



Master thesis

Responsibilities in Flood Risk Management

Case study of how views on responsibility influence the implementation of property-level flood risk adaptation measures

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Preface

The past years, I have had the opportunity to specialize in spatial planning as part of the master's program Landscape Architecture and Planning. During my master, I have deepened my knowledge of a large variety of themes, including spatial planning instruments, climate change policies, mobility and infrastructure, public space and flood risk management. Especially flood risk management and the growing importance of citizens in this field, became an interesting theme to me. The debate of responsibilities in flood risk management is becoming everyday more relevant for society and science, with the increasing amount of periods with extreme weather events, causing high water levels of rivers and water nuisance.

Over the past six months, I have dived with a lot of enthusiasm and curiosity into the topic of how responsibilities are viewed in flood risk management and how this relates to the implementation of property-level flood risk adaptation measures by citizens. Conducting research on this topic for six months has been a great learning experience with surprising findings. I would like to thank my supervisor dr. Barbara Tempels for stimulating me to think critically and for always providing useful feedback. This really helped me to bring my thesis to a higher level. Also, I would like to thank my interview participants for providing interesting insights into their opinions and perceptions. Lastly, I would like to thank my family and friends for always supporting me.

I hope you will enjoy reading my thesis as much as I enjoyed writing it!

Susan Stobbe

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Abstract

Flood risks are increasing due to climate change, urbanization and urban development in floodplains, which can cause significant economic damage. Therefore, the scientific community and policymakers are calling for an increasing responsibility of citizens in flood risk management (FRM). Despite high flood safety standards in the Netherlands, Dutch policymakers express that floods can no longer be prevented completely, and it is thus emphasized that citizens need to adapt to flood risks by taking their own property-level flood risk adaptation (PLFRA) measures. However, the implementation of PLFRA measures by citizens remains low, which could according to literature be influenced by how responsibilities are perceived. Previous studies have analyzed responsibilities by operationalizing responsibility as the perceived responsibility, but a recent study has found that responsibility is a concept with four notions: legal responsibility, accountability, moral responsibility and desired responsibility. Therefore, this research has analyzed how the views of stakeholders on the division of responsibilities in FRM influences the implementation of PLFRA measures by Dutch private property owners. This research has adopted a qualitative approach to analyze the views of policymakers and citizens on responsibilities in FRM in Zwolle, by conducting semi-structured interviews and a policy documents analysis. It has been found that the views on legal responsibilities and accountability are used as argumentation for deciding to implement PLFRA measures. Furthermore, the views of having an own responsibility relating to the accountability and moral responsibilities in FRM, result in a willingness to take PLFRA measures among citizens that did not implement PLFRA measures. This research also found that while policymakers express a desired increase in the responsibilities of citizens in FRM, they are concerned about allocating this responsibility and therefore hardly call this responsibility into action with policy instruments. This research highlights the complex interplay between how responsibilities are perceived by both policymakers and citizens and the decision-making process of Dutch citizens to implement PLFRA measures.

Key words: Flood risk management, views on responsibilities, property-level flood risk adaptation measures, climate change

Summary

Flood risks are increasing, as a result of climate change, urbanization and urban development of floodplains. The recent academic debate shows that policymakers and the scientific community are calling for increasing the involvement of citizens in flood risk management (FRM). Dutch policymakers have expressed that floods can no longer be prevented completely, so citizens need to adapt to flood risks, by taking their own property-level flood risk adaptation measures (PLFRA). This is a break from a long historical tradition of the Dutch government being exclusively responsible for FRM. However, despite this desire of the Dutch government to involve citizens in FRM, the implementation of PLFRA measures by citizens remains low. A possible explanation found in literature is the perceived responsibility, which could influence the decision-making process of citizens to take adaptive actions. However, previous literature has only reviewed this relation to a limited extent and has operationalized responsibility as the perceived responsibility, while it has recently been found that responsibility is a concept with various notions, which can each be perceived differently. These notions of responsibility are the legal responsibility, accountability, moral responsibility and desired responsibility.

Therefore, the main research question of this research is ***“How do stakeholder views of the division of responsibilities in flood risk management influence the implementation of property-level flood risk adaptation measures by Dutch private property owners?”***. The views of both policymakers and property owners in Zwolle have been analyzed to create a deeper understanding of their interactions. A qualitative single case study research strategy was adopted, by conducting semi-structured interviews and a policy documents analysis.

The findings of this research show that the views of policymakers and citizens on responsibilities in FRM are mostly similar to each other. Both stakeholders view that there are limits to the accountability of the government after a flood event occurred and therefore citizens also have a moral responsibility to contribute to FRM as much as lies in their capacities. However, this research has found that while one part of the interviewed citizens view the government to be primarily legally responsible for FRM, policymakers view that citizens also have an important legal responsibility to adapt to flood risks. Furthermore, it is found that a large part of the interviewed citizens would desire the responsibilities in FRM to be divided as they are now, with the government being primarily responsible for FRM. Yet policymakers desire that citizens have more responsibilities in FRM when it comes to adapting their house to flood risks, but concerns are also expressed about whether all citizens have the capacities to do this. In this light, the extent to which policymakers are supporting the implementation of PLFRA measures with policy instruments is found to be limited.

These views on responsibility are found to influence the decision-making process of property owners to implement PLFRA measures. The views on the legal responsibilities of citizens in FRM are used as an argumentation for deciding to (not) implement PLFRA measures. The part of the interviewed citizens that did not implement PLFRA measures argued that this is not necessary because the government is primarily legally responsible for FRM. However, the interviewees that did implement PLFRA measures decided to do this because of the legal responsibilities that citizens have for their own property and the limited extent to which the government can be held accountable for floods. Moreover, it is found that after thinking about the division of responsibilities in FRM, the citizens that did not implement PLFRA measures did express a willingness to take PLFRA measures, because of the limited accountability of the government and the perception that citizens have a moral responsibility in FRM.

Therefore, this research has found that the views on accountability and legal responsibility influenced the decision-making process for implementing PLFRA measures, while the views on accountability and moral responsibility influenced the willingness to take PLFRA measures for citizens that did not implement any measures.

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1. Introduction

1.1 Background

Flood risks are increasing as a consequence of climate change, urbanization and urban development in floodplains (Intergovernmental Panel on Climate Change, 2021; Snel, 2021). The impact of a flood event can be significant, by causing economic damage, health-related issues, and disruptions to society (Joseph, Proverbs & Lamond, 2015). For example, it has been estimated that in case of an extreme weather event in the Netherlands, 10 to 20 percent of the total land surface is flooded with at least five centimeters of water (Deltares, 2018). Extreme precipitation is expected to overwhelm the existing sewage system and can cause rivers to break out of their banks (Deltares, 2018).

In order to respond to these increasing flood risks, an extensive body of literature has identified a shift towards a growing involvement of citizens in flood risk management (FRM) (Koerth, Vafeidis & Hinkel, 2017; Kuhlicke et al., 2020; Wehn et al., 2015). It is argued that floods can no longer be prevented completely, and therefore citizens also need to adapt to these increasing flood risks (Snel et al., 2020). Governmental action needs to be complemented by self-protection of non-governmental actors to not only reduce the risks of floods, but also minimize the impact in case of a flood event (Begg, 2018; Hegger et al., 2017; Snel et al., 2020). Several studies have attempted to understand how the government should interact with citizens and the extent to which citizen contributions can play a role in flood risk management (Forrest, Trell & Woltjer, 2021; Harris et al., 2017). For example, a catalogue with possible property-level flood risk adaptation (PLFRA) measures that citizens can take was created by Attems et al. (2020), including the costs and technical feasibility of each measure. Examples of private flood risk adaptation measures are mobile flood barriers, a floor drain and flood proof basement windows (Attems et al., 2020). However, it is argued that increasing the involvement of citizens in flood risk management requires a shift in mentality and a shared division of power and responsibilities (Alexander et al., 2016; Davids, Boelens & Tempels, 2019).

This trend towards citizen involvement in FRM is described in the majority of the western European countries, but it is important to note that the emerging role of citizens is shaped by the institutional, cultural and physical context of each country individually (Forrest, Trell & Woltjer, 2021). For several countries, this shift means a break from a long tradition in which the government is primarily responsible for FRM (Snel et al., 2022). For example, in the Netherlands the waterboards and Rijkswaterstaat are formally responsible for taking flood protection measures and municipalities are responsible for drainage capacities of the city (National Government, n.d.). The role of citizens in flood risk management is formally limited to paying the waterboard taxes and ensuring adequate discharge of rainwater that falls within their property boundaries (Snel et al., 2022; Helpdesk water, n.d.). Only citizens living in outer dike areas are also responsible for taking their own flood protection measures (Snel et al., 2022; Helpdesk water, n.d.).

However, it has now been recognized by the Dutch government that floods can not be prevented for one hundred percent. This is despite the high safety standards of flood defenses in the Netherlands, which are namely an annual chance of 1/100.000 of being killed by a flood, and attempts to increase the water drainage capacities of inner-dike areas (National Water Program, 2022). Therefore, it has been increasingly underlined by Dutch policymakers that property owners need to take their own flood risk adaptation measures to protect their properties from these so called “residual flood risks” and hereby prevent potential damage (Snel et al., 2022; Terpstra & Gutteling, 2008; National climate adaptation strategy, 2016). In recent policy documents, the Dutch government expresses the aim to increase the adaptive actions of citizens to protect their private properties from floods (NAS, 2016; National Water Program, 2022). This shows the wish of policymakers that citizens adapt to and mitigate the effects of floods, which is part of the broader trend towards an emerging role of citizens in FRM (Kuhlicke et al., 2020; Hartmann et al., 2021).

1.2 Problem statement

The increasing flood risks can cause significant monetary damage to buildings and can disrupt society with social and health-related problems (Joseph, Proverbs & Lamond, 2015; Grothmann & Reusswig, 2006). Flood damage is found to be determined by the level of exposure to floods, the sensitivity of an area to floods and the level of adaptation measures that are taken by people to avoid potential damage (Grothmann & Reusswig, 2006). It has been found that the implementation of these PLFRA measures can reduce the economic damage of a flood with 80% (Grothmann & Reusswig, 2006). However, even though PLFRA measures have been found effective in research to reduce flood damage to properties, the implementation of such measures remains low (Snel et al., 2019; Hartmann et al., 2021).

This suggests the presence of obstacles to the involvement of citizens in FRM, for which literature has identified a large variety of variables that influence the individual decision-making process of citizens for taking adaptive measures (Kuhlicke et al., 2023). However, attention in literature has recently been raised towards the importance of the perceived responsibility for the willingness of citizens to take PLFRA measures (Mees et al., 2016; Snel et al., 2019). It has been found by a study conducted in Belgium, that the implementation of PLFRA measures is hindered by the ambiguous boundaries of the responsibilities of different actors in FRM (Mees et al., 2016). Citizens consider FRM as primarily a governmental responsibility, while policymakers are found to be in favor of increasing the responsibilities of citizens (Mees et al., 2016). This has also been found in the Netherlands, in which it is concluded that Dutch residents have a low perceived responsibility in FRM and citizens view FRM as a task purely for governmental professionals, who have the required expertise (Terpstra & Gutteling, 2008). This missing clarity on where the responsibility of the government and citizens ends or begins is also found in a study conducted in England, in which it is argued that this is a barrier to shifting the responsibilities in FRM (Johnson & Priest, 2008). Therefore, a shared understanding of responsibilities is argued to be essential for motivating property owners to take PLFRA measures (Mees et al., 2016).

The lacking awareness of citizens relating to their changing responsibilities in FRM could result from a weak coherence in the argumentation of policymakers for involving property owners in flood risk management (Snel et al., 2019). Bergsma, Gupta and Jong (2012) for example argue that despite the formal responsibility of citizens in flood risk management, such responsibility is rarely called into action by policymakers. A study conducted in the Netherlands has concluded that even though municipalities want to increase the involvement of citizens in FRM, they have a low willingness to actually allocate responsibilities towards citizens (Uittenbroek, Mees, Hegger & Driessen, 2020). Municipalities are hesitant to shift responsibilities, because they have concerns about an equal division of resources between citizens, citizens pursuing their own benefits, potential externalities and maintaining a good quality of public space (Uittenbroek, Mees, Hegger & Driessen, 2020). Yet a study in natural hazards management states that citizen initiatives emerge when there is a low level of trust that the governmental will take on responsibility, which results in spontaneous bottom-up initiatives (Thaler & Seebauer, 2019). This brings up the question how perceptions of responsibilities influence the adaptive actions of citizens.

1.3 Knowledge gap

The factors that influence households taking PLFRA measures are extensively covered in international research (Koerth, Vafeidis & Hinkel, 2017; Lechowska, 2022; Stancu et al., 2020). Most studies start from the Protection Motivation Theory (PMT) to investigate the cognitive motivations of citizens taking adaptive measures (Grothmann & Reusswig, 2006; Kuhlicke et al., 2020; Kuhlicke et al., 2023) and some studies focus on the socio-economic factors (Entorf & Jensen, 2020; Rauter et al., 2020). Factors such as risk perception (Fuchs et al., 2017), coping appraisal (Grothmann & Reusswig, 2006), affordability, social norms (Jacob et al., 2023; Kunreuther & Michel-Kerjan, 2009) and a missing shared understanding of responsibilities (Mees et al., 2016) have been found in literature to be drivers for adaptive behavior. Especially the positive relation between flood risk awareness and the willingness to

adapt to flood risks has received much attention (Scolobig, De Marchi & Borga, 2012; Rufat et al., 2020; Bubeck et al., 2012). A small number of studies has concentrated on the political context and how this relates to the perceptions of flood risk, by finding variables such as trust in authorities and in public flood protection measures (Lechowska, 2022; Lo, 2013).

However, several authors have argued that the variables that are described above, form an inadequate explanation of the decision-making process of property owners relating to the implementation of PLFRA measures (Kuhlicke et al., 2020; Oakley et al., 2020). It has been argued that the variable responsibility, or also called “Ownership appraisal”, needs to be added to the original Protection Motivation Theory, to be able to capture adaptation behavior more accurately (Oakley et al., 2020). The variable “Ownership appraisal” is related to the extent to which citizens accept their responsibilities, which is argued to influence the decision-making for adaptive actions (Oakley et al., 2020). However, the role of responsibility in the decision-making process to take PLFRA measures has only been researched to a limited extent (Koerth, Vafeidis & Hinkel, 2017). It is important to create a better understanding of this possible relation, because this could help gain a deeper understanding of the motivations of citizens to take measures for flood protection. Therefore, it is found to be unclear how the various views of responsibility relate to the decision-making process of Dutch property owners to implement PLFRA measures. This is the first knowledge gap that this thesis addresses.

Furthermore, the perceived responsibility of citizens as an important driver for taking PLFRA measures has been identified by some studies, but it has recently been found that the perceived responsibility is only one element of the concept of responsibility (Henstra et al., 2019; Rauter et al., 2020). In literature, responsibility is often conceptualized as a black and white concept, meaning that the responsibility for a task is either of the government or of private actors (Snel et al., 2022). Such studies have undertaken a quantitative approach by using surveys to find a significant relation between the willingness to adapt and the perceived responsibility, which is operationalized by using a five-point Likert scale (Terpstra & Gutteling, 2008; Rauter et al., 2020). Snel et al. (2022) argue that responsibility is a multi-faceted concept with four notions, and stakeholders can have different views on how responsibilities are and should be divided. In-depth knowledge on what these views and opinions of stakeholders are on the division of responsibilities in flood risk management in the Netherlands is lacking. This is the second knowledge gap that this thesis addresses.

1.4 Research questions and objective

The objective of this research is to contribute to creating a deeper understanding of the relation between the views on responsibilities and the implementation of PLFRA measures by citizens. Views are in this research defined as opinions, ideas, beliefs or a way of thinking about something. This will be achieved by conducting semi-structured interviews with private property owners and policymakers and conducting a policy documents analysis. Accordingly, the main research question of this study is ***“How do stakeholder views on the division of responsibilities in flood risk management influence the implementation of property-level flood risk adaptation measures by Dutch private property owners?”***. To answer the main research question, four sub-questions are created. These questions address the views of both property owners and policymakers to create a better understanding of the interactions and dynamics between the government and citizens in the context of responsibilities in FRM. For both stakeholders, this thesis first reviews how they perceive the responsibilities in flood risk management and then links it to the actions that each stakeholder takes.

More specifically, the sub-questions of this research are:

- 1) How do property owners perceive the responsibilities of themselves and the government in managing flood risks?
- 2) How do policymakers of the municipality and waterboard perceive the responsibilities of themselves and property owners in managing flood risks?

- 3) To what extent are policymakers supporting the implementation of PLFRA measures with policy instruments?
- 4) How do the views on responsibilities relate to the decision-making process of Dutch property owners to take property-level flood risk adaptation measures?

1.5 Scientific and societal relevance

This research is scientifically relevant because it contributes to further insights into a better division of responsibilities in FRM between the government and citizens. A better division of responsibilities in FRM is essential in the context of increasing flood risks, because this could significantly reduce the costs for flood risk management measures, since the economic damage can be significantly reduced by the implementation of PLFRA measures. Public flood protection measures are becoming more expensive as a result of climate change and the government has recognized that floods can no longer be prevented completely, so a better allocation of responsibilities in FRM could help solve these problems. Furthermore, this research contributes to a deeper scientific understanding of the motivations of citizens to decide to take PLFRA measures, which is useful for identifying effective strategies in FRM to increase the flood resilience of citizens.

The findings of this research can also contribute to practical insights for policymakers to help identify effective policies for stimulating citizens to take PLFRA measures. Knowledge on the views of responsibilities in FRM can help the government to better align policies to these views and motivate citizens to implement PLFRA measures. This would improve the flood resilience of Dutch citizens and increase their flood preparedness, which has been set as a policy goal by the government (National climate adaptation strategy, 2016). This research is relevant for society, because the monetary damage of citizens after a flood event can be reduced significantly when citizens have implemented PLFRA measures.

1.6 Reading guide

The introduction has set out the scope of this research on responsibilities in FRM. Chapter 2 presents the theoretical framework. It includes the debate regarding the shifting position of property owners in FRM, a definition of PLFRA measures, an operationalization of the four notions of responsibility and the link between responsibility and adaptive actions. The third chapter describes the methodological decisions that are made, including an explanation for the choice for semi-structured interviews, the policy documents analysis and the case study area of Zwolle. After the methodology, the results of this research are presented. Chapter 4 gives an overview of the findings of the viewpoint of policymakers, by describing the results of the semi-structured interviews and policy documents analysis. Chapter 5 describes the results from the interviews with citizens. After that, the results are interpreted and linked to literature in the discussion in chapter 6. Lastly, chapter 7 provides the conclusion of this research, by answering the main research question. Also, recommendations for future research and for policymakers are made in the conclusion chapter.

2. Theoretical framework

The previous chapter has highlighted the importance of gaining a deeper understanding of the relation between views on responsibilities in FRM and the implementation of PLFRA measures by citizens. This chapter starts with describing the wider academic debate relating to the shift towards citizen involvement in FRM, the reasons for involving citizens and the possible measures that can be taken by citizens to contribute to FRM, including PLFRA measures. After that, the concept of responsibility is operationalized by looking into the typologies of responsibility that are identified in literature, with a specific focus on the four notions of responsibility as identified by Snel et al. (2021). After that, the relation between the perceived responsibility and adaptive behavior is explained. Then, the policy instruments that support the implementation of PLFRA measures are discussed. Lastly, a conceptual framework is provided to translate how this theory is used for this research.

2.1 Debate about the growing involvement of citizens in FRM

As the introduction has shown, an extensive body of literature has identified a trend towards a growing involvement of citizens in FRM. The traditional approach to floods was since the industrialization based on protecting the land from floods with structural technical measures, such as the construction of dikes and dams (Snel et al., 2020). The government is the central actor in this traditional approach because they implement the large-scale flood defenses, which are “*designed to keep the water out*” (Johnson & Priest, 2008, p.514). However, over the past decades, this perception changed towards the idea that technical measures are not sufficient anymore and these measures should be complemented by measures to minimize the risk of floods (Snel et al., 2020). This shift towards a risk-based approach in FRM assumes that flood risk is influenced by land and water interactions (Tempels & Hartmann, 2014; Kuhlicke et al., 2020). The main difference between traditional flood management and the new approach of flood risk management, is that flood risk management recognizes the need for additional measures than only preventing floods, through measures that also address the socio-spatial system (Mees et al., 2016). This new approach requires the government to also include private actors in FRM (Snel et al., 2020). With the implementation of the European Flood Directive in 2007, participation of private actors in FRM became a legal obligation (Begg, 2018).

For example, in the Netherlands FRM was traditionally viewed as a collective problem in which the government takes the primary role with interventions in the public space (Hegger et al., 2017). A shift has occurred from a more centralized approach to a decentralized approach, in which the municipality has received more responsibility for preventing floods, as is recorded in the Water Act (Trell & van Geet, 2019). This approach is in the Netherlands embedded in the multi-layer safety concept, which is comprised of four layers that aim at flood prevention, flood protection, flood preparedness and recovery (National Water plan, 2009, p.6). However, it has recently been argued that the role of citizens is not well reflected in the original multi-layer safety approach, so therefore it is indicated that the layer of water awareness needs to be added to the approach, to show that citizens can contribute with actions to each of the four layers (see figure 1: Multi-layer safety approach) (National Delta Program, 2024).

