flooding, all interviewees stress the hilly landscape and increasing rainfall due to climate change.

With regard to the *prognostic frames*, the municipal interviewees share the belief that a mix of different types of measures is ideal, with a growing emphasis on measures in the spatial domain. For example, the waste water policy advisor wants to maximize the capacity of the sewage pipes, but also stresses the importance of safely draining storm water run-off that does not fit in the sewage system. However, internal differences become apparent when discussing where in the spatial domain this should be achieved. For example, the waste water policy advisor is skeptical about infiltration measures on private land due to his experience with citizens unwilling to cooperate:

“Often, a municipality believes that a certain neighborhood is no longer connected to the sewage system, when in fact private facilities are not kept operational. It would be better if the municipality takes care of storm water drainage [on public terrain], so that I at least know that everything is working.”⁷

⁷ Original quote: “Dus de gemeente denkt van die hele wijk is afgekoppeld, maar alle particuliere voorzieningen zijn buiten werking, die doen het niet. [...] Dan kun je beter als gemeente [...] zorgen dat het water wekomt, want dan weet ik in ieder geval dat het gebeurt.” (P13, interview transcript, 2019, p.15)

For this reason, the waste water policy advisor is not convinced of the effectiveness of a non-technical measure such as a subsidy scheme to stimulate private actions, preferring large retention basins to ensure control over the water system. As stated before, the alderman *does* support small-scale actions on private terrain, such as *Operatie Steenbreek*. Lastly, the municipal interviewees all believe damage prevention measures are very important, especially in vulnerable areas where flooding is difficult to prevent. Most notably, interviewees say the municipality should do this by publicly communicating about risks and responsibilities and by stimulating small private actions, such as the use of sandbags.

As to what moves the municipality to actually take specific actions, several *motivational frames* emerge from the data. In Meerssen, urgency seems to be high, although limited capacity sometimes leads to water issues being shelved due to more urgent matters. Responsibility is also an important driving factor, as interviewees believe the municipality has a big task in addressing pluvial flooding. In this context, the *Water in Balans* collaboration agreement is generally taken as a starting point, as interviewees state the responsibility is shared between the municipality, water authority and private land owners (e.g. agrarians, companies). Yet, outside the pilot project, discussions have occurred on responsibility for locations where responsibilities of the regional water authority and municipality meet, particularly concerning cases where the flood source is difficult to identify.

Although the role of citizens in taking measures is so far limited, the waste water policy advisor believes they too have a responsibility, especially regarding damage prevention:

“It will take a generation before we have addressed every bottleneck. In the meantime, certain places will still be flooded, [...] so citizens should take action themselves. Some people continue to believe the municipality and the water authority have to solve every water issue. I believe we all carry that responsibility together.”⁸

Yet, he does not believe citizens should be expected to fulfill their legal obligation to take care of storm water on private grounds, explaining that persuading citizens to take measures is very difficult. He has little faith that private measures will be taken effectively and on a large enough scale:

⁸ Original quote: “Het duurt nog een generatie voordat we zover zijn dat we alles, en in de tussentijd loop jij onder water. [...] Neem zelf ook maar actie. [...] Sommige mensen [...] blijven toch bij hun idee dat de gemeente verantwoordelijkheid is om samen met het waterschap het op te lossen. En dan denk ik, nee, we zijn met z'n allen verantwoordelijk.” (P13, interview transcript, 2019, p. 17)

“Every decoupled household helps. However, I do not have the illusion that these people will continue to do this forever. [...] Every drop of rain counts, but given the soil composition we have here, I believe we cannot expect too much from our citizens.”⁹

In other words, the feasibility of measures concerning the party that needs to take them also seems to be a driving factor.

5.3.3. Case study conclusion

The municipality of Meerssen is working hard to innovate its pluvial flood risk management towards a more adaptive, integrated approach. It maintains progressive ambitions, has introduced non-technical measures and seeks more extensive collaboration with external parties. However, non-technical measures are anchored significantly less well than technical ones, with the latter still taking up a vast majority of the available budgets. In other words, the traditional waste water perspective remains dominant in practice.

Looking at this approach in relation to the policy arrangement, a number of noteworthy links come forward. Starting with the rules, existing regional policy seems to have great influence on the municipality's individual ambitions. That being said, the informal rules of local politics play a role in putting forward certain (electorally interesting) measures too. In addition, the lack of a concrete definition of cost-efficiency and damage in (regional) policy highlights issues of anchoring in policy.

The municipality's participation in the *Water in Balans* program shapes the municipal approach too, most importantly in terms of external collaboration. The fact that stakeholder participation outside of the program is not anchored well reveals the municipality's dependence on other parties to carry out its water management tasks. This could be explained by the fact that the available human capacity is not nearly sufficient to carry out all tasks required according to the municipal sewage plan. Having so little time to invest in new projects, the limited knowledge of the waste water expert might also make executing adaptive, collaborative measures difficult. In other words, insufficient resources contribute directly to the municipality's anchoring issues, and might also be influential to the type of measures pursued.

As for discourses, frames present among the municipal interviewees correspond well with the municipal approach. For example, the waste water expert's preference for control and technical measures on public grounds seems based on negative experiences with stakeholder participation, although his educational background might also play a role. The municipality's investment in damage

⁹ Original quote: “Iedereen die afkoppelt, dat is meegenomen. Maar ik heb niet de illusie dat die mensen dat voor jaar en dag blijven doen, dus, ehm, het is goed, elke druppel telt [...] maar zeker gezien de bodemopbouw die wij hier hebben, [...] denk ik dat je van de burger niet te veel mag verwachten.” (P13, interview transcript, 2019, p. 16)

prevention might be linked to the belief that citizens need to take responsibility in this area, which in turn seems related to the conviction that flood risks are so high that they will not be solved in the near future.

Lastly, ideational incongruity between the municipality and regional water authority seems to be influential. Although interviewees of these institutions maintain similar diagnostic and prognostic frames, incongruity appears when it comes to responsibility as a driving factor. As the current policy framework does not cover responsibilities in hilly areas with ambiguous flood sources in a watertight manner, the municipality and regional water authority both tend to claim the other party is responsible for addressing flooding in such ambiguous areas. The same goes for stakeholder management in these particular areas, for which no legal framework or policy agreements exists either. All in all, this policy gap allows for different discourses to emerge between involved actors, which potentially affects anchoring in practical implementation.

5.4. Case study 2: Peel en Maas

5.4.1. Measures and anchoring

Looking at the measures taken by the municipality of Peel en Maas, a strong shift towards adaptive, integrated pluvial flood risk management is visible. Yet, waste water management is still the main context in which pluvial flooding is addressed. The sewage system is built to process 1:2 rainfall events, following the guidelines of Stichting Rioned. As of 2017, the municipality counted 35 kilometers of storm water sewage pipe infrastructure and 7.7 hectares of retention areas. Yet, the municipal sewage plan states that when rainfall events more extreme than 1:2 occur, a small number of bottleneck locations is still prone to flooding.

Besides technical measures, focus lies on measures in spatial planning that allow for natural storm water infiltration, most notably through large-scale decoupling. All newly constructed buildings are required to include separate waste and storm water flows and sufficient facilities to ensure on-site infiltration, while three existing neighborhoods have been decoupled in large reconstruction projects. In the regional partnership Limburgse Peelen, research is also conducted on future impacts of climate change on urban areas. Lastly, the water policy advisor is currently preparing a risk dialogue to hold with citizens and other parties affected by pluvial flooding to come to a concrete cost-efficiency norm, which is currently lacking.

To encourage citizens to take action themselves, the municipality has introduced new legislation obligating private land owners to decouple their land plots. According to the water policy advisor, this measure has already saved the municipality nearly 200.000 euros in energy costs, as sewage pumps have been noticeably less active since the rule came into force. The regulation was accompanied by a subsidy scheme (€9 euros per square meter) and participation in the large-scale public awareness

campaign *Waterklaar*, making available €164.244 to stimulate private decoupling measures for the years 2017-2021. On demand, the municipality also offers custom advice on how to make individual plots of land flood-proof. Interestingly, however, damage prevention measures are not actively promoted.

In addition to decoupling, the municipality is currently running a multi-purposed project surrounding the Kwistbeek, a small stream that is vulnerable to flooding and forms one of the municipality's few remaining bottlenecks. In 2018, the municipality and water authority started the project as part of the *Water in Balans* program to solve the issue together with all involved stakeholders. The Kwistbeek basin was also designated as a pilot area to experiment with the new Environment and Planning Act. The idea behind this is to design an integrated development plan for the entire area, addressing flooding as well as other spatial issues (e.g. restoring the natural environment and historical landmarks). Citizen participation is taken seriously, with many public meetings being organized to gather input (observation, April 18, 2019). Currently, a definitive project plan has been presented and is currently under last review before implementation is scheduled to start in Fall 2020. See figure 5 for an illustration of the process plan (in Dutch) that was used to inform the public.

The municipality of Peel en Maas has anchored pluvial flooding into the municipal organization relatively well. The municipality is currently working towards a flat organizational structure in which

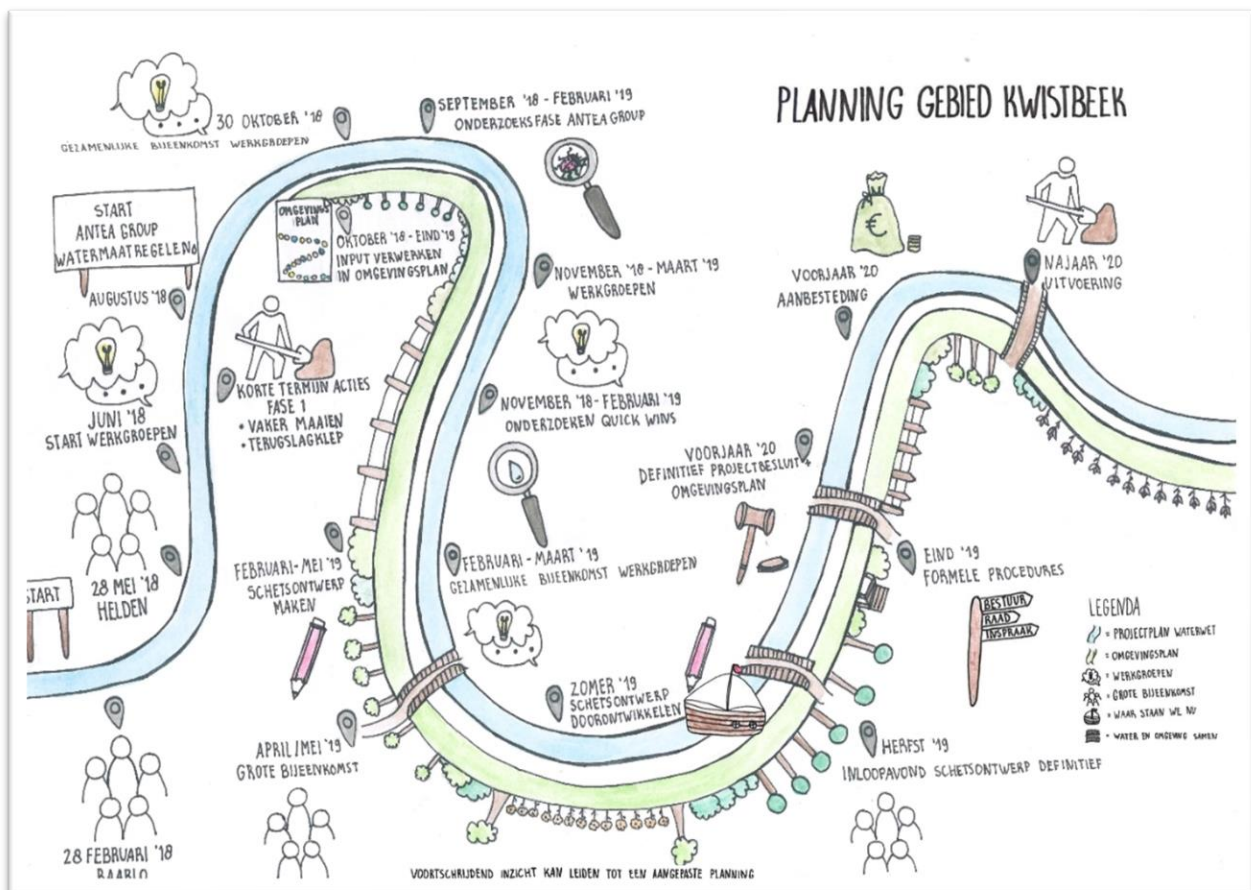


Figure 5: Time path illustration for the Kwistbeek redevelopment project (Heuts, 2019).

municipal issues are addressed in interdisciplinary project teams, enables collaboration from the beginning phase of projects and the active pursuit of co-benefits. However, interviewees indicate that the current organizational transformation also causes unclarity about who should be involved in such projects, as rules to follow when carrying out such projects are not formally fixed.

The level of anchoring in policy is high. The municipal sewage plan elaborates extensively on the current situation as well as future ambitions, describing technical as well as non-technical projects in detail and including budgets for almost every measure. In addition, the municipality states what citizens can expect in terms of protection and assistance, while also naming their responsibilities. Pluvial flooding is also mentioned regularly in the context of policy ambitions on climate change and sustainability and forms one of the three major spearpoints in the municipality's general vision document on sustainability that is currently being developed, indicating that its urgency is acknowledged throughout the entire organization. That being said, concrete examples of projects surrounding climate adaptation are not mentioned.

Regarding anchoring in implementation, there are no significant problems with resources. The municipality is financially relatively healthy, human capacity is sufficient to carry out all required tasks and a variety of expertise is internally available. Extensive external cooperation takes place, within as well as outside the *Water in Balans* program. As for monitoring, indicators for measuring progress with regard to implementing new policy are not specifically mentioned, but the municipality does carry out regular checks on the functioning of the waste water system. In addition, regulatory enforcement is taken seriously, as the municipality takes measurements in the sewage system to detect households that do not comply with decoupling regulation. All in all, policy implementation with regard to pluvial flooding generally goes smoothly.

5.4.2. Policy arrangement of Peel en Maas

Rules of the game

In Peel en Maas, regional water policy strongly shapes local policy on pluvial flooding. The municipality is part of a regional partnership called Limburgse Peelen, established in 2010 with the aim to realize an collaborative approach to water management, spatial planning and the living environment in general. In 2017, the partnership signed a regional water plan (*Waterketenplan*) focusing on the entire water chain in the region (instead of on the sewage system only). Each participating municipality still writes an individual waste water plan in which local goals and measures are discussed.

Looking at the municipal approach, Peel en Maas follows regional policy quite closely. The regional water plan lists progressive ambitions in the field of climate adaptation and includes a number of principles that are clearly taken over by the municipal sewage plan. For example, the regional plan explicitly holds private land owners responsible for storm water drainage on their private lands and

acknowledges that sewage systems alone cannot cope with the effects of climate change, stating that water should be incorporated in spatial planning to ensure controlled drainage. Another mentioned principle is that long-term (cost-)efficiency needs to be taken into account when considering measures, an issue on which the municipality aims to do research in the near future.

Another influential formal rule is that for certain issues, Peel en Maas has a tradition of encouraging self-management by communities within the municipality, drawing on the principle that the municipality should first and foremost be there to serve citizens (as stated in the Coalition Agreement of 2018). From the '90s onwards, the municipality has been working together with community platforms to create vision documents and agendas describing goals for the physical and social environment, which are then incorporated into municipal policy. As of today, many projects within the municipality start as external initiatives from citizens, which then receive municipal guidance. These long-existing ways of external cooperation might explain why the municipality is particularly active in citizen participation.

Actors and coalitions

Within the municipal organization, various actors are involved in pluvial flood risk management. The water policy advisor is the most prominent actor, as he is directly responsible for the process of policy development and implementation (maintenance and construction work is done by field service workers). In addition, employees from various other departments are involved in different ways. For example, the policy advisor sometimes contacts spatial planning colleagues to secure the interests of both domains and pursue co-benefits, for example if a specific measure for the sewage system affects spatial planning too. In addition, the communication department is involved for citizen communication, within as well as outside the context of the Kwistbeek project. Lastly, the alderman responsible for public space regards water policy as a high priority and plays an active role in making sure pluvial flooding is addressed within the municipality as well as regionally.

As for internal cooperation, experiences differ. Although all municipal interviewees indicate that internal cooperation generally goes smoothly, the newly introduced project-based approach to cooperation is not yet fixed in procedures. The advisor on environmental development states that, as a result, employees sometimes deliberately do not involve certain colleagues in a project to safeguard their own interests. In addition, the landscape architect states that his expertise on landscape design, nature and greenery is generally called upon in a late phase of the project when most of the development plans are already fixed. In other words, different agendas within the municipality sometimes hamper effective cooperation or result in missed co-benefits due to lack of clear rules on project management.

Although the municipality is part of several regional platforms, interviewees do not mention these very often when asked about external cooperation. Generally, they seem more focused on what

happens within the borders of their own municipality. Cooperation with private parties (e.g. citizens, companies, village councils, etc.) often concerns small-scale and self-initiated projects that somewhere have a link with water policy and are managed by municipal case managers. In addition, cooperation with the regional water authority takes place in standard forms (e.g. when applying for permits) as well as in the context of the *Water in Balans* program.

Cooperation with external actors generally goes smooth, although interviewees see more opportunities in areas where contacts are not established yet (e.g. housing associations). Experiences with the regional water authority differ, however. The water policy advisor and advisor on environmental development state that contacts with the permits department of the regional water authority could be better, for requests are processed slowly and employees seem unwilling to think along in difficult situations. Yet, the water policy advisor is happy with the engagement of the account manager of the regional water authority [P9], who acts as a helpful intermediary.

