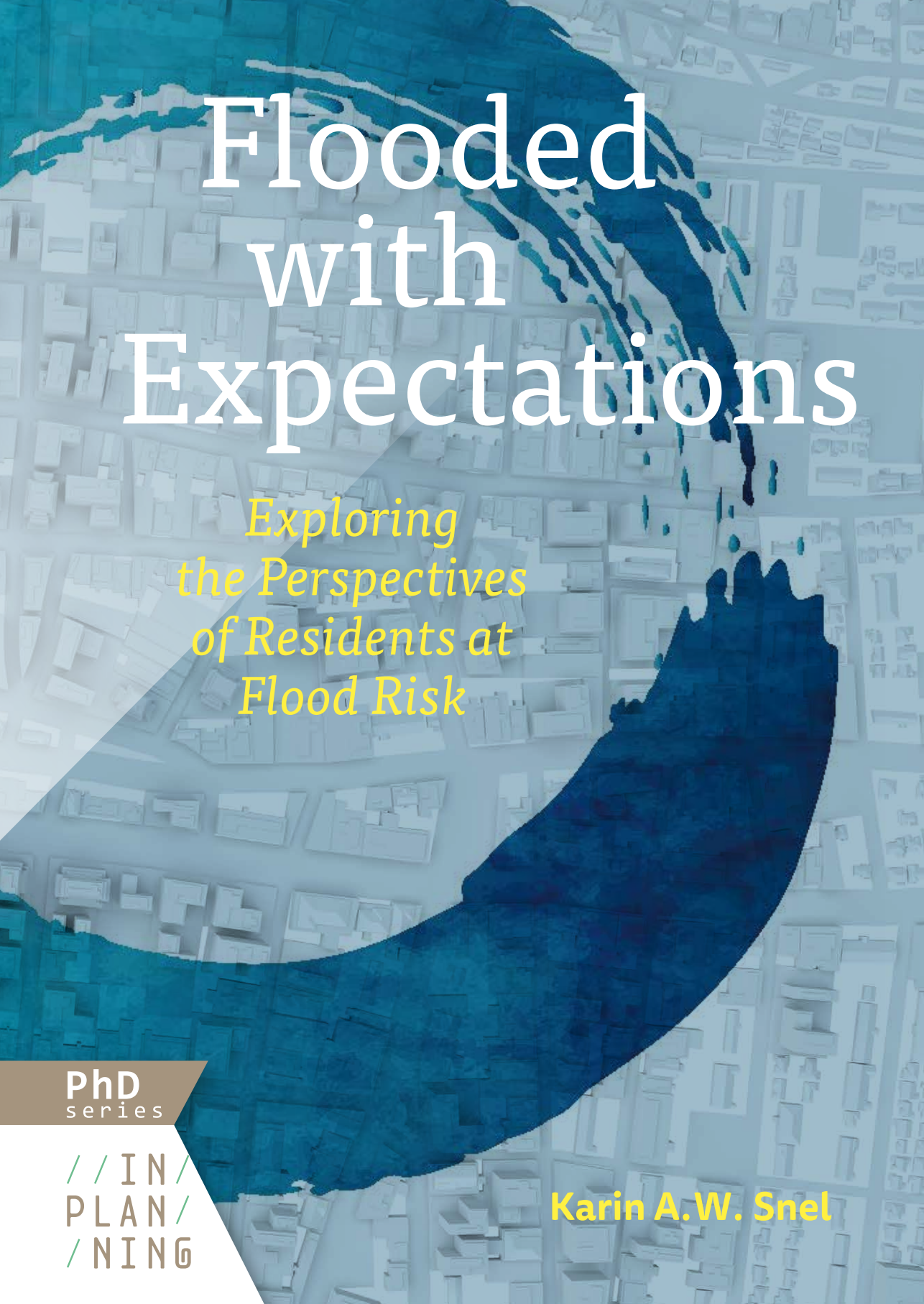
Flooded with Expectations
Exploring the Perspectives of Residents at Flood Risk
PhD series
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Karin A.W. Snel

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Exploring the Perspectives of Residents at Flood Risk

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Chapter 1

Introduction

1.1 The increasing risk of flooding

The risk of flooding has been rising as the frequency and intensity of flood events is increasing, along with the consequences thereof. Frequency, intensity and consequences of flood events are combined in the concept of flood risk, which is referred to as the product of the probability of occurrence times the extent of damage (Grothmann & Reusswig, 2006; Renn, & Benighaus, 2013). In general, three main reasons for the growing risk of flooding are identified, namely climate change, urbanisation, and urban development in floodplains (e.g., Driessen et al., 2016; Hegger et al., 2014; Hegger et al., 2016; Ludy & Kondolf, 2012; Francesch-Huidobro et al., 2017).

First, climate change is a worldwide trend that entails mainly the widespread consequences of global warming. The Intergovernmental Panel on Climate Change (IPCC) confirms that humans influence the climate system, and this impact is growing across all continents and oceans (IPCC, 2014). With 95% certainty the IPCC (2014) states that humans are the main cause of current global warming. The more human activities disrupt the climate, the greater the impact of a changing climate. Climate change is already amplifying existing risks and will create new risks for both natural and human systems. Flooding is one of these risks that is amplified. Flood events are increasing due to, for example, sea-level rise, increased precipitation, and ice/snow melt. On the one hand, these consequences of climate change are increasing in frequency; on the other hand the number of extreme events also increases. Worldwide 250 million people are at risk of experiencing a flood, on average once, a year due to a combination of sea level rise and heavy rainfall (Kulp & Strauss, 2019). In other words, many livelihoods are at risk of flooding, and this number is increasing. Kulp & Strauss (2019) predict that this number will have risen to 340 million people by 2050, under the IPCC (2014) high emissions scenario (RCP 8.5). This is why academia, policy and media increasingly call for preparations and adaptation to the amplified risk of flooding, and this call is increasingly addressed to residents (e.g. Wehn et al., 2015; Winsemius, Van Beek et al., 2013; Tullos, 2018; Kuhlicke, 2019; Kuhlicke et al., 2020; Rufat et al., 2020).

Second, urbanisation is one of the major factors that even further increase the number of people at risk of flooding. At the moment, more people in the world live in urban than in rural areas, namely 55% of the world's population resides in urban areas (United Nations, 2018). In the past century, the percentage of urban population has increased rapidly. The United Nations (2018) state that, in 1950, 30% of the world's population was urban, and it is projected that it will be nearly 70% by 2050. Urbanisation is a problem for increasing flood risk because, on the one hand, it comes with a growing volume of impermeable surfaces and land sealing, which limits the water-bearing capacity of the soil (Hegger et al., 2016; Mees et al., 2016; Ludy & Kondolf, 2012). On the other hand, urbanisation is signified by large numbers of people on a relatively small piece of land, which not only increases the damage potential in case of a flood event, but also accounts for greater exposure as a high number of people can be affected by one flood event (Hegger et al., 2016).

Third, the amount of urban developments in floodplains increases by what is called the 'dike paradox' or 'levee effect' (Hartmann & Spit, 2016; Ludy, & Kondolf, 2012). In many countries, dikes or other structural protection measures are installed to

minimise the risk of flooding from rivers or the sea. However, such measures stimulate the urban development in flood plains as these engineering structures lead to a 'promise of protection' (Hartmann & Spit, 2016; Davids, Boelens, & Tempels, 2019). In other words, dikes around a riverbed suggest that the hinterland is well-protected against floods. Engineers, public authorities, and residents generally tend to put trust in these structures (Ludy, & Kondolf, 2012). Therefore, it leads to a feeling of safety, which is often followed by urban development on the land behind the dikes. Paradoxically, these low-lying, floodplain locations are still at risk of flooding (only the probabilities of a flood event are minimised) and the consequences of a flood event are increase as the number of people at risk and the economic value of the land intensify (Haer, Husby, Botzen & Aerts, 2020).

In summary, the risk of flooding is increasing mainly due to climate change, urbanisation, and urban development in floodplains. In this dissertation, the focus lies on residents who are at risk of flooding, because specifically their role in flood risk governance has been subject to change. In other words, approaches to flood risk have changed over the past decades, and especially the role of residents at risk has varied in those approaches. The main changes and developments are discussed in the following section.

1.2 Approaches to Flood Risk Governance

To understand what changes and developments have characterised the approaches to preventing floods over the past century, this section emphasises the two main strategies, namely flood protection and flood risk management. Additionally, the impact of transition from government to governance is clarified. The role of residents is specifically addressed in these shifting approaches as their position has been most subjected to change.

1.2.1 Flood protection approach

Since the start of industrialisation, the dominant approach to combating floods was to provide protection against floods by large-scale defences like dikes and dams (Tempels & Hartmann, 2014). Such technical infrastructures are based on an engineering perspective that claims that basically all floods can be prevented and that land, people, and property can be protected sufficiently against this force of nature (Hartmann & Jüpner, 2014; Johnson & Priest, 2008). These structural protection measures are developed to withstand a potential flood of a certain statistical return period. The number of flood events that can exceed this design standard is considered negligible (Kuhlicke, 2019). In general, this traditional flood protection approach is a state-centred approach. In other words, governmental institutions are the main organisations that implement these large-scale protection measures against floods (Johnson & Priest, 2008; Wiering et al., 2014; van Buuren et al., 2012). It is envisioned as their main role to ensure that floods do not severely impact national security, economic growth or welfare standards

(Penning-Rowsell, Johnson, & Tunstall, 2006). In this approach, protection is provided as a public service. Generally, residents are not involved in the related planning processes and have been guaranteed that flooding will be prevented; i.e. the occurrence of the type of flood that can surpass the defences is very unlikely.

1.2.2 Flood risk management

From the 1990s onwards, within Europe, the perspective of traditional flood protection is gradually complemented by a growing emphasis on minimising the risk of a flood event (i.e., probability and impact). The notion of flood risk management is guided by the principle that "we cannot engineer our way out of this problem" (Penning-Rowsell et al., 2006), as floods cannot be fully prevented. This line of thinking is a response to the failure of technical flood protection measures during major floods in Central Europe in 1993, 1995, and 2002 along the rivers Rhine, Elbe, Danube, and others. Technical flood protection measures have since then been recognised as one aspect of flood risk management instead of the main defence strategy (Bradford et al., 2012; Hartmann & Scheibel, 2016; O'Neill, 2018). It is nowadays widely accepted that land assets cannot be defended through technically-oriented measures alone (O'Neill, 2018) and that absolute protection cannot be provided (Kuhlicke, 2019). This recognition points toward a shifting approach in which the risk of flooding is perceived as manageable with an increased focus on probabilities and impact (Johnson & Priest, 2008). Moreover, flood risk management is a more holistic perspective in that it takes the river-basin as a whole into consideration. This includes the river, the flood defences and the land behind the defences, such as neighbourhoods (Hartmann & Jüpner, 2014).

In addition, increased attention is paid to non-structural measures to alleviate the impact of flood events, such as flood warnings, raising awareness, household preparedness, insurance, and relocation (Birkholz et al., 2014; Bradford et al., 2012; Bubeck, Botzen, & Aerts, 2012; O'Neill, 2018). The combination of structural and non-structural measures allows for reducing flood risk by managing the frequency and impact of floods (Penning-Rowsell et al., 2006). Mees & Driessen (2019) therefore emphasise the importance of locally-oriented adaptation strategies to minimise the impact of the flood-related consequences of climate change on communities. Adaptation in general is understood as "the process of adjustment to actual or expected climate and its effects in order to either lessen or avoid harm or exploit beneficial opportunities" (IPCC, 2014, p. 76).

1.2.3 Towards an increasing role of residents

Overall, the shift to flood risk management has instigated a more governance-oriented perspective on floods (Hegger et al., 2014; Driessen et al., 2018; Wiering et al., 2017). As a consequence, the role of public authorities is transitioning as well. Since flood risk management takes the river-basin as a whole into account, public authorities are encouraged to increasingly involve non-governmental stakeholders in planning processes. Additionally, many of the non-structural measures are aimed at increasing preparedness and adaptiveness of the people who are at risk. Penning-Rowsell et al.

(2006), along with many others (e.g. Hegger et al., 2017; Begg, 2018; Kundzewicz et al., 2018), suggest that a balance is needed between state action and self-protection by other stakeholders at risk, such as residents.

This can be seen as illustrative of the societal transition from government toward governance that is more widely discussed in other disciplines (see e.g., Hartmann & Driessen, 2017; Rhodes, 1996; Jessop, 1998). Similar to the general governance notion, flood risk governance strives for cooperation among governments, market stakeholders, and civil society. So that they collaborate, analyse, communicate, and make decisions about flood risk together (Renn, Klinke, & Van Asselt, 2011). As Hegger et al. (2014, p. 4129) put it, flood risk governance includes "the arrangements of actors, discourses, rules and resources through which flood risk management strategies are delivered and put into practice." In other words, flood risk management is initially implemented through processes of flood risk governance (Alexander, Priest, & Mees, 2016). This means that flood protection and flood risk management are approaches to flood risk governance. Where flood protection and flood risk management are directed at implementing measures to prevent floods or manage the risk thereof, flood risk governance entails the governance processes through which such measures and plans are created, such as in collaboration with solely public authorities, or including market stakeholders and civil society as well.

1.3 Residents in Flood Risk Governance

Residents[1] (i.e., civil society) are relatively new players in the field of flood risk governance. Moreover, the role of residents in it is increasingly emphasised (Bubeck et al., 2012). Policymakers and academics recognise that it is imperative that residents adapt to floods, and therefore expectations are rising for residents to take adaptive actions to protect and prepare for flooding (Begg et al., 2017; Kuhlicke et al., 2020; Bubeck et al., 2017). The general principles of governance need to be employed when managing flood risk, that is, collaborative arrangements and a shared distribution of power between public authorities, market stakeholders, and civil society (Alexander et al., 2016). Residents have become part of the cost-benefit equation, because residents' adaptive behaviour can substantially contribute to minimising the impact of flood events (Aakre et al., 2010; Doorn, 2016; Hegger et al., 2017).

1.3.1 Risk perception and adaptive behaviour in protective action theories

With the shifting approaches to flood risk, residents have also increasingly become subjects in the field of flood risk research. Many studies have analysed residents' flood

1 The term 'residents' was chosen over terms such as homeowners or citizens. Homeowners is considered too narrow for this thesis as it solely addresses the residents who own a residential property, and the empirical analysis was not explicitly limited to property-owners. 'Citizens' is considered too broad as it is more associated with citizenship instead of with an individual's home, i.e., their residential location.

risk perception, willingness to pay and/or adapt and their preparedness for flood events in general (e.g., Bradford et al., 2012; Lechowska, 2018; O'Neill et al., 2016; Owusu, Wright, & Arthur, 2015; Soane et al., 2010). The main focus has been on how residents can be motivated to adapt to flood risk. As a consequence, it has been extensively analysed what influences residents' adaptive behaviour. In particular, the relation between risk perception and adaptive behaviour has been dominating the discourse. Many researchers have specifically analysed this based on the assumption that increased risk awareness has a positive influence on residents' willingness to take adaptive actions (e.g., Baan & Klijn, 2004; Siegrist & Gutscher, 2006; Plapp & Werner, 2006; Terpstra, Lindell & Gutteling, 2009; Terpstra, 2011; Botzen, Aerts & van den Bergh, 2009; Plattner, Plapp & Hebel, 2006; Bubeck, et al., 2012). This is a common assumption that is found in multiple protective action-theories (Protection Motivation Theory, Protective Action Decision Model, Regulatory Focus Theory, or Theory of Reasoned Action) (Attems et al., 2019).