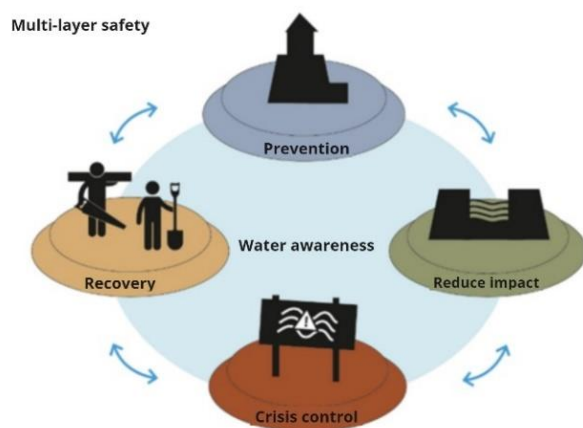


Figure 1 Multi-layer safety approach (Adapted from National Delta Program, 2024)

Argumentation for involving citizens in FRM

The argumentation of policymakers for involving citizens in FRM can be categorized into four reasons. First, it is argued that the current flood protection measures are becoming insufficient as a result of increasing pressures due to climate change (Thaler & Priest, 2014; Snel et al., 2020). Therefore, the involvement of citizens in FRM is required to complement the existing flood defenses, which is in literature also called a “*all-hands-on-deck-situation*” (Snel et al., 2020, p.5). Second, it is indicated that significant economic flood damage can be prevented by the adaptation of citizens to flood risks (Grothmann & Reusswig, 2006). This is considered to be especially important because the implementation of adaptation measures by citizens can also reduce the need for public flood risk management measures (Grothmann & Reusswig, 2006; Snel et al., 2020). Third, citizens can provide adaptation benefits for themselves by reducing flood damage, and for their community (Snel et al., 2020). This argument is underpinned by the notion that the government can not take measures on private property (Hegger et al., 2017). Fourth, it is argued that a shared responsibility in FRM is beneficial for solving governmental capacity and funding issues (Snel et al., 2020). The shifting responsibilities in flood risk management are found to have a positive effect on the awareness of property owners, which could lead to increased adaptation actions (Hegger et al., 2017).

However, questions have been raised regarding the fairness and justice of an increased responsibility for citizens (Kaufmann, Priest & Leroy, 2018). Butler and Pidgeon (2011) argue that this trend is not a redistribution of responsibilities but a redistribution of blame since private property owners are now stimulated or even required to take actions to adapt to flood risks. It has been argued by various authors that the expansion of responsibilities for property owners leads to increased inequalities, since variations in the adaptive capacities between property owners exist and the financial tools to invest in PLFRA measures may be lacking (Begg, Walker & Kuhlicke, 2015; Penning-Rowsell & Pardoe, 2015). On the contrary, it has been widely argued in literature that total flood security cannot be provided, as current flood risk management measures are insufficient (Grothmann & Reusswig, 2006; Begg, 2018). Since climate change is expected to increase the occurrence, severity, and impact of floods, it has been argued that all actors need to take action to improve flood resilience (Intergovernmental Panel on Climate Change, 2021; Snel et al., 2020).

Actions of citizens to contribute to FRM

Citizen involvement in FRM can be classified in three categories of actions, which are financial actions, behavioral actions and technical actions. Financial actions are related to the recovery of a household after a flood event, by taking measures such as insurance schemes (Snel et al., 2021). The behavioral actions can include for example, monitoring weather forecasts, the location choice of living, and

ensuring sufficient supplies in case of an emergency (Tempels, 2023; Snel et al., 2021). Other behavioral actions found in a study conducted by Forrest, Trell and Woltjer (2021), include gathering knowledge and reporting this knowledge to the authorities. For example, citizens can monitor waterways and identify weak spots in flood defenses (Forrest, Trell & Woltjer, 2021). Furthermore, citizens could contribute with behavioral actions to FRM by campaigning for a desired change in the governmental FRM approach or to raise awareness of flood risks (Forrest, Trell & Woltjer, 2021). The technical actions that citizens can take involve taking structural PLFRA measures (Snel et al., 2021). Property-level flood risk adaptation measures (PLFRA) are adaptive actions that aim to *“increase the physical resilience of buildings by diminishing the impact of flood events”* (Attems et al., 2020, p.2).

Property-level flood risk adaptation measures (PLFRA)

Attems et al. (2020) have created a categorization of PLFRA measures, including their possible costs and technical feasibility for implementation (see figure 2: Overview of categories of PFLRA measures with examples of measures). In literature, PLFRA measures are often categorized as either dry proofing or wet proofing. Dry proofing involves measures to ensure that water is not able to come inside a building, such as closing of openings of doors and windows and installing back stop valves (De Moel, van Vliet & Aerts, 2014). Wet proofing is the opposite of dry proofing, meaning that these measures aim at minimizing damage when the water does enter a building (De Moel, van Vliet & Aerts, 2014). Examples of a wet proofing measures are a floor drain, a pump to remove water and moving important functions to higher levels (De Moel, van Vliet & Aerts, 2014; Attems et al., 2020). Attems et al. (2020) have identified three additional categories of PLFRA measures. These categories are the avoidance of flood discharge, barriers and emergency measures (Attems et al., 2020). Measures that aim to avoid flood discharge can include building on elevated ground, amphibious buildings, and effective site drainage (Attems et al., 2020). The intrusion of water can also be stopped by the implementation of barriers, which can be either mobile in the form of temporary flood barriers or permanent in the form of concrete flood walls (Attems et al., 2020). The last category includes emergency measures, such as placing sandbags (Attems et al., 2020).

Avoidance of flood discharge	Wet flood-proofing	Dry flood-proofing	Barriers	Emergency measures
•Site drainage by greening •Elevation of buildings •Amphibious buildings	•Flood adapted interior •Pump to remove water	•Sealing building openings •Waterproof cellar •Back up valves	•Flood wall •Free standing barriers	•Tubes •Filled containers •Sandbags

Figure 2 Overview of categories of PFLRA measures with examples of measures (Adapted from Attems et al., 2020)

2.2 Towards defining responsibility in FRM: Four notions of responsibility

Previous studies have often reviewed responsibility in flood risk management as something that either the government or citizens or other actors are responsible for (Terpstra & Gutteling, 2008; Henstra et al., 2019). These studies operationalized responsibility as how responsible someone feels for taking actions to reduce flood risks, often based on a five-point Likert-scale (Terpstra & Gutteling, 2008; Henstra et al., 2019; Edelenbos et al., 2017; Wehn et al., 2015). However, it has recently been argued that these *“black and white”* notions of responsibility are unable to retrieve detailed information of the various meanings of responsibility in flood risk management, since the term responsibility is not always used in a similar way by different actors (Snel et al., 2022). Therefore, Snel et al. (2022) proposes a framework of four notions of responsibility in flood risk management.

This operationalization of responsibility builds on the work of Hart (1968) and Pellizzoni (2004). According to Hart (1968), attributing a responsibility to someone can be done on four grounds, which are role (place within a social organization), causation (whether someone is the cause of something), liability (whether someone is to be punished for their actions) and capacity (ability to influence outcomes). These grounds for attributing responsibility can respectively be linked to four dimensions of responsibility according to Pellizzoni (2004), in which role is categorized as care, causation is categorized as accountability, liability is categorized as liability, and capacity is categorized as responsiveness. Care is related to the normative beliefs about how the relationship between the government and citizens should be, so for example it can be believed that the government should care for the well-being of its citizens (Pellizzoni, 2004). Accountability is a responsibility that is assigned after an event has happened. While liability relates to the legal responsibility and judicial power, accountability is viewed as the core of “good governance” and how actors are answerable for their actions (Pellizzoni, 2004). Responsiveness is referred to as “a receptive attitude to external inputs to help in deciding what to do” (Pellizzoni, 2004, p. 557).

The dimension that a situation can be applied to depends on two factors according to Pellizzoni (2004) (see figure 3: A typology of responsibility). First, it depends on whether the event is before or after the responsibility is assigned (Pellizzoni, 2004; Snel et al., 2022). In other studies, this is referred to as forward-looking responsibilities (before something happened) and backward-looking responsibilities (after something happened) (van de Poel, 2011; Doorn, Brackel & Vermeulen, 2021). Second, this depends on whether something is a pull factor (in order to achieve something) or a push factor (because of something) for someone to act (Pellizzoni, 2004).

The notions of responsibility as proposed by Snel et al. (2022) are extracted from these theories and are namely legal responsibility (similar to liability), accountability, moral responsibility (similar to care), and perceived responsibility (similar to responsiveness). These four notions are similar to the notions from Pellizzoni (2004) which are described above, but then applied to flood risk governance. However, it is found by Snel et al. (2021) that in practice, the combination of the three categories of legal responsibility, accountability and moral responsibility form the perceived responsibility of citizens. Therefore, this notion has been reframed by Snel et al. (2021) to the notion of desired responsibility, which encompasses how someone would desire the division of responsibilities to be. The four notions of responsibility in flood risk governance will now be explained in more detail (see figure 3: A typology of responsibility).

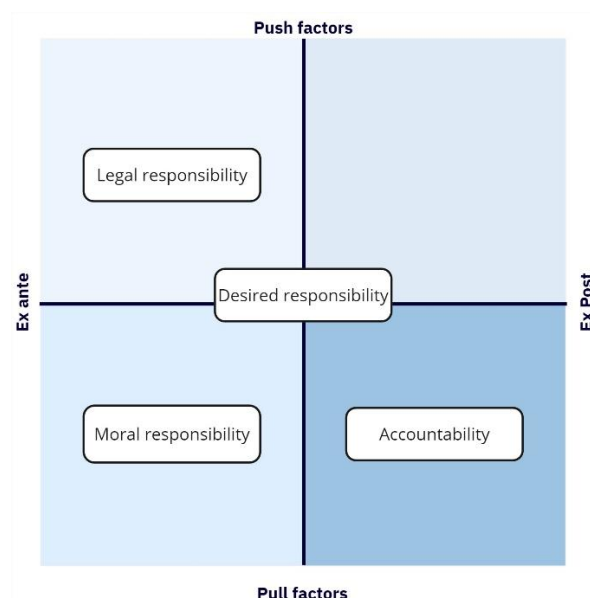


Figure 3 A typology of perceptions of responsibility (Adapted from Pellizzoni, 2004)

Legal responsibility

According to Trell and van Geet (2019) responsibilities are embedded in a formal and informal institutional context. The formal institutional context relates to legally enforced rules, such as constitutions, laws and regulations, and the institutions that enforce these rules, such as courts and legislatures (Trell & van Geet, 2019). This legal framework is enforced by formal sanctions (Pahl-Wostl, 2009). The opposite of a formal institutional context is an informal institutional context, which is related to accepted ways of acting and cultural values (Trell & van Geet, 2019). Legal responsibility can thus be viewed as embedded in this formal context, while it can be argued that the informal context relates to moral responsibility. Actions or behaviors can be either inside or outside the formal framework of law (Snel et al., 2022). According to Snel et al. (2022), the legal responsibility can include the legal duty to act and adapt to flood risks as well as the legal duty to compensate for flood damages.

The legal responsibility of the municipality and waterboard in the Netherlands is recorded in the Water Act (*Waterwet*) and the Environmental Management Act (*Wet milieubeheer*). These laws assign responsibility to the municipality for the collection and processing of rainwater and sewage water, and for the prevention of structural groundwater floods (Trell & van Geet, 2019). The waterboard has the legal responsibility to manage regional waters.

It has been argued that clearly defined legal responsibilities are key motivations for taking measures to prevent floods (Mees et al., 2016). Interestingly, perceptions of legal responsibility can differ as residents may have a different interpretation of the rules and formal actions that they or other actors need to take (Snel et al., 2021). For example, a study conducted in Flanders has found that boundaries between the legal responsibilities of the government and residents are fuzzy (Mees et al., 2016). It was found that residents assume that governments are legally responsible for flood protection based on informal norms, while this is not part of the legally defined responsibilities (Mees et al., 2016).

Accountability

In climate change adaptation studies, accountability is often called “blameworthiness”, which relates to the extent to which someone has to account for their role in what happened (Fahlquist, 2009; Doorn, Brackel & Vermeulen, 2021). This thus entails the actions that were undertaken to prevent an event from occurring and how these actions relate to their capacities. In this case, accountability can be conceptualized as the obligation to justify conduct (Bovens, 2007). According to Doorn, Brackel and Vermeulen (2021), the extent to which someone is accountable for something depends on how their actions relate to their capacities to influence the outcome.

This is in line with Pellizzoni (2004) and Snel et al (2022), who propose an external framing of accountability, which goes into the answerability of an actor to their actions and how these actions relate to their position and means to influence the impact of the event. Accountability is thus a responsibility that is assigned after an event has occurred (Doorn, Brackel & Vermeulen, 2021; Pellizzoni, 2004; Snel et al., 2022). In flood risk management this definition would imply that governments are for the largest part responsible for interventions in the public domain and residents can hold the government accountable for their actions (Snel et al., 2022). Governments can try to change this by increasing the involvement of citizens in decision-making processes and hereby letting citizens also bear some of the responsibilities (Abels, 2007).

Also, accountability can include the extent to which elected officials are perceived to live up to their promises and how well they executed the responsibility (Snel et al., 2022). This shows that accountability is closely related to legal responsibility, but this notion addresses the “*external framing of who should have to answer to other actors for how well, or whether, they actually executed those responsibilities*” (Snel et al., 2022, p.53). An important difference between accountability and legal

responsibility, is thus that the accountability is assigned after a flood event occurred (ex post), while legal responsibility is already assigned before the flood event (ex ante).

Moral responsibility

Traditionally, being morally responsible can be described as someone being the eligible person for reactions of blame or praise (Doorn, 2012). However, a second approach in literature to moral responsibility is based on the “No harm” principle (Doorn, 2012). According to this principle, moral responsibility is conceptualized as *“actions are right if and only if: either there are no (possible) consequences for others; or those who will experience the (possible) consequences have consented to the actions after having been fully informed”* (Zandvoort 2005, p. 46). In this regard, moral responsibility can be viewed as the moral obligation to do the right thing (Doorn, Brackel & Vermeulen, 2021).

Relating the no harm principle to moral responsibility in flood risk management, this means that someone is morally obligated to *“not cause harm, to help within your capacities, and to take responsibility for flood risk based on varying roles”* (Snel et al., 2022, p. 55). An important element of moral responsibility is thus someone’s sense of rightness or wrongness and the extent to which it is perceived that actions make an impact in the outcome (Eden, 1993). This is similar to the grounds of responsibility as identified by Hart (1968), in which the ability to influence the outcomes is mentioned to be important. The capacity as an important factor for attributing responsibility has also been found by Bickerstaff, Simmons and Pidgeon (2008), who argue that the acceptance of responsibility is based on the sense of self-efficacy. It has been argued that moral obligations are embedded in an informal institutional framework that entails intangible notions of informal rules, like cultural norms and values (Trell & van Geet, 2019).

This is in line with a study on the relation between social norms and adaptive behavior in FRM (Koerth, Vafeidis & Hinkel, 2017; Jacob et al., 2023). Jacob et al. (2023) has found that normative beliefs significantly shape attitudes of property owners towards taking PLFRA measures. Normative beliefs are the ideas that someone has about what actions should be taken according to important referents, such as family members (Jacob et al., 2023). For example, residents can perceive it as their moral responsibility to inform new neighbors about flood risks, if this person has the capacity to do this (Miller, 2001). From a governance perspective, it can be framed that the government has the moral responsibility to care for the welfare of its citizens (Van Der Plank et al., 2022). In Dutch flood risk management, municipalities have the *“duty of care”* (*zorgplicht*) to make an effort (*inspanningsverplichting*) in preventing floods in the public domain, meaning that the moral responsibility is partially recorded in the law (Trell & van Geet, 2019). However, the law does not include how much effort needs to be taken by the municipality (Trell & van Geet, 2019).

Desired responsibility

As is mentioned before, the previous notions of responsibility encompass how responsibilities are perceived to be currently divided. However, it has been found that these notions of responsibility can significantly vary from how stakeholder desire the responsibilities to be divided (Joseph, Proverbs & Lamond, 2015). For example, a study conducted in England has found that it is important that the government is aware of the limits to which individuals are willing to accept responsibilities (Joseph, Proverbs & Lamond, 2015). Differences in desired responsibilities and the other notions of responsibility can emerge when it is perceived that the responsibilities are ambiguously assigned, which can cause significant political tensions (Wamsler, 2015). It has been found that the social context and the provision of information can significantly influence the ideas of the desired responsibilities (Kunreuther & Michel-Kerjan, 2009). Desired responsibilities can be defined *“how individuals ideally would like the notions of responsibility to be divided among themselves and others”* (Snel et al., 2021, p.80).

The table below provides an overview of the how the notions of responsibilities are understood in the context of this study (see table 1: Overview of the notions of responsibility and their understanding). An operationalization of responsibility is outlined in Appendix 1: Operationalization of responsibility.

Notion	Definition	Understanding of the concept
Legal responsibility	<i>“Formally assigned duties to adapt to flood risk and on the duty to compensate for flood damages” (Trell & van Geet, 2019; Snel et al., 2022, p.55)</i>	Perceptions of legal responsibilities, including rules, regulations and formal actions
Accountability	<i>“External framing of who should have to answer to other actors for how well, or whether, they actually executed those responsibilities” (Pellizzoni, 2004; Snel et al., 2022, p.53)</i>	Perceptions of answerability to actions, based on individual capacities and how well responsibilities have been executed
Moral responsibility	<i>“The moral obligation to not cause harm, to help within your capacities, and to take responsibility for flood risk based on varying roles” (Snel et al., 2022, p.55)</i>	Perceptions of what is viewed as the right thing to do, based on cultural beliefs, social norms and values
Desired responsibility	<i>“How individuals ideally would like the notions of responsibility to be divided among themselves and others” (Joseph, Proverbs & Lamond, 2015; Snel et al., 2021, p.80)</i>	Perceptions of how responsibilities are ideally divided

Table 1 Overview of the notions of responsibility and their understanding

2.3 Relation between views on responsibilities and adaptive behavior

As the gap in knowledge has described, it is unclear how the previously mentioned views of the four notions of responsibility relate to the decision-making process of Dutch property owners to implement PLFRA measures. Therefore, this paragraph will show how the perceived responsibility can be related to the decision-making process to take adaptive measures.

Responsibility in Protection Motivation theory

The most prominent theory that attempts to explain adaptive behavior in flood risk management is the Protection Motivation Theory (PMT) from Grothmann and Reusswig (2006). According to this theory, adaptive behavior in flood risk management can be explained by the variables threat appraisal and coping appraisal (Grothmann & Reusswig, 2006). Threat appraisal is in literature also called “*risk perception*” and is based on how high people perceive the occurrence of a flood and how high the impact will be of that flood (Bradford et al., 2012; Lechowska, 2022). Coping appraisal is characterized by three elements, namely how an individual perceives the effectiveness of taking a measure (response efficacy), their ability to take such measures (self-efficacy), and the perceived costs of taking such measures (response costs) (Becker, Aerts, & Huitema, 2014; Bubeck et al., 2013; Thistlethwaite et al., 2020; Grothmann & Reusswig, 2006).

However, a literature review has found that these variables form an inadequate explanation of the decision-making process of property owners to take private protection measures against floods (Oakley et al., 2020). It has been found that despite a high risk perception and coping appraisal, adaptive behavior was not always adopted (Oakley et al., 2020). It has therefore been argued that the acceptance of responsibility, or also called “Ownership appraisal”, needs to be added to the original Protection Motivation Theory (PMT) from Grothmann and Reusswig (2006), to be able to capture adaptation behavior more accurately (see figure 4: Augmented Protection Motivation Theory) (Oakley et al., 2020). Ownership appraisal is hereby defined as whether someone thinks that it is their responsibility to take action and whether someone accepts their own responsibilities (Oakley et al., 2020). According to this theory, a high sense of personal responsibility in flood risk management

positively influences adaptive behavior and governments can incentivize this by increasing the public awareness of flood risks (Oakley et al., 2020). It is argued that the combined effect of threat appraisal, ownership appraisal and coping appraisal results in adaptive behavior (Oakley et al., 2020).



Figure 4 *Augmented Protection Motivation Theory* (Oakley et al., 2020)

In line with this theory, a large-scale study conducted in England has found that households with strong perceptions of having an own responsibility in FRM were significantly more likely to implement adaptive measures, and especially more likely to implement structural measures to their house (van der Plank et al., 2022). Furthermore, an extensive literature review of studies that looked at the perceived responsibility and adaptive behavior, found that individuals living in high flood risk areas often do not perceive it as their responsibility to take flood risk adaptation measures, regardless of their risk perception and coping appraisal (Terpstra & Gutteling, 2008; Henstra et al., 2019; Oakley et al., 2020). For example, a study conducted in Canada concluded that citizens are for a significant part not willing to accept responsibility in flood risk management and therefore not taking their own flood risk adaptation measures (Henstra et al., 2019).

2.4 Public policy instruments to stimulate adaptive behavior

Multiple studies have found that governmental flood risk arrangements and communication can be critical for increasing the public's flood risk awareness and sense of responsibility for taking adaptive actions (Davids, Priest & Hartmann, 2023; Grothmann & Reusswig, 2006; Snel et al., 2019). For example, tailor-made advice by experts on the measures that households could take to increase their flood resilience, can stimulate adaptive behavior (Davids, Priest & Hartmann, 2023). According to Rauter et al. (2020), a distinction can be made between three types of policy instruments which can be used to support the implementation of PLFRA measures.