Regarding cooperation on the Kwistbeek project, some issues occur too. Whereas the water policy advisor seems quite positive about the cooperative process, an account manager at the regional water authority [P1] expresses frustrations regarding the direction of the project and the pace with which it progresses. According to her, her municipal co-workers are focused too much on broad issues concerning the Strategy on Spatial Planning and the Environment, which hampers concrete actions to prevent flooding problems citizens experience. According to the communication advisor of the municipality, such frustrations are caused by the inherently different characters of the two organizations:

“[The regional water authority] is simply a different organization. They only have to deal with water questions, whereas the municipality has many other tasks. A municipality is also much more dependent on other stakeholders and needs to work together in an integrated way. [...] Yet, the regional water authority finds it difficult to take a broader approach and continues to focus specifically on water.”¹⁰

Therefore, the communication advisor believes that the *Water in Balans* project should not have been combined with the pilot for the Environment and Planning Act, stressing that citizens simply want flooding to be prevented and are not willing to discuss additional topics concerning the local

¹⁰ Original quote: “ze hebben alleen het waterstuk en wij zijn veel integraler. De gemeente is gewoon voor veel meer verschillende dingen afhankelijk en die kunnen ook invloed op elkaar hebben en, eh, dus je bent als gemeente ook verplicht om meer samen te werken, in teams onderling, eh, of met stakeholders, noem maar op. [...] in de samenwerking van het waterschap vind ik dat nog wel een groot verschil, dat zij die brede scope ook moeilijk kunnen pakken, erg specifiek op hun ding blijven zitten” (P16, interview transcript, p. 10)

environment. In addition, the communication advisor argues that the slow pace of the process has negatively affected citizen engagement, which improves with regular and fast communication. These opinions are also shared with the communication advisor of the regional water authority.

Resources

As discussed, Peel en Maas is generally not lacking any resources with regard to pluvial flood risk management. That being said, the municipal sewage plan anticipates a high increase in financial costs due to the impacts of climate change. For the water policy advisor, this is an important reason to start a risk dialogue and come to a decent cost-efficiency norm, as it is currently not clear at what costs risks may be mitigated. In addition, municipal interviewees indicate that the necessary knowledge and expertise to manage the policy development process is available. The water policy advisor states to benefit from his broad background in land- and water management, which gives him tools to take up non-technical tasks such as citizen participation as well. Due to the project-based working method, it is also easy to involve the expertise of colleagues from other disciplines. In other words, employees are well-equipped to handle new management challenges that come with a more adaptive, integrated approach to pluvial flooding.

Yet, small problems with human capacity occur due to a combination of factors. Although 2,6 fte are reserved for water policy design (and an additional 5,7 fte for field service), the water policy advisor is currently the only employee working on policy due to a colleague's recent departure. Due to a national shortage of water policy advisors, finding a suitable colleague is difficult. In addition, there is uncertainty surrounding the upcoming Environment and Planning Act, as it is yet unknown what kind of expertise will be needed in the future. Therefore, the municipality is reluctant to hire new colleagues before the law comes into force. All this leads to a temporary shortage of human capacity, although the interviewees expect to hire a new colleague soon.

Discourses

The discourses present among the employees that were interviewed correspond well with the current approach to pluvial flood risk management. As for *diagnostic frames*, interviewees believe pluvial flooding becomes a problem when water floods houses and causes hindrance for more than a couple of hours. If no dangerous situations arise, floods on the streets should be accepted. In addition, pluvial flooding is often mentioned together with heat stress and droughts, implying that the municipal employees see pluvial flooding as part of a bigger environmental problem. Regarding its causes, however, diagnostic frames differ slightly. Whereas the communication advisor generally mentions climate change as the main causal factor, the other three interviewees also specifically stress the impact of increased urbanization. For example, the advisor on environmental development states the following:

“Our destination plans regularly include clauses granting the freedom to take actions without getting a permit for it. This has led to an increasingly large percentage of the municipality’s surfaces being paved, causing problems for infiltration.”¹¹

In other words, the interviewees clearly acknowledge the human role in increasing the risk of pluvial flooding, which is also central to municipality’s efforts regarding citizen awareness.

As for *prognostic frames*, the municipal interviewees agree on the types of measures to be taken. Although a mix of measures is preferred, they all name measures in spatial planning as promising solutions, often mentioning the potential of advanced blue-green infrastructures to make sure water can be safely contained, stored and discharged. Some interviewees, e.g. the landscape advisor, also make a link with the societal value of such measures, believing their visibility can contribute to greater awareness about the problem while enhancing the attractiveness of the living environment.

When asked in which domain such measures should be taken, interviewees have a number of interesting views. For example, the landscape architect is particularly vocal about the current way in which the municipality deals with urban development, criticizing the council’s prioritization of economic development and the resulting negative effects on nature, biodiversity and water safety:

“When a plot of land becomes available, the traditional reflex is to build new homes, or bring back another urban function. However, I believe that [...] we have to take a step back and see how this land can contribute to more robust blue-green infrastructures.”¹²

The municipal interviewees also see great opportunities in measures taken on private land (e.g. decoupling, introducing greenery), either initiated by the municipality or by citizens themselves. The water policy advisor acknowledges that it is not always easy to convince private land owners to take these measures, but does believe the collective impact can be significant enough to reduce the risk and impact of pluvial flooding.

Several *motivational frames* come forward that seem influential to the municipal approach. Interestingly, however, urgency does not seem to be a great driving factor. Although interviewees find pluvial flooding an important problem, the urgency of the problem as seen by the municipal council is

¹¹ Original quote: “wij hebben in onze bestemmingsplannen geregeld zitten dat vergunningsvrij heel veel mag gebeuren, dus, eh, bedoeld en onbedoeld [...] krijgen we een steeds groter verhard oppervlakte, dus, eh, infiltratie is een probleem” (P18, interview transcript, p. 2)

¹² Original quote: “het traditionele ouderwetse reflex is, er komt een locatie vrij, daar gaan we woningbouw realiseren, of daar gaan wij, andere functies, dus een soort stedelijke functie die brengen we terug. Ik denk dat je [...] moet je even een stap terugnemen en bedenken van, wat kan dit bijdragen aan dit groenblauwe systeem robuuster te maken.” (P17, interview transcript, p. 2)

largely determined by the occurrence of floods, which outside of the Kwistbeek area do not happen often. That being said, the water policy advisor states that “heat stress and droughts are more imminent threats than pluvial flooding”¹³ and indicates that in the context of climate adaptation the urgency of flooding has been growing (as exemplified by the vision document on sustainability).

Responsibility seems to be a bigger driving factor. All interviewees agree that in terms of cooperation, the involved stakeholders share a responsibility to address flooding issues by looking for the most efficient solution possible. In this context, they also mention that a more flexible attitude by the regional water authority would be very welcome, as they find the organization sticks too firmly to its traditional and legal responsibilities. As for the role of private actors, all municipal interviewees stress that they should take more responsibility. This means private actors must be better informed to raise awareness, but should also be encouraged to actively participate by taking measures themselves. This perception relates to the municipality’s view on risk management regarding pluvial flooding. There is a strong determination that the municipality can only prevent flooding up to a certain point and the residual risk should simply be accepted, as explained by the water policy advisor:

“Of course, you can try and do better [...], but I believe that awareness and acceptance of hindrance are ultimately part of the solution. I mean, all problems can be solved, prevented or simply accepted.”¹⁴

The municipal interviewees believe that the municipality, regional water authority and other public institutions together have to make the public aware of the limits of the governmental responsibility by means of a comprehensive communication strategy, as they are already doing in the context of the *Water in Balans* pilot in the Kwistbeek area.

5.4.3. Case study conclusion

The municipality of Peel en Maas is well on its way towards integrated, collaborative pluvial flood risk management. Technical measures continue to be implemented, the general focus now lies on more adaptive measures in public as well as private space, and private actors are actively engaged. Apart from some minor issues, pluvial flood risk management is anchored well into the municipal organization. All in all, the municipality seems to have a genuine motivation to innovate its pluvial flood risk management by incorporating it in a larger context of climate adaptation and sustainability.

¹³ Original quote: “ik zie ook echt wel hittestress en droogte als een grotere bedreiging, dat bleek bij ons ook wel uit de stresstest, dan wateroverlast.” (P15, interview transcript, p. 7)

¹⁴ Original quote: “Ja, ik denk, eh, je kan wel beter [...] willen doen maar ik denk dat een stukje bewustwording, acceptatie van hinder, dat dat gewoon erbij hoort, [...] ik bedoel het is allemaal op te lossen, te verhelpen of te accepteren.” (P15, interview transcript, p. 15)

Looking at how the municipal approach relates to the policy arrangement, the fact that the municipality has progressed so far can be attributed to a pro-active and collaborative attitude towards addressing pluvial flooding, which is clearly reflected in the discourses present. In this context, sufficient access to resources is important, as the municipality's relatively large pool of employees with a variety of backgrounds prove to be enabling in terms of putting adaptive and integrated policy ambitions into practice. In addition, sufficient resources also create a state of independence, which explains why the municipality can focus on issues within its own municipal borders.

All this being said, it must not be forgotten that due to advantageous landscape characteristics, the scale of the flood problem in Peel en Maas is relatively small. As the landscape is flat and soils infiltrate well, flooding is less likely to occur and flood origins are clear, which might explain why major discussions on responsibility seem absent. In addition, the small problem scale might explain the lack of investment in damage prevention; as flooding has become incidental, damage prevention is simply less necessary.

Remaining anchoring issues most notably are related to cooperation. Internally, the lack of fixed cooperative procedures for interdisciplinary projects makes that internal collaboration remains informal and random. In this context, different internal discourses are at play too. As economic benefits are often prioritized, little room is left in the policy process for discussions on, for example, radical change of land use. This might explain why internal co-benefits are not always realized and adaptive projects besides large-scale decoupling are scarce. Externally, the Kwistbeek pilot project shows that taking a more integrated approach to pluvial flooding is possible, while also requiring a lot of time and effort to overcome ideational differences. The municipality and regional water authority seem to base their actions on different priorities and perceptions of responsibility, which leads to frustrations. Different discourses are also present in cooperative situations outside of the Kwistbeek project, for example in the domain of permit application. In other words, ideational incongruity occurring in internal and external cooperation sometimes hampers progress in pluvial flood risk management, most notably affecting anchoring in practical implementation.

5.5. Case study 3: Sittard-Geleen

5.5.1. Measures and anchoring

Generally, the municipality of Sittard-Geleen is approaching pluvial flooding from a traditional waste water perspective, although considerable steps have recently been made towards more adaptive, integrated flood risk management. Traditionally, the sewage system is the main context in which storm water run-off is processed. Its capacity is designed to handle a 1:5 rainfall event, which is more than the 1:2 norm recommended by Stichting Rioned. As of 2015, the municipality also counted 14 km of storm water sewage infrastructure and 32 retention areas. Despite these efforts, flooding still occurs, mostly

due to extreme storm events. A climate stress test performed by the municipality revealed 17 bottleneck locations vulnerable to flooding in case of a 1:10 rainfall event. Although not all issues have been addressed yet, the municipality has spent €3.600.000 on a program to technically solve the most urgent bottlenecks. Currently, more in-depth research is carried out to provide a detailed understanding of the future impacts of climate change on municipal water management.

In addition, more adaptive technical measures have recently been introduced as well. Most notably, the municipality is investing in separating storm and waste water, for example by cutting off rain pipes or introducing infiltration crates more greenery to restore the natural infiltration process. Sittard-Geleen is also encouraging private actions and damage prevention. For example, it has introduced a subsidy program for citizen, granting €10 per decoupled square kilometer. In addition, it is currently running tests with automated flood barriers on private land to protect houses from incoming water.

With regard to public participation, the municipality is making efforts too, although they are often ad hoc or incidental. There is a contact point where citizens can report flooding, after which officials sometimes pay visits to the affected locations to assess the situation and discuss further actions. During these so-called kitchen table chats, citizens are informed about the limits of the municipal's duty and possibilities, stressing the importance of taking preventive measures themselves. The general public is incidentally reached through social media and the local newspaper, but a structural public awareness campaign is still lacking. On balance, the majority of measures are carried out by the municipality in public space.

In terms of anchoring, the municipality is doing reasonably well. Regarding anchoring in organization, waste water management is part of the cluster Spatial Projects and Management, in which responsibilities are clearly divided and cost reduction is actively pursued by coordinating or combining projects. However, internal cooperation on adaptive, integrated projects is limited. Like Meerssen, the municipality is in the midst of a transition to a more compact organization, meaning that many departments need to invent new ways to perform their tasks with fewer employees. In this context, it is sometimes unclear which person or department should take up which task, and priority does not lie with seeking co-benefits.

Sittard-Geleen's policy on pluvial flooding is largely secured in the waste water plan set up in the context of the regional partnership Westelijke Mijnstreek. The waste water plan is well-structured and detailed, with clear descriptions of the current state of affairs as well as future projects. Especially technical measures (e.g. sewage system maintenance, storm and waste water separation) are well-formulated and accompanied by financial plans and time schedules. Non-technical measures (e.g. decoupling, public awareness campaign) are discussed too, albeit merely as ambitions. In practice, however, realization of such measures is limited: apart from the subsidy scheme, Sittard-Geleen's most recent project plan (2017) only lists projects of a technical nature (although a yearly budget of €2.500

is reserved for research on the “storm water problem” (p. 8)). As for integration at the strategic level, the waste water plan includes long-term goals with regard to the functioning of the waste water system and regional cooperation, but there is no concrete strategy on innovation in the field of water management in terms of climate adaptation or sustainability.

Regarding anchoring in practical implementation, the municipality is experiencing some issues that hamper processes of policy design and implementation. Most notably, there is a structural lack of human capacity due to the ongoing reorganization process. However, employees do benefit from the relatively large size of the municipal organization, which means a variety of expertise is standardly present. As demonstrated by the regional waste water plan, cooperation with other municipalities takes quite advanced forms, with all participants regularly working together on projects in the field of policy development, maintenance and research. Although it is mentioned as a policy ambition, structural cooperation with other external actors does not (yet) seem to take place. Lastly, Sittard-Geleen takes monitoring seriously. The regional waste water plan includes a set of achievement indicators to measure to what extent goals are reached, used to evaluate progress in a 2017 evaluation report. In addition, research is currently conducted on standardization of implementation methods and financial systems to make monitoring easier.

5.5.2. Policy arrangement of Sittard-Geleen

Rules of the game

As for the formal rules that apply to Sittard-Geleen, pluvial flooding is mainly addressed in the context of waste water policy, with storm water being traditionally processed by the sewage system. As stated, Sittard-Geleen is part of a regional partnership called Westelijke Mijnstreek, together with three other small municipalities and the regional water authority. In 2014, the regional partnership signed a collective waste water plan called *Beleidsplan afvalwater Westelijke Mijnstreek (2015-2020)*, which covers waste water policy and implementation for the entire region. The plan lists an interesting ambition regarding regional cooperation:

“We let go of the traditional, individual approach to the waste water system. For new developments, we take decisions based on what is necessary for the entire waste water chain, even if such decisions are not directly beneficial to our own organization.”¹⁵

¹⁵ Original quote: “Wij laten de traditionele, individuele, blik op de afvalwaterketen los. Voor nieuwe ontwikkelingen, nemen we beslissingen die rekening houden met de gehele (afval)waterketen, ook als deze beslissingen niet direct gunstig zijn voor onze eigen organisatie.” (Beleidsplan Afvalwater Westelijke Mijnstreek, 2014, p. 8)

This ambition implies a serious will to realize a more integrated approach to pluvial flooding. Contrary to the other case studies, the waste water plan has replaced the municipal sewage plan entirely, although concrete project plans and budgets are still set up individually for specific local issues. The reasons for pursuing such intensified cooperation are to increase the quality of the regional waste water chain, to reduce organizational vulnerability and limit costs with which citizens are burdened.

In terms of concrete policy, the regional waste water plan distinguishes a number of starting points for the storm water domain:

- Storm water is to be processed above ground as much as possible in order to ensure visibility and control;
- Separating storm and waste water is important to ensure a robust and sustainable water system, although such measures are costly and technically not always feasible. Only where efficient, the plan pursues decoupling and sewage capacity expansion on public grounds;
- Decoupling on private grounds will be stimulated by means of public campaigns, education and subsidies. Focus lies on encouraging voluntary action only, although the partnership is considering the introduction of regulations to enforce private actions;
- Measures are only taken when a specific area has experienced pluvial flooding;
- Measures will not be taken to prevent cases of pluvial flooding due to extreme rainfall.

All in all, regional policy focuses on a mix of measures, with great emphasis on efficiency. Interestingly, however, important terms such as 'extreme rainfall', 'efficient' and 'damage' are not concretely defined, which makes assessment of efficiency difficult.

As there is no individual sewage plan, these ambitions basically form Sittard-Geleen's policy on pluvial flooding, which logically means that the regional waste water plan has a large influence on the municipal approach. Comparing the starting points to the actual municipal approach, the measures pursued and level of anchoring realized also correspond well with regionally fixed ambitions. For example, according to the waste water policy advisor, decoupling measures are only taken in public areas where this is truly deemed efficient, and measures are only taken in places where pluvial flooding has occurred.

That being said, apart from the subsidy scheme, non-technical measures such as the promotion of private actions have not been realized on a large scale, despite the fact that their relevance is recognized by the municipal interviewees. An explanation for this could be the organizational issues caused by the municipality's shift towards a more compact organization. Municipal officials are still working out how to carry out all municipalities tasks in this new organizational structure with fewer human capacity,

which in practice means that officials working on water management are asked to help out in other spatial domains as well. All in all, employees feel little time to start new projects such as public awareness campaigns.

Actors and coalitions

Within the municipality, a number of internal actors play a role in water management. To start with, the waste water policy advisor is responsible for policy design regarding waste water management and pluvial flooding. A team of colleagues is available for technical design, maintenance and field service. In addition, the local alderman responsible for waste water policy and spatial planning puts water issues on the agenda of the municipality council. The policy advisor occasionally cooperates with spatial planning colleagues when measures to tackle flooding involve changes to the spatial environment. Involvement of the communication department, which could be relevant for non-technical measures, is only incidental. Cooperation with others clusters on issues such as sustainability, livability and climate change are currently not a priority due to the municipality's organizational issues.

In the process of policy design, the water policy advisor states that internal relations are experienced as positive. Involved parties generally succeed in settling on goals and measures that are politically attractive as well as effective and realistic in practice. That being said, he also sees that pluvial flooding is increasingly becoming politically charged. For example, politicians sometimes try to press measures in specific neighborhood that are strategically dear to them. The local alderman also recently prevented the introduction of new regulation that would have enforced citizens to process storm water on their private lands, because the prospect of extra private costs might cause unrest among citizens.

As for cooperation with external actors, Sittard-Geleen takes a lead position within the regional partnership, with the alderman overseeing meetings on the management level and the waste water policy advisor leading gatherings of municipal officials. Next to the regional partnership, the municipality also works together with the regional water authority. However, as the municipality is not part of a *Water in Balans* pilot, this cooperation mostly takes place in the end phase of projects, when permits have to be granted for specific spatial plans. The waste water policy advisor does state to have regular contact with the account manager at the regional water authority to discuss shared water issues. Lastly, the municipality incidentally works together with other external stakeholders (e.g. citizens, or companies) if they are involved in a certain pluvial flooding issue.