The most prominent theory in flood risk research is the Protection Motivation Theory (PMT) (Rogers, 1975; Rogers, 1983; Kuhlicke et al., 2020). However, the assumption that a high degree of risk perception leads to taking adaptive actions is largely building on just one aspect of this theory. Namely, PMT indicates that sources of information (e.g., risk communication or experience) positively influence an individual's threat appraisal (i.e., the way individuals feel about flood risk) and coping appraisal (i.e., the way individuals evaluate possible responses to the threat and their own abilities to undertake adaptive actions) (Bubeck, et al., 2012; Bamberg et al., 2017; Kuhlicke et al., 2020). PMT addresses that threat appraisal (i.e., risk perception) and coping appraisal both influence an individual's motivation to protect. The overall PMT assumptions include that when threat appraisal is low, individuals refrain from taking adaptive actions. When individuals have a high threat and high coping appraisal, adaptive actions are triggered. However, when high threat appraisal meets low coping appraisal, individuals are likely to deny the risk that they face and turn to non-protective responses (Attems, et al., 2019; Kuhlicke et al., 2020; Rogers & Prentice-Dunn, 1997).

Studies on PMT relating to flood risk show that coping appraisal is an important determinant for adaptive actions (Bubeck, et al., 2012; Kreibich et al., 2005; Grothmann & Reusswig, 2006; Zaalberg et al., 2009; Bamberg et al., 2017). Nevertheless, how residents' appraisals can be increased remains largely unanswered. This is mainly because the core variable that significantly affects flood risk perception is the experience of a flood event (Thistlethwaite et al., 2018; Bubeck, et al., 2012). Nonetheless, research shows that risk perception will decrease to a minimum again only within an average of seven years after a flood event (Lechowska, 2018; Thistlethwaite et al., 2018; Kreibich et al., 2011). Furthermore, the willingness to pay on part of the residents has been shown to be a problem. Barriers to residents' willingness to pay are often of an informational, emotional and financial nature (Bichard & Kazmierczak, 2012).

Despite the lack of a causal relation between flood risk perception and taking flood adaptive actions, there still is a growing demand for an answer to the question how residents can be motivated to take adaptive actions. Instead of working from the assumption that increased risk perception leads to increased adaptive behaviour, this doctoral thesis emphasises the residents' perspectives on their position in flood risk governance. As a consequence, this thesis builds on the insights of the previous studies on

threat and coping appraisal, but does not employ PMT itself. The residents' perspectives have been under-addressed in light of the call from academia and policy for increasing their involvement in flood risk governance.

1.3.2 Involving residents in flood risk governance

The involvement of residents in flood risk governance is understood as residents taking adaptive actions on the household level (Wamsler, 2017). This thesis refers to adaptive actions as actions that residents can take to manage the risk of floods for their home. These actions are divided into three categories: technical, financial, and behavioural actions. Technical actions aim to increase the physical resilience of buildings by implementing property-level flood risk adaptation (PLFRA) measures (Attems et al., 2020; Jüpner et al., 2020). Measures for financial resilient recovery include approaches as insurance schemes (Slavikova et al., 2020). Behavioural actions include monitoring flood forecasts, storing emergency supplies, or joining community emergency plans (Kuhlicke et al., 2020). The emphasis in academia and policy on flood risk adaptation highlights the increasingly proposed and required plea for residents to take adaptive actions (Kuhlicke et al., 2020; Bubeck et al., 2017). Therefore, residents' involvement is in this thesis understood as active involvement in adapting to the actual and expected issues that flood risk generates at the household level.

With a governance-oriented approach to flood risk, policy makers have increasingly recognised that residents are to be more involved in the fight against floods according to policy makers (e.g., Ministerie Infrastructuur en Waterstaat, 2020; Environment Agency, 2020). However, their involvement seems to be hindered by various aspects, because residents are not taking as much adaptive actions as public authorities expect them to (Kundzewicz et al., 2018; Tullos, 2018). Barriers can be related to concepts as responsibility, sense of urgency, or risk communication. For instance, in climate adaptation studies in general, it is concluded that the adaptive actions of residents are hindered because responsibilities are vague and ambiguous (Mees, 2014; Biesbroek et al., 2010; Runhaar et al., 2012; Termeer et al., 2013; Wamsler & Brink, 2014). Additionally, residents tend to lack a sense of urgency for taking flood adaptive actions, because climate change adaptation is not perceived as an urgent issue (Kaufmann & Wiering, 2019; Lenzholzer et al., 2020; Runhaar et al., 2012).

Above all, present-day flood risk communication generally originates from an expert point of view, meaning they are often expressed in flood probabilities (Patt & Jüpner, 2013). However, interpreting flood probabilities (i.e., flood recurrence intervals such as, 1-in-a-100-year protection level) typically often go beyond the lay understanding of flood risk (Everett & Lamond, 2013; Meyer et al., 2012). As a result, residents (i.e., lay people), tend to understand flood probabilities as a guarantee of flood protection (Hartmann, 2011). When a proper translation from expert to lay knowledge fails (in terms of, e.g., risk, responsibility, urgency, and adaptive actions), residents tend to distance themselves. In bridging this gap, it is crucial that residents' perspectives are used as the starting point to better understand how they interpret current communication approaches on flood risk and adaptive actions. In order to offer alternatives to expert-oriented flood risk communication strategies, it is essential to better understand the perspectives and preferences of the target group, i.e., residents.

1.4 Research questions

Therefore, this thesis takes a step back in the line of thought of existing research and takes the residents' perspectives as a starting point. This thesis did not intend to analyse what factors motivate or influence residents to adapt to flood risk (as a multitude of studies has already done so on the concepts of, e.g., risk perception, preparedness, and willingness to pay), but to take the residents' positions and perspectives centrally and start anew in analysing why residents' involvement is crucial for flood risk governance. The resident as focal point in this thesis will underline the necessity of incorporating them in flood risk governance and will emphasise the importance of creating a setting in which residents are able to make informed decisions about taking flood adaptive actions (Renn, 2009). The gap in academic research is precisely the lack of focus on the perspective of the residents on their involvement in flood risk governance. This thesis aspires to bridge this gap by emphasising the perceptions of residents in order to contribute to their involvement in flood risk governance. Therefore, the following main research question will be answered:

How can an enhanced understanding of residents' perspectives contribute to increasing involvement of residents in flood risk governance?

This main research question aims to analyse residents' perspectives on flood risk governance and their own role in it. Moreover, this question addresses how residents' perspectives are important in order to increase their involvement, in other words, increase taking adaptive actions. This main research question raises five underlying questions that address why residents' involvement is crucial for flood risk governance in the first place, what residents perceive as their own responsibility, what they expect other actors to take responsibility for, what residents' preferences for flood risk communication are, and how tailored risk communication can contribute to residents' ability to make informed decisions about taking adaptive actions. What these questions have in common is the focus on determining residents' perceptions, understandings, and preferences (i.e., perspectives) regarding flood risk governance in general, and responsibility divisions and risk communication specifically. These questions are explained in detail below.

RQ 1
Why should residents be more involved in flood risk governance?

The aim of this research question is to provide an overview of the arguments used in academia to underline the increasing expectations for residents to take adaptive actions. Although an overall agreement seems to exist on the involvement of residents in flood risk governance, the academic literature is dispersed in its argumentation on why they should be involved. To answer this question an overview is presented that distinguishes between macro-level and micro-level arguments for resident's involvement, and between individual and collective efforts. It illustrates the potential gap within policy making in convincing residents of the urgency to take adaptive actions, because the connection between the macro-level arguments (i.e., climate change and responsibility) and the micro-level arguments (i.e., minimising flood damage on privately owned properties) is

generally not made. Specifically, the argumentation related to residents' responsibility is highly valued in the academic debates, but the concept of responsibility is used in varying and confusing ways. This overview of the existing argumentation for resident involvement in flood risk governance is elaborated upon in Chapter 2.

RQ 2
How can responsibility in flood risk governance be conceptualised?

This second question explores the concept of responsibility in more detail. The aim of this research question is to conceptualise responsibility in flood risk governance. For the conceptual framework, four notions of responsibility (legal, accountable, moral and perceived) are distinguished and elucidated through a systematic comparison of the flood risk governance practices of the United States, Germany and the Netherlands. This conceptual framework and its illustration within these three countries are elaborated upon in Chapter 3, where, among others, the conclusion is drawn that the notion of perceived responsibility is rarely analysed, yet it is specifically that notion that could serve as a reference point in debates on responsibility for adaptive actions.

RQ 3
How do residents perceive responsibilities in flood risk governance to be divided?

The following subquestion addresses residents' perceptions on responsibility in detail. The aim of this question is to analyse how residents perceive responsibility divisions in flood risk governance by building on the conceptual framework presented in Chapter 3. A qualitative study is performed in England that highlights how residents of flood risk areas perceive responsibility and the division thereof. Residents have clear expectations and perceptions on how they think current responsibilities are divided among stakeholders and how they would prefer this division to be. This will be elaborated upon in Chapter 4, which concludes that responsibility divisions in flood risk governance raise questions and cause mismatches between the legal division of responsibility and residents' perceptions. And yet, responsibility remains a contested concept.

RQ 4
How can flood risk communication be better targeted towards the preferences of residents?

By clarifying the responsibility divisions in flood risk governance, the next step entails the question how this can be best communicated. In Chapter 5 the following research question aims to understand how residents interpret flood risk communication and what information residents themselves need in order to make informed decisions about adaptive actions. To meet this objective, qualitative research has been performed in the Netherlands on residents who are at risk of flooding. The preferences of residents regarding flood risk communication are divided into four distinct perspectives, which leads to the conclusion that a one-size-fits-all approach in communication is not beneficial to stimulate residents to take adaptive actions.

RQ 5
How do residents across countries prefer flood risk to be communicated?

As residents are becoming key stakeholders in flood risk governance, this shift requires that residents are aware of the risk they face and their responsibility in minimising it. However, the concepts of risk and responsibility are subject to pluralistic interpretations. Flood risk communication is a promising way to improve risk awareness and responsibility among residents of flood risk areas, but risk communication then does need to address these pluralities. Chapter 6 aims to understand how residents across countries prefer flood risk to be communicated in order to provide the basis for developing flood risk communication that is able to address flood risk, responsibilities of residents and potential adaptive actions. A cross-country analysis results in distinct sets of preferences for flood risk communication. Moreover, these sets of preferences are likely determined by residents' perceptions of responsibility, their country of residence and their experience with floods.

In the final chapter of this thesis the main research question will be answered by taking the answers to the distinctive subquestions into account. Additionally, the overall conclusion will be addressed on top of the theoretical and empirical considerations of the results of this study and for future research.

1.5 Research Strategy

To gain in-depth insight into the residents' perspectives regarding flood risk governance, responsibilities, and flood risk communication, this thesis applied qualitative research methods. These qualitative analyses were conducted using a social constructivism approach. A multiple case study design was employed (Bryman, 2012; Yin, 2003), to enable a cross-sectional exploration of residents' perspectives in the context of varying flood risk governance arrangements. To analyse residents' perspectives in a holistic manner, it is of added value to focus on a limited number of cases. This contributes to the thoroughness of analysing residents' perspectives. Case study research design was applied to study an empirical phenomenon in its actual context. This leads to a better understanding of the empirical insights in relation to contextual factors such as recent flood events, responsibility divisions, and governance arrangements case. These contexts are of interest as they tend to influence residents' perspectives. Depending on the chapter, a comparison is made between case-countries, namely England and the Netherlands, or within one of the case countries. This will be specified in the methods sections per chapter.

1.5.1 Case selection

As can be seen in Table 1.1, the case study locations are divided among England and the Netherlands. Both countries face the same types of floods, namely fluvial (river or streams), pluvial (rain), and coastal floods (sea). Similar to many European countries, England and the Netherlands have governance arrangements existing of multiple layers. This includes a complex mix of national, local, governmental, market and individual actors (Alexander et al., 2016). Yet, the actual arrangements of flood risk governance of the respective countries differ fundamentally.

The Netherlands has a long tradition of approaching flood risk as a collective issue where governmental organisations take the lead (Hegger et al., 2016). The Dutch constitution obliges the national government to maintain the country habitable and protect and improve the environment (Suykens et al., 2019). Practically, this obligation is embedded in the Second Delta Act, which also includes a safety norm that guarantees a basic level of protection to each Dutch citizen, expressed as an annual chance of being killed by a flood of no more than 1/100.000. Residents do formally have a responsibility to mitigate floods on their own properties, but this legal responsibility is seldom called into action (Bergsma, Gupta, & Jong, 2012). The legal responsibility of Dutch residents remains limited to paying taxes, both indirectly to the national governments (through income taxes) and directly to the regional water authorities. Yet, as flood risk is increasing (as indicated in section 1), the role of residents in the Netherlands is changing.

English flood risk governance consists of a range of strategies adopted to tackle flood risks of different types. This diversity has been inherent to English flood risk management for approximately 70 years with a mix of spatial planning, insurance provision, flood warning and incident management, complementing flood defences and other structural approaches (Alexander et al., 2016; Johnson & Priest, 2008). It is important to note that, although national public authorities, such as the Environment Agency (EA), have powers to construct and maintain flood defences, they hold no obligation to protect properties from flooding (EA, 2020). Under Common Law, the main legal responsibility for protecting property and land lies with the individual property owner. Additionally, national policy documents increase the attention given to the roles of individuals for managing risk and enhancing societal resilience (e.g., EA, 2020; Defra, 2020).

Although the role of public authorities and market stakeholders in flood risk governance differ between the countries, similar to the situation in England, Dutch residents are increasingly expected to take adaptive actions. Therefore, it is necessary to better understand individuals' perspectives on responsibility division, PLFRA and communication as part of flood risk governance.

Besides the varying flood risk governance arrangements, England and the Netherlands also have varying experiences with flood events over the past decades. England has suffered from various large-scale and small-scale flood events, across all types of flooding. In the Netherlands, the most recent flood events have been mainly pluvial and occasionally fluvial. These floods occur on a very local scale and the impact remains relatively small. Flooded streets and basements are often consequences of such events. Yet, the damages for the affected residents are significant. Fluvial and coastal

Table 1.1 Overview of the specific flood risk per case study locations.

	Fluvial	Pluvial	Coastal
Netherlands			
Dordrecht	x	x	x
Venlo	x	x	
Zwolle	x	x	
England			
Aldebrugh	x	x	
Great Yarmouth		x	x
Oxford	x	x	

floods are even less likely in the Netherlands as the rivers and coastline are protected with elaborate flood defences. The last large-scale (fluvial) flood event took place in 1995 when the rivers Meuse and Rhine flooded[2].