The first category of policy instruments are so-called "*sticks*", which are formal regulations that coerce citizens to take adaptive actions (Rauter et al., 2020). In other studies, these policy instruments are also called hard policy instruments, because they are legally binding rules or laws (Brockhoff, Koop & Snel, 2019; Snel et al., 2021). Examples are restricting the number of impermeable pavements of gardens, a minimum infiltration duty for newly built houses, and a duty for private property owners to disconnect rainwater from the sewage system (Municipality of Zwolle, 2019). These policy instruments make responsibilities explicit (Brockhoff, Koop & Snel, 2019; Snel et al., 2021).

The second category of policy instruments is "*carrots*", which are policy instruments that aim at incentivizing and persuading citizens to take adaptive actions (Rauter et al., 2020). Such instruments are mostly economic incentives that increase the availability of resources of someone. For example, subsidies can reduce the costs of innovations and can therefore reduce financial barriers to taking PLFRA measures (Van Valkengoed & van der Werff, 2022). An example of a Dutch subsidy for PLFRA measures, is the "de-tiling" subsidy, which entails a small amount of money for every removed tile in

the garden. This PLFRA measure can be categorized as an avoidance of flood discharge measure (Attems et al., 2020).

The third category of policy instruments in FRM is “*sermons*”, which relates to providing the required knowledge and information to be able to make decisions and act (Rauter et al., 2020). These policy instruments are non-binding instruments in the form of recommendations and guidelines, such as campaigns to raise awareness of flood risks and responsibilities, information provision or subsidies for taking such measures (Brockhoff, Koop & Snel, 2019). For example, a national de-tiling championship aims to motivate citizens to adapt to flood risks, and the national week of “Our Water” (*Ons water*) is aimed at raising awareness of flood risks. The choice for policy instruments to stimulate adaptive action by citizens in flood risk management could reflect the extent to which citizens are stimulated by the government to implement their own adaptive measures in FRM.

2.5 Conceptual model of responsibility

The conceptual model schematically shows how the concept of responsibility can be qualitatively operationalized from a theoretical perspective (see figure 5: Conceptual model responsibility in relation to the implementation of PLFRA measures). The four notions of responsibility on the left-side of the conceptual model serve to gain a deeper understanding of the views on responsibility of both citizens and policymakers. These views on responsibilities of citizens and policymakers are expected to influence the willingness to take PLFRA measures and the actual implementation of PFLRA measures. Furthermore, policymakers can support the willingness and implementation of PLFRA measures with policy instruments, which is included in the conceptual model. The policy instruments can be categorized as “sticks” (regulations), “carrots” (economic means) and “sermons” (information). Other factors that influence the willingness of property owners to take PLFRA measures, such as the cognitive factors, are outside the scope of this study and are therefore highlighted as a box with a dotted arrow.

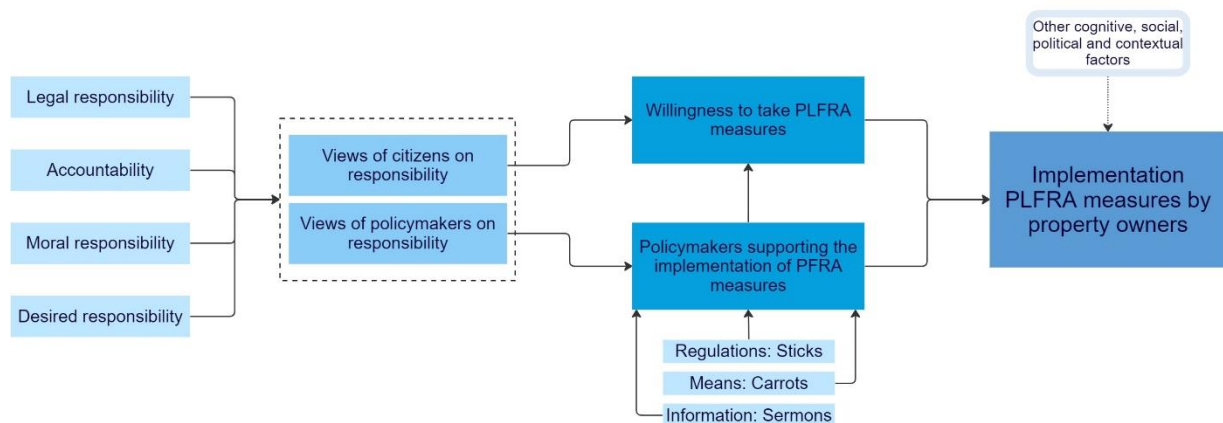


Figure 5 Conceptual model responsibility in relation to the implementation of PLFRA measures

3. Methodology

The methodological decisions of this research will be explained in this chapter, starting with the decision for a qualitative research methodology, by using the method of semi-structured interviews and an analysis of policy documents. After that, the decision for the case study location Zwolle will be justified and context of the area is provided in the third paragraph. The data collection process will be described in the fourth paragraph, after which the techniques for data analysis are discussed. Lastly, this chapter will go into the ethical considerations and biases of the research methods.

3.1 Research strategy: A qualitative approach

To answer the central question of this research *“How do stakeholder views of the division of responsibilities in flood risk management influence the implementation of property-level flood risk adaptation measures by Dutch private property owners?”*, a qualitative research approach is adopted. A qualitative research method is the most suitable method because this allows for the understanding of different meanings, beliefs and opinions about responsibility and the identification of patterns and perceptions of property owners and policymakers. A qualitative method can help to determine how views on responsibility influence the opinion of citizens relating to PLFRA measures (Hay, 2016). This research builds on a recent study that has shown that responsibility is a multi-faceted concept, meaning that responsibility can have different meanings to someone (Snel et al., 2021; Scheepers, Tobi & Boeijs, 2016). Therefore, in-depth knowledge on the experiences of property owners and policymakers needs to be gained for which a qualitative research strategy is the most suitable (Hay, 2016). The empirical data was used to identify views on responsibility and how responsibility is related to taking PLFRA measures.

3.2 Research design

To gain in-depth understanding of how the views of responsibility influence the implementation of PLFRA measures, a case study in Zwolle was performed. Case studies allow for more detailed and in-depth information in comparison to large sample sizes (Hay, 2016). In this paragraph, the decision for semi-structured interviews and a policy document analysis is explained (see table 2: Overview of methodology per sub research question).

Semi-structured interviews

To collect the individual experiences of property owners and policymakers, semi-structured interviews were conducted. Semi-structured interviews are the best method to retrieve information of attitudes, behaviors, experiences and opinions, because it provides the opportunity to ask follow-up questions and is therefore useful for gaining insight into why something is perceived in a certain way (Rowley, 2012). This research attempts to find out interpretations of the division of responsibilities from the perspective of different stakeholders, for which interviews are especially useful (Hay, 2016). There are three types of interviews, namely structured interviews, semi-structured interviews and unstructured interviews (Wilson, 2012). This research has used semi-structured interviews, because they have the advantage of the researcher being able to follow-up on interesting comments and explore responses of the interviewees further, while still maintaining a structured order that prevents the discussion from going off topic (Hay, 2016). This method thus helps to gain empirical insight into how the views on responsibility influence the implementation of PLFRA measures.

Policy documents analysis

To complement the empirical data of the semi-structured interviews, a policy document analysis was performed. A policy document analysis is defined as the systematic review of policy documents (Hay, 2016). The aim of the policy documents analysis is to review the extent to which the notions of responsibility are implicitly or explicitly mentioned in the governmental policies about water safety and

water nuisance. Policy documents are reliable sources of information because they need to be approved by the council members before publishing. The combination of different sources of information, namely a policy document analysis and semi-structured interviews, is in literature called methodological triangulation (Heesen, Bright & Zucker, 2019). It has been argued that using multiple sources of information increases the validity of the research, because *“the convergence of multiple methods upon a single conclusion better supports that conclusion than just one of those methods arriving at the conclusion”* (Heesen, Bright & Zucker, 2019, p.3068). Therefore, the policy document analysis provides a clear addition to the perceptions of the interviewed policymakers that are found in the semi-structured interviews.

Sub research question	Method	Source of data
<i>How do property owners perceive the responsibilities of themselves and the government in managing flood risks?</i>	Semi-structured interviews	Property owners of single-family houses in Wipstrik or Berkum in Zwolle
<i>How do policymakers of the municipality and waterboard perceive the responsibilities of themselves and property owners in managing flood risks?</i>	Semi-structured interviews Policy document analysis	Policymakers of the municipality and waterboard
<i>To what extent are policymakers supporting the implementation of PLFRA measures with policy instruments?</i>	Semi-structured interviews Policy document analysis	Policymakers of the municipality and waterboard
<i>How do the views on responsibilities relate to the decision-making process of Dutch property owners to take property-level flood risk adaptation measures?</i>	Semi-structured interviews	Property owners of single-family houses in Wipstrik or Berkum in Zwolle

Table 2 Overview of methodology per sub research question

3.3 Selection and context case study: Zwolle

The selected case study area is Zwolle, which is a mid-sized city in the Netherlands and the capital of the province of Overijssel. The municipality of Zwolle has approximately 125.548 inhabitants and the climate costs of residual floods until 2050 are estimated to be 93,9 million euros (Kennisportaal Klimaatadaptatie, n.d.).

This case study area is selected based on two criteria, which are the high flood risks of the area and the high ambitions of the municipality to be adapted to these increasing flood risks. First of all, the water system and location of Zwolle is considered to be extremely vulnerable to the effects of climate change. The city center of Zwolle is located next to the rivers Vecht and Zwarte Water, and its city moat is connected with the IJssel river via the Zwolle-IJsselkanaal (Municipality of Zwolle, 2019). The city center of Zwolle is not protected by flood defenses and the city moat is in direct connection to the IJssel lake. The water in Zwolle could come from five directions (see figure 6: Water system Zwolle), which are from the IJssel lake which is pushed up in case of a west wind (1); from the sky in the form of heavy rainfall (2); from the three rivers IJssel, Vecht and Zwarte Water (3); from stream water of the Sallandse Weteringen which flows to the IJssel lake (4); and from groundwater impoundment from the Veluwe or the Sallandse Weteringen (5) (Municipality of Zwolle, 2019). The neighborhoods of Zwolle are threatened by floods and previous heavy rainfall events have resulted in significant economic damage (Kennisportaal Klimaatadaptatie, n.d.). Its location in the delta of the Vecht and IJssel makes the city vulnerable to climate change and therefore especially interesting for this research. Coastal flood risks are excluded from this research, due to the fast-rising water levels and high water depths (more than two meters), which limits the effectiveness of PLFRA measures (Attems et al., 2020; Kennisportaal Klimaatadaptatie, n.d.).

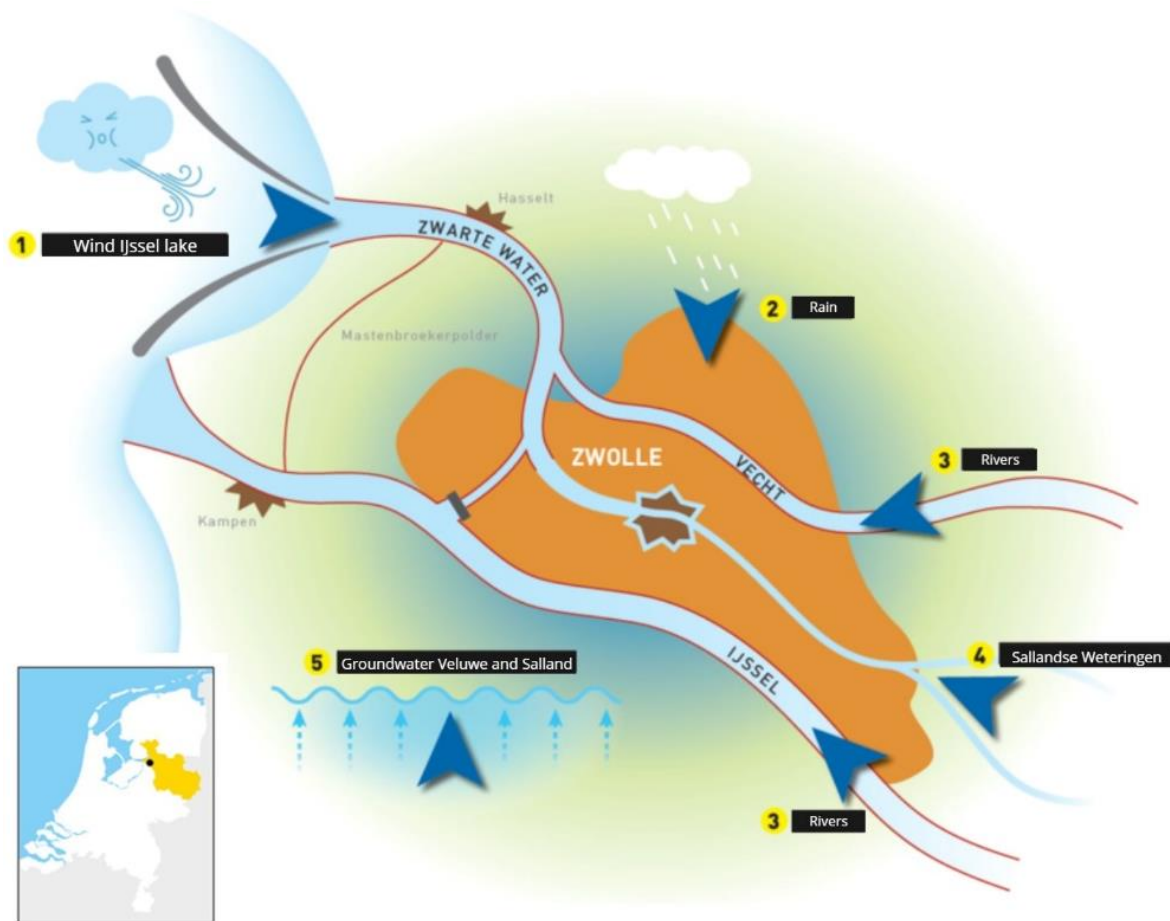


Figure 6 Water system Zwolle (Adapted from Municipality of Zwolle, 2019)

Second, Zwolle is selected because it is considered to be a front-runner city in the field of adaptive flood risk management. The city has high ambitions to become a leader and example for the rest of the Netherlands as a climate adaptive growth region. According to the climate adaptation strategy of Zwolle, the city tries to transcend legal responsibilities and already takes extra steps to create a water resilient city (Municipality of Zwolle, 2019). These high ambitions to become water resilient are reflected in the creation of a strategy for climate adaptation and their participation in the City Deal Climate Adaptation of 2016. Furthermore, the Dutch national government has indicated that the region Zwolle is a NOVEX (national environmental vision extra) area. Because Zwolle is viewed to be a miniature version of the Dutch delta, it has been given the function of “demodelta” (Ministry of the Interior and Kingdom Relations, 2024). This means that innovative ideas about climate adaptation are being put into practice in the region of Zwolle and then used as inspiration in other regions (Ministry of the Interior and Kingdom Relations, 2024). The high ambitions and opportunities for innovation in Zwolle when it comes to climate adaptation and water systems makes this case study area especially interesting for this research.

A climate stress test has shown that multiple neighborhoods of Zwolle are vulnerable to floods. Two neighborhoods in Zwolle were selected, based on the flood risks and the percentage of single family-houses. The selected neighborhoods are Wipstrik (see figure 7: Location Wipstrik in Zwolle) and Berkum (see figure 8: Location Berkum in Zwolle), which are areas that are indicated by the municipality to have low infiltration opportunities and a poor connection to the water system (Kennisportaal Klimaatadaptatie, n.d.). Figure 9 provides an impression of both Wipstrik and Berkum.

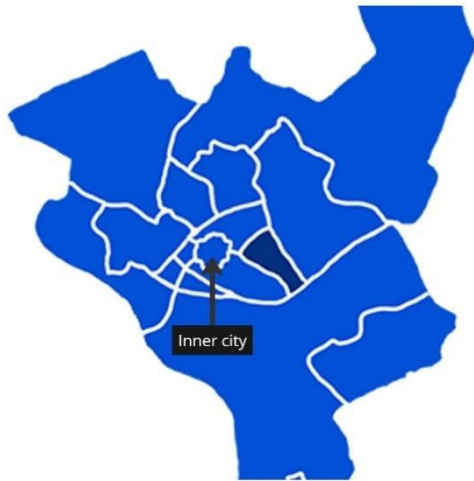


Figure 7 Location Wipstrik in Zwolle (Samen Zwolle, n.d)

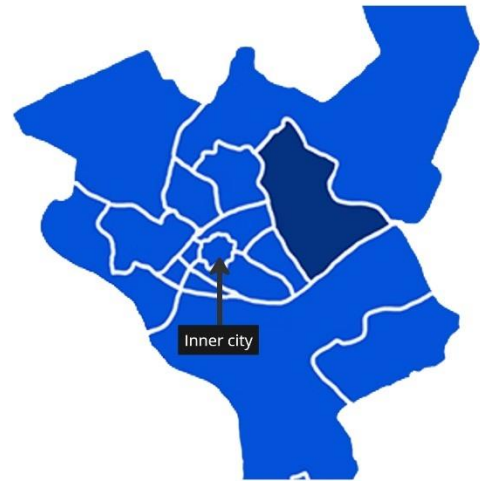


Figure 8 Location Berkum in Zwolle (Samen Zwolle, n.d.)

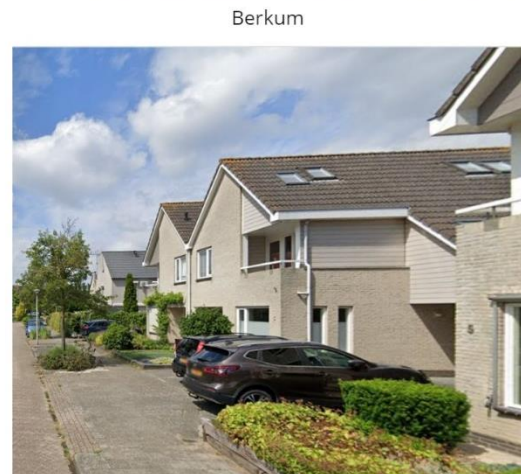


Figure 9 Impression of the selected neighborhoods Wipstrik and Berkum (Google Streetview, 2024)

3.4 Data collection

The semi-structured interviews were conducted with policymakers working for the municipality of Zwolle, policymakers working for the waterboard Drents Overijsselse Delta (WDO delta) and with residential property owners that live in a single-family house in the two selected neighborhoods with high flood risks in Zwolle. A total of thirteen interviews with stakeholders were conducted, from which eight interviews were held with citizens, three interviews were held with policymakers of the

municipality and two interviews were held with policymakers of the waterboard. Also, three policy documents were analyzed, as well as the governmental websites of the municipality of Zwolle and the waterboard WDO delta. These methodological decisions of the selection of policymakers and policy documents will now be explained in more detail as well as the process of data collection.

Stakeholder analysis: selection of participants

The choice for interviewing policymakers of the municipality of Zwolle and the waterboard is underpinned by a stakeholder analysis. The main water managers in the Netherlands are Rijkswaterstaat and the waterboards (National government, n.d.). These water managers have the responsibility to prevent floods, ensure a sufficient amount of water and ensure a good quality of the water. Rijkswaterstaat is responsible for the maintenance of large waters, such as the sea and rivers, and warns the responsible governments for high water levels or storm at sea (National government, n.d.). The waterboards are responsible for regional waters, such as channels, and ensures protection of the land from floods (National government, n.d.). This means that the waterboard is primarily responsible for the management of the water systems at the regional level and local level, whereas Rijkswaterstaat is nationally responsible. Since, this research is a case study of Zwolle, the waterboard is an interesting stakeholder to select as participant, due to its knowledge of the local context of Zwolle and their responsibilities for the regional water system.

Other government bodies are also stakeholders that are involved in Dutch water management. The national government is stakeholder on the national level, the provinces are responsible on the provincial level and municipalities are responsible for the groundwater, sewage and drainage opportunities in urban areas (National government, n.d.). The municipality is thus an interesting stakeholder for this research, because of their responsibilities on the local level. Furthermore, the municipality is responsible for the second layer of the multi-layer safety approach, which entails reducing the impacts of a flood event. Also, the municipality has the responsibility to raise awareness about the redistribution of responsibilities and facilitates the implementation of PLFRA measures (Trell & van Geet, 2019). Combining the perceptions of policymakers of the waterboard that is responsible for preventing floods, and the municipality that is also responsible for reducing the impacts of floods is especially relevant for this research.

The policymakers of the municipality and waterboard are selected through purposive sampling, which means that their selection is based on their usefulness to the research. This means that the policymakers are selected based on their function and experience with flood risk management policies. The participants found from the purposive sampling were used to snowball other possible participants, based on their expertise until data saturation is achieved. The sampling of the property owners followed the same approach of both purposive and snowball sampling. Property owners of selected neighborhoods with high vulnerability to floods were invited to participate in the interviews. No selection will be made relating to the experience of the property owners in taking flood risk adaptation measures, because it is interesting to investigate why property owners have or have not undertaken measures.

Selection of policy documents

Three policy documents were selected, based on their relevance for the topic and their date of issue. Also, the websites of the waterboard and the municipality were used to retrieve more detailed information. The most recent documents were selected to make the findings more accurate. The aim of the analysis is to create a better understanding of how the responsibilities in flood risk management are reflected in the policies of the municipality of Zwolle and the waterboard Drents Overijsselse Delta (WDO delta). The new environmental act obliges the municipality and waterboard to create an environmental vision that expresses their spatial planning ambitions for the coming years, making these vision documents important for this research. In addition to the spatial planning vision, the

municipality has also created an extra strategy for climate change adaptation. The selected policy documents for analysis are thus the Spatial Planning vision of the municipality (2021), the Water vision of the waterboard (2020) and the Climate Change Adaptation strategy of the municipality (2019).