In general, cooperation with external partners goes smoothly. As for the regional partnership, municipal interviewees emphasize decreased vulnerability, knowledge sharing and integrated projects as its main benefits. However, the water policy advisor does state that some (smaller) municipalities find it difficult to keep up due to limited capacity, which slows down cooperative projects. As for cooperation with the regional water authority, there appear to be some frustrations too. Although the

account manager is described as engaged and cooperative, the waste water policy advisor experiences difficulties with employees at the permit department, which have a rather strict and non-cooperative attitude towards regulatory compliance. In addition, the water policy advisor states unrealistic regulations are sometimes forced upon the municipality with regard to protecting the regional water system:

“Sometimes, the regional water authority acts really soloist. A notorious example is the Keur, which was introduced to us without consultation, even though it can have radical consequences for the municipality and its citizens.”¹⁶

These differences between internal attitudes make it difficult to know what to expect from the regional water authority. In addition, municipal interviewees are disappointed that their municipality was not selected for a *Water in Balans* pilot project. Although the municipal interviewees understand that the regional water authority cannot deal with every bottleneck throughout Limburg at the same time, representatives have raised expectations with citizens that problems will be solved in the near future. According to the waste water policy advisor, communication about the reasons for (not) selecting certain bottlenecks for pilot project could have been better.

Resources

In terms of resources, the municipality is struggling financially. Although financial resources are sufficient to continue measure implementation due to the fixed sewage charge, this leads to a structural lack of human capacity. Whereas the regional waste water plan states 9.1 fte is necessary to cover policy design and field service, only 7.5 fte was truly available as of 2017. In addition, the compactness of the organization has put further pressure on employees, while hiring new colleagues is impossible. All in all, the waste water policy advisor states that this lack of human capacity results in delays in policy implementation.

With regard to knowledge and expertise, the municipality does not seem to be experiencing any problems. According to the water policy advisor, this is due to the relatively large size of the municipality, which means it can afford to permanently hire useful expertise:

¹⁶ Original quote: “De keur, bij het waterschap is dat wel heel bekend, is daar een recent voorbeeld van. Die wordt gewoon over de schutting gegooid, terwijl het toch heel erg vergaande voorschriften, voor gemeenten, voor burgers in staan die gewoon financieel en ruimtelijk impact hebben. Dus je ziet toch dat, ja, soms wordt er heel solistisch gehandeld vanuit het waterschap, he.” (P19, interview transcript, p. 8)

*"We still have a field worker and a designer, so I think we have quite some expertise. In other municipalities, like Stein and Beek, there is sometimes only one person who has to take care of policy, design and administration."*¹⁷

The water policy advisor and especially the alderman also stress the usefulness of knowledge exchange within the regional partnership for filling up knowledge gaps. For tasks like complex calculations or writing the municipal sewage plan, the municipality hires consultancy companies.

Discourses

Several interesting (differences between) frames can be detected among the municipal interviewees. Starting with the *diagnostic frames*, perceptions on the causes of pluvial flooding differ slightly. The waste water policy advisor blames climate change, the increase in paved surfaces and human settlement behavior in general, whereas the alderman mostly stresses the increase of intense rainfall events. Regarding the question of when pluvial flooding becomes a problem, the diagnostic frames maintained largely correspond: both interviewees make a clear distinction between 'hindrance' (temporarily flooded streets) and 'nuisance' (damage and unsafe situations). According to the waste water policy advisor, hindrance is to be accepted, whereas safety issues and damage must be prevented:

*"If a road is inaccessible for an entire day due to flooded streets, there is reason to take action. If it's just one hour, well, I think we should learn to live with such situations."*¹⁸

Yet, the alderman goes further and states that sometimes even damage has to be accepted if the necessary measures turn out to be too costly or inefficient. Here, however, a definitional gap appears, as the municipality has not put into words what 'damage' exactly means. This is also acknowledged by the waste water policy advisor, who stresses the vagueness surrounding this concept:

*"The definition of damage is a difficult theme. Floods have many other effects that are indirect: people cannot reach their destination, or they are late at work. Social damage is often very great, but is difficult to define in financial or investment terms."*¹⁹

¹⁷ Original quote: "we hebben nog [...] een beheerder en we hebben nog een ontwerper, dus in die zin denk ik dat wij nog redelijk wat kennis in huis hebben. Maar als je bijvoorbeeld naar Stein of naar Beek kijkt, daar zit één ambtenaar die daar het beleid doet, het ontwerp, en het beheer doet.." (P19, interview transcript, p. 7)

¹⁸ Original quote: "als ergens een dag een weg is afgesloten omdat die onder water staat, dan is dat toch wel een reden om te gaan ingrijpen. [...] Waarbij een uurtje, ja goed, ehm, daar moeten we allemaal maar mee leren leven." (P19, interview transcript, p. 10)

¹⁹ Original quote: "wat is de schade eigenlijk, maar dat is al een heel lastig thema. [...] zo'n wateroverlastevenement heeft natuurlijk veel meer effecten, indirecte effecten, mensen kunnen niet doorrijden, ze komen te laat op hun werk, noem maar

The waste water policy advisor indicates that this definitional issue is currently on the agenda and will be discussed as part of the new climate stress test that is carried out.

Regarding *prognostic frames*, the waste water policy advisor strongly believes that pluvial flooding should be addressed in the context of climate adaptation, stressing that measures in the domain of spatial planning are best because they are visible, raise awareness and contribute to a better living environment. In this context, citizens must be made aware of their responsibility to contribute to the prevention of pluvial flooding, stating that measures like subsidy schemes or the introduction of regulation have great potential. However, the alderman is reserved about private measures to keep storm water separated from the sewage system. Partly because of soil characteristics, but also because of practical implications:

“People often need help for solutions on private land, like infiltration crates or bigger measures. They need to be guided in determining what is technically possible and how to solve problems. In these situations, you often see that the solution is more complicated than simply cutting off a rain pipe.”²⁰

In other words, taking measures takes much more effort from private actors than sometimes assumed (e.g. by municipalities in the northern parts of Limburg, where conditions are more convenient). The alderman believes it is important that all water managers in the region collectively address this issue, for example by launching a large public awareness campaign and providing customized advice to citizens who want to take measures on private terrain.

As for *motivational frames*, several driving factors can be identified that seem to motivate towards action. Although municipal interviewees do find addressing pluvial flooding important, urgency does not seem a big driving factor. For example, the municipality council (including the alderman) is clearly reluctant to raise the sewage charge or invest more in human capacity, most likely due to different priorities. Efficiency and cost-effectiveness do seem to be important driving factors for the interviewees to pursue certain measures. However, the vagueness surrounding the definition of damage and the question of where protection by the municipality should end is hampering the municipality in taking quick and targeted action. Once again, the waste water policy advisor indicates that sorting these issues out needs to be a priority in the upcoming years.

op. Kijk, al die aspecten die uiteindelijk de echte, maatschappelijke schade vormen, die zijn veel hoger. En ja, daar moet je op een of andere manier een investering tegenover kunnen zetten.” (P19, interview transcript, p. 11)

²⁰ Original quote: “mensen moeten vaak, eh, geholpen worden bij oplossingen zoals infiltratiekoffers of nog grootschaliger, over wat dan kan en hoe zij hun probleem kunnen oplossen en dan zie je dat die oplossing toch vaak omvangrijker is dan heel simpel maar iets doen.” (P20, interview transcript, p. 4)

With regard to the question of responsibility, the municipal interviewees clearly prefer intense cooperation within the water chain, which eventually should also be integrated in the larger policy context of climate adaptation. Responsibilities are clear to the municipal interviewees, who believe that the municipality, the regional water authority and private actors have major roles in addressing pluvial flooding. Although the interviewees would like to see more involvement of the regional water authority in municipal pluvial flood risk management, for example through the *Water in Balans* program, the interviewees do not mention any particular ambiguities about which party is to take action with regard to specific flooding situations. Lastly, both interviewees acknowledge citizens have a responsibility too, although it is up to the municipality and regional water authority to encourage them in doing so.

5.5.3. Case study conclusion

In terms of ambitions, the municipal approach of Sittard-Geleen is clearly shifting its attention from purely technical solutions in the sewage system towards more adaptive measures and damage prevention. In practice, however, the municipality is taking a mix of measures and the main focus is still on technical measures in the context of the sewage system. Anchoring in policy is achieved with detailed policy documents that reveal a clear vision on how pluvial flooding should be addressed. However, some issues emerge when looking at anchoring in organization and practical implementation. Although intense regional collaboration takes place, there are some frustrations regarding cooperation with the regional water authority. In addition, there is limited internal realization of co-benefits and scarce structural involvement of private land owners.

Looking at the policy arrangement, policy emerging from the regional partnership seems to largely shape local ambitions, as the municipality follows the regionally fixed policy ambitions closely. This is not surprising, however, since Sittard-Geleen has a big role in the regional policy making process being the largest municipality in the partnership. As for what is achieved in practice, organizational issues seem to cause problems regarding policy implementation, leaving little time for employees to start up new projects (despite the fact that such ambitions are definitely present). This might explain why the majority of measures are still of a technical nature and, for example, a structured public awareness campaign is not yet realized.

In this context, different internal discourses on the effectiveness and efficiency of measures influence the municipal approach as well. Whereas the waste water policy advisor seems to be driven largely by an intrinsic belief that the future of effective pluvial flood risk management lies in collaborative climate adaptation, the alderman is motivated much more by political processes and public opinion. Although the interviewees have similar diagnostic and prognostic frames, the motivational frames of local politicians seem to be more dominant in determining which measures are

taken than those of employees working on policy, which is exemplified by the alderman actively preventing the introduction of decoupling regulations for citizens.

Lastly, cooperation with the regional water authority seems to be affected by differences between motivational frames too. Whereas the municipal interviewees expect a more cooperative role of the regional water authority that transcends legal responsibilities as well as traditional domain of water, employees at the regional water authority generally tend to stick to their legal tasks (although opinions do differ at the water authority). Combined with the coincidental fact that Sittard-Geleen was not chosen as a *Water in Balans* pilot project, this ideational incongruity might explain the existence of frustrations experienced by the municipality.

5.6. Case study 4: Valkenburg

5.6.1. Measures and anchoring

Looking at the measures pursued by the municipality of Valkenburg, focus still clearly lies on technical measures. Storm water is generally collected through the sewage system, which is modelled to process a 1:2 rainfall incident. As of 2017, however, multiple bottleneck locations were vulnerable to flooding in case of such a rainfall event, while many locations experience flooding when more extreme incidents occur. The municipality has started planning measures for these bottlenecks, but still has to solve a significant number of issues. In addition to sewage system maintenance, the municipality is investing in more adaptive technical measures, such as separate storm water sewage systems (20 km as of 2017), retention areas and small road adjustments. In addition, it aims to decouple storm water on public areas and to stimulate similar measures on private lands as well, although such measures are not yet realized on a large scale.

Regarding non-technical measures, the municipality states not to allow new urban development in dry valley areas vulnerable to flooding and obligates decoupling of storm water from the sewage system for all new development projects. In addition, the municipality aims to achieve citizen engagement and to stimulate decoupling measures on existing terrains to be taken by private land owners. Although a subsidy scheme of €10 per square meter was recently introduced for decoupling private land, there is currently no legislation that obligates citizens to do this. No structural efforts are made to inform citizens about measures or raise awareness about private actions. After the flood incidents of 2018, the municipality also organized several information meetings for citizens to explain the current situation and discuss future actions, but these were incidental. The municipality does not actively facilitate damage prevention measures.

In terms of anchoring, the municipality is not doing well in all aspects. As for anchoring in organization, pluvial flood risk management has a clear place in the municipal organization, although it

remains limited to waste water management in the Department of Public Space. Although some co-benefits are sought within the department, most notably by combining construction projects to achieve cost reduction, little cooperation takes place with other departments. That being said, internal responsibilities are clear and relations are good, as the civil engineering officer states to be close with his direct colleagues as well as the responsible alderman.

As for anchoring in policy, the municipality seems to achieve different levels for certain types of measures. Regarding municipal policy ambitions in general, the Coalition Agreement (2018-2022) is quite concise, simply listing a number of priorities and spear points (among which pluvial flooding) without describing what they would mean in practice. Regarding concrete policy on pluvial flooding, the municipal sewage plan includes ambitious policy goals that sometimes also transcend the theme of water safety, for example focusing on climate adaptation or the added value of water for the living experience. That being said, technical measures in the sewage system domain are anchored much better than other ones, including concrete strategic plans for specific locations as well as financial paragraphs. Non-technical policy ambitions, regarding citizen participation for example, generally remain vague and without obligations. As for integration at the strategic level, the municipal sewage plan is designed for four years and investment schemes go further than that, but there is no vision (document) on issues such as sustainability or climate adaptation in which pluvial flooding is integrated.

Regarding anchoring in implementation, the municipality experiences serious issues. As for the availability of resources, the municipality is short on staff. Currently, only one employee is working on waste water management (and other civil engineering tasks), while 1.9 fte is officially required by the municipal sewage plan. According to the civil engineering officer, this quite regularly results in delays in policy implementation. Regarding collaboration with external actors, the municipality works closely together with other municipalities in the regional partnership Maas en Mergelland. Collaboration with the regional water authority mostly occurs in traditional ways (e.g. permit application). Cooperative projects with private stakeholders are limited, with little attention for structural citizen engagement. As for monitoring, the municipal sewage plan includes indicators set up by the regional partnership, discussing these to assess the status quo every time a new regional plan is drafted. In the meantime, the sewage system and other technical measures are subject to regular operational checks. In practice, however, such control mechanisms are approached rather informally. For example, the decoupling requirement for small-scale development projects is not always checked or enforced. In addition, the civil engineering officer argues that “the best control mechanism is the citizen himself” (P21, interview transcript, p. 6), meaning that he relies on citizens reporting issues to see where the system malfunctions.

5.6.2. Policy arrangement of Valkenburg

Rules of the game

Official policy documents provide a good overview of the formal rules that affect pluvial flood risk management in Valkenburg. Like Meerssen, Valkenburg is part of the regional partnership Maas en Mergelland, sharing the same ambitions and agreements as fixed in the regional water plan. The municipality's individual sewage plan follows the regional water plan quite closely, stressing (among other issues) the importance of strengthening formal collaboration, citizen participation and adaptive measures above ground. For example, the wish to further intensify citizen engagement and formalize collaboration within the regional partnership is explicitly expressed, while more adaptive and non-technical measures such as decoupling and visible retention areas are pursued as well. At the same time, the focus of the municipal sewage plan still largely lies with the sewage system, which it states is the primary domain in which pluvial flooding is addressed. According to the civil engineering officer, this can be explained by the fact that the municipality is hesitant to implement adaptive, non-technical measures due to uncertainty surrounding their (cost-)effectiveness.

In terms of informal rules, commercial interests play an interesting role. Valkenburg has a large tourist sector, which is (politically) highly esteemed in the municipality. The many events (Christmas markets, races, etc.) held each year occupy large plots of land, which significantly limits the time and space available to carry out construction work or other measures in the spatial domain. As indicated by the civil engineering officer, commercial interests often are prioritized, sometimes at the cost of addressing pluvial flooding. On the other side, however, the alderman stresses the function of water as a contributing factor to a pleasant living environment that generates commercial benefits. Overall, the thriving tourist sector creates urgency as well as practical implications for implementation of measures.

Actors and coalitions

Regarding the internal actors working on pluvial flooding, the civil engineering officer plays an important role, being responsible for waste water management and other civil engineering issues, such as road construction. Apart from a team of field workers and some occasional assistance from the financial or spatial department, he operates alone. However, the local alderman responsible for the spatial planning domain does provide advice and guidance in the process of setting up the municipal sewage plan and getting it through the municipality council. In the very small municipal organization, cooperation between the civil engineering officer and alderman and council goes well, as both interviewees indicate to be happy about the policy-making process.

The municipality also works together with a number of external actors. The regional partnership Maas en Mergelland is seen as the main context in which cooperation takes place. Municipalities make use of each other's expertise to discuss issues, divide specific regional tasks and carry out research

projects on the impact and solutions regarding pluvial flooding. According to the civil engineering officer, the regional partnership is very important to the municipality, because Valkenburg is too small to deal with all its pluvial flooding issues by itself. In fact, he would like to see more intense, regulated collaboration between the municipalities, as there currently is little cooperation in the field and municipalities are not always prepared to help out with issues not directly theirs. Interestingly, the alderman is content with the status quo.

Another important cooperative partner is the regional water authority. Apart from standard forms of cooperation, such as providing permits for destination plans, the municipality and regional water authority have worked together on retention areas in the rural landscape outside vulnerable urban areas. In the aftermath of the flood incidents of 2018, board members of the water authority also visited affected areas and spoke with citizens. In addition, the municipality sent citizens with the regional water authority to The Hague to tell their experiences and lobby for more subsidies to tackle pluvial flooding in Limburg. However, there is currently no *Water in Balans* pilot project running in Valkenburg, as the regional water authority decided to take six other cases as a start. According to the interviewees of the municipality, this decision came as a surprise for municipal employees as well as citizens, who expected to be a priority after having put so much effort into the cause. Whereas generally speaking, relations between the two parties were good, this miscommunication has caused feelings of irritation and mistrust towards the regional water authority.

Resources

In Valkenburg, access to resources differs per type of resource. The civil engineering officer indicates that despite municipal budget cuts, the fixed sewage charge ensures that his yearly budget (approximately 2.7 million euros) has roughly stayed the same. However, he mentions that these financial resources are not sufficient to take up all bottlenecks at short notice:

“Out of the yearly budget, you can invest around 800.000 euros in the sewage system. This is not a lot of money in our sector. Breaking up one street to redo the sewage system already costs a couple of 100.000 euros. In this sense, more money is needed.”²¹

Although a greater budget would thus be welcome, the civil engineering officer also states that the financial budget is simply a political choice he has to deal with. Citizens do not feel like paying a higher

²¹ Original quote: “ongeveer acht ton heb je op een jaar om te investeren in de riolering. Kijk, [...] wat is acht ton in de rioleringssector, dat is niet veel. Op het moment dat jij zegt, ga maar eens een rioleringsstraat maken, een woonwijk openbreken, een paar ton ben je zo kwijt. En dan heb je pas één straat gedaan van heel de gemeente, dus ja, er zou meer geld bij moeten.” (P21, interview transcript, p. 15)

charge, and council members are therefore reluctant to increase it, indicating a link between the availability of financial resources and the politics of pluvial flood risk management.