In England, pluvial, fluvial, and coastal floods occur more regularly. The Somerset floods of 2014 are an example of a recent large-scale flood event, but also the Lake District is regularly subjected to floods (2005, 2009, 2015). These are examples of pluvial and fluvial floods, but also coastal flooding has been an issue in England. During the storm surge season of 2013-2014 multiple coastal towns were flooded.

In both countries, three case study locations were chosen because of their location in relation to the varying types of flood risk. Great Yarmouth (England) and indirectly Aldeburgh (England) and Dordrecht (Netherlands) are susceptible to coastal flooding. Fluvial flood risk applies to Zwolle (Netherlands), Venlo (Netherlands), Dordrecht (Netherlands), Oxford (England) and Aldeburgh (England). Additionally, pluvial floods apply to all case study locations (see Table 1.1). In selecting these case study locations it was taken into account whether they have experienced flood event (or the threat thereof) recently, and whether they have not been subjected to much previous academic research. All locations have neighbourhoods at flood risk and some of these neighbourhoods have experienced floods once or multiple times over the past years. Respondents are selected based on their living location in flood risk areas. In other words, all the respondents' homes are at flood risk. Additionally, the selection of respondents aimed to include both respondents who have and have not experienced flood events before. The residents' perspectives from both groups are of added value in this study, as, for instance, flood risk communication does not solely address residents who have been flooded or who have not been flooded before. Any variations to the selection of respondents will be thoroughly addressed in each of the following chapters.

2 While this was the case when this research was performed, by the time this thesis was printed the Netherlands experienced a large-scale flood event in July 2021.

1.5.2 Research techniques and data collection

Multiple research methods were applied for data collection in this study. Qualitative research was the main focus and specifically in qualitative studies it is perceived to be of added value to combine various methods to increase the validity, in other words triangulation. Therefore, each chapter is based on a mix of research methods. The following research methods have been applied.

Desk research

This entails a content analysis of academic literature, reports, websites, and media. This type of research went into all chapters of this thesis. These analyses provide insight into the academic debates on the topics of flood risk governance, adaptation, residents' involvement, responsibility, and communication. In total, the literature review entailed largely 150 documents, which are referenced per chapter in this thesis.

Interviews

Semi-structured interviews

In-depth interviews on the topics of PLFRA, flood risk communication, responsibility division and flood risk governance in general comprise the primary form of empirical data collection. Insights from these empirical analyses contributed to answering research questions 3, 4 and 5. These interviews are crucial for gaining a deeper understanding of the perspectives and experiences of respondents as well as the applied context and governance arrangements. Using open-ended questions and scenarios, the empirical data facilitates explorations of different perspectives, experiences, and opinions. These were intensive interviews with a duration of more than 60 minutes in general. This approach generated enough time to ask follow-up questions and go into detail on experiences and the background of opinions. This type of interview was performed in both England (21 interviews) and the Netherlands (18 interviews).

Structured interviews

The structured interviews were performed in a door-to-door manner. These interviews were designed to collect empirical data across a larger target group. As the interviews took less time than the semi-structured interviews (approximately 20 minutes), it was possible to collect data from 51 Dutch respondents. These interviews were held in selected neighbourhoods in Dordrecht, Zwolle, and Venlo. They consisted of open-ended questions on the respondents' perception of flood risk, experience, PLFRA measures, responsibility, and communication.

All interviews were analysed qualitatively and coded with MAXQDA. The coding process consisted of various rounds of coding, starting from a specific to a more abstract level of codes.

Q Methodology

To specifically acquire more insight into residents' perspectives on flood risk communication, Q methodology was applied in both the Dutch and English empirical data collection. The added value of employing Q methodology as well as interviews is

that the results of Q methodology systematically provide insight into the differences and similarities between residents' perspectives and show how residents are grouped together based on their perspectives. Q methodology systematically reveals individual perspectives and groups them into shared perspectives using quantitative factor analysis (Raadgever, Mostert, & Van de Giesen, 2008). The factor analysis identifies the basic principal dimensions of respondents' perspectives (Kerr & Bjornlund, 2018). This methodology highlighted the various perspectives coexisting among Dutch and English residents on how they prefer flood risk to be communicated.

Q methodology consists of four steps. First, a Q-sample (or Q-set) was created. The sample was composed of statements extracted from the literature, interviews, or media. The statements in this study were formulated based on an analysis of the existing literature on flood risk communication, flood risk awareness, and PLFRA. The Q-sample consisted of a number of statements that covered these research topics, after which participants were selected. In the second step, Q-sorts were collected. Respondents ranked statements (i.e., the Q-sort) by assigning a value to each statement (Uittenbroek, Janssen-Jansen, Spit, & Runhaar, 2014). The Q-set consisted of 31 statements, and in total 36 respondents performed the Q-sort. They assigned each statement to one of 31 boxes in the Q-sort, which consisted of a 9-step scale from strongly agree (4) to strongly disagree (–4). Step three was a statistical analysis of the Q-sorts, namely a factor analysis. PQmethod software was used to run a principal component analysis (Schmolck, 2002). Step four was the interpretation of the factors. McKeown and Thomas (2013) refer to this as the task of distilling the core meanings hidden within the factors. The findings of this research method are clarified in Chapter 5 and 6.

Table 1.2 Thesis Outline

	Topic	RQ	Publication
Chapter 1	Introduction		
Chapter 2	Theoretical considerations of homeowner involvement	RQ 1	WIREs Water (2020)
Chapter 3	Conceptualising responsibility	RQ 2	Under review
Chapter 4	Empirical analysis perceived responsibility	RQ 3	Journal of Flood Risk Management (2021)
Chapter 5	Empirical analysis preferences for communication	RQ 4	Water International (2019)
Chapter 6	Empirical, cross-country analysis of preferences for communication	RQ 5	Under review
Chapter 7	Conclusion and discussion	Main RQ	

1.6 Thesis Outline

The structure of this thesis is outlined in Table 1.2. The following chapters are based on papers that have been published or submitted to peer-reviewed journals. Chapter 2 addresses research question 1 regarding the reasons why residents should be more involved in flood risk governance. Chapter 3 entails conceptualising responsibility in flood risk governance and provides an answer to research question 2. Furthermore, Chapter 4 empirically analyses residents' perceptions of responsibility by addressing research question 3, after which Chapter 5 and 6 address the topic of flood risk communication and the preferences of residents for flood risk communication. Chapter 5 provides an answer to research question 4, and, subsequently, chapter 6 addresses research question 5. Chapter 7 entails the conclusion and discussion of the findings and provides an answer to the main research question.

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Chapter 2

The shifting position of homeowners in flood resilience: From recipients to key-stakeholders

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Abstract

The academic debate on flood risk governance is paying increased attention to the shifting position of homeowners. Homeowners are increasingly expected to adapt their homes to protect against possible floods. Although an overall agreement seems to exist on the involvement of homeowners in flood risk governance, the academic literature is dispersed in its argumentation on why homeowners should be involved. Therefore, this article provides a coherent overview of the transition from flood protection to flood risk management, and subsequently of the arguments that unfold regarding the shifting position of homeowners within this debate. This overview, based on a systematic review of the academic literature, helps to shed light on the changing role of homeowners in flood risk governance and contributes to categorising the arguments used in current academic reasoning on homeowner involvement in flood risk governance. We use a conceptual distinction between macro-level and micro-level arguments, and between individual and collective efforts to structure our results. This conceptual overview illustrates the potential gap in convincing homeowners of the urgency to take action, because the connection between the macro-level arguments (i.e., climate change and responsibility) and the micro-level arguments (i.e., minimising flood damage on privately owned properties) is generally not made. We, therefore, suggest that a stronger coherence in the argumentation would contribute to increase homeowner awareness of their changing responsibilities, which might bring about a future shift toward a new phase in flood risk governance, in which the responsibilities of homeowners are more explicitly acknowledged and integrated into climate adaptation strategies.

2.1 Introduction

The debates of the last three decades on how to deal with flood risk have increasingly allotted more responsibility to homeowners in striving for flood resilience (Holub & Fuchs, 2009; Mees et al., 2012; Osberghaus, 2015). In these debates, it is generally stated that homeowners can, and increasingly must, prepare their homes against possible flooding. Such preparation usually implies relatively moderate and low-cost measures with the aim of minimising flood damage (e.g., installing back water valves or mobile barriers). In addition, research on the role of homeowners focuses mainly on their flood risk awareness, risk perception, preparedness to take adaptation measures, and their willingness to pay. Aside from the academic debate, this shift is also recognised in policy as homeowners are increasingly expected to take personal measures to protect and prepare their homes against flooding (Begg et al., 2017). This contribution adopts a Eurocentric perspective on flood risk governance and task divisions between government, market stakeholders, and civil society. Even though within Europe there are differences between countries regarding the approaches to flood risk, the overall trends are generalisable for the continent. Non-European countries, on the other hand, have varying traditions in flood protection and homeowner involvement, therefore they are excluded from this analysis.

Policymakers and academics are increasingly questioning whether it is a governmental responsibility to manage flood risk and whether full protection against floods can be provided (Krieger, 2013; Vis et al., 2003). They call on the general principles of governance to be employed in the processes of managing floods, that is, collaborative arrangements and a shared distribution of power between governmental organisations, market stakeholders, and civil society (Alexander et al., 2016). This emphasis on governance resembles the larger societal discussion on the shifting role of governments (i.e., "from government to governance"), that is discussed in various disciplines (e.g., Jessop, 1998; Rhodes, 2007; Nuissl & Heinrichs, 2011). In the context of this shift toward governance, homeowners are sometimes involved in local participation processes, but are also increasingly expected to implement adaptation measures on their own privately owned properties to protect themselves against floods. Homeowner involvement generally entails both the private implementation of adaptation measures, as well as participating in decision-making processes (Meijer, 2016; Wamsler, 2017). In this article, we specifically focus on the former and delineate homeowner involvement as more actively and practically involved actions of homeowners in solving the actual, practical issues that flood risks generate, usually on their own properties. This involvement can consist of taking specific adaptation measures to their homes or being generally more prepared for a flood event.

The increased expectations of the role of homeowners—both from policymakers and within academic literature – highlight a gap between the role of governmental organisations in flood risk management and protection in practice, and the expectation that civil society should be increasingly involved by implementing measures themselves. The starting point of this article is therefore the question: "Why should homeowners be more involved in flood risk governance?" By analysing the current academic debate, this article intends to clarify the varying answers provided to this question. The aim of

this article is, therefore, to provide an overview of the argumentation for homeowner involvement in the flood risk governance literature and to highlight how this relates to the larger shifts in managing flood risk over time. The concept of flood risk governance is here understood as an approach to direct flood risk management (Alexander et al., 2016). Flood risk governance is most successful when collaboration among governments as well as market stakeholders and civil society is achieved to collect, analyse, communicate, and make decisions about flood risk (Renn et al., 2011).

To this end, we will first explain the wider debates that have led to the call for more homeowner involvement in flood risk governance approaches, starting with the paradigm shift from flood protection to flood risk management (Section 2). Section 3 provides a structured overview of arguments for homeowner involvement in flood risk governance approaches. In the final discussion (Section 4), we will show how the ongoing shift in flood governance is moving toward advocating for homeowner involvement too.

2.2 An overview of transitions in flood risk governance

Before extensively discussing the argumentation for homeowner involvement in contemporary academic literature (Section 3), it is essential to highlight the previous changes flood risk governance has undergone and how this has affected the perspectives on the role of homeowners over time. Approaches to minimise floods have not only evolved "from government to governance", but are reflective of a wider societal shift toward more governance-oriented processes.

Overall, traditional flood protection approaches, consisting of large-scale measures like dikes and dams, has represented the dominant perspective on dealing with floods since the start of industrialisation (Tempels & Hartmann, 2014). The measures mainly entail technical defences aimed at reducing the probability and intensity of flooding (Mees et al., 2016; O'Neill et al., 2016). Such technical infrastructures are based on an engineering perspective that claims that floods can be prevented and that land, people, and property can be protected against this force of nature (Hartmann & Jüpner, 2014; Johnson & Priest, 2008). These structural protection measures are developed to withstand a potential flood of a certain statistical return period. The number of flood events that can exceed this design standard is considered neglectable (Kuhlicke, 2019). As a consequence, most (urban) living areas are separated from water and, indirectly, from flood protection processes. In general, this traditional flood protection approach is a state-centered approach. In other words, governmental institutions (e.g., the water boards in the Netherlands) are solely responsible for protection against floods (Johnson & Priest, 2008; Wiering et al., 2014; van Buuren et al., 2012). It is their main role to ensure that floods do not severely impact national security and economic growth or welfare standards (Penning-Rowsell et al., 2006). Therefore, homeowners are merely recipients of flood protection, which is provided as a public service. They have not been involved in the related planning processes and have been assured that flooding will be prevented. The role of homeowners in traditional flood protection has therefore been marginal.

From the 1990s onwards, at least within Europe, the perspective of traditional flood protection has gradually been complemented by a more governance-oriented perspective on flood risk management. This governance-oriented approach within flood risk management can be seen as illustrative of the societal transition from government toward governance that is more widely discussed in other disciplines in that time period as well (see, e.g., Hartmann & Driessen, 2017; Rhodes, 1996; Jessop, 1998). The notion of flood risk management is guided by the perception that "we cannot engineer our way out of this problem" (Penning-Rowsell et al., 2006), because floods cannot be fully prevented. This line of thinking is a response to the failure of traditional technical flood protection measures during major floods in Central Europe in 1993, 1995, and 2002 along the rivers Rhine, Elbe, Danube, and others. Technically oriented flood protection measures have since then been recognised as one aspect of flood risk management instead of the main defence strategy (Bradford et al., 2012; Hartmann & Scheibel, 2016; O'Neill, 2018). It is nowadays widely accepted that floods cannot be defended through technically oriented measures alone (O'Neill, 2018) and absolute protection cannot be provided (Kuhlicke, 2019). This recognition points toward a shifting governance approach to flooding in which floods are perceived as manageable instead of preventable with an increased focus on probabilities and effects (Johnson & Priest, 2008). This is a more holistic perspective, as also called by some authors a river-basin wide approach, that takes into consideration the riverbed, the flood protection measures in place, as well as the flood-prone areas beyond the dikes or flood walls (Hartmann & Jüpner, 2014).

In addition, increased attention is paid to nonstructural measures, such as flood warnings, raising awareness, household preparedness, insurance, and relocation (Birkholz et al., 2014; Bradford et al., 2012; O'Neill, 2018). Flood impact can be decreased by such nonstructural measures, but cannot be completely prevented. The risk-based approach of flood risk management allows for combinations of structural and nonstructural measures to reduce flood risk by managing the frequency and impact of floods (Penning-Rowsell et al., 2006).