Recruitment of interview participants

The recruitment strategies for the two types of stakeholders, namely citizens and policymakers, were different from each other. The strategies for recruitment of interview participants will now be explained further.

To find interview participants among citizens of the selected neighborhoods of Berkum and Wipstrik, notes announcing the researchers visit and topic for interview were put in the mailbox of possible interviewees. The note also contained the contact details of the researcher to give residents the opportunity to contact the researcher and make an appointment for an interview. Two days after the note was distributed in a part of the neighborhood, door-to-door recruitment took place. First, only citizens living in the neighborhood Berkum were approached for participation in the research, but due to low response rates, the neighborhood with similar flood risks Wipstrik was included in the research. Four times the notes were distributed, and participation was asked at the door on different days of the week. The door-to-door recruitment in Berkum took place on Monday, Wednesday, Friday and Saturday and a total of 240 notes were distributed within two weeks. From this first round of data collection, two interviews were conducted as a result of the door-to-door recruitment, one interview was held as a result of snowballing and two interview appointments were made via email. For the second round of recruitment of participants another 240 notes were distributed in Wipstrik. The door-to-door recruitment in Wipstrik took place on Friday, twice on a Saturday and Monday, over a time period of two weeks. Two interview participants contacted the researcher via email and one interview participant was found from the door-to-door recruitment. It was attempted to find interview participants from different socio-economic backgrounds by going door-to-door at different size houses.

For the policymakers, a total of seven interview invitations were sent via email to policymakers of the municipality in a time period of two weeks, starting on the 30th of November. Three policymakers responded to the invitation, of which two policymakers accepted the invitation and one was too busy to do the interview. The policymaker of the municipality that was busy accepted the invitation for an interview later on in January. Three policymakers did not respond to the invitation. Furthermore, through snowballing, two invitations were sent via email to policymakers of the waterboard, which were accepted. This means that a total of three interviews were conducted with policymakers of the municipality and two interviews were conducted with policymakers of the waterboard, which resulted in a total of five interviews that were conducted with policymakers (N=5).

Process of data collection

Open-ended questions were asked about their opinion of PLFRA measures, their views of the division of responsibilities, and how these perceptions relate to their decision-making to take measures. Policymakers were also asked about the extent to which they call these responsibilities into action with policies, because this can influence how responsibilities are viewed by property owners. An exact overview of the interview topics can be found in the interview guide, which is based on the concepts found in literature and described in the theoretical framework (see appendix 2: Interview guide). The theoretical framework serves as a starting point from which it was attempted to find new experiences and patterns about how responsibilities are viewed by stakeholders and how this relates to the decision-making to take PLFRA measures. Therefore, questions were first completely open for the interpretation of the participant, after which follow up questions were asked to gain more in-depth knowledge on specific notions of responsibility as identified in the theoretical framework.

The interviews continued until the point of saturation was reached, meaning that *“emerging concepts have been fully explored and no new theoretical insights are being generated”* (Bryman, 2012, p. 717). To find this point, the collected data was transcribed in between collecting more data, to constantly review the extent to which new concepts are still emerging. The point of data saturation was found after eight interviews with citizens (N=8) and five interviews with policymakers (N=5).

The total of eight interviews (N=8) with citizens were held within four weeks. Four interviewed citizens preferred an online interview, for which the platform Microsoft Teams was used, and four interviews with citizens took place in person. For the policymakers, three interviews were conducted online using the platform of Microsoft Teams, and two interviews took place in person. The interview questions were asked in Dutch, which is the native language of both the interview participants and the researcher. The total of thirteen interviews were held in a period of five weeks, with a two week pause due to the Christmas break. This means that the data collection took place from the 30th of November until the last interview on the 9th of January. The average duration of the interviews with citizens was 40 minutes and the average duration of the interviews with policymakers was 50 minutes (see appendix 3: Overview interview information).

3.5 Data analysis techniques

The data collected from the semi-structured interviews and the policy documents analysis were analyzed using different methods. This paragraph will first go into the data analysis techniques of the semi-structured interviews, after which the data analysis techniques are presented of the policy documents analysis.

The semi-structured interviews were analyzed using the computer software Atlas.ti, which is useful for structuring the data and coding the interviews. During the interview, notes on important responses were taken and all interviewees agreed to the recording of the interview. The interviews were transcribed in Dutch by first using the transcription function of Word and then altered to the spoken text manually. The coding of the collected data included three phases, which are the open coding phase, the axial coding phase and the selective coding phase. In the first phase of open coding, a coding tree was created inductively, meaning that the data is thoroughly reviewed for concepts that emerge from the data and these concepts were given a code (Scheepers, Tobi & Boeije, 2016). A total of six interviews with citizens and all interviews with policymakers were used for open coding. After finding no more new codes in the interviews, the open coding phase was finished. In the second phase of coding, axial coding was performed, in which the labels and subcategories are reviewed for similarities and to find common themes for overarching categories (Scheepers, Tobi & Boeije, 2016). The codes that were found in the open coding phase, were now expanded deductively by using the findings from the theoretical framework. The exact coding tree can be found in appendix 4: Coding tree. The last phase of coding included selective coding, in which all categories are connected to develop in-depth knowledge and theoretical insights (Hay, 2016).

The data analysis of the policy documents was performed by reading the selected policy documents and continuously reviewing the text, based on three pre-determined questions. The first question is how are the notions of responsibility, namely legal responsibility, accountability, moral responsibility and desired responsibilities, used in the policy documents. The second question is which PLFRA measures are the policy documents referring to. The third question is to what extent are the types of policy instruments, namely *“sticks”*, *“carrots”* and *“sermons”*, used to stimulate citizens to take actions to adapt to flood risks.

3.6 Validity and reliability of the research

Several important measures were taken by the researcher to ensure adequate handling of the raw and processed data, and to ensure that the qualitative data is reliable and valid. These considerations are now explained further.

Ethical considerations and data management

There are several ethical considerations for this research. First of all, it is important that the interviewees are completely informed about how the data will be analyzed and what happens with the data after the interview. Therefore, an informed consent form was created and signed before the interview. To prevent technical barriers, the consent was given verbally by the interviewee in case the interview took place online. All interviewees gave permission for the recording of the interview. The recording is deleted after submission of the thesis to ensure confidentiality and anonymity. Also, the transcription is anonymized by removing the name and possible address of the interviewee. The transcription is saved online in a protected environment that only the researcher has access to or the supervisor upon request. The interviewee can also review the transcription upon request to provide feedback.

Reliability and validity of the research

The quality of the research can be assessed by reviewing the reliability and validity of the methodology that is used. Reliability can be summarized as *“the extent to which accidental errors can be excluded”*, meaning that the reliability of the research can something about the consistency of the measurement (Scheepers, Tobi & Boeije, 2016, p. 135). The validity of the research is defined as the *“absence of systematic measurement errors”*, questioning if the findings cover what the researcher attempts to examine (Scheepers, Tobi & Boeije, 2016, p. 136). Four measures have been taken to ensure the reliability and validity of the research. First, the reliability of the research is warranted through the selection of the interview participants, in which the researcher attempted to create a representative sample of the population. Second, the interviewees received the transcription of the interview and were given the opportunity to provide feedback on the interpretation of their responses to ensure reliability of the data. Third, the interview guide is based on the findings from literature, but room will still be left for new information. Furthermore, the findings from literature are compared with the empirical findings to reveal any similarities or differences to increase the validity of the data. Fourth, data triangulation took place by interviewing policymakers and citizens with different backgrounds and also analyzing the secondary sources of policy documents (Hay, 2016).

4. Policymakers results: calling responsibility into action

This chapter will discuss the results of the policy documents analysis and the five interviews with policymakers of the municipality and waterboard WDO delta. First, the views of the policymakers (P) on the notions of responsibilities are explained based on the interviews and policy documents analysis. Participants P1, P2 and P3 are policymakers of the municipality, and participants P4 and P5 are policymakers of the waterboard WDO delta. Second, this chapter discusses the extent to which the policymakers are calling these responsibilities into action according to the results from the interviews and the results from the policy documents analysis and governmental websites.

4.1 General perspective of policymakers on the responsibilities in FRM

Policymakers generally expressed that tasks related to preventing floods are governmental tasks, but tasks related to reducing the impact of a flood event are responsibilities of both the government and citizens. The perception that reducing the impact of a flood is not viewed to be a responsibility solely of the government, comes from the idea that the traditional approach in the Netherlands of ensuring water safety with dikes and pumps is not sufficient anymore, which is already visible in the water systems of Zwolle (participant P3). Therefore, the collaboration between the waterboard and the municipality becomes more important, as well as collaboration with citizens (participant P2).

“It is a combination of the different governments together, the property owners and the society. Everyone has their own role and task, and its success depends on the level of collaboration between these parties.” (Participant P2)

Furthermore, the policymakers of the different government bodies brought up that the responsibilities in FRM differ between the different tiers of government. The waterboard is generally perceived to have different responsibilities in FRM than the municipality. According to the policymakers of the municipality, the municipality does not have responsibilities for preventing water nuisance and floods, so this responsibility lies with the waterboard (participant P1). However, the policymakers of the waterboard stated that the municipality does have responsibilities when it comes to reducing the impacts of floods (participant P4 & P5).

Reflection of responsibilities in the analyzed policy documents

The perception that the traditional approach of ensuring water safety with dikes and pumps is not sufficient anymore is also explained in the analyzed policy documents. In all policy documents the ambition is expressed to be climate adaptive and water resilient in 2050, to ensure that Zwolle continues to be safe for floods and adapted to extreme weather events. Furthermore, the policy documents explain that the risks of water nuisance and water damage are expected to increase as a result of climate change and that actions need to be taken by all possible stakeholders to be prepared for and adapted to new climatic trends (Municipality of Zwolle, 2019; Municipality of Zwolle, 2021; Waterboard Drents Overijsselse Delta, 2020). However, differences can be found in the way references are made to responsibilities in FRM.

The spatial planning vision (2021) has only implicit references to responsibilities. For example, in the spatial planning vision ambitions are expressed for “*collaboratively looking for solutions*” and “*the municipality takes initiative to collaborate with citizens and entrepreneurs*”, when talking about reducing the impacts of extreme weather events (Municipality of Zwolle, 2021, p.55). Yet the exact content of collaboration with citizens is not expressed and it is not described whether this collaboration is a voluntary commitment of the government or a legal obligation. The responsibilities of citizens are not mentioned in the spatial planning vision, besides the statement that “*realizing sufficient sponge effects is a task of the municipality in collaboration with citizens and businesses*” (Municipality of Zwolle, 2021, p.56).

In the contrary, the climate adaptation strategy (2019) is more explicit about the responsibilities of the municipality of Zwolle and other stakeholders. To start with, this document states that *“future measures can never create 100 percent certainty”* and indicates that flood proof building is essential to limit the impacts of floods (Municipality of Zwolle, 2019, p.25). This statement shows that the municipality recognizes the limitations to the capacities of the government to prevent floods and attempts to communicate this to citizens. It is also indicated that the government has to create awareness about flood risks and citizens that want to take actions to adapt to climate change have the opportunity to use governmental support (Municipality of Zwolle, 2019).

The water vision mentions that the waterboard wants to include citizens more in what the waterboard does but does not give an explicit or implicit responsibility to citizens. However, the water vision does include an incentive scheme of possible measures that citizens can take to allow for better water infiltration. This could indicate that the waterboard would like citizens to be more involved. Citizens do also have to be aware of flood risks and water management according to this document (Waterboard Drents Overijsselse Delta, 2020).

4.2 Policymakers views on the notions of responsibility in FRM

These general ideas about responsibilities in flood risk management were discussed further and more in-depth during the interviews with policymakers, by looking at their views on the four notions of responsibility: legal responsibilities, accountability, moral responsibilities and desired responsibilities. Also, these views are linked to what is found about the four notions of responsibility in the policy documents.

Legal responsibility

The majority of the interviewed policymakers have expressed that the legal governmental responsibility lies in taking measures to prevent floods and to reduce the impact of floods, while citizens are legally only responsible for water that falls inside their property boundaries (see table 3: Key take-away policymakers views on legal responsibilities). According to the interviewees, the waterboard and Rijkswaterstaat are responsible for ensuring flood safety with primary flood defenses, whereas the municipality is responsible for including the working of the soil and water systems in spatial planning interventions (participant P2 & P4). This is formally recorded in the law under the reference of water and soil guiding (*“water en bodem sturend”*), which means that the functioning of water systems needs to be included in spatial planning decisions (participant P3). For flood risk management this means that attempting to ensure flood safety and reduce the impact of a flood, with for example flood-proof building, is an important responsibility of the municipality (participant P1).

“You can view the city as having small compartments. If a flood happens somewhere, then it is a problem in that location, but the rest of the city remains safe. How can we shape the current environment to keep the city safe from floods with small interventions? .. That spatial planning is what the municipality of Zwolle is responsible for.” (Participant P2).

This is also recognized by the policymakers of the waterboard, who mention that the municipality is legally responsible for the second layer of the multi-layer safety approach, which entails that the spatial planning needs to be organized in a way that the impact of floods is limited (participant P4 & P5). The waterboard can advise how the impact of floods could be reduced but is not formally responsible for this (participant P4). Yet the policymakers of the municipality expressed that this responsibility of reducing the impact of floods is currently taken up voluntarily and is thus not established legally (participant P1, P2 & P3). It is expressed by the policymakers of the municipality, that the municipality does not have any legal responsibilities in flood risk management (participant P1 & P3). However,

another policymaker of the municipality indicates that there are two types of floods, namely water hindrance (“*waterhinder*”), which is a result of water standing against a building and water nuisance (“*wateroverlast*”), which is water entering a private building. Preventing water nuisance is a legal responsibility of the municipality according to participant P2, but preventing water hindrance is a legal responsibility of citizens.

“Water nuisance is a consequence of a government failure, meaning that water structurally enters buildings. Water hindrance is a risk for citizens and they have to become aware and accept that water can be on the street from time to time.”
(Participant P2)

This is in line with the perception of the policymakers of the waterboard, who mention that citizens are legally responsible for the rainwater that falls inside their own property boundaries (participant P4 & P5). Furthermore, citizens that are living outside the dikes are themselves responsible for their water safety (participant P1). The policymakers of the waterboard mention in the interviews that they are legally responsible for guaranteeing water safety within safety norms, which are established by the province and national government (participant P4 & P5).

“That role is currently for almost 100 percent for the government. At least the waterboard is completely responsible for maintaining the dikes and preventing floods.” (Participant P4)

However, when the water levels exceed this safety threshold, the government is no longer legally responsible (participant P2 & P4). This means that flood safety is legally up to a certain percentage guaranteed by the government for citizens that are living inside the dikes (participant P1 & P4). However, all interview participants stress that this safety level can perhaps no longer be maintained due to an increase in extreme weather events as a result of climate change, which consequently creates a higher probability of water levels exceeding the safety norms.

This is also found in the analyzed policy documents, in which a separate paragraph is included about which stakeholders would be responsible for which tasks, by specifically expressing the responsibilities of other government bodies, businesses and citizens (Municipality of Zwolle, 2019). The responsibilities of citizens and businesses are expressed explicitly, by mentioning that they are responsible themselves for adapting to climate change.

“Citizens and companies are primarily responsible themselves for the adaptation to reduce the impacts of climate change” (Municipality of Zwolle, 2019, p.36).

This suggests that the government is not responsible for adaptation to climate change in private spaces. The policy document analysis also shows the legal tasks of the waterboard, in which an adequate management of the water system are mentioned, by going into the tasks of the waterboard per societal problem and mentioning important legal frames (Waterboard Drents Overijsselse Delta, 2020).

Legal responsibility	It is generally viewed that the waterboard is legally responsible for preventing floods up to certain safety standards, while the municipality is viewed to be legally responsible for preventing water nuisance and limiting the impact of a flood. Citizens are legally responsible for the water that falls inside their property boundaries.
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Table 3 Key take-away policymakers views on legal responsibilities

Accountability

Relating to who can be held accountable for the damage after a flood event occurred, it is generally viewed by policymakers that the government can only be held accountable in the case of a faulty design of spatial interventions and not for force majeure situations in which safety norms are exceeded (see

table 4: Key take-away policymakers views on accountability). The accountability of the government after a flood event is not described in the analyzed policy documents. However, varying opinions about the accountability of the government and citizens after a flood event are found in the interviews with policymakers.

On the one hand, it is argued that citizens need to pay for water damages themselves, because guaranteeing that a flood will never occur is impossible for the government (participant P2, P3 & P5). It is stated that *“that is the reason why safety norms are formulated in the first place”* (participant P5). There will always be a chance that a flood happens and it can not be expected that the government can be held accountable for everything (participant P3). In the case of a large flood event, citizens are accountable for the damages themselves, because this is how things are arranged in the Netherlands (participant P3). The waterboard is only responsible for draining the area to make it habitable again (participant P4). And if a property owner did have the possibilities to place sandbags or water barriers to protect his house but decided not to do that, then the property owner is accountable for the damage (participant P2).

However, a nuance in this perception of accountability after a flood can be found in the way that the water has come to a certain area (participant P2). When the water nuisance is the result of a faulty design in the rainwater drainage capacities of a street, then the government can be held accountable for the damages (participant P2).

“There is a large difference in how the water got somewhere. If this is the result of a natural process and you (citizens) choose to not do something about this, then it is your own responsibility. But if it is a design error in the spatial planning, then you can hold the municipality accountable.” (Participant P2)

However, the narrative about flood risks is of importance when looking at the accountability of the government according to participant P1. The way that flood risks are communicated influences the extent to which the government should be accountable for a flood. Currently, it is communicated to citizens that the government ensures flood safety, so therefore the damages should be compensated by the government (participant P1).

“There are extremes that we (the government) cannot always be prepared for, so the government is not responsible for everything. But right now it is communicated that the government ensures safety. ... As long as we communicate this story, the government has to compensate damages.” (Participant P1)

The compensation fund is also linked by the interviewees to the motivation of property owners to protect their house from a flood. The need for a turning point in flood risk management was mentioned by policymakers of both the waterboard and the municipality. The government can not always be held accountable, because this limits the extent to which responsibilities are given to citizens (participant P1, P4 & P5). According to participant P5, the government takes away too many risks, which results in a lack of urgency for citizens to be aware of flood risks and prepare their house for a potential flood.

“Currently, there is no motivation for a property owner to protect his or her house from a flood, because when it happens it happens. And then it happens for a large area. So then it is viewed as a disaster and in the Netherlands we have a safety net for this.” (Participant P4)

Accountability	It is generally viewed that the government can not always be held accountable for a flood event as a result of increasing weather extremes, unless the flood was caused by a faulty design. Citizens need to pay for flood damages and can claim damages with insurance companies.
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Table 4 Key take-away policymakers views on accountability

Moral responsibility

The interviewed policymakers generally believe that the government has a guardian role in flood risk management and that the government is morally responsible for preventing floods to a certain extent (see table 5: Key take-away policymakers views on moral responsibility). The government has a duty of care for their citizens, meaning that the government should take measures to improve public health (participant P1). But the contents and exact meaning of this duty of care is according to participant P1 not clearly formulated, since the duty of care is only embedded in a best-effort obligation based on the governmental capacities.

Therefore, it is generally emphasized that the government has the moral responsibility to do everything within their capacities to prevent floods and reduce the impact of floods (participant P1, P2 & P3). The municipality has to transcend their legal responsibilities and voluntarily take all the possible measures that they are capable of (participant P2). Such measures can include spatial planning interventions that focus on creating flood proof neighborhoods with build in water barriers (participant P2 & P3). This is also found in the policy documents analysis, which mentions that there is a shift towards a more proactive role in spatial planning, and the government has to take up this responsibility because they have the knowledge, skills and experience in this field (Waterboard Drents Overijsselse Delta, 2020).

However, the majority of the interviewees perceived the capacities of the government to prevent floods to be limited. It is viewed that in the face of climate change, the costs for ensuring flood safety will increase significantly (participant P4 & P5). In the future, these costs are perceived to become unaffordable for the government (participant P4 & P5).

“We know that this (a flood event) can happen, and the waterboard can not continue to prevent this, because this will become unaffordable. This places more responsibility on the municipality and property owners.” (Participant P5)

Consequently, it is stressed that citizens also have a moral responsibility to reduce the impact of a flood inside their property boundaries. Citizens have bought a house in a certain location, meaning that they should know about the possible flood risks in this area (participant P1, P2 & P4). Furthermore, it is generally perceived that citizens as the property owners are morally obliged to do everything they can to prevent water damage (participant P1, P2 & P4). The example is given that citizens are also responsible for a leaking roof or making reparations to their house (participant P1). Choosing to not take measures to limit water damage, while it lies within the capacity of citizens, is thus viewed to be the own responsibility of citizens (participant P2).

“If citizens have the possibility to place sandbags or water barriers, but are choosing not to do that, then it is your own responsibility, and you need to bear the costs yourself.” (Participant P2)

In the contrary, it is questioned by policymakers whether citizens can be expected to have the capacities and resources to protect their house from floods (participant P1, P3 & P5). For example, with high water levels of more than two meters, it is expressed by an interviewee of the waterboard that he is unsure if citizens can do something in their house to reduce the impact of a flood (participant P4). Moreover, it is questioned if citizens can be expected to have the knowledge of possible measures to limit water damage in their house, especially since the narrative towards citizens has always been to pay waterboard taxes and then citizens are safe from floods (participant P1).

It is generally viewed that some citizens have more capacities and resources to take PLFRA measures than other citizens, so giving more responsibilities to citizens could create a larger divide between resourceful citizens and citizens that lack the resources to protect their house. Especially the possible future trend of a climate label to houses is perceived to create a division in society (participant P1, P3 & P4).