A type of resource that has been more directly affected by the budget costs is the human capacity available. Despite budgets for hiring extra temporary capacity for specific projects, the civil engineering officer does feel the workload has increased significantly in the past years. The alderman acknowledges that the entire municipality is coping with a lack of capacity, indicating that it actively pursues strong collaboration with other parties to cope with this situation. This does not only happen in the policy-making domain, but also in other areas such as communication:

“I will be honest with you: the communication department of the municipality of Valkenburg consists of only 1.5 people. Therefore, we try to take up projects together with the regional partnership as much as possible.”²²

In other words, the limited number of employees does not seem a temporary situation. Overall, this limited capacity is creating a large dependence on the regional partnership and causes delays in practical implementation.

In terms of knowledge and expertise, the interviewees of the municipality indicate not to experience many problems. Educated as a civil engineer, the civil engineering officer’s expertise mostly concerns the technical aspects of the sewage system and he does not feel like he misses crucial knowledge that cannot be hired externally. However, he experiences difficulty when trying to hire external expertise, pointing at a downward trend with regard to the available experts consultancy bureaus can offer. This sometimes makes it difficult to find suitable experts to carry out an assignment and causes delays. In addition, the policy officer does sometimes “miss the opportunity to discuss matters with a colleague”²³.

Discourses

The interviewed municipal employees hold several interesting frames, which generally follow the municipal approach closely. To start with, the present *diagnostic frames* correspond well. Regarding the cause of pluvial flooding, the municipal interviewees both answer climate change, mentioning the increasing frequency and intensity of storm events they have witnessed in the past ten years. The interviewees believe pluvial flooding becomes problematic when it enters houses, damages property or causes safety issues. However, water and even mud streams that temporarily flood streets should be

²² Original quote: “ik zal je eerlijk zeggen, de communicatieafdeling van de Gemeente Valkenburg, dat is anderhalf person, dus wij proberen dat ook in die regio op te pakken.” (P22, interview transcript, p. 4)

²³ Original quote: “soms mis je wel eens dat je met iemand erover kunt sparren” (P21, interview transcript, p. 14)

accepted. The interviewees also state that the guidelines of Stichting Rioned are followed closely when determining whether action is required, which make sense since the sewage system is regarded as the main domain to address pluvial flooding. In this context, the interviewees imply that when an extreme precipitation event superseding the 1:2 norm causes flooding, the cost-effectiveness of taking measures should be considered. Yet, the interviewees nor any relevant policy documents clearly state what cost-effectiveness exactly means, suggesting that the question of when pluvial flooding becomes a problem is not yet fully anchored in policy.

Regarding *prognostic frames*, the civil engineering officer believes that the sewage system should be kept in use as it is, although special attention should go to technical measures above ground to process the water that the sewage system cannot handle:

*"We must work towards retention areas. No collection of storm water underground, no difficult infiltration constructions, but natural retention areas that fit within the rural landscape. This way, water no longer runs off and flows are made visible, making it easier to manage the system."*²⁴

In other words, the policy officer mainly prefers large-scale spatial measures. He believes small-scale infiltration measures on private grounds are not very effective, as private land owners are unlikely to cooperate in a useful way:

*"Which citizen is going to dig open his entire garden to relocate rain pipes? Yes, we do have subsidies, but these are simply too small to be persuasive. [...] And, if a neighbor decides to decouple his land from the sewage system, who will be checking whether he does not secretly reconnects everything again during the weekends? This is all out of my sight!"*²⁵

In addition, he also states to prefer measures of which the effectiveness is proven. He mentions several sustainability initiatives that are supposed to be effective to address pluvial flooding as well, but finds there is too little proof that they will truly help to prevent flooding. Overall, certainty with regard to effectiveness and control over the water system seem to be important factors for the policy officer in shaping his preference for certain types of measures.

²⁴ Original quote: "Uiteindelijk moet je toch gewoon zorgen dat je naar waterbuffers moet. Opvang en, eh, niks onder de grond, geen moeilijke constructies met kratten en weet ik wat, gewoon natuurlijke buffers, eh, die worden een beetje ingepast in het landschap, [...] dat zie je gewoon, je kunt gewoon zelf waarnemen dat er water blijft staan en het stroomt niet meer af, daar heb ik zicht op, dat kan ik goed beheren en onderhouden." (P21, interview transcript, p. 9)

²⁵ Original quote: "Welke bewoner gaat zeggen, ik ga mijn hele tuin opengraven om regenpijpen naar voren te leggen, of, weet ik wat, [...], ja we hebben subsidies, maar de subsidies die er zijn, dat is, ja, een druppel op een gloeiende plaat, dus dat heeft ook geen zin. [...] en stel, ja, de buurman gaat zeggen, ik ga mijn afkoppelen, wie controleert als hij het daarna wil aansluiten in het weekend? Ik heb daar helemaal geen zicht op." (P21, interview transcript, p. 10)

Interestingly, the alderman does prefer a more integrative approach to pluvial flood risk management, in which maintenance of the sewage system and sustainability measures can be combined. He explicitly mentions that decoupling storm water is one of the municipality's major objectives, on public as well as private land. The alderman also names the importance of stressing "positive water experiences" (P21, interview transcript, p. 4) and creating economic value by improving the livability and visual attractiveness of the town. All in all, the alderman seems to think on a slightly different, broader level than the officer when it comes to solutions for pluvial flooding.

Arriving at *motivational frames*, a number of factors seem to drive the municipal interviewees to approach pluvial flooding in a certain way. To start with, the municipality seems urged by its citizens to take action, who have been affected repeatedly by pluvial flooding. According to the alderman, the ultimate goal of the municipality is to serve its citizens, stating that "in times of need, the municipality has to take the lead" (P21, interview transcript, p. 8). Citizens also have the tendency to look at the government for action first, which urges the municipality to initiate measures:

*"I do not believe many people know the difference between the regional water authority and the municipality in terms of government institutions. Citizens understand they have to take action too, but believe the government should take the first step."*²⁶

In addition, significant media attention and statements, made (among others) by prominent figures of the regional water authority, have raised expectations among citizens that issues with pluvial flooding will be solved in the near future. This has made citizens more vocal and demanding, which most likely urges municipal politicians to act on their wishes (either out of moral or personal interests).

Other driving factors that seem to play a role here are feasibility and responsibility, which are heavily intertwined. The civil engineering officer and alderman both see the municipality's pluvial flooding issues as a responsibility that is *shared* with other water managers, most predominantly the regional water authority. Most likely, this is because Valkenburg is struggling to address the issue independently. When it comes to the preferred role of citizens, interviewees believe they should be more acceptive of floods when they occur, in which context governmental organizations *together* have the responsibility to communicate to the public about what to expect from the local authorities. However, the alderman is reserved about what can be expected of private parties in terms of concrete solutions, whereas the civil engineering officer does not believe citizens should be given much responsibility at all. This low

²⁶ Original quote: "Ik weet niet of veel mensen het verschil in overheid weten tussen waterschappen en gemeenten, he, dat is de overheid he, en dat ze zelf iets moeten doen, dat snappen ze ook wel, maar ze vinden het dan fijn als de overheid zo'n eerste stap zet." (P22, interview transcript, p. 6)

perception of effectiveness and feasibility regarding private actions would also explain why adaptive, small-scale measures in private space are not (yet) actively realized.

Overall, the municipal interviewees believe in a shared responsibility that transcends responsibilities as fixed by law, expecting more flexible and pro-active attitudes from other municipalities and the regional water authority. For the interviewees, this not only concerns policy development and citizen communication, but also financing solutions. This perception of responsibility clearly clashes with the attitude of the regional water authority, who believes it is not the responsible party to pay for measures outside the regional water system. Combined with the miscommunication surrounding the *Water in Balans* program, this ideational incongruity has fueled irritation between the two parties, which especially is especially felt by the civil engineering officer:

“Knowledge and expertise is what we have to offer, is the regional water authority always saying. Citizens do not need this. Citizens want to know what they can expect from the regional water authority, what they concretely are going to do and when. When are they going to pay, when are they going to contribute?”²⁷

As of today, there are ongoing fierce discussions with the regional water authority on how to continue cooperation on pluvial flooding in the municipality.

5.6.3. Case study conclusion

Looking at the measures pursued, Valkenburg seems to maintain a rather traditional approach to pluvial flood risk management. Although policy documents do mention ambitions regarding climate change and sustainability, measures in practice are generally technical and focused on the sewage system. Waste water management seems relatively well-anchored into the municipal organization, but the more adaptive, integrated side of pluvial flood risk management remains vague and without obligation. The municipality does seek intense collaboration with external parties, although mostly for the benefit of cost-reduction and not to actively engage private stakeholders.

When looking at the policy arrangement, several phenomena seem particularly influential in relation to this approach. To start with, the limited availability of resources, especially in terms of human capacity, significantly hampers policy processes, causing delays and leaving little time to perform all tasks as agreed upon in policy documents. Although not mentioned as an issue by the municipal interviewees, the highly technical educational background of the civil engineering seems to be linked to

²⁷ Original quote: “Kennis en kunde kun je van ons verwachten, dat zijn altijd de dingen die ze zeggen. [...] En dan denk ik, [...] daar heeft de burger geen behoefte aan. [...] De burger, die wil gewoon concreet weten, waterschap, wat kan ik van jou verwachten en [...] wanneer ga je concreet iets doen, wanneer ga je betalen, wanneer ga je je bijdrage leveren.” (P21, p. 26)

the technical approach of the municipality, while skills and knowledge needed for integrated, collaborative measures are not visibly available. In addition, prioritization of commercial interests seems to negatively impact practical implementation. All in all, these factors might make it less appealing to invest in new, non-technical measures that require a lot of time and money, while having no experience with their effectiveness.

Certain discourses can also be linked to the fact that technical measures are still predominantly taken and integrated pluvial flood risk management in the private domain is not yet realized. The fact that both municipal interviewees have reservations about the effectiveness of private actions taken by citizens corresponds well with the focus on retention areas and the lack of a structural public communication campaign. The same goes for the civil engineering officer's skepticism about multi-purpose adaptive measures and belief that only measures of which efficiency is proven should be taken. In addition, ideational incongruity between municipal employees and the regional water authority creates unrest that possibly stands in the way of effective cooperation. As a result, issues in which both parties believe the other should take action remain unaddressed.

6. Conclusion

6.1. Comparison and discussion of results

In the sections below, the results of the case studies are compared and discussed by answering the three sub-questions.

Sub-question 1: Which measures are pursued by the municipality to tackle pluvial flooding and to what extent are these measures anchored into the municipal organization?

Although a mix of measures is pursued by each municipality, focus in ambition as well as in practice still lies on technical measures. All four municipalities address pluvial flooding in the context of waste water management and are investing heavily in the sewage system, retention areas and separation of storm and waste water infrastructures. In all municipalities, however, non-technical measures are on the rise, with particular attention for private decoupling subsidies, public awareness and regulations to ensure a more adapted urban landscape. Having set up a well-structured public campaign, Meerssen and Peel en Maas seem to be most active in terms of citizen engagement. Although Sittard-Geleen and Valkenburg both have introduced subsidy schemes, they do not reach out to citizens structurally on a large scale. All municipalities indicate to discuss private damage prevention measures during information meetings, but generally do not invest in them. Handing out free sandbags, Meerssen seems to be an exception.

As shown in table 7, the level of anchoring varies strongly for each municipality. Anchoring in organization is achieved partly in most municipalities. Although internal responsibilities are clear,

	Meerssen	Peel en Maas	Sittard-Geleen	Valkenburg
<i>Technical measures</i>	- Increasing sewage capacity - Construction of retention areas - Separate storm water sewage systems	- Increasing sewage capacity - Construction of retention areas - Separate storm water sewage systems - Neighborhood reconstruction projects to disconnect storm water from sewage system	- Increasing sewage capacity - Separate storm water sewage systems - Construction of retention areas - Adaptive measures in public space to restore the natural infiltration process (cut-off rain pipes, greenery, infiltration crates)	- Increasing sewage capacity - Construction of retention areas - Road adjustments to lead away storm water run-off safely
<i>Non-technical measures</i>	- Subsidy scheme for citizens to decouple private land - Water Information Point - Participation in <i>Operatie Steenbreek</i> - Public information meetings (in context of <i>Water in Balans</i> pilot)	- Subsidy scheme for citizens to decouple private land - Regulation obligating private land owners to decouple their lands - Active participation in <i>Waterklaar</i> campaign - Public information meetings (in context of <i>Water in Balans</i> pilot) - Custom advice for citizens that have experienced flooding - Research on impacts of climate change and cost-efficiency	- Subsidy scheme for citizens to decouple private land - Incidental public information meetings - Contact point for citizens to report flooding and discuss solutions - Research on impacts of climate change and cost-efficiency	- Subsidy scheme for citizens to decouple private land - Incidental public information meetings
<i>Damage prevention measures</i>	- Public awareness campaign - Water Information Point - Distribution of free sandbags - Research on automated flood barriers		Tests with automated barriers on private land	

Table 6: Overview of the measures pursued.

organizational structures are currently unstable, with major shifts occurring in all four municipalities. Shifts towards a more compact municipal organization sometimes causes ambiguities regarding who should take up specific projects. In Peel en Maas, the shift towards a flat organizational structure and project-based way of working is promising in terms of collaborative pluvial flood risk management, but a lack of formal hampers the realization of co-benefits. The Kwistbeek project in Peel en Maas forms an exception, as it involves several different municipal departments and multiple societal issues are addressed at the same time. Other municipalities do pursue financial co-benefits in practical implementation, but are not pursuing them in fields like climate adaptation.

Regarding anchoring in policy, results differ for each municipality. All municipalities have fixed policy on the sewage system and other technical measures in the municipal sewage plan well, describing construction and maintenance plans in large detail and ensuring integration at the operational level by including specific locations, time paths and financial paragraphs. However, for non-technical and damage prevention measures, policy generally remains limited to broad aims and ambitions, lacking concrete targets and plans of action. Differences occur, however, with Meerssen, Peel en Maas and Sittard-Geleen describing some non-technical projects, while Valkenburg does not concretely describe any. Following this, integration at the strategic level differs for each type of measure as well. All municipal sewage plans include long-term investment schemes for technical measures, while strategic visions on more adaptive, collaborative measures are often limited to a paragraph or two describing the importance of a future-proof water system. That being said, Peel en Maas and Sittard-Geleen have a vision document on sustainability that includes pluvial flooding and the spatial environment as major spearpoints, meaning that water is included in the municipality's general strategic vision on the future.

A particularly interesting observation related to anchoring in policy is the fact that all municipalities do not make concrete statements on the extent to which pluvial flooding is to be addressed. All four municipal sewage plans discuss the limits of the municipal responsibility to take action, but these are expressed in norms of rainfall incidents and vague terms of 'hindrance' and 'damage'. The general consensus is that hindrance is to be accepted and damage must be prevented, but municipal sewage

		Meerssen	Peel en Maas	Sittard-Geleen	Valkenburg
Anchoring in organization	Organizational structure	+	0	0	+
	Division of responsibility	+	+	+	+
	Pursuit of co-benefits	-	0	-	-
Anchoring in policy	Fixation in policy documents	0	+	+	-
	Integration on a strategic level	+	+	+	-
	Integration at the operational level	-	+	+	-
Anchoring in practical implementation	External cooperation	+	+	-	-
	Capacity and resources	-	+	0	-
	Monitoring	-	+	+	-

Table 7: Overview of the achieved level of anchoring.

plans also mention the importance of effective and affordable solutions in cases of extreme rainfall incidents. However, clear cost-efficiency norms and definitions of financial, economic and emotional damage are not listed. Interestingly, provincial as well as other regional water policy documents do not elaborate on these issues either. This is a serious flaw regarding anchoring in policy, as it could lead to different interpretations of the question whether taking action or not is justified.

Lastly, all four municipalities experience some difficulty realizing sufficient anchoring in implementation. Except in Peel en Maas, limited capacity and resources cause delays in policy implementation in all municipalities, affecting Meerssen and Valkenburg particularly hard. Involvement of private actors (e.g. housing associations, agrarians, business owners) from the starting phase of projects is often incidental. In practice, most measures are carried out by the municipality itself, while some projects are combined with the regional partnership or water authority. That being said, both Meerssen en Peel en Maas have taken steps towards more intense cooperation with private parties, given their collaboration agreements signed in the context of the Water in Balans pilot project. Lastly, monitoring is most typically done by evaluating progress of the past years in the municipal sewage plan. As for monitoring of progress and legal compliance in the meantime, approaches differ considerably. Peel en Maas is carrying out regular checks regarding the functioning of the sewage system and actively enforces decoupling regulations. The regional partnership of Sittard-Geleen writes a special evaluation report every two years to reflect on progress in specific projects. Meerssen and Valkenburg, however, seem to approach monitoring in a more informal way, carrying out check-ups when issues are reported.

Sub-question 2: In which policy arrangement does municipal policy regarding pluvial flooding come into being? Which rules, actors, resources and discourses apply?

Starting with the rules dimension, formal policy design is the same for each municipality: policy is fixed in the municipal sewage plans, which are based on policy ambitions set in the regional water plans (which in turn follow provincial and national policy closely). All regional plans are focused on intensifying regional collaboration to reduce costs and vulnerability. Yet, the focus and concreteness of the plans differ. The plans of Peel en Maas and Sittard-Geleen pay great attention to common challenges such as climate adaptation, provide detailed descriptions of policies and include concrete projects in which responsibilities are fixed per municipality. In contrast, the plan that covers Meerssen and Valkenburg is focused on waste water management and does not elaborate in great detail on how (non-technical) ambitions are to be realized in practice. Regional ambitions are not binding, however, meaning that municipalities ultimately work out their own policies (Sittard-Geleen being an exception). Yet, the municipal sewage plans very much follow the regional plans in terms of concrete actions.

Another notable informal rule concerns the organizational structure of the municipality. Even though internal relations are experienced as positive, pluvial flood risk management often still is a policy

island, with few policy links to other departments than the Department of Public Space to which it generally belongs. However, the shift towards a more compact organization, which takes place in all municipalities, should lead to a more flat organizational structure in which projects are to be carried out by interdisciplinary teams of employees. In Peel en Maas, such an integrated approach to municipal issues is indeed slowly taking shape. Yet, especially in the smaller municipalities, employees still struggle with their new role in the changing organizational structure.