Within this paradigm, the role of governmental organisations is undergoing change. The river-basin wide approach implies that nongovernmental stakeholders are to be increasingly involved in planning processes. Moreover, the emphasis on nonstructural measures also explicitly includes communication with market stakeholders and civil society. According to Penning-Rowsell et al. (2006), a balance is therefore needed between state action and self-protection by other stakeholders, including homeowners.

2.3 Why homeowners should prepare for floods

This section provides an overview of the arguments in the academic debate on homeowner involvement. As the perspectives on how to manage floods are in transition over time, as described in the previous section, many authors have provided various reasons for an increasing homeowner involvement. Since there is not a "core" scientific publication that marks the starting point of this shift toward more homeowner involvement, or that outlines clearly why they should take on a larger role, this article

aims to provide this overview based on a systematic inventory of the argumentation used in many research articles to date.

2.3.1 Methodological approach

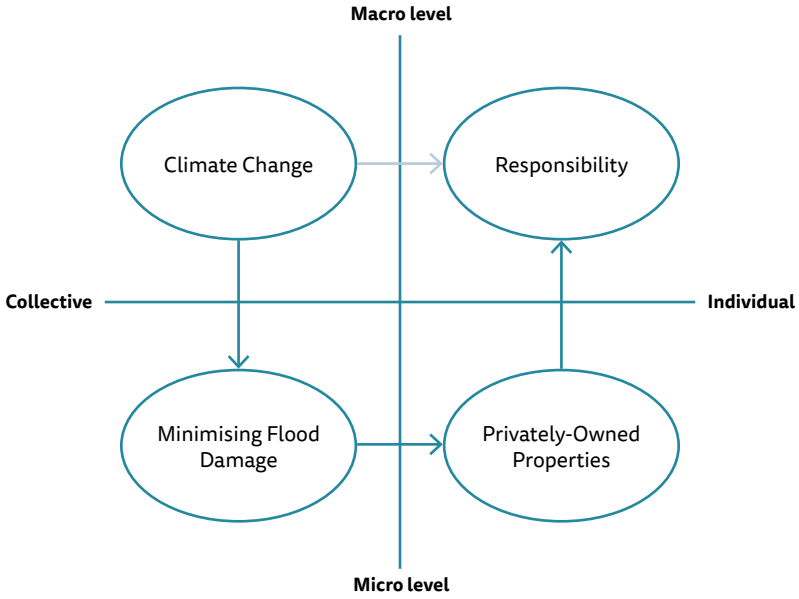
This overview of arguments is based on a systematic and in-depth analysis of existing academic research on flooding and in particular on the involvement of homeowners in flood risk governance. Over 125 international peer-reviewed academic journal papers were the result of our initial inquiry on the online academic search engine Scopus using the following keywords: Flood, homeowner, resident, citizen, household, risk, adaptation, mitigation, management, and responsibility. The next step in the selection process included selecting articles which were published between 2005 and 2019 and had a geographical focus on European countries. Articles before 2005 were assumed to be mainly focusing on flood risk management approaches and less on homeowner involvement, therefore less relevant for our analysis. We choose Europe as our geographical focus because we noticed that the overall trends in flood risk governance and responsibility divisions between governments, market stakeholders and civil society are generally taking place among European countries. Although the approaches differ between the countries, they are more comparable than non-European countries, that have more varying traditions in flood protection and homeowner involvement.

This initial selection process led to 25 documents. We have supplemented this selection with nine documents from outside the initial search scope by applying the snowballing method on relevant references in the initially selected articles. This leads to a total of 34 documents, which include leading peer-reviewed international journal articles and relevant academic research reports. Based on a systematic analysis of the identified literature, an overview of over 50 arguments for homeowner involvement was compiled. These arguments were then further grouped into four all-encompassing categories of arguments; namely arguments related to (a) climate change, (b) minimisation of damage costs, (c) privately owned properties, and (d) division of responsibility. We have categorised the arguments based on their overlap and distinctive characteristics. Moreover, following the reasoning of the connection between the macro level and micro level in the model by Coleman (1987)—that is, "Coleman's boat"—the arguments can be distributed in macro level and micro level arguments. Additionally, we distinguish the scope of collective and individualistic arguments. As will be further explained in Section 3.6, the categories of climate change and division of responsibility are at the macro scale, whereas minimisation of damage costs and privately owned properties contain arguments at the micro scale (Figure 2.1). In general, the four categories are all connected, they do not stand alone and some of them are more closely linked than others. The next sub-sections (3.1 to 3.5) will outline the argumentative categories in more detail.

2.3.2 Climate change (macro scale, collective level)

The first category comprises arguments related to climate change, which are in the literature mostly used as "introductory statements". The central argument for homeowner

Figure 2.1 Integrated overview of macro-level and micro-level arguments for homeowner involvement in flood risk governance (based on Coleman, 1987).



involvement in this category is that climate change increases the impact, intensity, and frequency of floods. This is often supported by reports such as the IPCC (2014). Previous research points to the physical, societal, and economic impacts of flood events as a result of climate change and emphasises that floods will occur more frequently and severely under climate change scenarios (among others: Bichard & Kazmierczak, 2012; Bubeck, Botzen, & Aerts, 2012; Johnson & Priest, 2008; Kreibich et al., 2011; Kundzewicz et al., 2018; Mees, 2017; O'Neill, 2018; Raška, 2015; Terpstra, 2011). As flood events likely increase in the near future, it is argued that sufficient protection cannot be guaranteed solely by traditional flood protection measures such as dikes and retention polders (Hartmann, 2011). Therefore, traditional flood protection does not provide total flood security (Grothmann & Reusswig, 2006). The improvement of these public protection measures is necessary, but will likely be insufficient as well. Consequently, it is expected that homeowners take on a role in flood risk adaptation through bottom-up processes (Begg, 2018; Raška, 2015; Terpstra, 2011).

Most studies state that because the environmental conditions are changing and solely flood protection measures are not sufficient to prevent flood damage, homeowners need to take action to complement the current traditional protection measures. It is depicted as an all-hands-on-deck-situation. The specific reasoning for why homeowners should take action, however, is often insufficiently substantiated. Essentially, it is only one of a wide array of possibilities to minimise future flood damage and more floods does not automatically justify more responsibility for homeowners. The climate change argument is therefore considered by us as a macro-scale argument, stressing the responsibility of homeowners at the collective level (Figure 2.1).

2.3.3 Minimising flood damage (micro scale, collective level)

The second category is based on the reasoning of multiple authors who indicate that, when homeowners implement personal measures, they are able to reduce flood-related damage and therefore increase their own resilience (e.g., Begg et al., 2017; Bubeck, Botzen, & Aerts, 2012; Everett & Lamond, 2013; Grothmann & Reusswig, 2006; Kreibich et al., 2011; Thurston et al., 2008). Flood adaptation efforts at the micro scale account for most of the collective differences in monetary losses in case of a flood event (Fink et al., 1996). Moreover, flood damage to private properties has been considerable in recent flood events, which indicates that existing flood prevention schemes and drainage systems have not been substantial enough to cope with rising water or heavy rain fall events (Soane et al., 2010).

It is argued that residents of flood-prone areas can reduce monetary flood damage by 80% through implementing flood risk adaptation measures themselves (Grothmann & Reusswig, 2006). Other studies show that adaptation measures that were implemented reduced damage ratios by 50% for the 2002 Elbe floods in Germany (Kreibich et al., 2011). In the UK, Thurston et al. (2008) found that protection measures are worthwhile for households that have a 2% chance of flooding and that temporary protection measures can reduce damage by 50% (Everett & Lamond, 2013). It has been demonstrated that private flood adaptation measures can significantly reduce flood damage and thereby contribute to risk reduction (Bubeck, Botzen, Kreibich, & Aerts, 2012). In the long term, adaptation measures can significantly reduce the need for public risk management (Grothmann & Reusswig, 2006).

In sum, the studies underlying this argumentative category demonstrate that measures at the home level have a positive impact on limiting the collective (financial) consequences and aftermath of a flood event (i.e., Everett and Lamond 2013; Grothmann and Reusswig 2006; Kreibich et al. 2011; Thurston et al. 2008). Therefore, this argument is considered by us as a micro-scale argument, stressing the collective effects of homeowner measures in terms of damage reduction (Figure 2.1).

2.3.4 Privately owned properties (micro scale, individual level)

The third category emphasises that homeowners can play a role in providing adaptation benefits, in particular due to the private ownership of their property. According to Tompkins and Eakin (2012), adaptation benefits are specific benefits resulting from actions homeowners have taken for themselves (e.g., limiting home flood damage through sand bags) and/or for their communities (e.g., contributing to the water buffering capacity of neighbourhoods by reducing soil sealing on their properties). Private properties are particularly at risk of flooding as traditional protection measures generally are implemented in public space and aim to provide protection on a large-scale. Since the implementation of adaptation measures reduces flood damage significantly, the added value of these measures is obvious, as was shown in the previous sub-section. Homeowners ought to and are able to adapt their private properties because they own the land where these measures are needed. Their initiative or consent is often needed for these adaptation measures (Hegger et al., 2017; Mees et al., 2012). As such, homeowner involvement is crucial for implementing adaptation measures in and around private

residences (Hegger et al., 2017), mainly because governmental institutions lack the legal authority to do so. For instance, only owners of the properties have the right to remove the surface pavement in their gardens to increase the level of infiltration.

This reasoning regarding who has the ability and right to minimise flood damage is of great importance and builds on the previous – and following – categories of arguments. In each context facing, a risk of flooding, homes exist that are unprotected by large-scale public protection measures. Even if governments aim to prevent all flood damages, a governmental organisation cannot implement any measures on private properties without consent of individual landowners. Large-scale flood protection measures can only do so much in a flood situation, especially with pluvial floods. This argumentative category therefore encompasses the individual right and obligation of homeowners for protecting their own properties (i.e., micro scale, individual level). It thus distinguishes itself from the other categories by being a legal argument aimed at a legal entity (i.e., individual property rights) rather than a collective argument aimed at collective goods (Figure 2.1).

2.3.5 Division of responsibility (macro scale, individual level)

The fourth and final category covers arguments regarding the societal division of responsibility, between government and citizens. The government has been seen as primarily responsible for flood protection, and the governmentally implemented structural forms of defence are favoured (Bichard & Kazmierczak, 2012; Werritty et al., 2007). This is clearly the case in Dutch flood risk management, where national-, regional-, and local-level governments are primary actors in terms of adaptation planning and have many formal responsibilities, including those for flood management and civil protection (Hegger et al., 2014; van Buuren et al., 2012). It is also the case in many other European countries, such as Germany, France, and UK, where flood risk management is foremost perceived as a governmental responsibility (Hartmann & Jüpner, 2014; Thaler & Priest, 2014). This category's main argument is that the sharing of responsibilities between government and citizens will lead to additional benefits thereof, particularly with regard to governmental capacity issues, lack of public funding and legitimacy and awareness issues.

Governments will have to communicate actively that public flood protection does not provide total security (Grothmann & Reusswig, 2006) and that flooding presents a challenge that affects society as a whole. A solution from a governmental perspective is the sharing of responsibility and, in addition, sharing the cost for risk management (Hegger et al., 2017). Begg (2018) states that the reductions in public funding have increased the pressure on the state to move toward sharing of responsibilities. Additional benefits of more homeowner involvement and less governmental responsibility are also mentioned by various authors. The main benefit is that the legitimacy of flood risk adaptation approaches can be increased by including citizens in both private implementation of measures and collective decision-making processes (Kundzewicz et al., 2018). Moreover, changing the division of responsibility can lead to increased awareness, more innovative capacity, and enhanced mainstreaming of adaptation into other activities (Hegger et al., 2017; Runhaar et al., 2012; Uittenbroek et al., 2013).

Sharing responsibilities significantly changes the role of the involved stakeholders and leads to the assumption that homeowners are obliged to take more flood adaptation measures (Bubeck, Botzen, & Aerts, 2012). For instance, Soane et al. (2010) and Begg et al. (2017) analyse the division of responsibility between government and homeowners and study what encourages homeowners to take more responsibility. Soane et al. (2010) highlight how homeowners can accept their individual responsibility and become more involved in flood risk governance. Moreover, homeowners are often expected to have the greatest incentives to take action (Everett & Lamond, 2013), but it has been widely concluded that people living in flood-prone areas often fail to act or do very little to lessen their risk of death, injury, or property damage (Grothmann & Reusswig, 2006; Peek & Mileti, 2002).

From the perspective of governmental organisations, the involvement of homeowners in flood risk management seems like a logical consequence of a lack of funding. However, as Begg (2018) and Bickerstaff, Simmons, and Pigeon (2008) state, the role of homeowners depends on how responsibilities are perceived by both the state and by the homeowners. Therefore, homeowners should also be included in the dialogue on responsibility. By not including them in the dialogue, the government assumes that homeowners share the same flood-related goals as the state, which might not be the case (Begg, 2018; Butler & Pidgeon, 2011). Hence, before a homeowner will actually implement measures, they need to first accept it is their responsibility to protect their home—rather than assuming that it is the prime responsibility of the state—and believe that their actions will have a positive, meaningful effect (Soane et al., 2010). They need to possess a sense of self-efficacy, that taking adaptation measures has a positive impact (Bickerstaff et al., 2008). However, various studies show that homeowners do not perceive implementing adaptation measures as their responsibility (Bichard & Kazmierczak, 2012; Everett & Lamond, 2013). On the contrary, one could argue that private adaptation by homeowners will be redundant if public agencies successfully prevent flooding of living areas, because if the residents at risk rely on the efficacy of the public flood protection, they will most likely take less precautionary action themselves (Grothmann & Reusswig, 2006). Consequently, the general tendency in academia is, as Kundzewicz et al. (2018) and Tullos (2018) also argue, that it is necessary to overcome the current public perception that the government is able to control flood risk and is solely in charge thereof. Therefore, this final category of arguments is seen as a growing sense of responsibility at the individual level, affecting what can be achieved with shared responsibility at the macro scale (Figure 2.1).

2.3.6 Integration of argumentative categories

We have distinguished four main categories that are used in the academic debate as arguments to include homeowners in flood risk governance (Figure 2.1). These four types of arguments are not unrelated, but build on each other and lead to a larger debate on the division of responsibility between governments and citizens. All four categories together make a more solid case for homeowner involvement, but none of the cited publications actually used all categories collectively to clarify why homeowners should be more involved. Most of the cited authors mention the consequences of climate change

(i.e., macro-collective), followed directly by considerations of responsibility division (i.e., macro-individual). However, the arguments regarding minimising damage (i.e., micro-collective) and private properties (i.e., micro-individual) are hardly used in the argumentation.