Therefore, it is generally believed that the creation of a compensation fund is a moral responsibility of the government (participant P1 & P4). The example of Limburg was often brought up, in which an emergency fund was created for those affected by the flood (participant P1, P4 & P5). The emergency fund for compensation after a flood is a voluntary moral responsibility of the national government and the creation of this fund depends on the impact of the flood (participant P4). This means that in practice, citizens would not have to pay for flood damages themselves (participant P4).

The government is also perceived to be responsible for limiting this divide by providing support in the form of subsidies or information (participant P2 & P4). The provision of information about flood risks and possible measures to limit water damage is perceived to be a governmental responsibility. If citizens are unaware of the flood risks, they will always be surprised and unprepared when a flood event would occur (participant P3). Informing citizens about flood risks and possible household level measures to be better prepared for floods is according to policymakers of the municipality a responsibility of the waterboard, because they have the technical knowledge (participant P1 & P2). Yet the waterboard mentions that the municipality is standing in a closer relationship with their citizens, and thus the municipality should be responsible for communicating about flood risks and possible PLFRA measures (participant P4 & P5).

Moral responsibility	The government has the moral responsibility to do everything in their capacities to prevent and adapt to flood events, because of its duty of care. Citizens can not be expected to have the resources to protect their house from a flood in the case of high water levels, but it is perceived that citizens should also do what lies in their capacities to limit water damage.
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Table 5 Key take-away policymakers views on moral responsibility

Desired responsibilities

The interview participants generally expressed that they would like both the government and citizens to have responsibilities for reducing the impact of floods (see table 6: Key take-away policymakers views on desired responsibility). As flood risks are expected to increase in the future, the role of the government in spatial planning to reduce the impact of floods will become more important according to all interviewees. The policymakers of the waterboard would like the waterboard to also have a responsibility for the spatial planning of areas to reduce impacts of floods (participant P4 & P5). Moreover, it is mentioned that a high level of collaboration between the municipality and the waterboard in spatial planning is becoming essential (participant P1, P2 & P3).

“In the Netherlands, all government agencies are on a small island with their own responsibilities. But climate change is not on one of these islands. So intensive collaboration is required.” (Participant P3)

This is similar to what is described in the policy documents, in which information is included about the desire of the municipality to jointly come up with solutions with regional partners for combining water and space, and hereby implicitly expressing a role for the municipality to contribute to water safety (Municipality of Zwolle, 2021).

“We (the municipality) are doing this (ensuring water safety) by connecting water and space. We collectively search for suitable solutions to create a safe main

water system, from which we follow an area approach instead of traditional dike reinforcements.” (Municipality of Zwolle, 2021, p. 54)

Furthermore, it is perceived by the policymakers that the responsibilities of citizens for limiting water damage on the household level should increase (participant P1, P2 & P5). However, it is viewed that before citizens will take up this responsibility to protect their house from floods, a *“complete change in thinking about flood risks is required”* and the policymakers believe that citizens are currently expecting too much from the government than what can be lived up to (participant P4). Therefore, the majority of the interviewees believe that the awareness of flood risks should increase significantly, before it can be expected that citizens take adaptive actions.

Consequently, it is argued by policymakers that the *“narrative that the water world is communicating needs to shift”*, because currently it is communicated to citizens that *“it is safe to go to sleep when you are living in an inner-dike area”* (participant P1). Policymakers perceive that citizens are currently unaware of flood risks and of their responsibilities in flood risk management (participant P2 & P4). Yet participant P2 does indicate that knowing all the risks in life will not make citizens happy, so carrying out this message about risks needs to be done carefully. Others state that there are currently already many opportunities for citizens to become aware of flood risks and possible perspectives for action (participant P4 & P5).

According to the majority of the interviewed policymakers, citizens can currently not yet be expected to take PLFRA measures because it is expected by policymakers that citizens view the government to be exclusively responsible for flood risk management. It is expected that citizens assume that floods are completely prevented by the government, resulting in a low flood risk awareness according to policymakers (participant P1, P4 & P5). Therefore, policymakers generally view that an elaborate flood risk awareness program needs to be carried out to show citizens that floods can not be prevented completely with governmental measures (participant P1, P2 & P4).

“As long as we, as policymakers in the field of flood risk management, continue to express to citizens that they are completely safe from floods, it can not be expected that citizens will take actions. Because that is what a government is responsible for.” (Participant P1)

It is generally perceived that a real shift in the sense of responsibility of citizens will occur when people experience a flood. In the past, citizens living in high flood risk areas were much better prepared for floods because a flood happened more often (participant P1). Over the past decades, the flood risks have been eliminated almost completely, but with current changing weather patterns this is no longer the case (participant P4). Citizens are currently not aware of the possibility that a flood can occur, so therefore the risk is not perceived to be real (participant P5). Several participants mention the prayer of the dike reeve, which means that people only realize what the flood risks are and why actions need to be taken to reduce flood risks after experiencing a flood (participant P1 & P5). The experience of a flood creates a sense of urgency among society that a change is required.

“The prayer of the dike reeve means something like: provide us with our daily bread and from time to time a flood. Nothing is as helpful for creating awareness as showing how it could be.” (Participant P5)

Therefore, it is expressed that the government should now take a step back and hereby place more responsibility on citizens to be prepared for floods (participant P5). Taking a step back as a government could mean to not take responsibility for the damage after a flood has occurred to create incentive for citizens to be better prepared and more proactive in protecting their house (participant P5). This is similar to the ambitions that are expressed in the policy documents of both the waterboard and municipality, in which it is described that citizens should be better prepared for floods in the future

(Waterboard Drents Overijsselse Delta, 2020; Municipality of Zwolle, 2019; Municipality of Zwolle, 2021). However, it is recognized that in the Netherlands policymakers are only at the start of this discussion and as a society this needs to be debated, because the complexity lays in the possibility that this could create a larger divide between wealthy citizens and citizens with less resources (participant P3).

Desired responsibility	The waterboard expresses to want to have more responsibilities in adapting to climate change with spatial planning interventions and all policymakers would like to increase the level of collaboration. Citizens should also have more responsibilities, but before this can be realized it is essential that the awareness of flood risks increases and that a discussion takes place about the possible negative consequences that this could bring for society.
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Table 6 Key take-away policymakers views on desired responsibility

4.3 Stimulating citizens to take action with policy instruments

This paragraph will discuss the results about the extent to which citizens are stimulated to take adaptive actions, by analyzing policy documents, governmental websites and the perception of policymakers. This will be based on the extent to which the policy instruments of “sticks” (regulations), “carrots” (means), and “sermons” (information) are used.

Sticks as policy instruments to stimulate citizens to take adaptive action

In the policy documents of the municipality, it is mentioned that the municipality is looking into using legal instruments to reduce water nuisance at private properties, such as a minimum percentage of infiltration duty, a minimum construction or floor level for new buildings, and a maximum percentage of concrete surface (Municipality of Zwolle, 2019). However, these legal instruments are not yet implemented and it is still being reviewed whether these legal instruments will be used in the future (Municipality of Zwolle, 2019). The websites of the municipality and waterboard are also not mentioning any formal obligations of citizens to adapt to flood risks (Waterboard Drents Overijsselse Delta, 2024; Municipality of Zwolle, 2024).

The finding that legal instruments to stimulate citizens to take adaptive actions are not yet present is in line with the perceptions of policymakers. According to participant P2, the municipality is looking into using legal instruments to stimulate adaptive action, but these instruments are currently not designed.

“Legal instruments to stimulate citizens to take action in protecting their house from a flood are not yet designed.” (Participant P2)

However, it is perceived by several interviewed policymakers that non-binding conversations with citizens will not create a shift in thinking, and it is therefore stated that an incentive should be created with legal instruments (participant P2, P3 & P5).

Carrots as policy instruments to stimulate citizens to take adaptive action

Economic means to stimulate citizens to take adaptive action are according to the policy documents and governmental websites used in the form of subsidies (Municipality of Zwolle, 2021). The waterboard WDO delta had a subsidy called “Climate Active”, which is a subsidy that can be obtained by citizens if the initiative is improving the water storage capacities of an area (Waterboard Drents Overijsselse Delta, 2024). Examples for which a subsidy can be obtained is removing tiles from gardens and placing a rainwater tank. These PLFRA measures that are subsidized can be categorized as measures to avoid flood discharge, according to the framework of Attems et al (2020). However, the website of the waterboard mentions that in 2024 the Climate Active subsidy is no longer available (Waterboard Drents Overijsselse Delta, 2024).

The municipality of Zwolle does still have a subsidy for placing a rainwater tank (Municipality of Zwolle, 2024). This is in line with the spatial planning vision of Zwolle, in which it is mentioned that citizens are supported to take adaptive measures with economic means.

“We (the municipality of Zwolle) are supporting with manpower, policy, or with a subsidy or a financial contribution.” (Municipality of Zwolle, 2021, p. 102)

However, besides the rainwater tank subsidy, other subsidies that stimulate citizens to take adaptive actions are not found in the policy documents, the interviews or the governmental websites. For social housing a subsidy is found to remove tiles from the garden (Municipality of Zwolle, 2024). However, subsidies for PLFRA measures related to dry-proofing and wet-proofing the house have not been found. It is expressed by several policymakers in the interviews that more subsidies should be created by the government to stimulate the implementation of PLFRA measures by citizens (participant P1, P2, P4).

Sermons as policy instruments to stimulate citizens to take adaptive action

The ambition to collaborate with private actors and regional partners is mentioned in all policy documents. For example, the vision of the waterboard expresses that they would like to share their knowledge and expertise with municipalities (Waterboard Drents Overijsselse Delta, 2020).

“We stimulate the municipalities to take climate adaptive measures. We reward these municipalities with participation in municipal projects and share our knowledge and expertise proactively, to stimulate municipalities to go beyond their own legal tasks.” (Waterboard Drents Overijsselse Delta, 2020, p.32)

Relating to stimulating citizens with information to take adaptive measures, the governmental websites play an important role. The websites of both the municipality and the waterboard have written down possible measures that citizens can take to adapt to flood risks and indicate the neighborhoods of Zwolle which are found to be vulnerable to flood risks (Municipality of Zwolle, 2024). Furthermore, links are provided to the Zwolle Climate Atlas with further information, and a so-called Wet Feet map which indicates the risks of floods per area (Municipality of Zwolle, 2024). There is also a team of policymakers available to help citizens with information and knowledge to start their initiative. Furthermore, all policy documents mention that citizens should be aware of flood risks.

“Be aware that water nuisance is a serious threat. This ensures that you are better prepared and can take action to prevent water nuisance.” (Municipality of Zwolle, 2024)

However, the majority of the interviewees argue that the government is not doing enough to create awareness about flood risks and provide information about possible measures that citizens can take to prepare their house for a flood. The current policies are considered to be focused on creating awareness without any obligations (participant P2 & P4). To increase the flood risk awareness of citizens, it is argued that there should be more conversations with citizens about the risks and possible measures that can be taken to be better prepared (participant P4).

Concerns of policymakers about allocating responsibilities

The previous paragraphs show that even though the policymakers of the municipality and waterboard would like citizens to take PLFRA measures, it is generally perceived by policymakers that the stimulation of citizens to take adaptive measures is limited. Several concerns were expressed by policymakers in the interviews to allocate responsibilities to citizens in FRM.

First of all, it is perceived by policymakers that an important problem for allocating responsibilities to citizens, is that citizens that live in inner-dike areas, are from a legal point of view currently safe from

floods (participant P1). But in practice, it is desirable that those citizens are resilient in case it does go wrong (participant P1). Furthermore, it is perceived by the interviewed policymakers there are already so many things that citizens should be doing, such as installing solar panels and isolating, so the reasons why the government wants citizens to take action needs to be carefully thought through (participant P1 & P2).

“Well, it is just not clear yet what actions citizens should be taken. There is already so much that citizens need to do themselves, like isolating, solar panels, a façade garden, etcetera.” (Participant P2)

Therefore, according to the majority of the interviewed policymakers, giving more responsibilities to citizens can only be done as a government in consultation with the citizens (participant P1). However, as was previously discussed, policymakers generally express the concern that giving citizens more responsibility can increase the divide between resourceful citizens and citizens that lack resources (participant P1 & P3). Potential solutions for supporting citizens that lack the resources to take PLFRA measures should therefore first be debated before responsibilities in FRM can actually be attributed to citizens (participant P1 & P3).

5. Citizens results: Responsibilities and willingness to take measures

In this chapter the results of the eight semi-structured interviews with citizens (C) of the neighborhoods Berkum and Wipstrik in Zwolle will be explained. First, this chapter describes the general perspective of the interviewees on flood risk management responsibilities. Second, a deeper understanding of their views on responsibilities in FRM is provided by examining their views on the four different notions of responsibilities: legal responsibility, accountability, moral responsibility and desired responsibility. Third, this chapter describes their decision-making to take PLFRA measures and how this relates to the views on responsibility.

5.1 General perspective of the roles and responsibilities in FRM

Variations can be found in how the interviewed citizens generally perceive the roles and responsibilities of themselves and the government in flood risk management. All interviewees first expressed that the primary responsibility for taking measures to prevent floods lays exclusively with the government. Governmental tasks such as management of water levels (participant C1 & C7), ensuring adequate drainage opportunities, dike constructions (participant C2, C3, C4 & C8), dike maintenance (all participants), and dike inspections (participant C3) were mentioned during the interviews. These tasks are all related to preventing a flood event from happening. The interviewees perceive that other governmental tasks can include coordinating evacuations, educating citizens about flood risks, and drainage after a flood has occurred. According to the majority of the participants, citizens are incapable of protecting their house from a flood, so therefore the government has this responsibility in flood prevention (participant C3, C4 & C7). In this line of thought, it is believed that citizens should assist and support the government by being aware of flood risks, inspecting the dikes and signaling possible problems to the government (participant C2, C3 & C4).

However, citizens are also viewed to have some responsibilities in FRM, in which several nuances can be found. On the one hand, several participants argued that citizens are obligated to pay the taxes, meaning that citizens have an implicit responsibility for FRM. By paying the taxes, it can be expected that the government creates a safe living environment in which floods can not occur (participant C1, C3 & C7). The main underpinning for this argument is that the government is also responsible for issuing building permits and therefore citizens can expect that when buying a house somewhere, the safety is guaranteed (participant C1 & C3).

“The permit is issued and then permission is granted for building the houses. So then you can assume that the situation is safe, otherwise the permit is not issued.”
(Participant C1)

On the other hand, some participants are more skeptical about the degree to which the government is able to include long term climate prognoses into spatial planning decisions and argue that citizens have their own responsibility in choosing where they buy a house (participant C2, C3, C4 & C8). Choosing to live in a low-lying area means accepting that there is a flood risk and people need to be aware of that risk when they decide to live there (participant C2, C4 & C8). However, it is acknowledged by these interviewees that most people would not think of this possible flood risk when buying a house, and that it is not always a possibility to live in a higher location.

5.2 Perspective on the different notions of responsibilities in FRM

As the previous paragraph shows, differences and similarities can be found in the way citizens view their responsibilities and the responsibilities of the government. Since these views are based on an elaborate underpinning, this paragraph provides a deeper understanding of how the four notions of responsibility are viewed in relation to flood risk management.

Legal responsibility

It is generally viewed that the government is primarily legally responsible for flood risk management and the legal responsibilities of citizens is perceived to end at their property boundary (see table 7: Key take-away citizen views on legal responsibility). However, knowledge about the content of the law relating to the legal responsibilities of citizens and the government in flood risk management is believed to be limited (participant C3). Many participants mentioned that they do not know what the legislation about flood risk management is, by stating that they are aware that the contents of the law should be known by them, but that it is not the case for the field of flood risk management.

“I should as a citizen know the law, but I wouldn’t know it’s contents exactly for this topic.” (Participant C5)

It is therefore generally assumed that the government is legally responsible for the prevention of floods, by managing the water and dikes, which is a task that has been assigned to the waterboard Drents Overijsselse Delta (participant C2, C4, C7 & C8). Another interviewee assumes that all the government bodies, such as the state, province and municipalities are responsible for water management in the Netherlands (participant C3). The idea that the government is legally primarily responsible for flood risk management comes from a long historical tradition in which the government communicated that citizens only need to contribute by paying waterboard taxes (participant C1).

Paying the waterboard taxes is implicitly a responsibility of citizens, but citizens are not viewed to be responsible for the way this money is spend, in the form of flood risk management measures (participant C1 & C3). But while the government is perceived to be legally responsible for water management in public areas, one part of the interviewed citizens perceive that citizens are legally responsible for water that falls within their property boundaries (participant C4, C5, C6 & C8).

*“Your own responsibility is related to your own house and property. But I do not and can not take responsibility for a dike, so this is the responsibility of the waterboard or municipality. My own responsibility ends at my property boundary.”
(Participant C4)*

However, it is also considered that the water could come from outside the property boundaries, but creates damage within property boundaries. While preventing water damage inside the house is legally viewed to be an own responsibility of citizens, it is found that citizens generally believe that the government is legally responsible for water that comes from outside their property boundaries.

Legal responsibility	Most of the interviewees have limited knowledge of how the responsibilities in flood risk management are legally divided. It is assumed that the government is primarily responsible for water management and one part of the interviewees perceive that citizen responsibilities are present within property boundaries.
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Table 7 Key take-away citizen views on legal responsibility

Accountability

After a flood event happened, the majority of the interviewed citizens perceive that the government can not always be held accountable for the damages, resulting in the perception that citizens are accountable for the extent to which citizens themselves have taken actions to limit water damage (see table 8: Key take-away citizen views on accountability). It is generally viewed by citizens that citizens are currently themselves accountable for water damage and citizens can possibly claim the costs of damage with their insurance company.

Several participants that earlier stated that the government is exclusively responsible for water management and ensuring flood safety, now thought that they probably have to pay for the damage

themselves (participant C1, C3 & C5). For these interviewees, doubts about government responsibilities arise when considering if the government is capable of guaranteeing that floods do not occur. For example, multiple days of extreme precipitation that cause critically high water levels cannot be prevented by the government, since the government cannot influence the weather (participant C1). Almost all other interviewees recognize the limits to the accountability of the government, because most flood events are considered to be force majeure situations.

“Two weeks of heavy precipitation is possible in an extreme case, resulting in extremely high water levels. That is something that neither the government nor citizens can influence.” (Participant C1)

However, differences can be found in the opinions about when a situation should be considered as force majeure. On the one hand, it is argued that citizens already expect a lot from the government and therefore floods should almost always be considered a force majeure, since it is a natural disaster (participant C4). On the other hand, force majeure situations are considered to be situations in which the government has not been negligent in their actions to prevent a flood from happening (participant C2 & C8). According to this interviewee, the government can be held accountable in case the government has taken insufficient actions, which results in a flood (participant C8).

“I think it is a force majeure situation, unless the government has been negligent, because then the government should be held accountable.” (Participant C2)

In such force majeure situations where the government can not be held accountable, citizens need to take responsibility and accept material damage, because *“accidents can happen and will continue to occur”* (participant C4). Subsequently, these interview participants think that they are responsible for the damage in and around their property, and thus should attempt to limit the extent of the damage.

“The government is not responsible for the condition of my home, so if it is your own responsibility and own costs, you should not remain a passive observer.” (Participant C5)

Furthermore, concerns were expressed if the insurance would cover this type of damage and it was felt by the interviewees that they should definitely look into this (participant C6 & C7). It is assumed by the majority of the interview participants that the home contents insurance covers the water damage as a result of a flood, because this insurance includes storm damage, so that would mean that water damage is also included (participant C1, C3 & C5). And if there is a higher flood risk, the premium for the insurance is also higher (participant C1). It is also assumed that the insurance company does expect from property owners that they have done what they could to prevent the damage (participant C3). However, coming back to the perception that floods are a natural disaster and thus a force majeure, others stated that the insurance does not cover damages as a result of a force majeure (participant C2 & C4). If a large area floods, the budget of the insurance companies is too small to pay for all the damages (participant C4).

“I miss inside information of the content of the insurance clause, but I can imagine that floods are emergency situations in which the insurance company does not pay for damages. So it is in my nature to then take my own responsibility.” (Participant C6)

Accountability	It is generally perceived that there are limits to the accountability of the government. The majority of the interview participants state that citizens are thus responsible for paying the damage after a flood event, but it is assumed that the damages can be claimed by their insurance.
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Table 8 Key take-away citizen views on accountability

Moral responsibility

The majority of the participants perceived that the government is morally responsible to do everything in their capacities to prevent floods, but this responsibility is also viewed to be a moral responsibility of citizens (see table 9: Key take-away citizen views on moral responsibility).

All interviewees thought that citizens do not have the capacities to prevent floods and the extent to which citizens perceive themselves to be able to reduce the impact of a flood on household level is also viewed to be limited by one part of the interviewees. It is considered that the water levels would be so high that it is impossible for an individual to act and the only thing you can do is watch and hope that it is not causing too much damage (participant C4 & C8). Moreover, the water could come very fast and by the time someone can respond to the water, it would already be too late (participant C6). Relating to taking measures to prevent floods, it is viewed that for some measures knowledge is required which most citizens would not have.

“A local engineer might know what to do, but you can not expect this from the average homeowner” (participant C1).

In the same line of reasoning, the majority of the interviewees argue that the government does have the resources and capacities to prevent floods from happening. This goes back to the idea that the government has the abilities to prevent floods, because *“we are living in a high flood risk area, but we are able to control these risks”* (participant C4). Expectations are discussed that the government has experts to come up with long-term interventions to deal with rising water levels as a result of climate change (participant C7).