As for informal rules, Valkenburg and Meerssen also benefit from being small organizations with short lines of communication, which helps creating political urgency and allows for efficient and quick actions. In bigger organizations, urgency is less high and internal processes go slower due to the involvement of many different actors, which is especially visible in Peel en Maas. Another informal rule is that pluvial flooding has become more interesting as a political issue in the context of climate change, which makes finding suitable solutions more complex. Especially in Meerssen and Sittard-Geleen, political interests of the aldermen seem to interfere with policy processes. However, cases of severe pluvial flooding have created urgency in public opinion too, which has also led to increasing budgets. Similarly, commercial interests also play a role, which is exemplified by the large tourist sector in Valkenburg. In general, economic interests are prioritized over the natural environment, which might explain why more radical adaptive measures (e.g. giving up built land) are generally not pursued.

In the actor dimension, actors that influence the municipal approach are generally those employees working on pluvial flood risk management, the alderman responsible for water issues, and, to a lesser extent, colleagues in neighboring policy domains (e.g. spatial planning). Internal collaboration goes smoothly in all four municipalities, although political tensions sometimes create some disagreement between officials and the aldermen. The extent to which cooperation is sought with external parties differs considerably per municipality. Although all municipalities stress the importance of the regional partnerships, Meerssen and Valkenburg rely quite heavily on regional cooperation for policy design and implementation, while Sittard-Geleen and Peel en Maas seem more focused on cooperation with stakeholders within their own borders. As for cooperation with private actors, Peel en Maas and Meerssen seem to be working most structurally with citizens and other local private parties, having set up elaborate communication campaigns.

That being said, intense cooperation is not necessarily positive, as it can also cause dependency issues or delays. For example, the municipality of Meerssen currently relies considerably on the *Water in Balans* program for policy implementation. In addition, the Kwistbeek pilot project in Peel en Maas shows that integrated cooperation can complicate projects, hampering quick solutions. That being said, the extra resources generated by cooperation are very welcome. In fact, Valkenburg and Sittard-Geleen feel disadvantaged for not being selected as a pilot project for *Water in Balans*, indicating that they could use assistance too.

In the resource dimensions, several notable phenomena emerge. Although all municipalities have experienced general financial struggles, they have adequate budgets for waste water management due to fixed sewage charges. Whether these budgets are sufficient to address pluvial flooding is subjective, of course, but none of the interviewees stated money formed a direct problem. Yet, financial problems do cause issues in terms of human capacity and expertise. All municipalities have recently been confronted with organizational changes and budget cuts, which has resulted in a structural lack of capacity. Interestingly, all municipalities currently have only one employee working on policy design, although this especially forms a problem in Meerssen and Valkenburg where employees have additional tasks (e.g. road construction). In addition, expertise in these municipalities is still highly focused on civil engineering, while a more adaptive, cooperative approach to pluvial flooding requires management skills and knowledge of new, non-technical measures as well. Peel en Maas and Sittard-Geleen enjoy the benefits of a larger organization with a bigger pool of employees and more varied expertise.

As for the discourse dimension, various influential frames seem present in the municipalities. The general consensus on the diagnostic frame of pluvial flooding is that it becomes a problem once it causes damage, while temporary nuisance is not. However, as stated before, a clear definition of damage is lacking in all municipalities. Regarding prognostic frames, perceptions differ more noticeably. The interviewees from Peel en Maas clearly prefer adaptive, integrated solutions in the spatial domain in the public as well as private domain, involving citizens and other private actors (e.g. housing associations, agrarians). However, interviewees from Meerssen, Valkenburg and (to a slightly lesser extent) Sittard-Geleen clearly stress the limitations of such measures: the costs and efforts of involving many different parties are deemed too high, while the impact is negligible and uncertain. Here, differences in motivational frames emerge as well. Whereas responsibility seems to prevail as a driving factor for Peel en Maas, interviewees of other municipalities seem to be driven more by the feasibility and effectiveness of a certain type of measures. For example, they state it is unrealistic to expect much from citizens, who require guidance and behave in unreliable ways. Therefore, their preference goes to the construction of large retention areas overseen by governmental organizations. However, all municipalities feel citizens have a responsibility to minimize damage as much as possible and see a governmental role in informing the public about the private actions they can take.

Another interesting observation concerns the significant differences between the motivational frames that are held by the municipalities and the regional water authority. On a broader level, there is discussion about whether they as governmental parties should stick to their the legal responsibilities or proactively transcend these in order to address pluvial flooding effectively. On a smaller, practical level, this regularly results in discussions, especially for bottlenecks where flood origins are ambiguous. However, different frames also appear regarding the responsibility for informing citizens about their responsibilities: municipalities see it as a shared task, while the regional water authority believes they

stand too far from citizens to be involved. In Sittard-Geleen and especially in Valkenburg, interviewees are vocal about wanting a more flexible attitude from the regional water authority.

Sub-question 3: How do the measures pursued and the level of anchoring achieved by the municipality relate to the municipal policy arrangement?

It has become clear that municipalities maintain different approaches to pluvial flooding. Looking at their policy arrangements, several links emerge that could explain why a municipality addresses pluvial flooding in a certain way, while the other does not. In all four dimensions of the policy arrangement, influential factors come forward, although the most direct impact on the municipal approach seems to come from the resource dimension. Municipalities with sufficient human capacity and a variety of available skills and knowledge seem to achieve better anchoring of pluvial flood risk management, especially regarding practical implementation, and tend to invest more effort in adaptive, non-technical measures. In addition, the educational background of the employee responsible for policy design heavily determines the availability of knowledge, which seems linked to the type of measures being taken.

However, rules also influence which measures are pursued, as well as the level of anchoring. For instance, the agreements and ambitions fixed in the regional (waste) water plan form a basic framework for the municipal sewage plan and thus determine the general direction in which the municipality will look for solutions. By extension, the detailedness of these policy documents determines the level of anchoring, especially in policy and practical implementation. On a local level, the organizational structure seems to affect the level of anchoring in organization, either stimulating or hampering internal cooperation and the pursuit of co-benefits. Informal rules such as political (and commercial) interests have a double effect: while creating urgency and therefore generating resources, they can also negatively affect practical implementation.

In the actor dimension, external cooperation seemingly has a particularly large impact on the municipal approach. For example, smaller municipalities with little human capacity (Meerssen and Valkenburg) depend heavily on regional cooperation for policy design and practical implementation, whereas the other two have more freedom to do things their own way. In addition, the way in which cooperation takes place with the regional water authority seems influential. Participation in the *Water in Balans* program seems strongly related to the extent to which private actors are engaged in projects and whether communication with citizens takes place structurally. Outside of the program, cooperation problems with the regional water authority can also have a negative effect on anchoring in practical implementation (e.g. in case of delayed permits).

As for the discourse dimension, the different frames held by the interviewees are in line with the municipal approach in general, suggesting that discourses indeed institutionalize in municipal actions. A number of specific links between discourses and the municipal approach come forward. For example,

the fact that a concrete definition of damage and cost-efficiency is not fixed in formal rules leads to differences between diagnostic frames concerning the question of when to address pluvial flooding, which leads to discussion. In addition, prognostic and motivational frames seem determinative regarding which types of measures are pursued and how well they are anchored, and are particularly intertwined. For example, a preference for technical measures is often related to the motivational driver of feasibility, the interviewee stating not to believe in the effectiveness of private decoupling actions. Moreover, ideational incongruity, internally as well as with the regional water authority, influences the municipal approach as well. For example, it affects smoothness of cooperation and thus slows down progress, or results in issues not being addressed at all because no party feels ownership for them.

6.2. Answering the main research question

In the introduction, the following main research question was formulated:

How do municipalities in Limburg address pluvial flooding and what factors explain the differences between their approaches?

Having discussed the three sub-questions, the answer to the first part of the question has already been given. In short, municipalities in Limburg have progressive policy ambitions with regard to more adaptive, collaborative pluvial flood risk management, but these ambitions are generally not yet put into practice in a structured, large-scale manner. Although all municipalities have started implementing non-technical measures, most still rely heavily on the traditional sewage system for safely processing storm water run-off. Technical measures are well-anchored, whereas non-technical and damage prevention measures generally are not. In addition, important steps are made to achieve more integrated forms of collaboration, but in many cases collaboration is still subject to difficulties of various forms.

That being said, there are significant differences between the municipal approaches, as Sittard-Geleen and especially Peel en Maas seem to have progressed further towards a more adaptive and integrated approach to pluvial flooding than Meerssen and Valkenburg. Many differences that emerged can be linked to the three factors on which case selection was based. Starting with the size of the municipality, smaller municipalities have access to fewer resources, leading to a less advanced level of anchoring (especially in implementation). By extension, they have limited possibilities to take on new projects and are much more dependent on regional cooperation. All in all, the constraints that small municipalities experience in the resource dimension might explain why they lean towards traditional measures to address pluvial flooding, experience difficulty in terms of practical implementation and

generally do not invest structurally in non-technical measures, while regional cooperation with governmental partners is sought extensively. However, a small size is not purely negative, as a small municipality also benefits from close-knit internal relations and highly localized knowledge.

The geographical location of the municipality indeed accounts for differences too. The hilly surroundings and unfortunate soil conditions in the southern municipalities make solutions to flooding more complex and lead to more ambiguity with regard to responsibility. In Peel en Maas, flood origins are more easily identified due to the flat landscape, with no ongoing discussions with external stakeholders. In this context, previous experiences with pluvial flooding in such circumstances seem to explain why southern municipalities have a different mindset in terms of ideal solutions and motivational drivers. Whereas Peel en Maas is generally very optimistic about non-technical measures and see a large role for private stakeholders, Sittard-Geleen, Meerssen and Valkenburg are much more reserved about their effectiveness because they have experienced or expect difficulty successfully implementing them.

As explained when answering sub-question 3, participation in the *Water in Balans* program indeed accounts for differences, explaining why pilot municipalities have access to more resources, experience fewer ideational incongruity and engage in external cooperation in a more structural manner. Interestingly, however, all municipalities want to be part of the program, so not being a pilot municipality does not mean there is no will to collaborate. A difference lies in the motivational driver behind it, though: Meerssen and Valkenburg are interested in participation because they simply do not have enough resources to carry out important tasks themselves, whereas Sittard-Geleen and Peel en Maas seemingly have a more intrinsic motivation to pursue integrated, adaptive approach to pluvial flooding.

Apart from these three factors, a number of other aspects that were not pre-selected upon seem to account for important differences as well. For example, (a lack of) Dutch laws concerning pluvial flood risk management are disproportionately affecting southern municipalities. They are not well-designed for hilly areas, where flood causes are complex and ambiguous. In addition, the behavior of private stakeholders is more influential in hilly areas, but no clear law enforcement rules exist in case private actors fail to take responsibility. As a result, clear agreements for areas with overlapping responsibilities are lacking, which explains why more ideational incongruity exists between southern municipalities and the regional water authority.

Another notable factor that accounts for differences seems to be the scale of the problem. Although resources and the geographical location play a role here, the problem scale ultimately determines the starting point from which the municipality addresses pluvial flooding, which leads to different approaches. Climate change has a much bigger impact on the scale of the problem in a municipality like Meerssen than in Peel en Maas, meaning they simply have more work to do. This also explains why

Meerssen is investing in risk communication and private damage prevention measures, with flood risks so high that the problem cannot be solved in the near future. In addition, other factors that might explain differences are the extent to which commercial interests are intertwined with the spatial environment (e.g. tourism in Valkenburg) and to which the (new, compact) internal organizational structure is formalized in fixed policy procedures.

All in all, there indeed are important differences between municipal approaches to pluvial flooding that lead to different levels of progress towards adaptive, collaborative pluvial flood risk management. Here, a number of remarks must be made about the general direction in which municipal pluvial flood risk management is going. Although municipalities still heavily rely on the sewage system and other technical measures, this is not per se a negative phenomenon. As argued in the literature review, a mix of measures is preferable to come to a robust approach to pluvial flooding. Given that adaptive and non-technical measures only become fully effective on a drastic scale, the sewage system cannot simply be abandoned all at once. It must also not be forgotten that the adaptive, collaborative trend emerged relatively recently, while municipalities are complex, ponderous organizations that need time to set up and implement new policies. All in all, the challenge is to find a good balance between different types of measures. Making several steps throughout the course of this research project alone (e.g. the introduction of the public campaign of Waterklaar in southern municipalities), municipalities definitely show a will to progress towards this balance.

6.3. Reflections and limitations

Reflecting on the results, it can be concluded that they generally correspond well with the existing literature. Although research on municipal pluvial flood risk management is scarce, most studies focused on climate adaptation in Dutch cities have produced similar results, concluding that progress is made towards integrated and collaborative management, but non-traditional measures are often not yet structurally integrated in the municipal organization (Brockhoff et al., 2019; Dai et al, 2018; den Exter et al., 2015). Regarding explanatory factors emerging in this research, especially the lack of resources and horizontal policy integration are mentioned as influential in other studies (e.g. Runhaar et al., 2012; van den Berg & Coenen, 2012). However, some factors (e.g. geographical location) are difficult to confirm as they are highly specific for this research and Limburg. In addition, previous studies are conducted on relatively large municipalities (e.g. Begg, 2018), while no material on smaller municipalities is available for comparison.

Looking at the conceptual model, it seems broad and comprehensive enough to cover all relevant aspects of the municipal approach as well as contextual factors of municipal pluvial flood risk management emerging from the data. Some small adjustments could be made to the conceptual model,

however. As demonstrated in Peel en Maas, a flat organizational structure does not necessarily lead to better anchoring in organization, as policy integration in practice strongly depends on how procedures are formally fixed; a nuance that should be included in the variable description. In addition, the indicator of 'clear norms and definitions' might be added to the variable of anchoring in policy to include the influence of cost-efficiency norms and definitions of damage.

Regarding the use of the Policy Arrangements Approach, all dimensions prove to have some effect on the municipal approach. However, the conceptual model lacks concrete concepts to explore their interrelatedness, which makes the identification of independent links with the municipal approach highly complex. Therefore, the policy arrangement of municipal pluvial flood risk management as mapped in this research should be perceived as an integrated whole, while one should be cautious to claim direct links between the institutional context and aspects of the municipal approach. For this exploratory research, this does not form a large issue, but for more specific studies on independent links it could. In such cases, it is worthwhile to consider including extra theoretical concepts to disentangle relations between the dimensions.

Another shortcoming is that the currently maintained definition of a policy arrangement does not directly consider past developments municipalities have gone through. Looking at the results, it becomes clear that several important decisions made in the past (e.g. long-term financial investments in the sewage system) still affect the current municipal approach today. In retrospect, a useful theoretical addition to the conceptual model would be the concept of organizational path dependence. Sydow et al. (2009) argue that in policy processes, commitments are made to an "organizational path" (p. 692) on which decisions are (un)intentionally steered in a certain direction, creating organizational lock-ins in which other options are no longer available. Several types of such "self-reinforcing mechanisms" (p. 689) can lead to lock-ins in flood risk management. For example, learning effects²⁸ could help explain the relation between the availability of resources and types of measures pursued (Sydow et al, 2009). Overall, to achieve a more complete conceptual model, such mechanisms could be linked as variables to different policy arrangement dimensions, as was already done by Wiering et al. (2018).

Some additional methodological limitations need to be discussed as well. For example, the interviewees seemed to be well aware that the research project was carried out by someone from the regional water authority. Although questions were designed to retrieve information about the broad municipal approach to pluvial flooding, the fact that an 'employee' from the regional water authority

²⁸ The more often a specific "operation" (Sydow et al., 2009, p. 700) is performed, the easier, faster and more reliable it becomes. As skills and knowledge to carry out a specific practice are built up, it becomes less attractive to choose alternative paths, as it would cost too much effort to start from scratch. Learning effects seem to be present in smaller municipalities with highly specialized technical experience and little time to explore new alternatives.

was speaking to them might have been seen as a chance to express frustrations, which could possibly have led to more biased statements. In addition, it sometimes proved difficult to effectively compare results of municipalities because they have different ways of reporting on specific aspects, such as progress, funding or monitoring. Moreover, some potentially interesting follow-up policy documents mentioned in the municipal sewage plan were not publically available. Given the observed informality in some municipalities, it is also possible that some important information was missed because it was not fixed in documents or remained unmentioned during the interviews.

6.4. Recommendations for further research

From the conclusions and limitations, several new research opportunities come forward. As this research is a in-depth, exploratory study on municipal pluvial flood risk management, more research should be conducted to see to what extent the results of this study apply universally. The study could be repeated entirely in different municipalities to see if contributing factors are similar, or separate links could be explored in more detail, for example using a quantitative approach.

In addition, several specific issues emerged from the data that require further exploration because of their potential impact on the municipal approach. For example, (the impact of) public opinion was not directly researched, but turned out to be influential to the political interests of municipal politicians. Therefore, the interaction between public opinion, political interests and policy design in the context of local pluvial flood risk management would be an interesting research topic. On another note, as many municipalities struggle with citizen participation, it could be helpful to find out what citizens need and expect from the municipality (or other organizations) to start taking private action.

To achieve improvement of efficiency and collaboration in municipal pluvial flood risk management, the concept of ideational congruity provides new research opportunities. A lot of potential lies in finding out how different perceptions of damage and cost-efficiency are present within and outside the municipality (involving citizens as well) and how these can be brought together. Researching views on what cooperative processes should look like, e.g. in terms of communication, might be helpful as well. Given the frequent discussions on responsibility for ambiguous flooding situations, research is also needed on the extent to which Dutch law provides sufficient legal instructions on how to deal with responsibility in regional and local pluvial flood risk management in hilly areas.

6.5. Policy recommendations

Based on the difficulties that municipalities still seem to experience in achieving a more adaptive, collaborative approach to pluvial flooding, this research makes the following policy recommendations:

Invest in sufficient human capacity and expertise

Municipalities should invest in more human capacity. Sufficient human capital is essential to put ambitions with regard to cooperation and integration into practice. In addition, it is advisable to review the skills that current employees possess. Given the changing nature of the jobs related to pluvial flood risk management, it might be wise to consider retraining to ensure sufficient management skills are present, and hire more broadly educated candidates in the future. Because extra funds are not easily lobbied for, it is important to develop a persuasive story in which the need for more capacity is justified. As already suggested by some interviewees, the climate adaptation debate can contribute to this. By ensuring water is incorporated into sustainability and climate adaptation plans, the urgency of the issue becomes visible and access to resources is likely to increase.