Figure 2.1 shows how the most applied reasoning, from climate change to responsibilities arguments (grey arrow), is actually passing over the arguments that address the micro level (black arrows). Climate change and responsibility are arguments that operate on a macro level, as they encompass reasons that are more abstract to grasp. In contrast, the arguments of minimising flood damage and privately owned properties are addressing homeowners at a micro level hands-on, by emphasising flood protection measures that can be taken directly by themselves. We argue that, in accordance to "Coleman's boat", at the macro level, climate change and its consequences for the division of responsibilities in flood risk management can be further strengthened and substantiated, by connecting these arguments to the micro level arguments of minimising flood damage by adaptations on privately owned properties (Figure 2.1). In other words, to convince homeowners to become more involved, which is becoming more urgent due to climate change, one can point out the effect of minimising flood damage by taking adaptation measures on their own properties and indicate that it is something that only the property owner can decide, which would likely benefit a greater uptake of responsibilities by the homeowners at the macro-level. This could in turn lead to greater participation of homeowners in collective decision-making and/or enhanced legitimacy of planning outcomes.

We acknowledge that not every article can and should go into the same level of detail on the debate regarding homeowner involvement and division of responsibilities. Still, it is striking that most of the literature referred to here does not provide more clarification of why homeowners' involvement is necessary, and how to effectively accomplish that. As the overview of categories shows, a wide array of disciplines contributes to the debates on flood risk governance, which might be the underlying cause for the lack of an overall convincing and integrated argumentation. For instance, the category of climate change mainly portrays a natural sciences way of reasoning, which is dominant in traditional flood protection approaches. Minimisation of flood damages is an economic argument, which can be part of cost benefit analyses that are underlying risk-based approaches of flood risk management. The category of private properties depicts a legal argument, whereas the responsibility category is a policy-oriented type of reasoning.

2.4 Discussion

The changing role of homeowners in flood risk governance is related to the different approaches to dealing with floods over time. When the main strategy was traditional flood protection, the government was in general the sole problem-holder, while individuals were merely recipients. Changing toward the perspective of flood risk management, awareness rises that protection cannot be 100% guaranteed, and governments are consequently more open to the involvement of other stakeholders in the management of floods. This indicates the first step toward flood risk governance,

in which governmental organisations move away from centralised power toward the involvement of market stakeholders and civil society (Walker, Tweed, & Whittle, 2014). However, civil society members (i.e., homeowners) are not yet actively involved in flood risk management processes.

This article has shown how homeowner involvement is currently substantiated in academic literature and what the opportunities are to improve this involvement in flood risk governance, particularly through stressing their potential individual, micro-level contribution in this. Of course, to a certain extent, residents are also involved more collectively by participating in decision-making processes of new flood risk management plans in which there is some room for involving the public that might be affected by these new plans. Moreover, the management of natural hazards in general has always consisted of the participation of a variety of actors, including community organisations (Walker et al., 2014). However, this is not the same as their active involvement in flood risk governance as adapters and implementers. We argue here that the increase in academic attention paid to the specific role of homeowners in flood risk management indicates an even further step within flood risk governance, namely, the sharing of responsibilities between government, market, and civil society This would lead to even more involvement of non-governmental stakeholders that are self-motivated to engage in the planning process.

We observe a tendency in academic literature to gradually shift toward a new approach in flood risk governance, in which homeowners are further expected to prepare themselves and take adaptation measures. We tentatively address this latest shift as "flood resilience". Flood resilience is not an isolated strategy. Flood resilience requires society to be able to reduce the vulnerability to floods while maintaining the basic functions of living areas in the face of climate change (Klijn & Koppenjan, 2012). The concept extends flood risk management by separating three capacities; (a) the capacity to resist, (b) the capacity to absorb and recover, and (c) the capacity to transform and adapt (Hegger et al., 2016). Doing so, it is an approach that builds on the protection and management approaches to floods, but further clarifies the current emphasis on homeowner responsibility in flood risk governance. Flood risk management accounted for a lot of beneficial flood risk measures, policy and funding. With a gradual shift to flood resilience, it might be possible to lead to a similar set of benefits (both in academia and practice), in which the position of homeowners is getting more prominent. By acknowledging that flood risk management is in transition to flood resilience, this potentially new paradigm opens possibilities for homeowner involvement in flood risk governance, not just in academic research or policy documents, but in open, public discussions on the division of responsibilities.

This transition to flood resilience potentially gives meaning to the unfolding changes in flood risk governance regarding the redistribution of responsibilities between governmental organisations, market stakeholders, and civil society (Kuhlicke, 2019; Welsh, 2014). To achieve flood resilience, the added value of participation and decentralised governance approaches are emphasised in establishing a society that is more receptive to transformation and adaptation (Hegger et al., 2016). The involvement of homeowners in the actual responsibility debates is most essential in this transition. Now that the debate in flood-related academia and policy is moving toward involving individuals, an additional step is taken to complete the governance triangle of

government, market stakeholders, and civil society. By broadening the scope, the flood risk governance discussions can gain insight from debates in the wider context of natural disasters (e.g., Collier, 2014). As a transition from government to governance is being undertaken, all actors are meant to take part in the governance processes in order to establish flood resilience.

2.5 Conclusion

The presented overview of arguments demonstrates how dispersed the topic of flood risk governance is across multiple disciplines and it signifies gaps that can be overcome if it is better understood why homeowners are necessary stake
holders in flood risk governance. First, with the shift to flood risk management, the tendency has been to aim at involving homeowners more. However, in practice, homeowners have not been part of this shift and were not consulted or actively informed about this possible change, even though various researchers claim that it is essential to include them in the dialogue regarding the division of responsibilities (e.g., Begg, 2018; Bickerstaff et al., 2008; Butler & Pidgeon, 2011; Terpstra & Gutteling, 2008).

Second, climate change is mentioned by all cited references, but the argument for action is often described too abstract to grasp. The climate change argument seems a solid reason for taking action, yet it is foremost a long term and large-scale trend for which consequences are usually portrayed as a collective problem. This potentially negatively affects the sense of self-efficacy of homeowners, as they might perceive that their individual behaviour does not result in a meaningful contribution to the collective (Bickerstaff et al., 2008). Moreover, climate change has already often been used to convince homeowners to change their behaviour (e.g., CO_2 neutral-energy, recycling, eating less meat). Flood risk can be added to this list and wait in line for other more pressing issues in daily life to pass.

Third, the potentially more convincing arguments are currently insufficiently used in the debates. The arguments based on empirical research and the more practical benefits to individuals of adapting homes to floods, are under-referenced. Homeowners are likely to relate more to for instance the argument that taking adaptation measures leads to serious reduction of flood damage. On the contrary, the category of responsibility is the one that is most often mentioned in literature. Generally, research states that the division of responsibility should be changed and that homeowners should take on a larger role, but why this change should take place is not specifically addressed. This all leads to the conclusion that, ironically so, the arguments that homeowners can most likely identify with are those that are until now least applied to them.

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Chapter 3

Unpacking Notions of Residents' Responsibility in Flood Risk Governance

Under Review

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Abstract

Environmental disasters and especially those triggered by floods are among today's biggest sustainability challenges. Both the number and intensity of floods are increasing, challenging associated governance approaches. Governments worldwide are looking to diversify their flood risk management and adaptation strategies, amongst others, by increasing resident involvement in flood risk governance. Such involvement of individuals shifts responsibilities for flood risk management from public to private actors. A clear understanding of the extent and implications of this shift is difficult to reach as theoretical perspectives on the concept of responsibility vary. Correspondingly, grounds for attributing responsibility for flood preparedness and response also differ across countries. This lack of analytical and empirical clarity complicates academic and policy discourses on what it actually means to 'be responsible.' The current article focuses on systematising these different approaches to responsibility in flood risk governance. To improve current knowledge on responsibilities of residents involved in flood risk governance, we present a conceptual framework that distinguishes among four theoretical notions of responsibility: legal responsibility, accountability, perceived responsibility, and moral responsibility. These notions are elucidated with the help of examples of flood risk governance practices in the United States, Germany and the Netherlands. We find that the four notions are closely intertwined; that is, all notions are reflected in the governance processes of the examples. More importantly, this article documents divergences between what individuals perceive as their own responsibility in flood risk management and the responsibilities that governments assume. We conclude the paper with a discussion on the tensions between perceived responsibilities and the other three notions. Explicit, transparent and open discussion on these tensions will allow attribution of responsibility in flood risk governance, specifically the residents' roles, to be reconsidered - especially, with an eye toward better aligning popular perceptions of responsibility with legal assignments in flood risk governance processes.

3.1 Introduction

The risk of flooding is generally seen as an external threat (i.e., an environmental disaster) against which societies should protect themselves. Over the course of the 20th century, governments have been the main actors responsible for protecting their countries (Johnson & Priest, 2008; Wiering et al., 2014). However, the protection measures have been insufficient to prevent widespread increases in flood damage. Floods have been increasing both in frequency and intensity, and the expectation is that floods will become more severe in the coming century as a result of climate change (IPCC, 2014; Wehn et al., 2015; Winsemius et al., 2013). The increasing number of flood events all over the world has shown that financial and organisational constraints severely limit public authorities' capacity to cope with floods, in terms of providing protection and disaster relief (Jongman et al., 2014; Michel-Kerjan & Kunreuther, 2011). Public authorities are not able to fully control floods and hence cannot be the sole actor in charge of flood risk management (Tullos, 2018). Governments increasingly recognise this fact, allowing them to be more open to involving other stakeholders in the processes of managing floods (McEwen et al., 2018; Söderholm et al., 2018). Governmental organisations and academia alike have therefore called for a greater degree of resident involvement in flood risk governance (Bubeck et al., 2012; Mees et al., 2012; Osberghaus, 2015). The concept of flood risk governance is understood as "the arrangements of actors, discourses, rules and resources through which flood risk management strategies are delivered and put into practice" (Hegger et al., 2014; see also, Wiering et al., 2017).

Opening up flood risk governance to the involvement of residents has increasingly turned the attention to the responsibility of residents in flood risk governance (Snel et al., 2020). Academics and policymakers both profess that a shift in the division of responsibilities in flood risk governance, from government to residents, is a sensible and imperative transition. As a consequence, residents have become part of the cost-benefit equation, because resident behaviour can contribute to flood damage mitigation and adaptation (Aakre et al., 2010; Doorn, 2016; Hegger et al., 2017). Residents can mitigate and adapt by implementing measures that, for instance, retain water or minimise damage at the property-level (Attems et al., 2019). Yet, increasing residents' responsibilities in flood risk governance requires consideration of both their role and the meaning of responsibility in flood risk governance.

In this article, residents' role mostly concerns their capacity as citizens vis-à-vis governmental actors and – to a lesser extent – as consumers in the market and as members of civil society (Hegger et al., 2017). Moreover, assessing the meaning of responsibility is more complicated. While researchers often mention residents' responsibilities in flood risk governance, they do not always use the term 'responsibility' in the same way, leading to miscommunication and scholarly dissonance (Doorn, 2012; Giddens, 1999; Pellizzoni, 2004). This requires an objective reconsideration of the concept of responsibility and its various facets. Not only because of this scholarly confusion, but also because actors are likely less willing to take action if responsibility is unsuccessfully assigned (Doorn, 2019; Miller, 2001). Especially since residents generally expect public authorities to be responsible for providing protection against floods (Terpstra & Gutteling, 2008; Lawrence et al., 2014; Raška et al., 2020).

This article contributes to existing research (e.g., Meijerink & Dicke, 2008; Raška et al., 2020; Lawrence et al., 2014) by unpacking what it actually means to 'be responsible', both acknowledging and explicating the various notions of responsibility that come into play in flood risk governance and related disciplines. The concept of responsibility varies based on, for instance, roles, actor capacity, and whether responsibility arises before or after a flood event. These different perspectives reveal a multiplicity of meanings surrounding the concept of responsibility (Doorn, 2012; Giddens, 1999; Pellizzoni, 2004).

This article aims to contribute to our conceptual understanding of existing residents' responsibilities in flood risk governance and how these might inform a discussion on potential responsibilities by answering the following research question: How can responsibility in flood risk governance be conceptualised, and how do different notions of residents' responsibility manifest themselves in practice? It does so by, first, providing a nuanced conceptualisation of responsibility by explicitly defining four key notions of 'responsibility'. Second, it will demonstrate, through examples of flood risk governance practices in the United States, Germany, and the Netherlands, how responsibilities are attributed differently, both in formal and informal ways. These examples show how different theoretical notions have become institutionalised in different countries. All three countries are western democratic countries where flood risk is a pressing societal issue – major flood events have taken place in each country over the past 30 years, and the risk of flooding will likely increase in the near future (Suykens et al., 2019). Third, it will draw conclusions from this conceptualisation and illustrative comparison. The final section provides a discussion on the tensions between the different notions of responsibility, including some suggestions for future research.

3.2 Unpacking the concept of responsibility

Responsibility is an ambiguous and complex term with many connotations. This article aims to conceptualise the term in such a way that it distinguishes the different uses of the term, both in academia in general and, more specifically, for the practice of flood risk governance. Academics from various disciplines have aimed to clarify the term, which has led to a diverse set of characteristics, principles, and notions of responsibility. This article builds on the work of Pellizzoni (2004), Mostert (2015), and Hart (1968). They all have conceptualised responsibility from the perspective of disciplines that are closely related to flood risk governance, namely environmental governance, environmental management, and legal philosophy. All of them made a distinction between grounds for attributing responsibility and notions of responsibility that arise from these attributions.

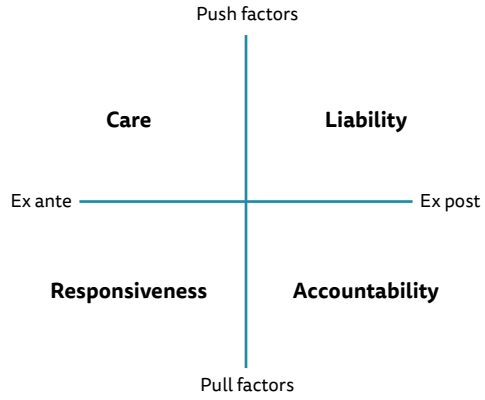
Hart (1968) emphasised the notions of legal and moral responsibility. He depicted the complexity of the concept by determining various grounds for attributing responsibility. He used an example of a captain who lost his ship to illustrate four grounds for attributing responsibility to an actor, namely: [1] role, [2] causation, [3] liability, and [4] capacity. Role refers to a distinctive place or office a person occupies within a social organisation. Causation refers to whether actors, actions or events have been the cause of, for instance, a disaster. Liability refers to whether an actor is to be punished or to be made to pay

> "As captain of the ship, X was responsible for the safety of his passengers and crew. But on his last voyage he got drunk every night and was responsible for the loss of the ship and all aboard. It was rumoured that he was insane, but the doctors considered that he was responsible for his actions. Throughout the voyage he behaved quite irresponsibly, and various incidents in his career showed that he was not a responsible person. He always maintained that the exceptional winter storms were responsible for the loss of the ship, but in the legal proceedings brought against him he was found criminally responsible for his negligent conduct and in separate civil proceedings he was held legally responsible for the loss of life and property. He is still alive and he is morally responsible for the deaths of many women and children" (Hart, 1968).

compensation for his or her actions. Finally, capacity addresses the mental, financial, or physical ability of an actor to positively influence the outcome/consequences of his or her actions.