“The government can with its knowledge, money and other resources employ experts, technicians and other companies to take measures to prevent floods.”
(Participant C1)

The government is bound to the duty of care according to the interviewed citizens, and thus has to do everything in their capacities to manage flood risks. The government is morally obliged to serve the public interest and should therefore ensure flood safety (participant C2). The government has to care for guaranteeing that the flood defenses comply with the safety norms (participant C4). The extent to which the government complies with the duty of care depends on the political party that is in power at a certain moment according to participant C2. For example, a more social left-winged government finds the guarding and caring role of the government more important than a liberal government (participant C2).

Furthermore, it is generally viewed that the government has the moral responsibility to establish a financial compensation fund after a flood, even if the government can not be held accountable (participant C2, C3, C5 & C8). Especially in situations where the impact of the flood has been substantial and the insurance company does not cover the expenses, such as the flood in Limburg in 2021, it is expected that the government creates an emergency fund for disasters (participant C2 & C3). This comes from the idea that some citizens lack the resources to financially recover from a large flood event. Since the government can not always be held accountable for a flood, the compensation fund would be a voluntary moral responsibility (participant C4 & C7).

When looking at household-level flood protection measures, it is viewed that citizens do have a moral responsibility to prevent water damage as much as possible in case of a flood event. Since most participants indicated that they expect that they would have to pay for the damages themselves, it is mentioned that *“you have an interest to protect your own house”* (participant C7). Therefore, it is viewed that citizens should contribute to limiting the impact of floods as much as possible (participant C2, C5 & C6). Examples of contributions that are mentioned are moving important belongings upstairs,

ensuring adequate water drainage opportunities and putting sandbags in front of the house. It is also considered a moral obligation to communicate to neighbors about how they can help each other in an emergency situation (participant C7).

“I think we should look at how we can help each other in times of an emergency situation. ... I think you should take up collective responsibilities on a neighborhood scale.” (Participant C7)

Another frequently mentioned moral obligation of citizens is the signaling function. This function includes looking at the dikes and water levels when walking near the dikes (participant C2, C3 & C4). Inspecting the state of the dikes and giving the information to the government if something stands out is perceived to be an important task of citizens (participant C2). However, it can be questioned if citizens have the skills and knowledge to inspect the dikes correctly (participant C3).

“I think you have a signaling function as citizens. That when you walk on the dike, you look at the water levels. But as citizen you should monitor the condition of the dike.” (Participant C2)

Moral responsibility	It is generally viewed that both citizens and the government need to do everything in their capacities to limit the impact of a flood event. The government is also morally responsible for establishing a compensation fund after a flood event, because not all citizens have the capacities to recover from a flood.
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Table 9 Key take-away citizen views on moral responsibility

Desired responsibility division

The current division of responsibilities is viewed to be similar to how the majority of the participants would like the responsibilities to be divided (see table 10: Key take-away citizen views on desired responsibility). For one part of the interviewees this means that the government should continue to be responsible for FRM, and it is expressed that the government needs to have more resources to reduce the impact of a flood (participant C1, C3 & C7). Another part of the interviewees felt that citizens also should have some responsibilities in protecting their house from floods, however it is viewed that the main responsibilities in FRM should continue to be a responsibility of the government (participant C2 & C5 & C8).

However, it is generally perceived that the communication by the government about the exact contents of the responsibilities of citizens in FRM should be improved. For example, more should be known about the actual flood risks and possible measures that citizens can take to limit water damage in their house (participant C3 & C6). It is currently viewed to be unclear to what extent homeowners are legally responsible for taking flood protection measures and therefore more should be known about what is expected from citizens (participant C3).

“In my opinion it is very unclear. There should be more known about it. If for example the homeowner is responsible, then the flood risk should be communicated.” (Participant C3)

Other suggestions for the government are to “translate moral responsibilities of citizens into legal obligations” (participant C7), to increase the awareness of flood risks (all participants), to provide adequate education about possible citizen contributions (participant C8), to create a subsidy arrangement (participant C8) and to hand out sandbags (participant C2). A water label could also be an interesting measure to increase the flood risk awareness of citizens (participant C8).

Yet a difference could exist between how someone would like the responsibilities to be divided and what a realistic division is (participant C6). For example, the government should take the responsibility of guaranteeing flood safety when building somewhere, by looking at long-term climatic predictions, and citizens should also be fully prepared for floods (participant C6). However, this would not be a realistic option according to participant C6, because floods cannot be prevented for one hundred percent and people cannot be influenced to only make the right choices and be prepared for floods.

Desired responsibility	The desired responsibility of the interviewees is viewed to be similar to the current situation. Yet adequate communication about these responsibilities, what the responsibilities mean for citizens, possible courses of action for citizens and flood risks, is perceived to be lacking.
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Table 10 Key take-away citizen views on desired responsibility

5.3 Responsibility in the decision-making of citizens to take PLFRA measures

Several PLFRA measures were taken by the interviewed citizens, which are the closing of holes in the basement (participant C8), ensuring adequate drainage capacities in the garden (participant C2, C5 & C6), and moving belongings from the basement (participant C5). These measures can be classified according to the categorization of Attems et al. (2020), under respectively a dry proofing measure, a measure to avoid flood discharge, and a wet proofing measure. The extent to which responsibility is included in the decision-making process of taking or not taking PLFRA measures will now be discussed, by first going into the reasoning of the participants why they decided to implement or not implement PLFRA measures and how the willingness to take PLFRA measures was influenced by thinking about the division of responsibilities in FRM. This is structured around how the four notions of responsibility are translated into deciding to (not) take adaptive actions or (no) willingness to take adaptive actions. Lastly, this paragraph describes other factors that influenced their decision-making to take or not take PLFRA measures.

Legal responsibilities and decision-making process for PLFRA measures

The views on legal responsibilities in FRM are used in the underpinning for both perceiving to not needing to implement PLFRA measures (participant C1, C3, C4 & C7) as well as for deciding to implement PLFRA measures (participant C2, C5, C6 & C8). Flood risk management is by the majority of the interviewees firstly associated with measures to prevent floods from happening, while most interviewees had never thought of implementing PLFRA measures. Therefore, the perception of the interviewees that did not implement PLFRA measures was that they did not need to do take adaptive actions, because citizens are not legally responsible for FRM while the government is legally responsible for FRM (participant C1, C3 & C4). However, it is viewed that if the government wants citizens to contribute to FRM, then a willingness to support the government with measures is expressed (participant C2).

“The government is advocate of the public interest and citizens have no role in this. I think it is legally assigned to the government. So I do not see myself contributing to this, but if I the government wants me to contribute with a shovel, I will contribute.” (Participant C2)

The legal responsibility of the government to make spatial planning decisions about building locations is perceived to be an important reason to not implement PLFRA measures. It is found that these interviewed citizens generally had never thought of adapting their house to flood risks, because the government is present so that taking such measures is unnecessary (participant C3 & C4). This comes from the expectation that in spatial planning decisions, the government is legally obliged to take flood risks into account, so it can be expected that houses are not located in vulnerable areas (participant C1, C3 & C7). In this line, the legal governmental responsibility is used as an underpinning for not implementing PLFRA measures.

“No I am not taking property-level flood risk adaptation measures, because of what I was saying. I think that this is a governmental responsibility, especially in the field of spatial planning.” (Participant C1)

The interviewees that did implement PLFRA measures expressed that this decision came from the understanding that the water that falls within your property boundaries is a legal responsibility of citizens themselves (participant C2 & C5). It is viewed that the government is legally not responsible for private property, so previous experiences with water nuisance for which the government is not perceived to be responsible, has resulted in the implementation of PLFRA measures (participant C5, C6 & C8).

Accountability and decision-making process for PLFRA measures

The limits to the accountability of the government after a flood event has happened, is mentioned to be a reason for being willing to take PLFRA measures and for actually implementing PLFRA measures. All interviewees recognized that there are limits to which the government can be held accountable for a flood event and citizens would have to pay for flood damages. Therefore, a willingness was expressed to implement PLFRA measures, because a flood can happen while the government has done everything in their capacity to prevent this and limit the impact, so then it is expected that citizens have to take emergency measures (participant C4 & C8).

“It is really difficult as a citizen to do something. You assume that the government solves these issues. And it is possible that it goes wrong, but if it goes wrong, I can imagine that the government arranges that sandbags can be collected by citizens.” (Participant C8)

However, the underlying perception is that the government is doing well in preventing floods from happening, by mentioning that *“I am paying for it, for the constant investments in the raising of the dikes and so on”* (participant C4). It is generally expressed by the interviewed citizens that they have a high level of confidence in the extent to which the government can prevent a flood from happening.

“I think the government can lower water levels and bring the water to outer dike areas. .. I trust that the government and waterboard are doing well in taking safety measures.” (Participant C6)

The limited accountability of the government for flood events is also mentioned by participants to be a factor that influenced the decision-making to actually implement PLFRA measures. It is mentioned that after water entered the basement of the interviewee, he closed the holes of the basement to prevent this from happening in the future, because the government can not be held responsible for water that entered the basement (participant C8). It is perceived that citizens would have to pay for the damage themselves after a flood event happened, so it is in your own interest to take PLFRA measures (participant C5).

Moral responsibilities and decision-making process for PLFRA measures

The views on moral responsibilities in FRM also resulted for the interviewees that did not implement PLFRA measures in the expression of being willing to take measures. The nuance of perceiving to have an own moral responsibility after discussing the division of responsibilities in FRM, resulted in the willingness to take PLFRA measures. This willingness is generally explained by the notion that citizens are morally responsible to take PLFRA measures as much as possible, so if taking PLFRA measures lies in your capacities, such measures need to be taken (participant C1, C3 & C4). Therefore, a willingness is expressed to take PLFRA measures, such as placing sandbags and ensuring adequate drainage (participant C6).

“I would, in case of a flood event, collect sandbags to limit the water damage as much as possible, because this is my own responsibility.” (Participant C6)

A general willingness for other types of citizen involvement in FRM is also mentioned, as a result of the moral obligations of citizens to support the government in their execution of FRM tasks (participant C1, C3 & C4). This moral responsibility comes from the perception that the government lacks the capacities to completely prevent floods solely (participant C3 & C4). A willingness was expressed to support the government by signaling if the water levels are becoming high, conducting inspection of the dikes and signaling if an area has inadequate drainage opportunities (participant C1, C3 & C4). Especially ensuring adequate drainage opportunities is mentioned to be a measure that most citizens are viewed to be capable of (participant C7). Therefore, the willingness was expressed to remove tiles from the garden and remove leaves from drainage facilities (participant C3 & C7).

However, one interviewee raised concerns about the extent to which taking PLFRA measures would impact their living environment. For example, it is mentioned that *“sealing the house to make it waterproof would decrease the living environment”* so therefore this participant did not want to take such PLFRA measures (participant C4).

Desired responsibilities and decision-making process for PLFRA measures

The views on the desired division of responsibilities are not mentioned in the decision-making process for taking PLFRA measures. However, the views on the desired division of responsibilities did contribute to the awareness of citizens of how they would expect other citizens to be responsible for involvement in FRM and to what extent they are themselves executing these responsibilities by being involved in FRM. For example, it is mentioned that it can not be desired that citizens have responsibilities in FRM while the interviewee is not implementing PLFRA measures (participant C2). Therefore, this participant took measures to increase the drainage capacities of the garden, because he perceived that citizens should have responsibilities in FRM (participant C2).

“I can not say that other citizens need to take measures, while I am not doing anything. ... I can not desire something from someone when I am not doing that myself.” (Participant C2)

In sum, a part of the interviewed citizens did not consider before the interview how the responsibilities are divided in flood risk management and whether citizens have an own responsibility in adapting their house to flood risks. Therefore, the interviewees that did not implement PLFRA measures nuanced their opinions about responsibilities in FRM during the course of the interview. During the course of the interview, the willingness of these interviewees was expressed to take PLFRA measures, as a result of their views on the limited accountability of the government and the moral responsibilities of citizens. The views on legal responsibilities and accountability in FRM are used as an underpinning by the interviewees that actually implemented PLFRA measures.

Other factors that influence the decision to take PLFRA measures

Other factors that were mentioned to explain why PLFRA measures were not implemented or no additional PLFRA measures were implemented, are the perceived flood risk, affordability and availability of resources. The reasoning to not implement PLFRA measures is generally explained by a low perceived flood risk. The majority of the interviewees associated flood risks with fluvial floods in which the river breaks out of its banks, while three interviewees also mention the risks of pluvial floods. When discussing fluvial floods, all interviewees think that there is not a high probability that the area they live in will flood in the near future. It is explained that they do not know if this area has a high flood risk and therefore assume that there is no flood risk (participant C1, C3 & C5). Even if there is an extreme weather event with high levels of precipitation, it is not expected that the flood defenses will fail and cause a flood (participant C1, C4 & C6). Flood probabilities of a flood once in 100 years or in

250 years are estimated (participant C1 & C6). Also, an interviewee of an older age (60+) estimates that a flood will not occur anymore in his lifetime (participant C5). These interviewees have never experienced a flood, and it is viewed that the waterboard is doing everything they can to continue to raise dikes and they thus feel protected for floods (participant C3 & C7). According to participant C6, there is an overflow area near his house and in the past times of high water levels, he has never seen the area full of water.

“Just outside this neighborhood there is an overflow area. I have seen this area marshy but it has never flooded. And I understand that construction of houses is not allowed in that area, at least not at ground level.” (Participant C6)

For floods that are induced by heavy rainfall, the probabilities are estimated to be higher, such as once in ten years (participant C1). However, it is expected that the damage is not that high for pluvial floods, so therefore no PLFRA measures were implemented (participant C1). Other interviewees did not mention the flood risks perceptions for pluvial floods (participant C3, C5, C7 & C8). The interviewees that did implement PLFRA measures, had experienced a flood with limited damage in the past and therefore decided to take PLFRA measures (participant C2, C5, C6 & C8).

Other factors that were mentioned by the interviewees that did not take PLFRA measures, were the affordability of PLFRA measures (participant C3) and the resources that someone has to take PLFRA measures (participant C1 & C4). Taking PLFRA measures requires investments and it is argued that *“right now I wouldn’t invest money in it, because I think the probability is not that high, even though I feel that it is my own responsibility”* (participant C6). Furthermore, it is mentioned that not everyone is physically capable of taking PLFRA measures (participant C1). It is also mentioned that lacking the resources, such as sand to fill up sandbags, is a reason to not take PLFRA measures (participant C4).

6. Discussion

The results of this research, which are described in the previous two chapters, will now be reflected upon and critically interpreted by relating the results to the findings of other studies. This chapter will start by answering the four sub-research questions and interpreting the results of the research. After that, a reflection is made on the methodology and the strengths and limitations of this research.

6.1 Citizen views on responsibilities in FRM

The findings of the first research question about how property owners view the division of responsibilities in flood risk management suggest that citizens primarily view the government to be responsible for FRM and that the responsibilities of citizens are viewed to be limited. At the start of the interviews, the citizens generally perceived that the government is exclusively responsible for flood risk management. Flood risk management is generally associated with preventing floods from happening, while it is found in this research that responsibilities for adapting to flood risks are hardly considered by citizens. In this line of thought, citizens are viewed to be obligated to pay the taxes, after which the government is responsible for deciding where houses can be build. One part of the interviewed citizens argues that the government is legally responsible for guaranteeing flood safety of neighborhoods, while another part of the interviewees believe that citizens are responsible for knowing the flood risks of the location they decide to live in.

However, this perception of exclusive governmental responsibilities in FRM was nuanced after asking more specific questions about the four notions of responsibilities in the interviews. In this research it is found that citizens recognize the limits of the accountability of the government after a flood event happened. This is underpinned by the perception that a flood event is a natural disaster, which is not caused by the government. The majority of the interviewees thus perceive that citizens themselves are accountable for the damage after a flood event occurred. Therefore, it is viewed that citizens have the moral responsibility to do everything in their capacities to limit water damage in their house. Yet one part of the interviewees perceived that citizens lack the capacities to limit water damage in their house, and view that the government has the capacities to prevent floods and reduce the impact of floods. For these citizens, the perceived moral responsibility of citizens is related to supporting the government with tasks such as dike inspections and signaling if the water levels would be high.

Furthermore, one part of the interviewed citizens perceive that the government has the primary legal responsibility in FRM, while another part of the citizens perceive that citizens are legally responsible for water that falls within their property boundaries. When the water comes from outside their property boundaries, the government is viewed to be legally responsible. The desired division of responsibilities is according to citizens similar to how the responsibilities are currently divided in FRM, which means that citizens desire their own responsibility in FRM to be present to a small extent. The government should be given more resources for the necessary adaptations of FRM to climate change and should communicate better about flood risks and the responsibilities that citizens have.

This finding is partially in line with previous studies, which found that citizens of various countries perceive the government to be primarily responsible for flood risk management (Begg., 2018; Terpstra & Gutteling, 2008; Mees et al., 2016; Rauter et al., 2020; Henstra et al., 2019). The results of this study support the notion in literature that citizens generally perceive the government to have large responsibilities in FRM, but this research has also found that citizens view themselves to have some responsibilities in FRM. This research has expanded existing knowledge, by showing that citizens generally recognize the limits of the accountability of the government in case of a flood. Furthermore, it is found that citizens perceive themselves to have moral obligations to attempt to limit the water damage in their house, and support the government with tasks such as dike inspections. Supporting the government with knowledge on the status of the dikes and water levels, is an action which can be

categorized as a behavioral action of citizen involvement in FRM, according to Forrest, Trell and Woltjer (2021).

This expansion of existing knowledge could possibly be explained by the differences in how responsibility is operationalized in this research. The previous studies have operationalized responsibility as the perceived responsibility in FRM. However, this research has operationalized responsibility as a concept with four notions, and reviewed perceptions of legal responsibility, accountability, moral responsibility and desired responsibilities in FRM. This could have resulted in a more nuanced picture of the views on responsibilities in FRM than what is found in previous studies. A study of Snel et al. (2021) conducted in the United Kingdom used a similar nuanced operationalization, and has, in line with the findings of this research, found that citizens do perceive to have a moral responsibility in flood risk management.

This research also supports the notion in literature that citizens can have different perceptions of legal responsibilities in flood risk management. It was found that one part of the interviewed citizens perceive themselves to be responsible for water that falls within their property boundaries and it is therefore interpreted that water that comes from outside property boundaries is part of the legal responsibilities of the government. This is similar to the study of Snel et al. (2021), in which it was found that residents can have different interpretations of formal rules and actions. This could imply that the legal responsibilities in flood risk management are currently perceived to be unclear by citizens, which was also expressed during the interviews.

Similar to the results from the study by Snel et al. (2021), the decision to take out an insurance policy for damage as a result of floods, is viewed to be part of the legal responsibilities of citizens in FRM. Taking out an insurance policy for flood risks can be viewed as part of citizen involvement in FRM, because this measure helps with the financial recovery of a household after a flood. However, it is found that citizens expect that water damage after a flood can be claimed with insurance companies, while currently no insurance companies in the Netherlands insure for water damage as a result of failure of a primary and in some cases regional flood defense (Botzen & van den Bergh, 2008; Aerts & Botzen, 2011). This implies that the perceived involvement of citizens in FRM by taking out an insurance for damage as a result of floods, is not aligned with the actual opportunities for behavioral action, since damage for flood events in case of failure of a primary or regional flood defense is not covered by the insurance companies.

6.2 Policymakers views on responsibilities in FRM

The findings of the second research question about the views of policymakers on responsibilities in FRM, show that policymakers view the government to be responsible for preventing floods, while measures to reduce the impact of floods are a responsibility of both citizens and the government. This is similar to the expressions of citizen responsibilities found in the policy documents analysis. It has been found in this research that policymakers view citizens to be legally responsible for adapting their house to flood risks, because the government can not always be held accountable for floods. It is generally perceived by policymakers that in the face of climate change, the traditional approach of ensuring water safety with dikes and pumps is becoming insufficient. In the policy documents this is also found, by stating that future measures can never create a 100% certainty that floods will not occur. The capacities of the government to prevent floods are perceived to be limited according to the interviewed policymakers, so therefore citizens need to be prepared for and adapted to increasing floods risks.

It is perceived by policymakers that citizens have a moral responsibility to adapt their house to flood risks, as a result of the limited accountability of the government. However, it is also viewed by policymakers that there are still many more responsibilities that the government is morally obliged to

take on. For example, including water systems in spatial planning decisions can be done better by the government. This perception of policymakers comes from the underpinning that the government is currently legally responsible for flood risk management and citizens are only responsible for water that falls within their property boundaries. The desire of the interviewed policymakers is expressed that citizens receive more responsibilities in flood risk management, especially when it comes to adapting to flood risks.

In explaining why the interviewed policymakers desired citizen involvement in FRM, it is generally expressed that climate change has created a situation in FRM in which everyone is needed to reduce flood risks. This is similar to the findings of the theoretical framework, in which the “*all-hands-on-deck*” situation is mentioned of Snel et al. (2020) to be one of four reasons for involving citizens in FRM. However, the study by Snel et al (2020) has found that this argument is too abstract for citizens to relate to and to take actions. This could imply that the argumentation of policymakers to involve citizens in FRM needs to be improved to legitimize why citizens should be given more responsibilities in FRM.