Achieve better anchoring of policy and implementation

As non-technical ambitions are often not worked out well into concrete policy plans, it is sensible to invest in measures that ensure better anchoring, especially in the field of policy design and implementation. For example, policy documents could include more concrete goals (and fewer ambitions) with time paths and binding targets to increase the urgency of actually reaching them. In addition, cooperation could be structured into fixed procedures, forcing project leaders to gather input from all kinds of disciplines. This way, problems emerging in the end-phase of the project can be prevented, while co-benefits can automatically be safeguarded. In fact, this is an important goal of the Environment and Planning Act, which will take effect in 2022. In this context, extra efforts could be made to ensure water and climate policy are incorporated well in the municipal Strategy on Spatial Planning and the Environment.

Determine clear cost-efficiency norms

The lack of clear cost-efficiency norm results in ambiguity as to when, where and which actions should be taken. It is therefore recommended to concretely define what is understood with 'damage' (in financial, emotional or other relevant terms) and work out to what extent different types of damage are to be addressed at which costs. Ideally, this happens in cooperation with citizens and other relevant external parties in order to generate widespread support. Here, municipalities might make use of tools provided by the Delta Program for Spatial Adaptation (2018) to carry out a risk dialogue (*risicodialoog*). All in all, a clear cost-efficiency norm would facilitate quick decisions and targeted actions, while also clarifying for citizens when to expect action or not.

Address ideational incongruity

Clear and detailed divisions of responsibility for every involved party are important for successful external collaboration. Especially between municipalities and the regional water authority, the collaborative process could be improved by addressing the differences between their perceptions of responsibility. A practical measure would be to set up more structural and engaged cooperative procedures, which would help avoid frustrations and achieve consensus on actions to be taken. In this line, municipalities and the regional water authority must continue to invest in long-term account managers, which are extremely valuable to oversee and understand what is happening in both organizations. Regarding other forms of external cooperation, a special regional committee could put issues of ideational incongruity on the regional agenda, for example by discussing them during important meetings (e.g. of regional partnerships, or the Bestuurlijke Klimaattafel Limburg). Here, the issue of unclarity about responsibility in hilly areas seems most urgent, possibly requiring involvement of provincial or even national officials.

7. References

- 1Limburg. (2018, May 22). Noodweer: vooral Meerssen en Sittard-Geleen hard getroffen [Photograph]. 1Limburg. <https://www.1limburg.nl/noodweer-vooral-meerssen-en-sittard-geleen-hard-getroffen>
- ANP. (2014, August 4). Auto's in een ondergelopen straat in het Limburgse Meerssen [Photograph]. Het Parool. <https://www.parool.nl/nieuws/auto-s-onder-water-na-noodweer-limburg~bd54275a/>
- Artifex Terra. (2015). *Bodemkwaliteits- en bodemfunctieklassenkaart gemeente Sittard-Geleen 2016-2020*. <https://decentrale.regelgeving.overheid.nl/cvdr/images/Sittard-Geleen/i262438.pdf>
- Arts, B., & Leroy, P. (2006). Institutional Dynamics in Environmental Governance. In B.J.M. Arts & P. Leroy (Eds.), *Institutional Dynamics in Environmental Governance* (pp. 1-19). Dordrecht: Springer.
- Arts, B., Leroy, P., & van Tatenhove, J. (2006). Political Modernisation and Policy Arrangements: A Framework for Understanding Environmental Policy Change. *Public Organization Review*, 6, 93-106. <https://doi.org/10.1007/s11115-006-0001-4>
- Arts, B., & van Tatenhove, J. (2004). Policy and power: A conceptual framework between the 'old' and 'new' policy idioms. *Policy Sciences*, 37, 339-356. <https://doi.org/10.1007/s11077-005-0156-9>
- Begg, C. (2018). Power, responsibility and justice: a review of local stakeholder participation in European flood risk management. *The International Journal of Justice and Sustainability*, 23(4), 382-397. <https://doi.org/10.1080/13549839.2017.1422119>
- van den Berg, M., & Coenen, F. (2012). Integrating climate change adaptation into Dutch local policies and the role of contextual factors. *Local Environment*, 17(4), 441-460. <https://doi.org/10.1080/13549839.2012.678313>
- Bestuurlijke Klimaattafel Limburg. (2018). *Bestuurlijke Klimaattafel Limburg: Regionaal governancemodel voor klimaatadaptatie*.
- Bor, A., & Mesters, C. (2018). *Financiële prikkels voor klimaatadaptatie: Inventarisatie financiële beloningen voor klimaatbestendige gebouwen en tuinen*. Deltaprogramma Ruimtelijk Adaptatie. <https://nextgreen.nl/wp-content/uploads/2018/01/20180118-Financiele-prikkels-voor-klimaatadaptatie.pdf>
- Bouwer, L.M., D. Huitema, & J.C.J.H. Aerts. (Eds.) (2007). *Adaptive flood management: the role of insurance and compensation in Europe*. Amsterdam, The Netherlands: Institute for Environmental Studies. <https://research.vu.nl/files/2257096/198976.pdf>
- Brockhoff, R.C., Koop, S.H.A., & Snel, K.A.W. (2019). Pluvial flooding in Utrecht: On Its Way to a Flood-Proof City. *Water*, 11(7), 1501. <https://doi.org/10.3390/w11071501>
- Bryman, A. (2012). *Social Research Methods* (4th ed.). Oxford: Oxford University Press.
- Bulti, D.T., Girma, B., & Megento, T.L. (2019). Community flood resilient assessment frameworks: a

- review. *SN Applied Sciences*, 1, 1663. <https://doi.org/10.1007/s42452-019-1731-6>
- van Buuren, A., Klijn, E., & Edelenbos, J. (2012). Democratic Legitimacy of New Forms of Water Management in the Netherlands. *International Journal of Water Resources Development*, 28(4), 629-645. <https://doi.org/10.1080/07900627.2011.627756>
- Central Bureau for Statistics. (2020, February 29). *Gemeenten – Aantal inwoners, 2017* [Data set]. https://cbsinuwbuurt.nl/#gemeenten2017_aantal_inwoners
- Compston, H. (2009). *Policy Networks and Policy Change: Putting Policy Network Theory to the Test*. London: Palgrave Macmillan UK.
- Creswell, J.W., & Poth, C.N. (2018). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches* (4th ed.). New Delhi: Sage.
- Dai, L., Wörner, R., & van Rijswijk, H.F.M.W. (2018). Rainproof cities in the Netherlands: approaches in Dutch water governance to climate-adaptive urban planning. *International Journal of Water Resources Development*, 34(4), 652-674. <https://doi.org/10.1080/07900627.2017.1372273>
- Douglas, I., Garvin, S., Lawson, N., Richards, J., Tippet, J., & White, I. (2010). Urban pluvial flooding: a qualitative case study of cause, effect and nonstructural mitigation. *Journal of Flood Risk Management*, 3, 112-125. <https://doi.org/10.1111/j.1753-318X.2010.01061.x>
- Emerson, K., Nabatchi, T., & Balogh, S. (2011). An Integrative Framework for Collaborative Governance. *Journal of Public Administration Research and Theory*, 22(1), 1-29. <https://doi.org/10.1093/jopart/mur011>
- den Exter, R., Lenhart, J., & Kern, K. (2015). Governing climate change in Dutch cities: anchoring local climate strategies in organization, policy and practical implementation. *Local Environment*, 20(9), 1062-1080. <http://dx.doi.org/10.1080/13549839.2014.892919>
- Falconer, R.H., Cobby, D., Smyth, P., Astle, G., Dent, J., & Golding, B. (2009). Pluvial flooding: new approaches in flood warning, mapping and risk management. *Journal of Flood Risk Management*, 2(3), 198-208. <https://doi.org/10.1111/j.1753-318X.2009.01034.x>
- Farrugia, S., Hudson, M.D., & McCulloch, L. (2013). An evaluation of flood control and urban cooling ecosystem services delivered by urban green infrastructure. *International Journal of Biodiversity Science, Ecosystem Services & Management*, 9(2), 136-145. <https://doi.org/10.1080/21513732.2013.782342>
- Flyvbjerg, B. (2006). Five Misunderstandings About Case-Study Research. *Qualitative Inquiry*, 12(2), 219-245. <https://doi.org/10.1177%2F1077800405284363>
- Gilissen, H.K. (2013). *Adaptatie aan klimaatverandering in het Nederlandse waterbeheer: verantwoordelijkheden en aansprakelijkheid* (Doctoral dissertation, Utrecht University, Utrecht, The Netherlands).
- Government of the Netherlands. (2020, February 26). *Revision of Environment and Planning Laws*.

<https://www.government.nl/topics/spatial-planning-and-infrastructure/revision-of-environment-planning-laws>

- Guba, E.G., & Lincoln, Y.S. (1994). Competing Paradigms in Qualitative Research. In N.K. Denzin & Y.S. Lincoln (eds.), *Handbook of qualitative research* (pp. 105-117). Thousand Oaks, CA: Sage.
- Gupta, J., Bergsma, E., Termeer, C.J.A.M., Biesbroek, G.R., van den Brink, M., Jong, P., Kloostermann, J.E.M., Meijerink, S., & Nooteboom, S. (2016). The adaptive capacity of institutions in the spatial planning, water, agriculture and nature sectors in the Netherlands. *Mitigation and Adaptation Strategies for Global Change*, 21, 883, 903. <https://doi.org/10.1007/s11027-014-9630-z>
- Hajer, M., & Versteeg, W. (2005). A decade of discourse analysis of environmental politics: Achievements, challenges, perspectives. *Journal of Environmental Policy & Planning*, 7(3), 175-183. <https://doi.org/10.1080/15239080500339646>
- Heuts, K. (2019, January 20). Procesplanning tekening gebied Kwistbeek [illustration]. <https://metelkaar.waterschaplimburg.nl/projecten/gebied+kwistbeek/documentenkwistbeek/default.aspx>
- Hofmann, J., & Schüttrumpf, H. (2019). Risk-Based Early Warning System for Pluvial Flash Floods: Approaches and Foundations. *Geosciences*, 9(3), 127. <https://doi.org/10.3390/geosciences9030127>
- Houston, D., Werritty, A., Bassett, D., Geddes, A., Hoolachan, A., & McMillan, M. (2011). *Pluvial (rain-related) flooding in urban areas: the invisible hazard*. Joseph Rowntree Foundation. <https://www.jrf.org.uk/report/pluvial-rain-related-flooding-urban-areas-invisible-hazard>.
- Hudson, P., Botzen, W.J., & Aerts, J.C.J.H. (2019). Flood insurance arrangements in the European Union for future flood risks under climate and socioeconomic change. *Global Environmental Change*, 58, 101966. <https://doi.org/10.1016/j.gloenvcha.2019.101966>
- Hughes, S., & Sarzynski, A. (2015). Building capacity for climate change adaptation in urban areas: Editors' introduction. *Urban Climate*, 14, 1-3. <http://dx.doi.org/10.1016/j.uclim.2015.07.002>
- de Jonge, V.N. (2009). From a Defensive to an Integrated Approach. In S. Reinhard & H. Folmer (Eds.), *Water Policy in the Netherlands: Integrated Management in a Densely Populated Delta* (pp. 17-46). Washington, D.C.: Resources for the Future.
- Kaspersen, P.S., Ravn, N.H., Arnbjerg-Nielsen, K., Madsen, H., & Drews, M. (2017). Comparison of the impacts of urban development and climate change on exposing European cities to pluvial flooding. *Hydrology and Earth System Sciences*, 21, 4131-4147. <https://doi.org/10.5194/hess-21-4131-2017>
- Kaufmann, M., Priest, S.J., & Leroy, P. (2018). The undebated issue of justice: silent discourses in Dutch flood risk management. *Regional Environmental Change*, 18, 325-337. <https://doi.org/10.1007/s10113-016-1086-0>
- Klein Tank, A., Beersma, J., Bessembinder, J., van den Hurk, B., & Lenderink, G. (2015). *KNMI'14*

- climate scenarios for the Netherlands*. KNMI.
http://www.klimaatsscenarios.nl/brochures/images/Brochure_KNMI14_EN_2015.pdf
- Knaggård, Å. (2015). The Multiple Streams Framework and the problem broker. *European Journal of Political Research*, 54(3), 450-465. <https://doi.org/10.1111/1475-6765.12097>
- Kooiman, N., de Jong, A., Huisman, C., van Duin, C., & Stoeldraijer, L. (2016). *PBL/CBS Regionale bevolkings- en huishoudensprognose 2016-2040*. Centraal Bureau voor de Statistiek.
<https://www.cbs.nl/-/media/pdf/2016/39/regionale-bevolkings-en-huishoudensprognose-2016.pdf>
- Koop, S.H.A., Koetsier, L., Doornhof, A., Reinstra, O., van Leeuwen, C.J., Brouwer, S., Dieperink, C., & Driessen, P.P.J. (2017). Assessing the Governance Capacity of Cities to Address Challenges of Water, Waste and Climate Change. *Water Resource Management*, 31, 3427-3443.
<https://doi.org/10.1007/s11269-017-1677-7>
- Koopmans, S. (2018, March 2). Wateroverlast in het gebied Soeterbeek in Baarlo als gevolg van hevige regenval, waardoor de Kwistbeek overstroomde [Photograph]. De Limburger.
https://www.limburger.nl/cnt/dmf20180301_00056899/miljoenen-om-beken-plensbuiproof-te-maken
- Kunst, O. (2015). *Gemeentelijke aanpak regenwateroverlast*. Stichting Rioned.
<https://bit.ly/2l2SDo9>
- 't Lam, N. (2019). *Gebiedspilots programma Water in Balans: Ervaringen eerste fase en uitdagingen voor vervolg*. Arcadis.
- Lammers, J.C., & Garcia, M.A. (2017). Institutional Theory Approaches. In C.R. Scott, J.R. Barker, T. Kuhn, J. Keyton, P.K. Turner, & L.K. Lewis (Eds.), *The International Encyclopedia of Organizational Communication* (pp. 1-10). John Wiley & Sons, Inc.
<https://doi.org/10.1002/9781118955567.wbieoc113>
- Langeveld, J.G. (2019). *Afkoppelen: kansen en risico's van anders omgaan met hemelwater in de stad*. Stichting Toegepast Onderzoek Waterbeheer.
<https://www.stowa.nl/sites/default/files/assets/PUBLICATIES/Publicaties%202019/STOWA%202019%2022%20WEB.pdf>
- Lennon, M., Scott, M., & O'Neill, E. (2014). Urban Design and Adapting to Flood Risk: The Role of Green Infrastructure. *Journal of Urban Design*, 19(4), 745-758.
<https://doi.org/10.1080/13574809.2014.944113>
- Liefferink, D. (2006). The Dynamics of Policy Arrangements: Turning Round the Tetrahedron. In B.J.M. Arts & P. Leroy (Eds.), *Institutional Dynamics in Environmental Governance* (pp. 45-68). Dordrecht: Springer.
- Ministerie van Infrastructuur en Waterstaat. (2014). *Synthesedocument Ruimtelijke Adaptatie*:

Deltaprogramma 2015 Achtergronddocument B3.

<https://ruimtelijkeadaptatie.nl/deltabeslissing/deltabeslissing/>

- Mols, J., & Schut, M. (2012). *Gemeentelijke aansprakelijkheid bij wateroverlast: Wetgeving, rechtspraak en praktijkvoorbeelden*. Stichting RIONED. <https://edepot.wur.nl/196928>
- Montalto, F.A., Bartrand, T.A., Waldman, A.M., Travaline, K.A., Loomis, C.H., McAfee, C., Geldi, J.M., Rigall, J.G., & Boles, L.M. (2013). Decentralized green infrastructure: the importance of stakeholder behavior in determining spatial and temporal outcomes. *Structure and Infrastructure Engineering*, 9(12), 1187-1205. <https://doi.org/10.1080/15732479.2012.671834>
- Neuvel, J.M.M., & van den Brink, A. (2009). Flood risk management in Dutch local spatial planning practices. *Journal of Environmental Planning and Management*, 52(7), 866-880. <https://doi.org/10.1080/09640560903180909>
- Nifoma. (2018, May 21). De Lindenstraat in Berg en Terblijt overspoeld door modderstroom [Photograph]. 1Limburg. <https://www.1limburg.nl/flinke-stortbuien-modderstroom-berg-en-terblijt>
- North, D.C. (1990). *Institutions, Institutional Change and Economic Performance*. Cambridge: Cambridge University Press. <https://doi.org/10.1017/CBO9780511808678>
- OECD. (2014). *OECD Studies on Water: Water Governance in the Netherlands: Fit for the Future?* <http://dx.doi.org/10.1787/9789264102637-en>
- Pot, W. (2019). Anticipating the Future in Urban Water Management. An Assessment of Municipal Investment Decisions. *Water Resources Management*, 33, 1297-1313. <https://doi.org/10.1007/s11269-019-2198-3>
- Pregolato, M., Ford, A., Glenis, V., Wilkinson, S., & Dawson, R. (2017). Impact of climate change on disruption to urban transport networks from pluvial flooding. *Journal of Infrastructure Systems*, 23(4), 04017015. [https://doi.org/10.1061/\(ASCE\)IS.1943-555X.0000372](https://doi.org/10.1061/(ASCE)IS.1943-555X.0000372)
- Provincie Limburg. (2020, March 6). *Bodemkaart 50.000 (2014)* [Data set]. <https://portal.prvlimburg.nl/viewer/app/default>
- Restemeyer, B., Woltjer, J., & van den Brink, M. (2015). A strategy-based framework for assessing the flood resilience of cities – A Hamburg case study. *Planning Theory & Practice*, 16(1), 45-62. <http://dx.doi.org/10.1080/14649357.2014.1000950>
- van Riel, W. (2011). *Exploratory study of pluvial flood impacts in Dutch urban areas*. Deltares. <https://library.wur.nl/WebQuery/hydrotheek/2047255>
- Rosenzweig, B.R., McPhillips, L., Chang, H., Cheng, C., Welty, C., Matsler, M., Iwaniec, D., & Davidson, C.I. (2018). Pluvial flood risk and opportunities for resilience. *Water*, 5(6), 1302. <https://doi.org/10.1002/wat2.1302>
- Rözer, V., Müller, M., Bubeck, P., Kienzler, S., Thieken, A., Pech, I., Schröter, K., Bucholz, O., & Kreibich,