Pellizzoni (2004) distinguished four dimensions (i.e., notions) of responsibility: care, liability, accountability, and responsiveness (See Figure 3.1). The two factors that determine which of these dimensions of responsibility apply to a situation are, according to Pellizzoni (2004), as follows: time of imputation (i.e., before or after an event) and grounds for justification (i.e., actions driven by previous experience or future desire). 'Time of imputation' refers to whether responsibility is attributed ex ante or ex post, that is, before or after the event for which responsibility must be attributed. For instance, the obligation or duty to ensure preparations are taken care of is an ex ante attribution of responsibility (Doorn, 2019; van de Poel et al., 2012). The obligation to compensate for damages resulting from an action or decision is an ex post attribution of responsibility. Ex post refers to responsibility that arises after something has happened, for instance, the responsibility to compensate for damages or the obligation to account for what you did or decided. Pellizzoni (2004) defined grounds for justification as in-order-to-motives and because-of-motives, which indicate the justification of behaviour based on respectively 'pull factors' or 'push factors', that prompted somebody to act. Pellizzoni (2004) justified all four notions of responsibility through their presence in governmental systems.

Figure 3.1 Typology of Responsibility from Pellizzoni (2004).



Liability relates to judicial power, while accountability and responsiveness relate to the democratic processes of electing representatives. Care is expressed in the relationship between a government and its citizens.

Moftert (2015), in turn, has distinguished twelve principles for allocating responsibility in environmental management or grounds for attributing responsibility: capacity, social costs, causation, interest, scale, subsidiarity, structural integration, separation, solidarity, transparency, stability, and acquired rights. Similar to Hart (1968), Mostert (2015) did not distinguish between different notions of responsibility that exist based on combinations of these principles; instead he focuses solely on allocation of responsibilities that is conducive for managing the environment, mainly from the perspective of public authorities. Nevertheless, the fact that Mostert (2015) emphasises the plurality of responsibilities indicates that, beyond the twelve principles, multiple notions of responsibility exist.

As Pellizzoni (2004: p. 546) stated providing a comprehensive analysis of the concept of responsibility is 'out of the question.' Therefore, our aim is not to provide an all-encompassing synthesis of the concept, but rather to operationalise responsibility in flood risk governance. Our conceptual framework has three dimensions. First, we categorise the meaning of responsibility into four notions: legal responsibility, moral responsibility, perceived responsibility and accountability. These notions are abstract and are similar to the notions or dimensions of responsibility elucidated in Pellizzoni (2004) and Hart (1968). We argue that legal and moral responsibility are commonly understood as key aspects of the responsibility concept, but these two do not fully cover all connotations of responsibility in flood risk governance. Building on Pellizzoni's (2004) conceptualisation, this article argues that accountability addresses the gap that arises when an actor has a certain role, capacity, or cause, but without legally defined tasks. Moreover, how residents and other actors perceive responsibility for flood risk governance may have little connection to legal or moral responsibility. An actor can perceive a responsibility to fall on him- or herself that is not based on legally defined tasks or moral considerations. These four notions of responsibility cover the different forms of responsibilities applicable in terms of flood risk governance. They are explained in detail in the following sections. Overall, the notions are robust and abstract enough to allow for an open-minded analysis of responsibility divisions in flood risk governance on various scales (such as, individual or governmental).

Second, these four notions of responsibility are comprised of varying combinations of attributes (see Table 3.1). Based on the conceptualisations supplied by Hart (1968), Pellizzoni (2004) and Mostert (2015), we distinguish four grounds for attributing responsibility to an actor, namely role, causation, liability, and capacity. These attributes reflect an actor's involvement in relation to a flood event. Role refers to the responsibility that originates from having a certain position or office in an organisation. Causation refers to whether an actor has (partially) caused a flood event or has negatively influenced its impact. Capacity refers to an actor's capacity to minimise or prevent a flood or flood damage. Liability refers to the duty to compensate for flood-related damages. The attributes of role, causation and capacity are relevant to both ex ante and ex post attribution of responsibility, while liability is only an ex post ground for attributing responsibility because it applies only after a flood event has caused damage. For the

conceptualisation of responsibility in flood risk governance, the parsimonious examples of Hart (1968) and Pellizzoni (2004) were followed. Specifically, a more abstract approach was chosen by identifying four broader attributes rather than multiple finer-grained ones similar to Mostert (2015). Although these attributes are equally important, they are not equally divided across the notions of responsibility (see Table 3.1). For instance, the attribute of role applies to all the notions because of the numerous actors by floods and involved in flood risk governance. Moreover, they often have multiple roles as well (e.g., employee, community member, property owner).

Finally, this article unpacks the concept of responsibility in flood risk governance by focusing only on residents as citizens in relationship to governmental actors and less as consumers in the market or as members or addressees of civil society organisations. The discussion is narrowed to these actors to shed a light on the shifting expectations of both governments and residents in flood risk governance. In addition, it also provides this article with focus and allows us to focus on relevant aspects of the topic. Table 3.1 provides an overview of the notions, attributes and operationalisations, and each notion is unpacked in more detail in the sections below.

Table 3.1 Overview of notions, attributes and operationalisation of responsibility.

Notions of responsibility	**Attributes** (Hart, 1968; Pellizzoni, 2004; Mostert, 2015)	**Theoretical Understanding**	**Implication**
Legal responsibility Ex ante and ex post responsibility (Pellizzoni, 2004)	– Liability (ex post) – Role (ex ante)	– Legal liability: a duty to compensate for flood damage resulting from (in) actions controlling floodwaters. – Legal responsibility: a duty to mitigate flood risk	– Who has duty to mitigate? – Who has duty to compensate for damages caused or experienced?
Accountability Ex post responsibility (Pellizzoni, 2004)	– Role (ex post) – Causation (ex post) – Capacity (ex post)	Accountability as the external aspect of responsibility. Those actors bearing responsibility, should be answerable to this; they should be held to account.	To which extent are actors account holders or account givers? – Account holders; e.g. residents can hold authorities accountable. – Account givers; actors who are part of decision-making processes become accountable.
Perceived responsibility Ex ante and ex post responsibility (Pellizzoni, 2004)	– Role (ex ante and ex post) – Capacity (ex ante and ex post)	Perceived responsibility describes individuals' view of their own, and others', responsibility.	What are actors' point of view on flood risk governance? What are their beliefs, world-view, awareness, understanding?

Moral responsibility Ex ante responsibility (Pellizzoni, 2004)	– Role (ex ante) – Causation (ex ante) – Capacity (ex ante)	Responsibility as moral obligation. Person A is responsible to person B to ensure that X. A = who is responsible X = responsible for what?	Determine who is responsible to whom and for what? Grounds for attributing responsibility can be role, causation, capacity. Take into account, interpret and weigh the empirical information (legal/accountable/ perceived).

3.2.1 Legal responsibility

Legal responsibility generally follows from human agency (Balkin, 1990). Thus, for legal purposes, a baseline assumption regarding flood responsibility is that humans do not cause the rain or sudden snowmelt and play no part in controlling or changing the flood's progress. Such floods are entirely natural phenomena for which neither residents nor governments acquire legal responsibility. In other words, not one actor involved in flood risk governance, whether it is a government, an organisation, or an individual resident, can be held legally responsible for a flood event when it is considered purely an act of nature.

In most cases, legal responsibility for flood damage and flood risk management follows from the recognition of legally cognisable human agency in a given flood situation. The interjection of human agency into floods can arise from two sources. First, humans can cause the flood themselves. This situation remains more theoretical than legally actualised. Second, and far more common, humans can change the behaviour of floodwater and enhance or mitigate the damage that floods cause. Infrastructure that changes flood behaviour is quite common. Governments and property-owners around the world use technology to contain, channel, direct, and otherwise control floodwater (Bergsma, 2018). Such direct human intervention can give rise to both a legal duty to act (i.e., to mitigate flood risk) as is suitable to an actor's role and legal liability (a duty to compensate for damage resulting from incompletely controlled floodwaters or infrastructure failure). Often these two aspects of legal responsibility are closely intertwined.

3.2.2 Accountability

The concepts of responsibility and accountability are related, and they are often used interchangeably (e.g., Mason, 2008; Mulgan, 2000). A common link between the two concepts is that responsibility entails an actor's is accountability for his/her action to some other actor, among other connotations (Mulgan, 2000). In environmental governance literature, accountability is usually regarded as a specific framing of responsibility, signalling that those actors bearing responsibility should be answerable to others for how well they exercise this responsibility or, in other words, their role. In

the context of flood risk governance, accountability mechanisms thus serve to allow others to attribute responsibility to an actor ex-post, after a flood event, on the basis of improper action or inaction, relating to the attributes of causation and capacity (Mason, 2008). This article adopts this 'external framing' of accountability, implying the external function of another actor who is able to scrutinise the actors' responsibility and thus, in a sense, can control the responsible actor, calling him/her to account for his/her actions, or sanctioning him/her for irresponsible actions, because they were in the position, had the means, or sanctioned actions that influenced the impact of a flood event (Mulgan, 2000). Bovens (2007, p. 450) has defined accountability as "a relationship between an actor and a forum, in which the actor has an obligation to explain and justify his or her conduct, the forum can pose questions and pass judgement, and the actor may face consequences." In traditional forms of government, governments bear the majority of responsibilities for the public domain. As such, through political mechanisms, residents or their representatives are the forums that can hold governmental actors to account for their actions (e.g., Mason, 2008). In this default scenario, residents operate as the account holders.

However, the situation changes when residents start to bear responsibilities as a result of their involvement in public issues. It has become quite common to involve residents in local decision-making processes that affect the community as a means for achieving improved democracy and effectiveness (Abels, 2007). Some of this resident involvement creates more direct accountability, essentially leaving responsibilities with governmental actors but allowing residents to hold them accountable more immediately instead of acting through indirect political processes and their governance representatives (Abelson & Gauvin, 2004; Damgaard & Lewis, 2014). For example, residents can hold authorities accountable by directly participating in the development of public policy (Damgaard & Lewis, 2014). Through their voices, residents can increase the responsiveness of public authorities to residents' concerns (Devas & Grant, 2003). Moreover, access to the public debate with governance networks is then not limited to directly affected residents but should extend to all residents (Sørensen & Torfing, 2005).

3.2.3 Perceived responsibility

Responsibilities can be established in law or as part of moral obligation, but how actors perceive their own and others' responsibilities is not necessarily similar to how they are legally defined or morally considered. Legal responsibilities are written and tend to leave little room for interpretation; however, how responsibility is perceived can vary greatly from for instance legal responsibilities as the legal division of responsibility is often not clearly communicated or acted upon in practice. Residents' awareness of, beliefs about, and assumptions regarding their own and others' responsibility influence perceived responsibility (Wamsler, 2016). Imprecisely or ambiguously assigned responsibility for mitigating flood risk in particular and, more generally, climate change allows for perceived responsibilities to emerge and, occasionally, to dominate legal responsibilities (Wamsler & Brink, 2014). As such, perceived responsibility often translates into political pressure and conflicts, especially in situations where accountability, perceived and legal responsibilities are inconsistent (Wamsler, 2016). An example of such pressure and conflict is the 2013 flood in Deggendorf. A general notion of state protection from flood hazards as

a legal responsibility existed prior to the flood; however, after the flood, despite pressure from impacted residents, the public authorities refrained from addressing residents' post-disaster recovery needs and adaptation, causing conflict between residents and the responsible authorities. A typical example for flood risk governance is that residents fail to act because they see governmental authorities as responsible for managing floods, or because explicitly defined responsibilities are lacking (Wamsler, 2015). This highlights that attributes of role and capacity apply to the notion of perceived responsibility. When residents do not perceive it as their role to act, or when they do not perceive that they have the capacity to act, they will refrain from taking indicated actions.

Patterns of perceived responsibility vary among countries and social contexts and are influenced by the severity of risk, information provided, access to advice, the public's level of confidence in authorities, and worldviews. An important influencing factor is the amount and type of information residents receive (e.g., digital or face-to-face, on implementing adaptive measures or on preparing for a flood event). In fact, providing information can increase perceived risk and the residents' sense of their own responsibility. Moreover, providing locally-focused information (e.g., property-level risk communication) as opposed to globally-focused information (e.g., global impact of climate change) can lead to higher levels of perceived risk and responsibility still; and higher levels of perceived risk and responsibility can lead to higher levels of motivation to adapt (Osberghaus et al., 2010). However, information alone is not sufficient to spur motivation to adapt; access to concrete behavioural advice also matters. Above all, people's intrinsic belief systems and worldviews are important (Brink & Wamsler, 2019; Wamsler & Brink, 2018). Each worldview can be ascribed its own view of risk and nature, preferred policy options, and social order (Dake, 1992; Poortinga et al., 2002; Douglas & Wildavsky, 1992). These diverse worldviews, especially in combination with varying flood risks, produce a diverse array of people's perceived responsibilities regarding their roles in flood risk governance.

3.2.4 Moral responsibility

Moral responsibility is a notoriously difficult concept, and its use is often ambiguous (Doorn, 2012). This article focuses on responsibility as moral obligation. The best way to think of responsibility as moral obligation is in terms of a threefold relationship: person A is responsible to person B to ensure that something is the case or that something is being done (Duff, 2007). For example, a state has a responsibility to provide safety from flooding. This is a moral obligation the state has to the people present in the country (its citizens but to some extent also to other residents), but not to people globally. For moral responsibility, it is therefore always important to ask to whom something is owed. There are different grounds for assigning moral responsibility. In the context of flood risk governance, an actor's role, causal relation, and capacity are the most important sources of moral responsibility (see Doorn, 2019, for an elaborate discussion).

Responsibility based on role refers to moral obligations that arise simply because of the actor's position in society. Most obviously, a country's government has moral as well as legal responsibilities towards its citizens. As part of the governance turn in managing

flood risk, private parties as well as governmental organisations have a role to play. In this context, governmental policy is achieved partly by residents, private companies and non-governmental organisations (Butler & Pidgeon, 2011). If the government delegates responsibility to residents, a risk of increased inequality arises. Vulnerable groups may lack the social and cultural capacity, as well as the economic power or national strategic interests, to profit equally from this shift of responsibility (Doorn, 2016). Hence, in the case of these changing responsibility arrangements, where some responsibility is transferred to residents or businesses, governments have the moral obligation to secure public values, such as equity, non-discrimination, and inclusiveness (Alexander et al., 2018). However, in their role as resident, residents themselves may also have moral obligations. In the context of flood risk management, residents' moral obligation might be to reduce the hardened surfaces in their garden. Moreover, residents in their role as neighbour have responsibilities that emerge from the connections within communities (Heying, 1999). In case of an evacuation due to flooding, residents might have the moral obligation to help vulnerable neighbours.