The views of policymakers on responsibilities in flood risk management support the notion in literature that there is a shift towards a desired growing involvement of citizens in FRM by policymakers (Kuhlicke et al., 2020; Hartmann et al., 2021). Furthermore, this research has found that policymakers desire that citizens are also responsible for reducing the impact of a flood. This is similar to the findings of several studies, in which it is argued by policymakers that flood risk management should become a shared responsibility of citizens and governmental actors (Mees et al., 2016; Henstra et al., 2019; Snel et al., 2019). However, this finding that policymakers desire citizens to have more responsibilities in FRM raises new questions about the exact extent to which responsibilities should and could be allocated to citizens, because not all citizens have similar capacities and resources to take up responsibilities in FRM.

A difference is made by the interviewed policymakers between the legal responsibilities of different tiers of government. It is assumed that other tiers of government fulfill certain tasks when the government body that the policymaker works for is not taking up this task. Especially when discussing how policymakers desire the responsibilities to be divided in the future, it is indicated that the policymakers generally want to improve the collaboration between the different tiers of government. This suggests that policymakers would like a redistribution of the responsibilities in FRM between the different tiers of government. This could imply that the current fragmentation of responsibilities in FRM between the tiers of government causes tasks to fall through the cracks.

6.3 Reflection of the views on responsibilities of citizens and policymakers

The previous two paragraphs have presented the views on responsibilities in FRM from the perspective of citizens and policymakers. These findings are now synthesized to create a better understanding of the similarities and differences between these two stakeholder perspectives.

The results of this research show that the views of policymakers and citizens on responsibilities in FRM are mostly similar to each other. It is found that both citizens and policymakers view that there are limits to which the government is accountable for floods, especially in the face of climate change. The government is therefore viewed by both stakeholders to be not exclusively responsible for FRM, meaning that citizens also have a moral responsibility in FRM.

The majority of the interviewees perceived the moral responsibility and the legal responsibility to be the most important type of responsibility. However, the views on moral responsibility resulted in the expression of concerns for both citizens and policymakers about the extent to which citizens have the capacities to adapt their house to flood risks. While citizens are perceived by both stakeholders to have a moral responsibility in FRM, it is argued that some citizens might lack the capacities and resources to implement PLFRA measures. This suggests that while the moral responsibility of citizens is perceived

to be one of the most important types of responsibility, the exact extent to which citizens are viewed to have a moral responsibility in FRM is questioned.

Furthermore, the views on legal responsibilities of citizens and policymakers are found to be disputable. The interviewed citizens expressed that the legal responsibilities are unclear and that they would not know if citizens have legal responsibilities in FRM. For one part of the interviewed citizens, it is therefore assumed that the government has the primary legal responsibility in FRM and that the responsibility of citizens is purely a moral responsibility rather than a legal responsibility. Another part of the interviewed citizens assume that citizens are legally responsible for water that falls within their property boundaries. Yet policymakers perceive that citizens already have legal responsibilities for adapting their house to flood risks. This suggests that the views on the legal responsibilities are contested, which could result from a lacking clarity on the legal responsibilities in FRM.

Contesting views are also found in the perceptions of the desired responsibilities of citizens and policymakers. One part of the interviewed citizens think that the current division of responsibilities in which the government is primarily responsible for FRM is adequate, while another part of the interviewed citizens expressed that citizens should also have some responsibilities in FRM. It is found that citizens generally would like the government to take up more responsibility for adapting the environment to flood risks and for the communication about these responsibilities and risks. Yet policymakers expressed the desire that citizens have more responsibilities in FRM. This shows that there are differences between the views on responsibility of citizens and policymakers and how they would ideally like these responsibilities to be divided. This is found by Begg (2018) to be an important issue for shifting towards an egalitarian approach of citizen involvement in FRM, because it is found that a shared understanding of responsibilities in FRM is essential to ensure that all citizens have the capacities and resources to protect themselves from flood risks. Therefore, the debate about responsibilities in FRM should be started to create a shared understanding of which division of responsibilities in FRM is considered to be desirable.

6.4 Extent of policymakers supporting the implementation of PLFRA measures

The results of this research show that policymakers view the extent to which the government is stimulating citizens to take PLFRA measures to be limited. It is found in the policy documents analysis and the interviews with policymakers that citizens are only stimulated to a limited extent to take PLFRA measures.

The policy documents and governmental websites show that the usage of “sticks” to stimulate citizens to take action is being reviewed, but not implemented. Furthermore, the usage of “carrots” to persuade citizens to take action with economic means is limited to providing a subsidy for implementing a rainwater tank and for social housing also for removing tiles from the garden. Providing information, “sermons”, is mostly done on the governmental websites by supporting with links, written information and knowledge from experts. The interviewed policymakers expressed that policy instruments to stimulate citizens to take PLFRA measures are not used to a sufficient extent and more could be done in the form of creating legal obligations, subsidies and increasing the awareness about flood risks. However, as the previous paragraph has shown, policymakers did express the desire that citizens have more responsibilities in FRM. These findings suggest the presence of underlying barriers for supporting the implementation of PLFRA measures with policy instruments.

In this study it is found that policymakers have several concerns about allocating responsibilities in FRM to citizens. It is found that policymakers generally have the perception that the previous tradition of flood risk communication means that it can not be expected from citizens that they are prepared for floods. The long historical trend of telling citizens that the government is responsible for flood risk management and that the government has the management of floods completely under control is no

longer perceived to be accurate. However, it is viewed by policymakers that the limits to governmental capacities are inadequately communicated to citizens. Therefore, it can not yet be expected that citizens will take adaptive actions to become flood resilient.

Moreover, it is found in this research that policymakers are concerned about the capacities of citizens to take their own adaptive actions. Policymakers generally express the concern that adding a legal responsibility to citizens for taking PLFRA measures might not be the right thing to do, because not every citizen has the capacities and resources to take these measures. Differences in resources of citizens could possibly mean that resourceful citizens are better able to adapt their house to flood risks than others, which potentially creates a divide between wealthy well protected citizens and citizens with less resources that are unable to protect themselves from floods. This suggests that before responsibilities should be shifted to citizens, there first needs to be a wider societal debate about how to deal with differences in capacities of citizens to take adaptive actions. This concern about resource inequality is similar to the findings of Uittenbroek, Mees, Hegger and Driessen (2020), who argued that a shift in responsibilities for citizens should be accompanied by a relocation of resources. This raises new questions about the fairness of increasing the responsibilities of citizens and the extent to which citizens have the capacities to take PLFRA measures. This research has found several arguments for and against shifting the responsibilities in FRM towards citizens, which implies that a wider debate should be started about if society would want citizens to take PLFRA measures.

However, since it was found in this study that policymakers would generally like citizens to have more responsibilities in FRM, this could imply that with the provision of adequate resources, policymakers view citizens to be better able to reduce the impact of a flood event. According to policymakers, there are still many opportunities to increase the flood risk awareness of citizens and stimulate citizens to take adaptive action. The focus of policymakers is currently on stimulating citizens to take measures for the avoidance of flood discharge to ensure adequate drainage capacities of the garden, by for example taking de-tiling measures or removing leaves from the gutter. However, other measures, such as making the floor flood proof, removing important belongings upstairs, placing a water barrier or sandbags, and closing holes in the basement are perceived to not be stimulated yet. It is perceived that these dry-proofing and wet-proofing measures are becoming important in the future. As described in the theoretical framework, avoidance of flood discharge measures are aimed at preventing floods by reducing the amount of water in a location, whereas other PLFRA measures are focused on limiting and adapting to the impact of floods (Attems et al., 2020). This implies that policymakers are still preferring to aim at attempting to prevent floods, and not yet completely accepting that floods can happen and adaptation to limit the impact is also needed.

6.5 Relating views on responsibilities to decision-making of citizens for PLFRA measures

The findings of the fourth research question indicate that the interviewed citizens use their perception of responsibilities in FRM in their underpinning for deciding to (not) implement PLFRA measures. It is found that the views on accountability and moral responsibility resulted in a willingness to take PLFRA measures for the interviewees that did not implement PLFRA measures, while the interviewees that actually implemented PLFRA measures used the views on legal responsibility and the accountability as an argument for their decision.

One part of the interviewed citizens did not implement PLFRA measures, because of a strong reliance on the governmental responsibilities in FRM. For these interviewees, taking PLFRA measures is perceived to be unnecessary, because it is the legal responsibility of the government so therefore citizens would not need to take these measures. The government is viewed to have a guardian role for citizens and with the taxpayers money, the government has the capacities to prevent floods and ensure that the impact of a flood would be limited. Also, it is mentioned that they did not take PLFRA measures

because the government is legally responsible for making spatial planning decisions about building locations, so citizens can assume that there are no flood risks in their neighborhood.

However, this was nuanced during the interviews by expressing a willingness to take PLFRA measures, as a result of thinking about the division of responsibilities in FRM. It is found that the perceptions of the limited accountability of the government after a flood event happened and the moral responsibility of citizens to adapt to flood risks as much as possible, created a willingness to take PLFRA measures among citizens that did not yet implement PLFRA measures. Citizens have to pay for the damages themselves after a flood event happened, so if a flood would happen, these citizens were willing to take PLFRA measures to limit the water damage. Furthermore, it is viewed that citizens have a moral responsibility to care for their own property, so if taking PLFRA measures lies in your capacities, such measures need to be taken to limit water damage. In this line it is expressed that they would be willing to take PLFRA measures.

Another part of the interviewed citizens did implement PLFRA measures, such as moving important belongings to a higher floor level, closing holes in the basement and ensuring adequate drainage opportunities. This decision is underpinned by emphasizing the legal responsibilities of citizens and the limited accountability of the government. These interviewees perceive that limiting water damage is their own legal responsibility, because the government is legally not responsible for water that falls within your property boundaries. For these interviewees it is perceived that limiting water damage is a legal obligation that comes with buying your own property. Furthermore, it is mentioned that the government can not always be held accountable for water that enters their property boundaries. Citizens would have to pay for the damage themselves after a flood occurred, so it is perceived that it is in your own interest to take PLFRA measures. Therefore, previous experiences with water nuisance for which the government is not perceived to be responsible, resulted in the decision to implement PLFRA measures.

In line with the extended version of the Protection Motivation Theory (PMT), as described in the theoretical framework, these findings suggest a relation between the perceived responsibilities in FRM and adaptive behavior. The extended version of PMT argues that the combined effect of the variables risk perception ("*threat appraisal*"), the capacities to take measures ("*coping appraisal*") and the sense of responsibility ("*ownership appraisal*"), influence the decision-making process of citizens to take adaptive actions (Oakley et al., 2020). This research has also shown that the perceptions of responsibilities in FRM influence the extent to which adaptive action is taken by citizens.

However, this research has expanded existing knowledge, by providing a deeper understanding of how the perceptions of different notions of responsibility explain the decision-making process for implementing PLFRA measures. It has been found that especially the views on moral responsibility and accountability influence the willingness to take PLFRA measures, while the views of the legal responsibility and accountability were used as argumentation for the actual implementation of PLFRA measures. However, similar to both argumentations is that citizens view that buying a house comes with certain obligations, which can be either moral in the form of being morally responsible for caring for your own property or legal in the form of being legally obligated to prevent damage to your property. This suggests that the implementation of PLFRA measures can be increased by stimulating citizens to think about the limited accountability of the government after a flood event occurred and about the responsibilities that citizens have for their own property.

Furthermore, the citizens that did not implement PLFRA measures argued for this decision that citizens are legally not responsible for FRM, while citizens that did implement PLFRA measures used their own legal responsibilities as an argument for deciding to take these measures. It is also found in this research that a large part of the interviewed citizens view the legal responsibilities of citizens to be unclear. This

implies that a clear communication about the legal responsibilities of citizens in FRM could increase the implementation of PLFRA measures by citizens.

The findings of this research also show that deciding to not implement PLFRA measures is grounded in a strong reliance on the government in FRM and a high perception of the government being responsible for FRM. An explanation for the strong perception of governmental responsibilities in FRM can be found in the narrow scope of actions undertaken by policymakers to communicate FRM responsibilities and to stimulate citizens to take PLFRA measures. This is in line with a large body of literature, which indicated that stimulation of citizens with governmental policy instruments is essential for creating a sense of urgency that citizens need to take their own measures to protect their house (Davids, Priest & Hartmann, 2023; Grothmann & Reusswig, 2006; Snel et al., 2019). Also, several interviewees indicated that they would not need to take responsibility for the implementation of PLFRA measures, because they perceive that the government has FRM under control. The finding that citizens generally perceive that the government is doing well in creating protection from floods is similar to several studies that have found that Dutch citizens have a high level of confidence in the government (Terpstra & Gutteling, 2008; Zaalberg et al., 2009). This implies that communicating the limits to which the government is capable of preventing floods and can be held accountable for floods is important for increasing the implementation of PLFRA measures by citizens.

6.6 Reflection on methodology and results

Several reflections on this research can be made, which influences how the results of this study should be interpreted. The limitations of the methodology and results will be discussed in this paragraph, starting with the generalizability of the results. After that, reflections are made on the interviewees that participated in the research and on the methodological choice for two types of stakeholders. Lastly, the influence of contextual factors on the results of the research is reflected upon.

Generalizability of the results

This research has adopted a case study approach to create a deeper understanding of the views of responsibility and their relation to the implementation of PLFRA measures in the mid-sized city of Zwolle. Therefore, the results of this study are not externally valid, meaning that the results can not be generalized for other mid-size cities in the Netherlands. However, generalizability was not the objective of this qualitative research, since the aim of this research was to gain in-depth insights into the opinions, perceptions and beliefs about responsibilities in flood risk management and how this influences the implementation of PLFRA measures. The case study of Zwolle was carefully selected based on the flood risks and the ambitions of the municipality to be a front-runner city in flood risk management in the Netherlands, providing interesting insights into the stakeholder views on responsibility. The case study of Zwolle has allowed for an in-depth understanding of the perspectives of different stakeholders on responsibilities in flood risk management.

Reflection on interviewees

It should also be noted that the demographic and socio-economic backgrounds of the interviewees are limited in their diversity. An overrepresentation of males over the age of 60 living in semi-detached houses is found in the backgrounds of the interviewed citizens. Diversity between demographic characteristics and socio-economic backgrounds are important for creating a better representation of the variety of views that property owners potentially have on responsibilities in flood risk management. Several attempts were made to limit this bias in the sample population. First of all, door-to-door research was performed to attempt to reach all potential interviewees and not only receive an accepted interview invitation via email from interviewees that are interested in the topic. Furthermore, it was attempted to specifically find interviewees from a lower socioeconomic background and age. This was done by on the one hand, distributing notes in parts of the neighborhood that contained houses of a lower economic value. On the other hand, potential interviewees with a lower age, which are likely to

be not at home during weekdays, were attempted to be found by conducting the door-to-door research on different days of the week, including Saturday.

Also, only the views of policymakers of the municipality and waterboard and of property owners were included in the research, due to time constraints. Other possible stakeholders, such as insurance companies and commercial property owners, could provide new perspectives on how views of responsibilities influence the implementation of PLFRA measures. However, an important strength of this research is that the perceptions of multiple stakeholders were included instead of only reviewing the views of one stakeholder group. The inclusion of both policymakers and property owners in this research has created a more comprehensive understanding of how responsibilities in flood risk management are viewed and allowed for more accurate policy recommendations in which the views of both these stakeholders are matched.

Influence of contextual factors

Lastly, it is important to note that the findings from the single case study of Zwolle are embedded in a geographical, cultural, social, economic and political context that could have influenced perceptions on responsibilities in flood risk management and perceptions of implementing PLFRA measures. For example, the political agenda shapes the extent to which the adaptation to flood risks is stimulated by the municipality or waterboard. The municipality of Zwolle expressed the ambitions to become a front-runner city when it comes to climate change adaptation, which could have influenced the extent to which awareness for adaptation to flood risks is raised and hereby perceptions on responsibilities in FRM. The knowledge gap in the introduction of this research showed that the decision-making process to implement PLFRA measures is influenced by a large variety of factors, such as socio-economic factors and underlying cognitive motivations. The scope of this research is limited to reviewing underlying ideas about responsibilities in flood risk management, meaning that other factors that could influence the implementation of PLFRA measures were not included in this research.

7. Conclusion

Policymakers and the scientific community are calling for a growing involvement of citizens in flood risk management to respond to increasing flood risks. Dutch policymakers have expressed that floods can no longer be completely prevented, so citizens need to adapt to flood risks, by taking their own PLFRA measures. This is a break from a long historical tradition of the Dutch government being exclusively responsible for flood risk management. However, while PLFRA measures are found to be effective for reducing the monetary damage of a flood significantly, the implementation of these measures remains low. A large body of literature has identified the possible variables that explain this adaptive behavior. However, it has recently been argued that these factors form an inadequate explanation of the decision-making process of citizens to take PLFRA measures and that the perceived responsibility is important for explaining adaptive behavior. But while previous studies have operationalized responsibility as only the perceived responsibility, it has been found that the concept of responsibility is multi-faceted. Views on responsibilities in FRM are based on four notions of responsibility, namely legal responsibility, accountability, moral responsibility and desired responsibility.

Therefore, this research has analyzed the relation between the views of responsibilities in flood risk management and the implementation of PLFRA measures. This research has attempted to answer the main research question ***“How do stakeholder views of the division of responsibilities in flood risk management influence the implementation of property-level flood risk adaptation measures by Dutch private property owners?”***. A qualitative case study approach was adopted, by analyzing the views on responsibilities in FRM of policymakers and property owners in Zwolle, using the methods of semi-structured interviews and policy documents analysis. The main research question will first be answered, after which recommendations are provided for future research and for policymakers.

7.1 Answer to the main research question

The analysis of the views on responsibilities and their relation to the implementation of PLFRA measures has shown that the views of accountability and moral responsibility are influencing the willingness to take PLFRA measures, while the views on the legal responsibility and accountability are used as argumentation for actually implementing PLFRA measures. Half of the interviewed citizens did not implement PLFRA measures, while the other half did implement PLFRA measures. The implemented PLFRA measures can be categorized as a measure to avoid flood discharge, a dry-proofing measure and a wet-proofing measure. Furthermore, it is found that while policymakers desire that citizens are responsible for taking PLFRA measures, communication of this citizen responsibility and stimulation of the implementation of PLFRA measures with policy instruments is limited.

This research has found that the legal responsibilities in FRM are mainly viewed by both stakeholders to be responsibilities of the government. The legal responsibilities of citizens are viewed to be limited to citizens being responsible for the water that falls within their property boundaries, according to both stakeholders. It is found in this research that citizens view the legal responsibilities of citizens in FRM to be unclear. However, while one part of the citizens view the legal responsibilities of the government to be the most important responsibility, policymakers emphasize that the government is not solely responsible and that citizens also have legal responsibilities in FRM when it comes to adapting to flood risks. Yet this part of the citizens perceived that ensuring flood safety is an important governmental responsibility, because the government is responsible for deciding on building locations. It is perceived by the citizens that did not implement PLFRA measures that if a flood would happen, they would have to accept the damage. Therefore, these citizens perceived that they do not need to take PLFRA measures, because the government is mainly legally responsible for managing flood risks. However, the citizens that did implement PLFRA measures, decided to take these measures because they perceived that the government is legally not responsible for water that falls on private property, and limiting water damage is viewed to be part of the property rights of a property owner.

However, during the interviews the perceptions of citizens about the government being primarily responsible for FRM were nuanced, which resulted in an expression by interviewed citizens that did not implement PLFRA measures of being willing to take PLFR measures. It is found that both stakeholders recognize the limits to the accountability of the government after a flood event happened. It is generally perceived that floods are not always caused by the government and force majeure situations can occur in which the government is not accountable for the flood. This resulted in the perception of both policymakers and citizens that citizens are responsible for the possible damages after a flood has occurred. In this line of thought, a willingness of citizens to take PLFRA measures was expressed because it is in your own interest to limit the water damage, since the government can not always be held accountable for a flood. This was also used by citizens that implemented PLFRA measures as an argument for deciding to take these measures.

Furthermore, it is found that both stakeholders view that citizens and the government have a moral responsibility in FRM to do what they can to manage flood risks. However, while policymakers stress that there are limits to the capacities of the government to completely eliminate flood risks, citizens do perceive that the government has the capacities to manage flood risks, and citizens expressed a high level of confidence in the way the government is managing flood risks. Citizens generally expect that the government has the moral responsibility to tell citizens what needs to be done in case of a flood and that the government is morally obliged to create a compensation fund to support citizens after a flood event occurred, which is a voluntary governmental measure. However, it is found that both stakeholders view that citizens also have a moral responsibility in FRM. Policymakers and citizens perceive that if a citizen has the capacity to take a PLFRA measure, but decided to not take this measure, then this citizen is self-responsible. For example, citizens expressed that they can support the government in FRM with tasks such as signaling high water levels, conducting dike inspections and signaling inadequate drainage capacities. These views on moral responsibility are found to influence the willingness of citizens to take PLFRA measures because citizens view it as their own responsibility to care for their property, so if a flood would happen they expressed a willingness to take PLFRA measures.

In the views on the desired division of responsibilities, some contesting views are found. It is found that one part of the citizens viewed the current division of responsibilities in which the government is primarily responsible for FRM to be sufficient, while another part of the interviewed citizens expressed that citizens should also have some responsibilities in FRM. Yet policymakers desire that citizens have more responsibilities in FRM in the form of adapting their house to increasing flood risks. However, policymakers did express concerns whether citizens should receive more responsibilities in FRM, since this could create a divide between resourceful citizens and less resourceful citizens. Similarly, the interviewed policymakers expressed the concern whether it can be expected that citizens are capable of taking PFLRA measures. The interviewed policymakers argue that before citizen responsibilities can be formally allocated, it should be adequately debated how the differences between the capacities and resources of citizens can be reduced.