- H. (2016). Coping with Pluvial Floods by Private Households. *Water*, 8(7), 304.
<https://doi.org/10.3390/w8070304>
- Runhaar, H., Driessen, P., & Uittenbroek, C. (2014). Towards a Systemic Framework for the Analysis of Environmental Policy Integration. *Environmental Policy and Governance*, 24, 233-246.
<https://doi.org/10.1002/eet.1647>
- Runhaar, H., Mees, H., Wardekker, A., van der Sluijs, J., & Driessen, P.P.J. (2012). Adaptation to climate change-related risks in Dutch urban areas: stimuli and barriers. *Regional Environmental Change*, 12, 777-790. <http://dx.doi.org/10.1007/s10113-012-0292-7>
- Sabatier, P.A. (1998). The advocacy coalition framework: revisions and relevance for Europe. *Journal of European Public Policy*, 5(1), 98-130. <https://doi.org/10.1080/13501768880000051>
- Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students* (5th ed.). Harlow: Pearson Education Unlimited.
- Schanze, J. (2018). Pluvial flood risk management: an evolving and specific field. *Journal of Flood Risk Management*, 11(3), 227-229. <https://doi.org/10.1111/jfr3.12487>
- Schmitt, T.G., & Scheid, C. (2019). Evaluation and communication of pluvial flood risk in urban areas. *WIREs Water*, 7(1), 1401. <https://doi.org/10.1002/wat2.1401>
- Snow, D.A., & Benford, R.D. (1988). Ideology, Frame Resonance, and Participant Mobilization. *International Social Movement Research*, 1, 197-217.
- Sörensen, J., Persson, A., Sternudd, C., Aspegren, H., Nilsson, J., Nordström, J., Jönsson, K., Mottaghi, M., Becker, P., Pilesjö, P., Larsson, R., Berndtsson, R., & Mobini, S. (2016). Re-Thinking Urban Flood Management – Time for a Regime Shift. *Water*, 8(8), 322. <https://doi.org/10.3390/w8080332>
- Spekkers, M.H., ten Veldhuis, J.A.E., Kok, M., & Clemens, F.H.L.R. (Eds.) (2011). *Analysis of pluvial flood damage based on data from insurance companies in the Netherlands*. Graz: Technische Universität Graz. <http://resolver.tudelft.nl/uuid:de414d3d-fe45-459a-bfd6-f46b91d5a7cd>
- Staddon, C., Ward, S., De Vito, L., Zuniga-Teran, A., Gerlak, A.K., Schoeman, Y., Hart, A., & Booth, G. (2018). Contributions of green infrastructure to enhancing urban resilience. *Environment Systems and Decisions*, 38, 330-338. <https://doi.org/10.1007/s10669-018-9702-9>
- Sydow, J., Schreyögg, G., & Koch, J. (2009). Organizational Path Dependence: Opening the Black Box. *Academy of Management Review*, 34(4), 689-709. <https://doi.org/10.5465/AMR.2009.44885978>
- Termeer, C., Dewulf, A., & Breeman, G. (2013). Governance of Wicked Climate Adaptation Problems. In J. Knieling & W. Leal Filho (Eds.), *Climate Change Governance*. (pp. 27-39). Berlin, Heidelberg: Springer. https://doi.org/10.1007/978-3-642-29831-8_3
- Termeer, C., Dewulf, A., van Rijswijk, H., van Buuren, A., Huitema, D., Meijerink, S., Rayner, T., & Wiering, M. (2011). The regional governance of climate adaptation: A framework for

- developing legitimate effective, and resilient governance arrangements. *Climate Law*, 2(2), 159-179. <https://doi.org/10.3233/CL-2011-032>
- Tosun, J., & Lang, A. (2017). Policy integration: mapping the different concepts. *Policy Studies*, 38(6), 553-570. <https://doi.org/10.1080/01442872.2017.1339239>
- Verschuren, P., & Doorewaard, H. (2010). *Designing a Research Project* (2nd ed.). The Hague: Eleven International Publishing.
- Waterschap Limburg. (2018). *Samen bouwen en verankeren: Najaarsrapportage 2018*. https://www.waterschaplimburg.nl/publish/pages/4141/najaarsrapportage_2018.pdf
- Waterschap Limburg. (2019). *Water in Balans 2019-2025: Programmaplan*.
- Wensink, W. (2018). Van Waterwet naar Omgevingswet. *Water Governance*, 1, 6-11. <http://edepot.wur.nl/457757>
- Wiering, M., Liefverink, D., & Crabbé, A. (2018). Stability and change in flood risk governance: on path dependencies and change agents. *Journal of Flood Risk Management*, 11, 230-238. <https://doi.org/10.1111/jfr3.12295>
- Winteraeken, H.J., & Spaan, W.P. (2010). A new approach to soil erosion and runoff in south Limburg—The Netherlands. *Land Degradation and Development*, 21(4), 346-352. <https://doi.org/10.1002/ldr.1009>
- Wolsink, M. (2006). River basin approach and integrated water management: Governance pitfalls for the Dutch Space-Water-Adjustment Management Principle. *Geoforum*, 37(4), 473-487. <https://doi.org/10.1016/j.geoforum.2005.07.001>
- Yin, R.K. (1981). The Case Study as a Serious Research Strategy. *Knowledge: Creation, Diffusion, Utilization*, 3(1), 97-114.

8. Annexes

Annex A: List of consulted policy documents

General policy documents

Nr.	Year	Document Title	Publisher	Level
D1	2011	Bestuursakkoord Water	Ministerie van Infrastructuur en Milieu	National
D2	2018	Bouwstenen voor Water en Klimaat	Waterpanel Noord	Regional
D3	2019	Keur	Waterschap Limburg	Regional
D4	2014	Normering regionale wateroverlast	Provinciale Staten van Limburg	Provincial
D5	2019	Programmaplan Water in Balans	Waterschap Limburg	Regional
D6	2019	Provinciaal Omgevingsplan Limburg 2014 (updated version 2019/1)	Provinciale Staten van Limburg	Provincial
D7	2015	Provinciaal Waterplan Limburg 2016-2021	Provinciale Staten van Limburg	Provincial
D8	2015	Waardevol groeien: De Limburgse visie op samenwerken in de Waterketen	Waterpanels Limburg	Regional
D9	2015	Waterbeheerplan 2016-2021	Waterschap Peel en Maasvallei, Waterschap Roer en Overmaas	Regional

Documents for the case study of Meerssen

Nr.	Year	Document Title	Publisher	Level
D1	2018	Bestuursakkoord 2018-2022 Gemeente Meerssen	Gemeente Meerssen	Local
D2	2017	Gemeentelijk Rioleringsplan Meerssen 2018-2022	Sweco	Local
D3	2018	Samenwerkingsovereenkomst – Water in Balans – Aanpak Wateroverlast Knelpunt Kern Meerssen/Ulestraten	Waterschap Limburg, Gemeente Meerssen, Provincie Limburg, Staatsbosbeheer, Waterleiding Maatschappij Limburg, LLTB	Regional
D4	2019	Stimuleringsregeling afkoppelen hemelwater [web link]	Gemeente Meerssen	Local
D5	2017	Waterplan Maas en Mergelland 2018-2022	Sweco	Regional

Documents for the case study of Peel en Maas

Nr.	Year	Document Title	Publisher	Level
D1	2018	Geef de ruimte! Keuze voor ontwikkeling en groei – Coalitieakkoord 2018 – 2022	Gemeente Peel en Maas	Local
D2	2016	Gemeentelijk rioleringsplan Peel en Maas 2017-2021	Sweco	Local
D3	2017	Verordening op de afvoer van hemel- en grondwater [web link]	Gemeente Peel en Maas	Local
D4	2017	Uitvoeringsregeling stimuleren afkoppelen hemelwater private terreinen Peel en Maas [web link]	Gemeente Peel en Maas	Local
D5	2016	Waterketenplan Limburgse Peelen 2017-2021	Grontmij	Regional

Documents for the case study of Sittard-Geleen

Nr.	Year	Document Title	Publisher	Level
D1	2014	Beheerplan Afvalwater Westelijke Mijnstreek	Grontmij	Regional
D2	2014	Beleidsplan Afvalwater Westelijke Mijnstreek – planperiode 2015-2020	Grontmij	Regional
D3	2018	Coalitieakkoord op hoofdlijnen 2018-2022 – Samen duurzaam	Gemeente Sittard-Geleen	Local
D4	2017	Evaluatie Afvalwaterplannen – Westelijke Mijnstreek – Versie gemeente Sittard-Geleen	Sweco	Local
D5	2017	Projectplan Afvalwater Sittard-Geleen 2018-2020	Sweco	Local
D6	2018	Stimuleringsregeling Afkoppelen Hemelwater Sittard-Geleen	Gemeente Sittard-Geleen	Local

Documents for the case study of Valkenburg

Nr.	Year	Document Title	Publisher	Level
D1	2018	Coalitieakkoord Valkenburg aan de Geul 2018-2022	Gemeente Valkenburg	Local
D2	2017	Gemeentelijk Rioleringsplan 2018-2022 – Gemeente Valkenburg	Sweco	Local
D3	2017	Waterplan Maas en Mergelland 2018-2022	Sweco	Regional

Annex B: Schematic overview of interviews

Overview of interviewees				
Organization	Participant code	Job title (English)	Job title (Dutch)	Date of interview
Waterschap Limburg	P1	Account manager	Omgevingsmanager Water in Balans	April 16, 2019
	P2	Communication advisor	Adviseur communicatie Water in Balans	April 16, 2019
	P3	Account manager	Omgevingsmanager Water in Balans	April 16, 2019
	P4	Program manager	Adviseur programmamanager Water in Balans	April 17, 2019
	P5	Water system advisor, accountmanager	Adviseur watersysteem en -keten, accountmanager	April 25, 2019
	P6	Legal advisor	Adviseur juridische zaken	April 25, 2019
	P7	Water system advisor, accountmanager	Adviseur watersysteem en -keten, accountmanager	April 29, 2019
	P8	Program manager South Limburg	Deelprogrammamanager Zuid Water in Balans	April 30, 2019
	P9	Water system advisor, accountmanager	Adviseur watersysteem en -keten, accountmanager	May 7, 2019
	P10	Executive board member	Lid dagelijks bestuur	June 20, 2019
	P11	Permits and testing expert	Vakspecialist vergunningen en toetsingen	June 5, 2019
Municipality of Meerssen	P12	Head of Department of Public Space	Hoofd afdeling ruimte	May 29, 2019
	P13	Waste water policy advisor	Beleidsmedewerker riool/water	May 17, 2019
	P14	Communication advisor	Senior communicatieadviseur	May 17, 2019
Municipality of Peel en Maas	P15	Water policy advisor	Adviseur water en riolering	May 13, 2019
	P16	Communication advisor	Medewerker communicatie	May 13, 2019
	P17	Landscape, nature and neighborhood policy advisor	Adviseur wijk, natuur en landschap	May 13, 2019
	P18	Advisor on environmental development	Adviseur omgevingsontwikkeling	May 22, 2019
Municipality of Sittard-Geleen	P19	Waste water policy advisor	Adviseur riolering	May 9, 2019
	P20	Alderman for the Living Environment	Wethouder Leefomgeving	June 26, 2019
Municipality of Valkenburg aan de Geul	P21	Civil engineering officer	Beleidsmedewerker civiele techniek	May 15, 2019
	P22	Alderman for Public Space	Wethouder Openbare Ruimte	June 11, 2019

Annex C: Interview guide for the regional water authority (in Dutch)

INTRODUCTIE	
Voorstellen	Mijn naam is Pleun Weijers en ik ben een studente aan de Radboud Universiteit. In het kader van mijn master Milieu- en Maatschappijwetenschappen, waarbij ik specialiseer in duurzaam watermanagement, loop ik stage bij het programma Water in Balans van Waterschap Limburg.
Doel van het onderzoek	Veel Limburgse gemeenten zijn hard bezig met de aanpak van wateroverlast, wat een lastige, complexe opgave kan zijn. Met dit onderzoek probeer ik inzicht te krijgen in het beleid dat Limburgse gemeenten voeren op het gebied van wateroverlast en de belemmeringen/dilemma's/moeilijkheden die gemeenten hierbij tegenkomen. Zodoende probeer ik te onderzoeken op welke manier Waterschap Limburg met gemeenten kan samenwerken om gezamenlijk wateroverlast op een succesvolle manier aan te pakken.
Opzet van interview	Tijdens het interview zal ik vragen stellen over een aantal verschillende onderwerpen, zoals de verschillende maatregelen die u voorbij ziet komen bij gemeenten en de samenwerking tussen gemeenten en Waterschap Limburg. Ik zal bij bepaalde vragen naar uw eigen mening vragen.
Deelname, anonimiteit en vertrouwelijkheid	Dit interview zal anoniem worden afgenomen, wat betekent dat uw persoonlijke gegevens niet openbaar worden gemaakt. De informatie die u geeft zal alleen worden gebruikt voor dit onderzoek. Mocht u het interview willen onderbreken, dan kunt u dat gewoon aangeven.
Opname en verwerking data	Zoals u ziet heb ik opnameapparatuur meegenomen. Door het interview op te nemen, kan ik het gesprek later rustig uitwerken en mis ik geen belangrijke informatie. Vindt u het goed als ik dit gesprek opneem?
Rolverdeling	Ik zal u dadelijk een aantal vragen gaan stellen. Daarnaast maak ik enkele notities. Ik wil echter graag met u echt het gesprek aangaan in plaats van een vragenlijst afwerken, dus u bent vrij om vragen te stellen of zelf onderwerpen aan te snijden.
Vragen	Heeft u nog vragen over het onderzoek, of het verloop van dit interview? Als tijdens het interview iets onduidelijk is, kunt u altijd vragen stellen.

VRAGEN	
Huidig beleid + problematiek	- Kunt u aangeven in hoeverre gemeenten bezig zijn met de aanpak van wateroverlast? <i>Waar leidt u dit uit af?</i> - Ziet u dat ze actief bezig zijn met het vastleggen van beleid? - o <i>Hoe ziet u dit terug?</i> - o <i>In hoeverre worden vastgelegde afspraken gerealiseerd?</i> - Welke concrete maatregelen worden er vaak genomen? ➔ <i>structurele maatregelen (vergroten capaciteit riolering)?</i> ➔ <i>adaptieve maatregelen in het straatbeeld?</i> ➔ <i>schadebeperking?</i> - Ziet u bepaalde belemmeringen waar gemeenten tegenaanlopen in hun aanpak van wateroverlast? - o <i>Om wat voor belemmeringen gaat het? Wat zijn hiervan volgens u de oorzaken?</i> - Zitten er veel verschillen tussen de gemeenten in de aanpak van wateroverlast? - o <i>Zo ja, welke verschillen? Waar ligt dit volgens u aan?</i>

Context + totstandkoming daarvan	- Wat was de <u>aanleiding</u> dat gemeenten begonnen met het aanpakken van wateroverlast? <u>Wanneer</u> zijn ze daarmee gestart? - <u>Wie</u> zijn er binnen de gemeente betrokken bij de aanpak van wateroverlast? - Wordt er samengewerkt met andere partijen? - o <i>Zo ja, met wie, en hoe?</i> - o <i>Hoe verloopt de samenwerking met het waterschap?</i> - o <i>Is iedereen het met elkaar eens?</i>
Percepties	<u>DEFINITIE EN URGENTIE VAN PROBLEEM</u> - Wat zijn volgens u de <u>oorzaken</u> van wateroverlast in Limburgse gemeenten? - o <i>Klimaatverandering, economische ontwikkeling, ruimtelijke ordening, landbouw, etc.?</i> - Wat zijn de gevolgen van wateroverlast in Limburg, en voor wie? <i>In hoeverre vindt u wateroverlast een ernstig probleem? Waarom wel/niet?</i> - Vindt u het <u>belangrijk</u> dat wateroverlast aangepakt wordt? <i>Waarom wel/niet?</i> - Hoe belangrijk vindt u de aanpak van wateroverlast <u>ten opzichte van</u> andere waterproblemen, zoals hoogwater, droogte, waterkwaliteit, etc.? - Wateroverlast is vaak <u>moeilijk te voorspellen</u>. Hierdoor is niet altijd zeker of een (soms dure en ingrijpende) maatregel ergens nodig zal zijn en of de maatregel effect heeft wanneer er een flinke bui valt. Vindt u dat er alles aan gedaan moet worden om het risico op wateroverlast zo klein mogelijk te houden, of mag hierin wel risico worden genomen? - Bent u <u>tevreden over de aandacht</u> die het Waterschap geeft aan de aanpak van wateroverlast? <i>Waarom wel/niet?</i> <u>OPLOSSING</u> - Hoe zou wateroverlast volgens u moeten worden <u>aangepakt</u>? - Welke maatregelen zijn het meest <u>effectief</u>, denkt u? - o <i>structurele maatregelen zoals capaciteit riolering?</i> - o <i>adaptieve maatregelen in het straatbeeld?</i> - o <i>schadebeperking?</i> - Hoe belangrijk vindt u het om <u>samen te werken</u> met andere partijen om wateroverlast aan te pakken? <i>Met wie en in welke vorm?</i> <u>DRIJFVEREN</u> - Wat zijn volgens u de redenen achter de aanpak die het waterschap op dit moment hanteert? - o <i>Bijv. verantwoordelijkheid, haalbaarheid, betaalbaarheid, effectiviteit, politieke status, etc.?</i> - Wie is er volgens u verantwoordelijk voor de aanpak van wateroverlast? - o <i>Is het voor u duidelijk wat de verantwoordelijkheid van gemeenten is?</i> - o <i>Is het duidelijk wat de verantwoordelijkheid van Waterschap Limburg is?</i> - Welke maatregelen zouden gemeenten volgens u moeten nemen? - o <i>het collecteren en afvoeren van hemelwater op openbaar terrein?</i> - o <i>het stimuleren van particulieren om maatregelen te nemen op privéterrein?</i> - o <i>het beperken van schade door wateroverlast?</i> - o <i>het stimuleren van particulieren om schade te beperken aan eigen woning?</i>

	- Bent u tevreden over de manier waarop gemeenten nu wateroverlast aanpakken? <i>Wat zou er anders of beter kunnen?</i>
Maatregelen	Welke hulp biedt het waterschap <u>op dit moment</u> al aan gemeenten om hen te helpen in de aanpak van wateroverlast? <i>Bent u hier tevreden over?</i> Op welke manieren zou het waterschap gemeenten <u>kunnen</u> helpen om deze wateroverlast aan te pakken? Vindt u het de <u>taak</u> van het Waterschap om gemeenten te ondersteunen in hun aanpak van wateroverlast? <i>Waarom wel/niet?</i>

AFSLUITING	
Evaluatie	Zijn er bepaalde zaken niet aan bod gekomen die u wel graag wilt bespreken? Wat vond u van het interview? - <i>Waren de vragen duidelijk en zinvol?</i> - <i>Heeft u nog praktische en/of inhoudelijke tips voor mij?</i> Zijn er nog andere mensen die naar uw mening interessant zijn om te interviewen in het kader van dit onderzoek?
Resultaten + eventuele vervolgspraak	Ik ga dit interview uittypen, analyseren en de gegevens vergelijken met de andere gegevens die ik heb verzameld. Verder zou ik graag de resultaten van dit interview aan u voorleggen om te kijken of mijn conclusies kloppen en aanbevelingen haalbaar en passend zijn. Heeft u hier ook behoefte aan, en zo ja, hoe kan ik dit het beste met u terugkoppelen?
Nader contact	Mocht u achteraf nog vragen hebben, dan kunt u mij altijd bereiken via de mail (p.weijers@waterschaplimburg.nl) of telefonisch (06 20 51 28 58). Mocht ik achteraf nog vragen hebben, zou ik u hiervoor in de toekomst kunnen benaderen?
Bedanken	Hartelijk bedankt voor uw tijd en moeite!