Moral responsibility can be attributed by a person's capacity (Miller, 2001). The moral obligation of having the capacity takes many forms, including a physical ability to act, financial capacity, or ownership of critical property. As such, the obligation to allow one's land to be used for water retention in the event of high river discharges could qualify as a resident's moral responsibility to mitigate flood risk based on capacity (Doorn, 2019). Moreover, moral responsibility, like legal responsibility, may also derive from an actor's contribution to an undesirable situation, such as when a person causes water shortage by pumping too much groundwater. The causer acquires moral responsibility to set things right. Although causation is mostly formulated in a backward-looking (ex post) sense, it could also be formulated in a forward-looking (ex-ante) sense as an obligation not to cause an undesirable situation. In the context of flood risk governance, this is the moral responsibility not to cause or bring about a dangerous situation.

Moral responsibility partly overlaps with the other notions, but it is based on different ethical principles. These principles do not find their justification in what is legally codified (legal responsibility) or in the relationship between an actor and a forum (accountability), nor in what individual people consider justified (perceived responsibility), but in moral argumentation and theorising. This explains why moral responsibilities are often also formulated at a more abstract level than the other three notions.

To summarise, in the context of flood risk governance, this article refers to moral responsibility as a moral obligation to not cause harm, to help within your capacities, and to take responsibility for flood risk based on varying roles, such as member of a community (see Table 1). In contrast, legal responsibilities are based on formally assigned duties (i.e., role) to mitigate flood risk and on liability—that is, the duty to compensate for flood damages. Moral and legal responsibility provide the two most common notions of responsibility but they do not cover all aspects of how the term responsibility is used in academia and in practice. Therefore, in this article, two additional notions of responsibility are distinguished in order to provide a more complete analysis of how different institutional frameworks actually divide responsibilities in flood risk governance. The third notion is

related to the legal notion of responsibility, which is accountability (also see Pellizzoni, 2004). Accountability addresses the ex post responsibility of actors involved in flood risk governance. It is identified here as the external framing of responsibility by implying the external function of another actor who is able to scrutinise the actors' responsibility – in other words, to monitor the responsible actor, calling him/her to account for his/her actions, or sanctioning him/her for irresponsible actions, because they were in the position, had the means, or sanctioned actions that influenced the impact of a flood event (Mulgan, 2000). Whoever bears certain responsibilities should have to answer to other actors for how well, or whether, they actually executed those responsibilities, regardless of whether those actors are residents, governments, companies, or communities (Bovens, 2007). This notion resonates with the attributes of role, causation and capacity. The fourth notion is perceived responsibility. Perceived responsibility refers to one's actual understanding of who is responsible for what in flood risk governance, regardless of what the law or norms of morality might otherwise indicate (Wamsler, 2016). Perceived responsibility is helpful to explain disjunctions between formally expected behaviour and actual behaviour before, during, and after flood events. This notion emphasises the perceived role and capacity of actors in flood risk governance.

3.3 Methodology

This article analyses responsibility, as conceptualised in section 2, by applying the notions of responsibility and grounds for attributing them to the flood risk governance arrangements of three countries, namely the United States, Germany and the Netherlands. These countries share a Western democratic context of flood risk governance, which allows for an illustrative comparison across continents. Furthermore, these countries share similar characteristics, such as risk of flooding, experience with flood events, democratic processes, and economic development. Nonetheless, some important variations also exist among these three countries in terms of their approaches to flood risk governance, roles of residents, and political landscape (see Table 3.2 for an overview). These are also countries with which the author team has empirical expertise, which is helpful in view of this paper's aim to conduct a multi-faceted analysis of residents' responsibility in flood risk governance. The choice for the three countries provides an opportunity to compare and reflect on residents' responsibilities in varying flood risk governance contexts. As the roles of residents are currently at the heart of flood risk governance debates in all three countries, the following section focuses specifically on the responsibility divisions between residents and governmental actors in the United States, Germany, and the Netherlands. This way, light will be shed on how the roles of residents differ among the nations and in relation to their respective notions of responsibility.

This article does not aim to provide an in-depth empirical analysis but rather uses empirical examples to illustrate conceptual points. The following sections serve the purpose of a preliminary analysis to determine whether the abstract notions of responsibility can empirically be applied to actual flood risk governance arrangements. Additionally, the scope of this article did not allow for an in-depth elaboration. As

a consequence, the methodology and case study selection are mainly based on the expertise of the author team. Although case studies in this article are merely illustrative of the theoretical conceptualisations, the analysis is certainly of added value. It provides the opportunity to make a translation between the abstract theoretical considerations of responsibility and the empirical reality in which responsibilities in flood risk governance are an everyday matter.

Due to the illustrative nature of this empirical analysis, a comparative case study design is not applicable. However, the choices that were made were made systematically. The complexity of responsibility in flood risk governance is acknowledged, and therefore we compiled a group of experts as authors. The authors of this article form a team of scientific experts in the field of flood risk governance[3]. All have extensive experience with and knowledge of one or more of these countries based on their involvement in scientific research, empirical data collection, and/or policy advice. In addition, the authors have varying forms of complementary expertise in accordance with the different notions of responsibility. This methodology approach entails that the following section encompasses insights from academic literature (which will be referenced in the final version but has been left out here to retain anonymity) as well as tacit knowledge of the author team of experts.

Table 3.2 Descriptive characteristics of the selected countries, including dominant approaches to flood risk governance.

	Political system	Legal system	Focus in flood risk management	Dominant flood risk governance approaches
United States	Federal state	Common law	Addressing the consequences of floods through flood preparation and flood recovery	Relatively limited action taken by the federal and state governments – large focus on residents' own responsibility
Germany	Federal state	Civil law	Focus on both reducing flood probability through protection measures and reducing consequences through flood preparation	Residents hold main legal responsibility in addition to with governmental flood risk adaptation
The Nether-lands	Constitutional monarchy	Civil law	Dominant focus on flood defense, but debates on broadening strategies is ongoing	Government holds main legal responsibility, in addition to residents' responsibility for adaptation and damages

3 See for instance, Snel et al., 2019; Hegger et al., 2017; Mees et al., 2019; Mees et al., 2014; Kammerbauer & Wamsler, 2017b; Wamsler, 2016; Doorn, 2019; Bergsma, 2018; Bergsma et al., 2012.

3.4 Responsibility of residents in the United States, Germany, and the Netherlands

In this section, the notions of responsibility are illustrated with the examples of the flood risk governance arrangements of three countries, namely the United States, Germany, and the Netherlands. In doing so, this article aims to analyse whether the theoretical unpacking of the concept of responsibility is also operative in actual governance settings.

3.4.1 Legal Responsibility of residents

Duty to mitigate floods

In the 1960s, the approach of 'floodplain management' was adopted in the United States. This approach focused on reducing flood damage by addressing the individual responsibilities of floodplain residents. It was effectuated in the form of a national insurance program that uses insurance premiums to incentivise flood-wise building choices. While this policy approach addresses the responsibility of residents in mitigating floods, it uses behavioural incentives rather than legal instruments: residents in the United States have no legal duty to either adapt to direct or consequential damage from flooding or to intervene proactively to prevent flooding. However, residents in the United States have long had legal duties to act reasonably in controlling floodwaters on their own properties to avoid causing excessive harm to their neighbours[4].

The legal basis for flood risk governance in Germany is the Federal Water Act, which corresponds in legal terms to the European Floods Directive (European Commission, 2007; Government of the Federal Republic of Germany, 2009). It was enacted in 1957 and revised numerous times, reflecting a shift from disaster protection as a responsibility of governmental organisations and related structural flood mitigation towards individual responsibility and an emphasis on non-structural measures (DKKV, 2015; Thieken et al., 2016). Residents are legally responsible for protecting their own property in Germany.

The Netherlands has a long tradition of approaching flood risk as a collective issue where governmental organisations take the lead (Hegger et al., 2016). The Dutch constitution obliges the national government to maintain the country habitable and protect and improve the environment (Suykens et al., 2019). Practically, this obligation is embedded in the Second Delta Act, which also includes a safety norm that guarantees a basic level of protection to each Dutch citizen, expressed as an annual chance of being killed by a flood of no more than 1/100.000. Residents do formally have a responsibility to mitigate floods on their own properties, but this legal responsibility is seldom called into action (Bergsma et al., 2012). The legal responsibility of Dutch residents remains limited to paying taxes, both indirectly to the national governments (through income taxes) and directly to the regional water authorities.

4 See for instance, Keys v. Romley, 412 P.2d 529, 535-36 (Cal. 1966) (en banc); 983 P.2d 626 (Wash. 1999) (en banc).

Duty to compensate for flood damages

Governmental organisations are rarely legally liable for flood damage compensation in the United States. However, individual legal liability for flood damage compensation is far more common and focuses on personal liability for flood damage that a resident's actions directly caused or made worse. Thus, for example, individuals incur legal liability for damage compensation when they build structures in waterways that cause or exacerbate the harm a flood inflicts on others. Similarly, landowners building flood control structures on their private properties increasingly must do so reasonably and can be held liable for negligence if the floodwater damages a neighbour's property.

The legal liability of the German government in the recovery phase of a flood disaster is changing. For one, the previous understanding that impacted residents should receive government funding reached its limits when it was announced that this approach would be terminated after the 2013 floods (Kammerbauer & Wamsler, 2018). In particular, it has been called into question whether at all to provide governmental funding to uninsured affected residents. Additionally, residents are not only legally responsible for protecting their own property but also must compensate for any negative impacts their actions may have on local flood risk governance, such as redirecting water flows to other properties. Also, residential development is only permitted in areas that have 100-year flood protection (Wamsler, 2016). Following a flood, residents may have to fulfil additional requirements to obtain (re)building permission.

The legal liability of the Dutch national government entails it to bear the burden of damage costs. The Netherlands has a Calamities Compensation Act, a governmental compensation scheme. After an environmental disaster such as a flood, this compensation act can come into force, but it is not a given that it will; and, if it is enforced, it is unclear which damages will be compensated for and to what extent (Suykens et al., 2019). In general, flood recovery is not prioritised in the Netherlands because the focus is on prevention. The safety standards are high. Large-scale flood events and the associated need for large-scale recovery are therefore rare.

All in all, legal responsibility in the United States focuses on liability, specifically private liability (see Table 3.3 for an overview). A duty to mitigate flood risk is generally not legally imposed on either public or private actors. In Germany, the legal responsibility for managing floods seems to be, on the one hand, clearly divided between the different levels of government, and, additionally, residents are above all responsible for their own property. In the Netherlands, the government has a legal responsibility to mitigate flood risks, and the government has the opportunity to compensate for flood damage, but it is not a given that it will.

3.4.2 Accountability of residents

The division of responsibility for flooding in the United States is rooted in an understanding of floods as 'forces of nature' that can only be partly controlled by human intervention. This understanding limits accountability across all sectors. With respect to government action or inaction, residents remain primarily account holders, but they often must operationalise that accountability through political rather than legal avenues.

For example, despite having no legal obligation to do so, the federal government routinely supplies disaster relief after flood events in response to the collectively voiced demands of affected residents, either directly or through their representatives (and often both) (Michel-Kerjan, 2010). In contrast, at the property level, owners are simultaneously account holders and account givers with respect to individual flood-related actions, because every private property owner can hold every other actor to account for the flood-related damage that they caused, generally through legal rather than political processes. Finally, albeit rarely, the public at large or governments can hold private property owners to account for both flood-related risk and actual flood damage through the doctrine of public nuisance (Big Horn Power Co. v. State, 1915; City of Jackson v. Robertson, 1950).

The current emphasis on individual risk management in Germany obscures the social obligation of the welfare state to offer certain services and/or funds to residents, specifically in terms of recovery after a flood event. In general, German flood risk governance demonstrates a lack of accountability, which also plays a role in German local political challenges. An example is the case of Deggendorf in South Germany after the floods in 2013. Residents' participation in public forums was found to be muted. Moreover, challenges to disaster management arose because governmental actors recognised that they were also responsible for resident-volunteers' security and wellbeing on site. Since volunteer help is not 'illegal', it remains to be seen how this is handled; and it depends on local capacities to integrate this security within their flood risk management plans. Another example of the 2013 floods is the city of Freising. The local government was held accountable by the residents for having abdicated their responsibility (Stadt Freising, 2014). Residents expected municipal authorities to 'properly' conduct flood risk management within the range of their mandate. Subsequently, a resident of Freising pointed out that "it could all have been avoided if the municipality had maintained the drainage ditches and managed the water gates properly" (Wamsler, 2016, p. 188).

The role of residents as account givers is minor in the German context. Local German governments have been legally required to have flood risk management plans in place since 2015. During the process of developing these plans, only local governments are consulted and residents are not involved (StMUV, 2017). No legal requirements are in place to involve residents in flood risk governance. And as long as resident participation is limited, their role as account givers will be limited.

When it comes to Dutch flood risk governance, residents are generally account holders. Dutch accountability mainly consists of residents who hold governments to account through elections. Relevant governmental actors are the national government, the regional water authorities and local governments. However, issues of flood protection are barely featured on the agendas of political parties. Residents can elect their local water authorities every four years, although the turnout in elections is generally very low. Instances when Dutch accountability mechanisms work more directly are very specific and locally oriented. These mainly pertain to local participatory processes that involve residents (Mees et al., 2019; Uittenbroek et al., 2019). For instance, some regional water authorities aim to involve residents through volunteering programs or information evenings. In such situations residents have been shown to also become account givers to some extent, meaning the ones that need to give account of their responsibilities to other

actors; but in most cases the participatory process rarely exceeds giving advice (Mees & Driessen, 2019).

All in all, in all three countries, residents can act as account holders towards public authorities (see Table 3.3). In the United States, residents specifically hold the government accountable for providing disaster relief to the affected residents. Moreover, residents in their role as private property-owners can be both account holders and account givers, because every private property-owner can hold every other actor to account for the flood-related damage that they caused. In Germany, however, a general lack of accountability is notable as residents rarely hold public authorities accountable after a flood event, which is similar to residents of the Netherlands, although Dutch residents can through democratic processes. Moreover, Dutch residents are rarely involved in decision-making processes as well, so they rarely become account givers themselves.

3.4.3 Perceived responsibility of residents

Perceived responsibility in the United States depends on context. The Midwest flooding in 2019 provides considerable insight into how perceived responsibility with respect to flooding operates in the United States. A regional flood event like that normally generates a perception among the public that it is the federal government's responsibility to 'make people right,' often in the form of millions of dollars in disaster relief. Thus, the fact that the federal government could not legally do anything to help farmers in the Midwest whose current crops and stored surpluses were destroyed by unusually severe flooding made national headlines because of confounded expectations that the federal government would help (CNBC, 2019). The flooding also revealed perceived responsibilities at smaller scales. The City of Davenport, Iowa, has long refused to engage in flood control despite its location on the Mississippi River, and residents in 2019 complained that the town had become "complacent" (Bosman et al., 2019). Breaching levees throughout the Midwest rivers brought both local government levee districts and the U.S. Army Corps of Engineers into the spotlight for their perceived failures to maintain, upgrade, and operate large-scale flood control infrastructures as they were expected to by their residents (Smith & Schwartz, 2019). However, many individuals and NGOs decided to help, leading to a variety of volunteer campaigns to fill sandbags and provide emergency assistance to those who needed it (Bosman et al., 2019). Thus, residents perceived themselves to hold a private responsibility to prepare for and respond to existing flood events that had nothing to do with their legal responsibility or individual accountability for that flood.