This is reflected in the extent to which policy instruments, such as *“sticks”* (regulations), *“carrots”* (economic means) and *“sermons”* (information), are used to stimulate citizens to take adaptive actions. Despite the desire of policymakers that citizens should have responsibilities in FRM, it is found that policymakers perceive that the policy instruments to stimulate the implementation of PLFRA measures are insufficiently used. The policy documents analysis and governmental websites have shown that no *“sticks”* are used for the stimulation of citizens to take PLFRA measures, while policymakers perceived that these binding instruments can be useful for increasing the adaptive actions. Furthermore, it is perceived by policymakers that *“carrots”* and *“sermons”* as policy instruments could be used more effectively to increase the implementation of PLFRA measures by citizens.

In conclusion, this research has shown that the decision-making process of Dutch private property owners for taking PLFRA measures is influenced by the views of responsibilities in FRM, which is also reflected in the extent to which policymakers support the implementation of PLFRA measures with policy instruments. The decision-making process to not take PLFRA measures is found to be underpinned by the perception that the government is legally responsible for ensuring flood safety, however a willingness to implement PLFRA measures was found after discussing the views on accountability and moral responsibility. The views on legal responsibilities and accountability in FRM were found to be used as argumentation for actually implementing PLFRA measures. This means that the difficulty for policymakers lies in persuading citizens to consider the division of responsibilities in FRM, by showing the urgency that the government can no longer be held solely responsible and with clear communication about the legal responsibilities of citizens.

7.2 Recommendations for future research

This research has created a better understanding of how the views on responsibilities influence the implementation of PLFRA measures in Zwolle. This research has explored these views on responsibilities by operationalizing responsibility as a multi-faceted concept with four notions: legal responsibility, accountability, moral responsibility and desired responsibility. This has allowed for in-depth knowledge on how these views influence and motivate adaptive actions of citizens. However, a gap in knowledge still exists about how these views can be used in the communication strategies of policymakers to stimulate the implementation of PLFRA measures. Since this research is an explorative qualitative research, a relatively small sample size was used for the interviews. To gain a deeper understanding of how the different notions of responsibility can be used to stimulate citizens to take PLFRA measures, a larger sample size would be useful. Research on how the views on responsibilities relate to the preferences of citizens for flood risk communication could be useful for finding ways to establish more effective flood risk communication. In this line, research on effective ways for policymakers to shift the views on responsibilities to a higher sense of own responsibility of citizens would be an interesting alley for future research.

Furthermore, it was found in this research that both policymakers and citizens are questioning the extent to which citizens have the capacities to take PLFRA measures. This research has not looked into the views that stakeholders have on the fairness of allocating responsibilities to citizens in FRM or on the exact extent to which citizen responsibilities are perceived to be just. Research on the opportunities and barriers for the allocation of responsibilities to citizens in flood risk management could therefore be interesting, especially from an angle of fairness. It would also be interesting to create a deeper understanding of the capacities of households for taking PLFRA measures, by reviewing the factors that influence household capacities with empirical data. Such research can help to get a better picture of what can be done to increase the coping capacities of citizens and how citizens can become more flood resilient.

Lastly, this research has reviewed how citizens and policymakers of the municipality and waterboard view responsibilities. In the interviews with policymakers it was found that policymakers prefer to make a distinguishment in the tasks of different tiers of government. It would be an interesting alley for future research to look into how both citizens and policymakers make distinguishments for different responsibilities of the tiers of government. It could also be interesting to analyze the views on responsibilities from other stakeholders, such as insurance companies and educators, since these stakeholders are also becoming more important as a result of the shifting responsibilities in FRM.

7.3 Recommendations for policymakers

This research has provided insights into the decision-making process of citizens to take PLFRA measures. From the results of this research, two policy recommendations can be made.

First, this research has found that the views on legal responsibilities and accountability are used as an argumentation by citizens for implementing PLFRA measures. Furthermore, the views on accountability and moral responsibility in FRM resulted in a willingness of citizens to take PLFRA measures. However, these interviewees did not implement PLFRA measures because they did not perceive themselves to have legally responsibilities in FRM. Also, it is found in this research that it is generally perceived by citizens that the legal responsibilities of citizens in FRM are unclear. This suggests that clear communication about the legal responsibilities of citizens as well as emphasizing that there are limits to the accountability of the government could increase the implementation of PLFRA measures. It is therefore recommended to create a policy objective for increasing the communication about the legal responsibilities of citizens and the accountability of the government in FRM. The sense of responsibility of citizens for FRM can be increased by adequately communicating the limitations of the current flood defenses and underlining that it can no longer be expected from the government that floods will not occur. Decreasing the expectations that citizens have of governmental flood risk measures can show citizens that adaptation to flood risks is also an own responsibility, which can help create a sense of urgency for citizens to take PLFRA measures.

Second, it was found in this research that policymakers are unsure about the exact extent and shape of citizen responsibilities for implementing PLFRA measures should be attributed to citizens. Concerns about the capacities of citizens to take adaptive actions were expressed by policymakers and citizens. Starting the debate in the Netherlands about the desired level of implementation of PLFRA measures by citizens and how to deal with possible negative externalities, such as differences in capacities of citizens, would be useful. The outcomes of this debate could serve as a baseline for future policy goals and communication of responsibilities towards citizens. This could also help to determine which policy instruments will be used to achieve this. It is recommended that policymakers create a clear picture of what is expected from citizens in adapting their house to flood risks and embed this into clear cut policy objectives.

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Appendices

Appendix 1: Operationalization responsibility into interview topics

Concept	Understanding of the concept	Topics for interview guide
Legal responsibility	Perceptions of legal responsibilities, including rules, regulations and formal actions	Legal obligations of the municipality
		Legal obligations of the waterboard
		Legal obligations of citizens
Accountability	Perceptions of answerability to actions, based on individual capacities and how well responsibilities have been executed	Who has to answer for (in)actions
Moral responsibility	Perceptions of what is viewed as the “right thing to do”, based on cultural and social norms or values	Personal idea about the “right thing” to do / moral obligations in FRM
		Idea of what important referents view as the “right thing to do” / moral obligations
Desired responsibility	Perceptions of how responsibilities are ideally divided	What tasks do you want the municipality to do in FRM?
		What tasks do you want citizens to do in FRM?
Perceived responsibility	Perceptions and assumptions of how responsibilities are currently divided	Awareness of responsibilities
		Assumptions of governmental responsibilities
		Assumptions of responsibilities of citizens

Appendix 2: Interview guide citizens and policymakers

Citizens

Leidraad voor burgers

- Welkom heten en voorstellen
- Bedanken voor instemming met interview
- Vragen toestemming voor opnemen, mogelijkheid uitleggen tot uitzetten recorder & informed consent formulier
- Doel: inzicht verkrijgen in hoe de verschillende perspectieven op de verdeling van verantwoordelijkheden in overstromingsrisicomanagement zich relateren aan de keuze voor huiseigenaren om zelf maatregelen in huis te nemen ter voorkoming van schade door overstromingen.
- Dataverwerking: Er wordt een transcriptie gemaakt van de opname, welke ingezien mag worden. Namen, adressen en functies worden anoniem gemaakt.
- Interview bestaat uit drie delen. Eerst introducerende vragen. Vervolgens ingaan op de rol van de overheid en burgers in voor het voorkomen van schade door overstromingen. Daarna, ingaan op de perspectieven van verantwoordelijkheid in overstromingsrisicomanagement. Als laatste, vragen over de kansen voor de gemeente voor het stimuleren van burgers bij het nemen van eigen maatregelen tegen wateroverlast door overstromingen.

- Heeft u nog vragen voordat we beginnen met het interview?

Introductievragen

Ik zou graag willen beginnen met enkele algemene vragen.

1. Hoe lang woont u al in dit huis?
2. In hoeverre denkt u dat uw huis kan overstromen/dat er water in uw huis kan komen bij een overstroming?
 - In het verleden een overstroming ervaren?

Keuze voor het wel of niet nemen van maatregelen

3. Welke maatregelen denkt u dat u zelf zou kunnen nemen om te voorkomen dat er schade ontstaat door water in uw huis bij een overstroming?
4. Heeft u maatregelen genomen in of om het huis die voorkomen dat er schade ontstaat door water in uw huis bij een overstroming? *Maatregelen die de kans op een overstroming verkleinen buiten beschouwing gelaten, zoals minder verstening in de tuin.*
 - Ja: Welke maatregelen?
 - Nee: Waarom niet?
5. Zou u bereidt zijn om (meer) maatregelen tegen schade aan huis door water te nemen?
 - Waarom wel/niet?

Perspectief op verantwoordelijkheid algemeen

Dan zou ik nu in willen gaan op de manier waarop u denkt dat de verantwoordelijkheden voor het nemen van maatregelen tegen overstromingen verdeeld zijn in Nederland.

6. Wat is volgens u de rol van de overheid in het voorkomen van schade aan huizen door overstromingen?
 - Waarom?
 - Welke taken en plichten?
7. Wat is volgens u de rol van burgers/huiseigenaren in het voorkomen van schade aan huizen door overstromingen?
 - Waarom?
 - Welke taken en plichten?
8. Welke rol denkt u dat de overheid toeschrijft aan burgers/huiseigenaren in het voorkomen van schade aan huizen bij een overstroming?
 - Waarom?
 - Verwachtingen van de overheid?
9. Hoe ziet u de verantwoordelijkheden van burgers en de overheid voor het voorkomen van schade aan huizen door overstromingen?
 - Waarom?

Perspectief op verschillende noties van verantwoordelijkheid

Nog enkele vragen ter verduidelijking met betrekking tot waar de verantwoordelijkheid ligt.

10. Wettelijke verantwoordelijkheid:
 - Wie is er volgens de wet verantwoordelijk voor het nemen van maatregelen ter voorkoming van schade aan huizen door overstromingen?
 - Waarom?
 - Welke verantwoordelijkheden in overstromingsrisicobeheer heeft de overheid volgens de wet denkt u?
 - Welke verantwoordelijkheden hebben huiseigenaren in overstromingsrisicobeheer volgens de wet denkt u?
11. Toerekenbare verantwoordelijkheid na overstroming (accountability):

- Wie moet er verantwoordelijk gehouden worden voor (in)acties met als gevolg schade aan huizen na een overstroming?
 - Waarom?
12. Morele verantwoordelijkheid:
- Wie is volgens u moreel gezien verplicht om maatregelen te nemen tegen overstromingen en de schade door overstromingen te beperken? *Met moreel wordt bedoelt wat het juiste is om te doen voor een bepaalde actor.*
 - Hoe ziet u uw eigen verantwoordelijkheid als huiseigenaar in het voorkomen van schade door overstromingen?
 - Denkt u dat huiseigenaren de capaciteiten (kennis & kunde) hebben om schade aan huizen te voorkomen bij een overstroming?
13. Gewenste verantwoordelijkheidsverdeling:
- Hoe zou u graag willen dat de verantwoordelijkheden voor het voorkomen van schade aan huizen door overstromingen verdeeld zouden zijn?
 - Waarom? Verschil tussen gewenste en daadwerkelijke verantwoordelijkheid?

Relatie tussen verantwoordelijkheid en het nemen van eigen maatregelen

14. Welke soort verantwoordelijkheid is volgens u het belangrijkste?
Wettelijke verantwoordelijkheid, toerekenbare verantwoordelijkheid na overstroming, morele verantwoordelijkheid en gewenste verantwoordelijkheid
- Waarom dit type verantwoordelijkheid?
15. Zouden huiseigenaren meer moeten doen om hun huis te beschermen tegen waterschade bij een overstroming?
- Waarom wel/niet?
16. Wat zou er voor u moeten veranderen om wel/meer maatregelen te nemen in huis tegen overstromingen?
- Kansen voor de overheid? Knelpunten?

Afsluiting

- *Dit was het laatste onderdeel van het interview.*
- *Heel erg bedankt voor uw tijd!*
- *Heeft u nog vragen, opmerkingen of toevoegingen?*
- *Ik zal een transcriptie van het interview via de mail naar u toesturen, zodat u eventueel nog toevoegingen of aanpassingen zou kunnen doen aan uw antwoorden.*

Polycymakers

- *Welkom heten en voorstellen*
- *Bedanken voor instemming met interview*
- *Vragen toestemming voor opnemen, mogelijkheid uitleggen tot uitzetten recorder & informed consent formulier*
- *Doel: inzicht verkrijgen in hoe de verschillende perspectieven op de verdeling van verantwoordelijkheden in overstromingsrisicomanagement zich relateren aan de keuze voor huiseigenaren om zelf maatregelen in huis te nemen ter voorkoming van schade door overstromingen.*
- *Dataverwerking: Er wordt een transcriptie gemaakt van de opname, welke ingezien mag worden. Namen, adressen en functies worden anoniem gemaakt.*
- *Interview bestaat uit drie delen. Eerst introducerende vragen. Vervolgens ingaan op de rol van de overheid en burgers in voor het voorkomen van schade door overstromingen. Daarna, ingaan op de perspectieven van verantwoordelijkheid in overstromingsrisicomanagement. Als laatste, vragen over de kansen voor de gemeente voor het stimuleren van burgers bij het nemen van eigen maatregelen tegen wateroverlast door overstromingen.*

- Heeft u nog vragen voordat we beginnen met het interview?

Introductievragen

Ik zou graag willen beginnen met enkele algemene vragen.

17. Zou u iets kunnen vertellen over uzelf?
18. Op welke manier bent u betrokken bij het maken van beleid voor het creëren van een overstromingsbestendige stad? Functie?

Perspectief op verantwoordelijkheid en beleid algemeen

Dan zou ik nu in willen gaan op de manier waarop u denkt dat de verantwoordelijkheden voor het nemen van maatregelen tegen overstromingen verdeeld zijn in Nederland.

19. Wat is volgens u de rol van de gemeente in het voorkomen van schade aan huizen door overstromingen?
 - Waarom?
20. Wat is volgens u de rol van huiseigenaren in het voorkomen van schade aan huizen door overstromingen?
 - Waarom?
21. In hoeverre denkt u dat de gemeente voldoende maatregelen neemt tegen wateroverlast in huizen door een overstroming?
 - Waarom wel/niet?
22. In welke mate verwacht u dat burgers zelf maatregelen nemen tegen wateroverlast in huis door een overstroming?
 - Op welke manier wordt dit gestimuleerd door de gemeente?
 - Beleidsinstrumenten?
23. Wie is er verantwoordelijk voor het voorkomen van schade aan huizen door overstromingen?
 - Waarom?
 - Verdeling tussen burgers en overheid?

Perspectief op verschillende noties van verantwoordelijkheid

Nog enkele vragen ter verduidelijking met betrekking tot waar de verantwoordelijkheid ligt.

24. Wettelijke verantwoordelijkheid:
 - Wie is er volgens de wet verantwoordelijk voor het nemen van maatregelen ter voorkoming van schade aan huizen door overstromingen?
 - Waarom?
 - Welke verantwoordelijkheden in overstromingsrisicobeheer heeft de overheid volgens de wet denkt u?
 - Welke verantwoordelijkheden hebben huiseigenaren in overstromingsrisicobeheer volgens de wet denkt u?
25. Toerekenbare verantwoordelijkheid na overstroming (accountability):
 - Wie moet er verantwoordelijk gehouden worden voor (in)acties met als gevolg schade aan huizen na een overstroming?
 - Waarom?
26. Morele verantwoordelijkheid:
 - Wie is volgens u moreel gezien verplicht om maatregelen te nemen tegen overstromingen en de schade door overstromingen te beperken? *Met moreel wordt bedoeld wat het juiste is om te doen voor een bepaalde actor.*
 - In welke mate hebben huiseigenaren volgens u een eigen verantwoordelijkheid in het voorkomen van schade door overstromingen?
 - In hoeverre hebben burgers volgens u voldoende capaciteiten (kennis en kunde) van maatregelen voor het overstromingsbestendig maken van hun huis?

- Welke verwachtingen denkt u dat burgers hebben van de rol van de gemeente?
- 27. Gewenste verantwoordelijkheidsverdeling:
 - Hoe zou u graag willen dat de verantwoordelijkheden voor het voorkomen van schade aan huizen door overstromingen verdeeld zouden zijn?
 - Waarom? Verschil tussen gewenste en daadwerkelijke verantwoordelijkheid?

Prioriteren verantwoordelijkheid en kansen

- 28. Welke verantwoordelijkheid weegt volgens u het zwaarste en is het belangrijkste?
Wettelijke verantwoordelijkheid, toerekenbare verantwoordelijkheid na overstroming, morele verantwoordelijkheid en gewenste verantwoordelijkheid
- 29. Wat vindt u van de mate waarin burgers zelf maatregelen nemen tegen schade aan hun huis bij een overstroming?
 - Waarom voldoende / moeten burgers meer doen?
- 30. Waar denkt u dat de kansen liggen voor de gemeente Zwolle/Arnhem in het stimuleren van burgers om zelf maatregelen te nemen tegen wateroverlast in huis door overstromingen?
 - Mogelijke knelpunten?

Afsluiting

- *Dit was het laatste onderdeel van het interview.*
- *Heel erg bedankt voor uw tijd!*
- *Heeft u nog vragen, opmerkingen of toevoegingen?*
- *Ik zal de transcriptie van het interview via de mail naar u toesturen, zodat u eventueel nog toevoegingen of aanpassingen zou kunnen doen aan uw antwoorden.*

Appendix 3: Overview of interview information

Interviews with citizens:

Name	Neighborhood	Gender	Age group	Interview time	Date	Location
Participant 1	Berkum	M	40 – 60	50 minutes	4-12	Online
Participant 2	Berkum	M	40 – 60	35 minutes	4-12	In person
Participant 3	Berkum	M + F	40 – 60	35 minutes	4-12	In person
Participant 4	Berkum	M + F	60+	45 minutes	6-12	In person
Participant 5	Wipstrik	M	60+	30 minutes	8-12	In person
Participant 6	Wipstrik	M	40 – 60	35 minutes	18-12	Online
Participant 7	Berkum	M	60+	45 minutes	15-12	Online
Participant 8	Wipstrik	M	60+	40 minutes	21-12	Online

Interviews with policymakers:

Name	Function	Gender	Age group	Government	Time	Date	Location
Participant 1	Strategic Advisor Water and Spatial Adaptation	F	20 – 40	Municipality of Zwolle	60 minutes	6-12	Office
Participant 2	Senior Advisor Climate adaptation Civil and Green	M	20 – 40	Municipality of Zwolle	45 minutes	14-12	Office
Participant 3	Advisor Spatial Adaptation	M	40 – 60	Municipality of Zwolle	45 minutes	9-1	Online

Participant 4	Strategic director	M	40 – 60	Waterboard Drents Overijsselse Delta	45 minutes	19-12	Online
Participant 5	Advisor Climate Adaptation and Strategic Relations management	M	20 – 40	Waterboard Drents Overijsselse Delta	40 minutes	20-12	Online

Appendix 4: Coding tree in Atlas.ti

Coding tree citizens

Code group	Codes
Accountability	Force majeure
	Negligence by government
	Own responsibility
	Financial compensation fund
	General accountability
	Insurance
	Liability for damage
Decision-making taking PLFRA measures	Expectations of citizens
	Expectations of government
	Implemented PLFRA measures
	Most important responsibility
	Possible PLFRA measures
	Trust in government
	General willingness
Desired responsibility	General desired responsibilities
	Suggestions for government
	Opportunities for including citizens
	Water label
General perceived responsibility	Decisions living location
	Decisions building location
	General citizen responsibility
	General government responsibility
Legal responsibility	Historical legal responsibilities
	Knowledge of law
	General legal responsibility
Moral responsibility	Capacities of citizens
	Capacities of government
	Duty of care
	Moral obligation government
	Signaling functions
	Moral obligation citizens
	Politics moral responsibility
Perceived flood risk	Experiences with floods
	Perceived flood risk
	Knowledge of flood risks
	Limiting climate change

Coding tree policymakers

Code group	Codes
Accountability	Accountability
	Force majeure
	Fund for damage
	Insurance
	Liability for damage
	Negligence of government
	Own responsibility citizens
Desired responsibility	Awareness of citizens
	Desired responsibility
	Wish citizens do more
Expectations and opportunities	Citizen expectations of government
	Expected role of citizens
	Future trends water safety
	Narrative of risk
	Opportunities stimulating citizens
	Shifting role citizens
	Shifting role government
	Should government do more
General division of responsibility	Choice for building
	Choice for living location
	Citizen tasks
	Collaboration waterboard
	Current citizen initiatives
	Flood proof building
	General division of responsibility
	Government tasks
	Knowledge of measures
	Most important responsibility
	water safety current policies
Legal responsibility	Formal responsibility citizens
	Formal responsibility government
Moral responsibility	Capacities of citizens
	Capacities of government
	General moral responsibility
	Duty of care
	Citizen moral obligation
Other	Forms water nuisance
	Function description

Appendix 5: Use of Artificial Intelligence (AI)

The website Chat GPT was sporadically used in this research to reformulate sentences or research questions. The usage of Chat GPT has served as an inspiration, but has not been used to generate texts or parts of this report. The links to the conversations and the prompts used, are:

Perceptions of Flood risk management:

<https://chat.openai.com/share/87e7fdb6-c0b8-4aa9-913a-c52ccaa84e55>

Wat is het verschil tussen het beleid van overstromingen van de gemeente van Zwolle en de gemeente van Arnhem?

<https://chat.openai.com/share/0f5ade94-6740-45ed-a39e-8d4d0de18428>

Interviewvragen over morele verantwoordelijkheid bij overstromingen:

<https://chat.openai.com/share/9a38b20b-d835-42b7-8280-fc01b6b5bd29>