Annex D: Interview guide for municipalities (in Dutch)

INTRODUCTIE	
Voorstellen	Mijn naam is Pleun Weijers en ik ben een studente aan de Radboud Universiteit. In het kader van mijn master Milieu- en Maatschappijwetenschappen, waarbij ik specialiseer in duurzaam watermanagement, loop ik stage bij het programma Water in Balans van Waterschap Limburg.
Doel van het onderzoek	Veel Limburgse gemeenten zijn hard bezig met de aanpak van wateroverlast, wat een lastige, complexe opgave kan zijn. Met dit onderzoek probeer ik inzicht te krijgen in het beleid dat Limburgse gemeenten voeren op het gebied van wateroverlast en de belemmeringen/dilemma's/moeilijkheden die gemeenten hierbij tegenkomen. Zodoende probeer ik te onderzoeken op welke manier Waterschap Limburg met gemeenten kan samenwerken om gezamenlijk wateroverlast op een succesvolle manier aan te pakken.
Opzet van interview	Tijdens het interview zal ik vragen stellen over een aantal verschillende onderwerpen, zoals de verschillende maatregelen die uw gemeente neemt en de samenwerking tussen gemeenten en andere partijen. Ik zal bij bepaalde vragen naar uw eigen mening vragen.
Deelname, anonimiteit en vertrouwelijkheid	Dit interview zal anoniem worden afgenomen, wat betekent dat uw persoonlijke gegevens niet openbaar worden gemaakt. De informatie die u geeft zal alleen worden gebruikt voor dit onderzoek. Mocht u het interview willen onderbreken, dan kunt u dat altijd aangeven.
Opname en verwerking data	Zoals u ziet heb ik opnameapparatuur meegenomen. Door het interview op te nemen, kan ik het gesprek later rustig uitwerken en mis ik geen belangrijke informatie. Vind u het goed als ik dit gesprek opneem?
Rolverdeling	Ik zal u dadelijk een aantal vragen gaan stellen. Daarnaast maak ik enkele notities. Ik wil echter graag met u echt het gesprek aangaan in plaats van een vragenlijst afwerken, dus u bent vrij om vragen te stellen of zelf onderwerpen aan te snijden.
Vragen	Heeft u nog vragen over het onderzoek, of het verloop van dit interview? Als tijdens het interview iets onduidelijk is, kunt u altijd vragen stellen.

VRAGEN VOOR GEMEENTELIJKE AMBTENAREN	
Problematiek + huidig beleid	- Kunt u zich even kort voorstellen? - Kunt u omschrijven waar en op welke manier uw gemeente met wateroverlast te maken heeft? - Kunt u aangeven in hoeverre uw gemeente bezig is met de aanpak van wateroverlast? Waar leidt u dit uit af? - In hoeverre is uw gemeente actief bezig met het vastleggen van beleid? - o <i>In welke plannen/documenten? (rioleringsplan, bestemmingsplan, etc.)</i> - o <i>Welke afdelingen worden hierbij betrokken?</i> - o <i>Wordt er gecontroleerd of en hoe beleid wordt uitgevoerd? Zo ja, hoe?</i> - o <i>Is er binnen de gemeente een manager/coördinator die zich bezighoudt met klimaatadaptatie?</i> - o <i>In hoeverre wordt (nieuw) beleid onder de aandacht gebracht van ambtenaren, burgers en/of andere partijen?</i> - Welke concrete maatregelen worden er al genomen? Waarom is er gekozen voor deze specifieke maatregelen? - o <i>structurele maatregelen zoals capaciteit riolering?</i> - o <i>maatregelen in de ruimtelijke planning? (burgers?)</i> - o <i>schadebeperking?</i>

Context + totstandkoming daarvan	- <u>Wanneer</u> is uw gemeente gestart met het aanpakken van wateroverlast? <i>Wat was hier de aanleiding voor?</i> - Hoe komt beleid omtrent wateroverlast tot stand in uw gemeente? <u>Wie</u> zijn hierbij betrokken, en wat is hun rol? - o <i>Hoeveel invloed heeft u als ambtenaar op dit beleid?</i> - o <i>Is iedereen het met elkaar eens over de juiste aanpak van wateroverlast, of heersen er verschillende ideeën?</i> - Hoeveel vrijheid krijgt u om zelf het vastgelegde beleid uit te voeren? - Welke middelen heeft u ter beschikking om maatregelen te realiseren? - o <i>Zijn dit juiste/voldoende middelen? Waarom? Hoe komt dit?</i> - o <i>Hoe komt u aan die middelen?</i> - Heeft de gemeente volgens u voldoende kennis en expertise in huis om wateroverlast aan te pakken? <i>Zo ja, wordt deze kennis/expertise ook ingezet?</i> - Met welke partijen werkt uw gemeente samen om wateroverlast aan te pakken? <i>Hoe verloopt die samenwerking?</i> - o <i>Bent u tevreden over de manier waarop er samengewerkt wordt?</i>
Persoonlijke ideeën over wateroverlast + oplossing	- Wat is volgens u de definitie van wateroverlast? <i>Wat zijn de oorzaken?</i> - Vindt u het belangrijk dat wateroverlast aangepakt wordt? <i>Waarom wel/niet?</i> - Hoe belangrijk vindt u de aanpak van wateroverlast <u>ten opzichte van</u> andere problemen die in uw gemeente spelen? - Vindt u dat er alles aan gedaan moet worden om de kans op wateroverlast zo klein mogelijk te houden, of mag hierin volgens u wel risico worden genomen? - o <i>Waar ligt deze grens? Kunt u hierin een voorbeeld geven?</i> - o <i>Bent u tevreden over de manier waarop deze grens nu wordt bepaald? Waarom wel/niet?</i> - Hoe zou wateroverlast volgens u moeten worden <u>aangepakt</u>? <i>Welke maatregelen zijn het meest <u>effectief</u>, denkt u?</i> - o <i>structurele maatregelen zoals capaciteit riolering?</i> - o <i>maatregelen in de ruimtelijke planning? (burgers?)</i> - o <i>schadebeperking?</i> - Bij wie ligt volgens u de verantwoordelijkheid voor de aanpak van wateroverlast? - o <i>Is dit voor u duidelijk?</i> - o <i>Bent u het hiermee eens?</i> - Zijn er bepaalde belemmeringen waar u tegenaan loopt in de aanpak van wateroverlast? - o <i>Zo ja, om welke belemmeringen gaat het?</i> - o <i>Wat zijn hiervan volgens u de oorzaken?</i> - Bent u tevreden over de manier waarop uw gemeente wateroverlast aanpakt? <i>Wat zou er anders of beter kunnen?</i> - o <i>Inhoudelijk (qua maatregelen)</i> - o <i>Organisatorisch</i> - o <i>Samenwerking met andere partijen (WL?)</i>

Samenwerking gemeente en waterschap	- Welke ondersteuning biedt het waterschap momenteel aan uw gemeente om te helpen met de aanpak van wateroverlast? <i>Bent u hier tevreden over?</i> - Vindt u het de taak van het waterschap om gemeenten te ondersteunen in hun aanpak van wateroverlast? <i>Waarom wel/niet?</i> - Op welke concrete manieren zou het waterschap gemeenten nog kunnen ondersteunen om wateroverlast aan te pakken?
-------------------------------------	---

AFSLUITING	
Evaluatie	Zijn er bepaalde zaken niet aan bod gekomen die u wel graag wilt bespreken? Wat vond u van het interview? - <i>Waren de vragen duidelijk en zinvol?</i> - <i>Heeft u nog praktische en/of inhoudelijke tips voor mij?</i> Zijn er nog andere mensen die naar uw mening interessant zijn om te interviewen in het kader van dit onderzoek?
Resultaten + eventuele vervolgspraak	Ik ga dit interview uittypen, analyseren en de gegevens vergelijken met de andere gegevens die ik heb verzameld. Verder zou ik graag de resultaten van mijn onderzoek aan u voorleggen om te kijken of mijn conclusies kloppen en aanbevelingen haalbaar en passend zijn. Heeft u hier ook behoefte aan, en zo ja, hoe kan ik dit het beste met u terugkoppelen? Mocht ik achteraf nog vragen hebben, zou ik u hiervoor in de toekomst kunnen benaderen?
Nader contact	Mocht u achteraf nog vragen hebben, dan kunt u mij altijd bereiken via de mail of telefonisch. Heeft u mijn contactgegevens?
Bedanken	Hartelijk bedankt voor uw tijd en moeite!

Annex E: Codebook

	Code name	Description	Code example (in Dutch)
1	Situation_pluvial flooding	Personal statements and pieces of information on the situation and impact of flooding in a municipality, e.g. in terms of locations, scale, frequency and/or damage.	“je zit en met extreme neerslag, en met een groot oppervlak en je zit met een extreem smal dal waar alles doorheen moet, ja dat zijn de ingrediënten om een groot probleem te krijgen en dat hebben we dus nu ook.” [P13, p. 2]
2	General_PAA	Personal statements and pieces of information on general trends in pluvial flood risk management in Limburg that apply to all municipalities.	“In het Provinciale Waterplan Limburg 2010-2015 hebben wij normen voor regionale wateroverlast vastgelegd op basis van de referentienormen (werknormen) uit het Nationaal Bestuursakkoord Water (2008). Deze normen hebben wij toen ruimtelijk aangeduid op de “normeringskaart” bij de omgevingsverordening.” [Provinciaal Waterplan 2016-2021, p. 23]
3	Measures_technical	Personal statements and pieces of information on technical measures that are pursued by a municipality.	“dat kan zijn, eh, rioolverzwaringen, dus grotere buisdiameters, eh, het kan zijn, inderdaad kijken gewoon, een stukje de rijbaan een andere kant opleggen, een drempel opheffen, een grotere instroomput maken, maar ook kijken naar inderdaad de aanleg van waterbuffers, die dingen.” [P21, p. 9]
4	Measures_non-technical	Personal statements and pieces of information on non-technical measures that are pursued by a municipality.	“We hebben een afkoppelsubsidie, voor particulieren waar ze aan mee kunnen doen. Daar doen we ook actief wijken aanschrijven om te benaderen..” [P15, p. 5]
5	Measures_damageprevention	Personal statements and pieces of information on damage prevention measures that are pursued by a municipality.	“we hebben wel een handleiding gemaakt wat mensen zelf aan overlast kunnen doen. Een soort boekje en daarin worden allerlei tips gegeven. We zetten ook met enige regelmatig in de Geulbode, zeker als er weer een natte periode aankomt, van, hou hier rekening mee, wat kunt u zelf doen, hoe kunt u wateroverlast beperken, dus ja, dat is wat we nu doen.” [P12, p. 2]
6	Anchoring_organization	Personal statements and pieces of information on the level of anchoring in organization, e.g. referring to organizational characteristics, the pursuit of co-benefits, and division of responsibility.	“de gemeente zit in ontwikkeling naar een regieorganisatie, ze willen dus hier, eh, een kleine compacte hoogwaardige ambtelijke organisatie houden met twintig tot vijftientwintig man en het bestuur, en de rest willen ze dan gaan overdragen naar Maastricht die dan de ambtelijke dingen moet gaan doen.” [P14, p.9]
7	Anchoring_policy	Personal statements and pieces of information on the level of anchoring in policy, e.g. referring to the existence and contents of policy documents, strategic plans and operational plans.	“We stimuleren afkoppelen op particulier grondgebied door communicatie, voorlichting en mogelijk met een afkoppelsubsidie. We onderzoeken mogelijke vormen van dwang om bij bestaande bebouwing hemelwater beter te kunnen verwerken.” [Beleidsplan Afvalwater Westelijke Mijnstreek 2015-2020, p. 11]
8	Anchoring_implementation	Personal statements and pieces of information on the level of anchoring in implementation, e.g. referring monitoring processes, access to resources and collaboration with external actors.	“onze eigen werkzaamheden controleren, he, als ik het zou terugpakken naar het probleem zoals jij, eh, het onderwerp, wateroverlast, dan zeg ik de beste controle is de burger zelf. Op het moment dat er een probleem is en ik zou het oplossen, en ik krijg geen telefoon meer, dan weet ik dat het goed gedaan is.” [P21, p.6]
9	Actors_internal	Personal statements and pieces of information revealing which employees work on pluvial flood risk management in a municipality.	“mijn wethouder, ja, goed en die, ehm, ja goed, eigenlijk moet ik een stuk maken maar hij zegt, daar sta ik achter, en dan ga je daar weer mee verder. Dus in principe ben je daar wel één op één mee bezig” [P21, p. 13]
10	Actors_external	Personal statements and pieces of information revealing the actors with which a municipality works together on pluvial flood risk management.	“de inwoners, de dorpsraden, ondernemers hebben zich ook, eh, ja, daar hebben we interne collega's die doen daar het relatiebeheer mee” [P15, p. 12]
11	Actors_cooperation_internal	Personal statements and pieces of information on forms of internal collaboration, as well as experiences with them.	“Omdat we uiteindelijk altijd toch wel tot een, eh, tot goede doelen komen. En gedragen doelen, ja dat het ook uiteindelijk de doelen zijn die de technische mensen willen en waar de politiek zich dan ook in kan vinden.” [P19, p.5]
12	Actors_cooperation_external	Personal statements and pieces of information on forms of external collaboration, as well as experiences with them.	“[het waterschap en de gemeente] zijn twee hele andere organisaties met andere belangen. Wij wouden een omgevingsplan opleveren voor de toekomst, en het waterschap wou de problematiek zo snel mogelijk oplossen en daarnaast nog wel een doorkijkje maken naar de toekomst en [...] dan merk je hoe belangrijk het is dat er in het begin gewoon heel goed gecommuniceerd wordt, [...] Nou ja, dat was een struggle vond ik in het hele proces, het heeft nogal even geduurd, vond ik, voordat we daar samen de balans in hadden gevonden.” [P16, p.2]
13	Rules_formal	Personal statements and pieces of information on formal rules that pluvial flood risk management in a municipality is subject to, e.g. in terms of internal policy procedures.	“we zijn op alle fronten actief bezig om teamoverstijgend integraal samen te werken, langzaamaan zijn we onze teams aan het opheffen en proberen we meer projectgericht te gaan [werken].” [P18, p. 7]
14	Rules_informal	Personal statements and pieces of information on informal rules that pluvial flood risk management in a municipality is subject to, e.g. in terms of the influence of political interests.	“Wat soms wel lastiger is, is dat een wethouder een politieke agenda heeft en dat die niet altijd vanuit de inhoud te verklaren is.” [P12, p. 12]

15	Resources_humancapacity	Personal statements and pieces of information on human capacity available, e.g. in terms of the number of employees working (indirectly) on pluvial flood risk management.	"Ja ik zie dat er toch wel een capaciteitsprobleem ligt. Bepaalde ambtenaren ja die worden dan ziek en niet vervangen, of ze gaan weg en worden niet vervangen, of er is er maar ééntje en die is vervolgens met tachtig projecten bezig. Dat hoor je ook wel eens, ja ze zien zelf door de bomen het bos niet meer, wat ze nu met voorrang moeten oppakken." [P2, p. 3]
16	Resources_financial	Personal statements and pieces of information on financial resources available in the municipality (in general as well as specifically for pluvial flood risk management).	"in het laatste gemeentelijk rioleringsplan, dat is van 2018, is vastgesteld, 2018-2022, ehm, het gaat eigenlijk alleen in op de wateroverlast ongeveer. Dus daar wordt behoorlijk geld voor vrijgemaakt, ja, en we hebben nu ook onlangs, eh, samen met het waterschap 3 miljoen subsidie, he, binnengehaald." [P13, p. 5-6]
17	Resources_knowledge	Personal statements and pieces of information on the knowledge and expertise available to those working in pluvial flood risk management, e.g. in terms of their educational background.	"die mannen die bij mij zitten, ja, die zijn echt gewoon superspecialist, dus technisch inhoudelijke kennis is geen enkel probleem [...]. En daar is ook denk ik niet zoveel winst te behalen. Ik denk, he, de vraag is wel of mensen die zo technisch onderlegd zijn of dat ook altijd de mensen zijn die bijvoorbeeld communicatief de sterkste vaardigheden hebben." [P12, p. 17]
18	Discourses_diagnostic	Personal statements that reveal individual diagnostic frames, or their perception of the cause of pluvial flooding and when it becomes a problem.	"in basis natuurlijk gewoon dat het regent en dat het harder regent en, ehm, dat onze stedelijke inrichting daar niet op uitgerold is." [P5, p. 9]
19	Discourses_prognostic	Personal statements that reveal individual prognostic frames, or their perception of how pluvial flooding should be addressed.	"die bui van 100 millimeter ofzo, als jij dat allemaal ondergronds wil oplossen, dat gaat 'm niet worden, [...], dan kun je beter ruimtelijk de oplossing zoeken, [...] dat is ook het meest robuust, zichtbaar" [P15, p. 5]
20	Discourses_motivational	Personal statements that reveal individual motivational frames, or perceptions of what drives individuals to address pluvial flooding in a certain way, e.g. responsibility, efficiency or feasibility.	"je wilt ook geen rioolheffing die heel fors de pan uitrijst, het moet ook allemaal betaalbaar blijven. Dus je moet altijd kijken, welke maatregel is doelmatig, is het doelmatig om af te koppelen" [P20, p.5]