From the perspective of German residents, local governments are seen as the main body responsible for flood risk governance (Wamsler, 2016). This can be viewed as a holdover from notions of flood protection that predate recent flood risk management schemes, which is particularly salient if individuals built their homes before current EU directives were enacted. According to Wamsler (2016), one resident commented, "the city has responsibility for adaptation. They get our taxes to do this" (p. 188). This understanding translates into political pressure and legal conflicts. Additionally, residents are not aware of the responsibilities of higher-level authorities. The division

of responsibilities between municipal and district authorities is not well understood, which leads to confusion, especially post-disaster. Moreover, residents do not know their own responsibilities very well. Residents are becoming slightly more aware regarding the need to take individual action. Moreover, specific forms of cooperation exist in Germany that support the involvement of residents within flood risk management, such as water and land associations and flood communities. German residents of affected areas often assume responsibility by deciding to become volunteers to help impacted individuals (Kammerbauer & Wamsler, 2017b). This includes clean-up tasks or collecting donations. As a consequence, such activities can alleviate their own social vulnerability and that of fellow residents (EEA, 2012; Kammerbauer & Wamsler, 2017b, 2017a; Wamsler, 2016).

As Dutch residents' current flood risk awareness is low (OECD, 2014), they also perceive they have little responsibility in managing floods (Mees et al., 2014). Dutch governance arrangements appear to indicate that responsibilities are clearly divided among the different levels of government. This is often understood to mean that the government has all responsibility for mitigating flood risk, and residents only need to contribute by paying their taxes (Keessen et al., 2016). This seemingly clear division of responsibilities also limits the involvement of residents and stakeholders (Koop et al., 2018). The main perception of Dutch residents is that floods are a technical issue to be dealt with by (public) professionals, and it is not within a resident's ability to cope with flooding (Snel et al., 2019). Moreover, Dutch residents have been repeatedly told by government officials that they are well-protected against floods, even though they are still at risk of flooding to a certain extent. Residents expect flood safety to be guaranteed by the authorities (Wehn et al., 2015). Especially on the local level, this causes problems. Gradually, a more concerted effort to appeal to residents to take responsibility has been made.

All in all, residents of all three countries perceive strong responsibilities for the public authorities, which go beyond the actual legal responsibilities of these authorities (see Table 3.3). United States residents perceive the government to be responsible for providing disaster relief after a flood event, German residents perceive local authorities to be mainly responsible for flood risk management and Dutch residents perceive public authorities to be responsible for preventing all floods.

3.4.4 Moral responsibility of residents

While legal, accountable and perceived responsibility divisions can be identified through empirical research, moral responsibility is a more normative concept. It needs to be established by confronting considerations of capacity, role and causation to legal, accountable and perceived responsibilities in each country. The moral notion of responsibility is characterised here as having a moral obligation. This obligation is assigned through a person's role, capacity, and as a causation (i.e., to not cause harm).

Residents in all three countries tend to value the attributes of moral responsibility related to flood risk similarly. They all endorse the same underlying principles. First, residents should not cause a flood or purposely increase the risk thereof for others (Doorn, 2019). Second, as a resident, one can have multiple roles in order to experience

moral responsibility; for instance, property owners could experience it as their moral responsibility to contribute to flood prevention by adapting their property. However, the same person can also experience moral responsibility to their neighbours to provide help during a flood. Moral responsibility always entails another actor or target; it encompasses the external responsibility of providing help. Whether that means to help your family, neighbours or the environment, moral responsibility is rarely about a sense of responsibility to oneself. Third, the attribute of capacity also builds on the moral element of providing help to others but emphasises the capacity for providing this help and considers varying concepts of justice. So residents seem to agree on moral obligations at an abstract level across the three countries, but responsibilities play out differently in practice and have been institutionalised in different ways.

In the United States, moral responsibility has multiple connotations. On the one hand, it is associated with a general desire to reduce human vulnerabilities to floods. Residents have the moral obligation to ensure their own flood protection. Yet, residents generally expect that governments will make them 'whole' after a flood. When that expectation is not met, residents provide help to others in need, either by volunteering or by making donations. The political culture of the United States, on the other hand, places much emphasis on individual responsibility and autonomy. Therefore, moral responsibility is understood in terms of residents' capacity to make their own location and building choices while not being dependent upon the government for flood protection or damage compensation.

Moral responsibility in Germany is strongly contextual (historical, cultural, political). On the one hand, this is based on a common understanding of the Federal Republic as a welfare state that is thought of as *taking care* of its residents. For the German government, moral responsibility for adaptation in flood risk governance is often undermined by other demands. Political and pragmatic solutions predominate the debates, and the necessity of handing over more responsibility to residents is recognised. Recent developments in flood risk governance clearly indicate a shift towards individual responsibility, where residents *take care of themselves*. On the other hand, Germany is not only a federal state but comprised of sixteen federated states with distinguishable regional cultures, related to history, culture, politics, housing tenure, and social status, which influence how moral responsibility is understood, all the while being bound to a shared legal framework under the nation's constitution. Thus, moral responsibility might differ per state and is likely to fully align with the federal constitution.

In the Netherlands, the capacity attribute of moral responsibility is incorporated into the tax system; all residents pay taxes to ensure the national flood risk management measures, but the residents who have more money contribute more. Additionally, the Dutch government has a moral responsibility to keep its residents safe. However, the current policy debate revolves around the government's assumption that it is a resident's moral obligation to adapt to flood risk and protect themselves against pluvial floods (e.g., by removing hardened surfaces from their garden). The question as to whether or not residents have such a moral obligation can be debated and answers differ per individual. For instance, if a resident has knowledge on and finances for flood risk adaptation, it increases their moral obligation to adapt. On the other hand, if a resident is not informed about flood risk adaptation and is lacking capacity, they have a lower moral obligation.

In general, a resident's moral obligation to contribute to flood risk governance is very low in the Netherlands. As illustrated under perceived responsibility, residents do not believe they can make a difference in relation to the large-scale defence infrastructures in place (Snel et al., 2019; Terpstra & Gutteling, 2008). But, the moral obligation to contribute to flood risk adaptation on their own properties is subject to change as this depends on residents' role and capacity, and these obligations are increasingly part of the political debates.

All in all, these three countries are coping with the moral considerations based on capacity and role factors (see Table 3.3). By delegating responsibility to residents, governments are increasing the possibility of inequality within society (Doorn et al., 2012). Morally, the ideal solution would be that the residents who, for example, possess more financial capacity also take on more of the moral responsibility in flood risk governance. In practice, this does not apply to any of the three countries (except for the tax-systems in which this is incorporated).

3.5 Discussion

Table 3.3 gives an overview of each country's notions of responsibility for flood risk governance. This discussion section addresses first the conceptualisation of the notions in relation to the illustrative empirical examples, after which the responsibility division regarding the flood risk governance approach in the three countries is analysed. Also the limitations of the methodological approach are discussed.

3.5.1 Elucidating the four notions of responsibility

Although we find all four notions in each nation's flood risk governance settings, not every notion can be as clearly contoured per country. Legal responsibility is generally straightforward as the division of responsibility is formulated in rules and regulations. Accountability is more of a process-oriented notion of who can be held accountable or is able to account for their (in)actions and their contributions, which addresses an actor's responsibility within a certain task or role and its justification in relation to a (in) action. Moral responsibility is additionally closely linked to perceived responsibility, but it emphasises a broader sense of responsibility that is more uniform such as the moral obligation to not cause harm to others. Perceived responsibility is currently under-researched, but the empirical analysis shows a clear gap between perceived responsibilities and the legal division of responsibility. Perceived responsibility turns out to be less clear-cut and might cause confusion as perceived responsibility can be applied to all three other notions of responsibility, meaning perceived legal responsibility, perceived accountability, and perceived moral responsibility. However, the conceptualisation in this article intended that perceived responsibility, although it might apply to the other notions, is a stand-alone notion in itself. Specifically distinguishing perceived responsibility is what makes this conceptualisation applicable to flood risk governance

Table 3.3 Overview of the country-specific understandings of the four notions of responsibility.

	Residents of the United States	Residents of Germany	Residents of the Netherlands
Legal responsibility	– Legal duty to reasonably control floodwater on property – Legal duty to compensate for flood damage caused or made worse	– Legal duty to protect their own property – Legal duty to compensate for negative impact on local flood risk governance	– Legally responsible for paying taxes to the regional water authorities and national government – No explicit legal responsibility to compensate for flood damage. Residents are legally responsible to mitigate flood damage on their own property
Accountability	Floods as 'force of nature' – Residents are account holders and can demand disaster relief for affected parties. – Property-owners are both account holders and account givers.	General lack of accountability – Residents rarely participate but hold government to account post flood event.	General lack of accountability – Residents hold government to account through elections. – Residents could become account givers through participation processes, but are rarely involved. Therefore, they are mostly account holders.
Perceived responsibility	– Residents perceive: Government should 'make people right' by providing disaster relief. – If governments do not provide expected help, residents volunteer and raise money.	– Residents perceive: Local governments are responsible even though they are not legally responsibly body. – Residents have little awareness of their own legal responsibility.	– Residents perceive: No responsibility for themselves. – Governments take care of all flood issues.
Moral responsibility	– Residents have moral obligation to make sure they are well protected against floods, either by insurance or adaptation. – Residents' moral obligation is mainly visible in providing help to others in need, either by volunteering or by making donations.	– Residents at flood risk have moral obligation to be prepared, e.g., by having flood insurance. – Policy debates are taking turn toward handing over moral responsibility from government to residents.	– Capacity attribute is incorporated into income tax system. – Moral obligation for residents to contribute to flood risk adaptation is subject to change, as these obligations are increasingly part of policy debates to increase residents' moral obligation therein.

practices, so that it is not limited to merely theoretical considerations. The empirical application of perceived responsibility as a notion has shown that actors of flood risk governance perceive responsibilities in a certain way that differs from all the other three notions. How residents perceive their own responsibility in flood risk governance does not necessarily align with legal responsibility, accountability, or moral responsibilities. This points at an important tension between 'perceived' responsibility and the other three notions. We consistently found, in all three countries, that the degree of perceived responsibility is lower than the other three notions, or said differently, that residents perceive to bear less responsibility than they actually do. It is striking that this finding holds not only in the Netherlands where flood risk governance historically has been a government's affair, but also in the US, a country that has traditionally has placed much more emphasis on citizens' self-reliance.

So, even though some aspects of the notion are less clear-cut, all are distinguishable in varying flood risk settings. Yet, the theoretical conceptualisation of the notions of responsibility sometimes does not fully align with the practical understanding of those notions, as presented in the case studies. For instance, legal responsibility of residents is theoretically conceptualised as the duty to mitigate flood risk and the duty to compensate for flood damages caused. In practice, however, legal responsibility seems to focus on the division of tasks as stated in the laws of the countries. This goes beyond the duty to mitigate and compensate damages: it is about which actor is tasked with what aspect of flood risk governance.

3.5.2 Country illustrations

The analysis of the three country examples indicates that even though the countries have similar governance settings, they approach the roles of residents in flood risk governance very differently. This can be related to both administrative and cultural traditions of the countries (e.g., Knill, 1998; Vink et al., 2015). The United States, for instance, has a more individualistic and liberal tradition and appreciation for autonomy when compared to the Netherlands and Germany. So it is not surprising that the notions of residents' responsibility in the United States are more individualistic in nature (Doorn, 2019). Both Germany and the Netherlands have a tradition of social-liberal values and a welfare state, which also characterizes their flood risk governance to date, meaning a larger portion of the responsibility is attributed to the government in managing flood risk (Doorn, 2019). However, Germany's federated institutional framework is more top-down and hierarchical than that of the Netherlands (Kammerbauer, 2019). The Netherlands has a mostly egalitarian approach to flood risk management (Keessen et al., 2016). Virtually all Dutch residents financially contribute to the nation's flood risk management plans, and they are well-protected by these governmental efforts. However great the differences between countries may be, they are all facing increasing flood risk due to, among others, climate change. As a consequence, residents of all three countries are increasingly expected to protect themselves against flood damage.

In addition, it is striking that flood events are envisioned differently in the United States than in the European countries in this analysis. Partly, this relates to the different character of floods in Europe as compared to the United States where floods are often

hurricane driven. However, it is also determined by cultural differences in perception of the controllability of floods; Europeans in general, and people in the Netherlands in particular, tend to view flood risk as controllable, whereas in the United States, people place flood risk into the category of 'forces of nature', which puts them largely beyond human control (Tullos, 2018). Also, flood disasters in the United States often exceed European cases in terms of impact (Dartmouth Flood Observatory, 2020). Perhaps these experiences inflect the modernist idea of control over the environment in ways specific to the selected nation-states, which then inform the observations on responsibilities made in this paper.

Moreover, it should be noted that the scope of this article did not allow for an in-depth comparison of the country examples, but we favour the added value of the examples over an article with a solely theoretical conceptualisation. Yet, a detailed analysis of the countries promises additional relevant insights on the notions of responsibility and the flood risk governance approaches per country. Ideally, such a comparison would consist of empirical data on perceptions of responsibility from various actors involved in flood risk governance, for instance, residents, policy makers, planners, business owners, and non-profit organisations. Moreover, future research can determine whether the conceptualisation of responsibility as presented here is also applicable to broader climate change adaptation processes; after all the debates on responsibility in relation to motivating residents to take adaptive actions are not limited to flood risk governance but apply also to climate issues like heat stress or drought (Doorn et al., 2012; Mees, Driessen & Runhaar, 2015; Mees, 2017).

3.6 Conclusion

This paper has engaged with the prominent and timely debate on the attribution of responsibilities in flood risk governance. We have shown that conceptualising and empirically illustrating 'responsibility' is a daunting task because a conceptual confusion pervades in scholarly work on how to understand responsibility. In addition, the notion is to be understood as a multi-faceted concept. The academic contribution of the current paper lies disentangling the concept into four notions: legal responsibility, accountability, perceived responsibility and moral responsibility. As the previous sections have shown, these four notions allow for a nuanced and systematic analysis and discussion of the attribution of responsibilities, which strikes a balance between being overly simplistic on the one hand and lacking parsimony on the other. We hold that the four notions will help to structure debates, both academically and in practice.

A key message to be derived from the findings is that residents' perceived responsibilities often stand in conflict with the other notions of responsibility. Even though residents often have a legal responsibility to protect their own properties, this is overshadowed by the other notions. For instance, residents hold governments to account for flood events, and they perceive that governments have the responsibility to pay disaster relief, even though governments do not have this legal responsibility. But this perception prevails as governments often do provide disaster relief after a flood event. The current paper

emphasises making considerations for responsibility divisions explicit. Transparency is essential in making the shift to involving residents to a greater degree. These insights allow the debates and decision-making on residents' roles in flood risk governance to reconsider responsibilities and, especially, take the perceived notions into consideration. Perceived responsibility in all cases has shown that what actors perceive as their own or others' responsibility often does not align with the legally stated responsibilities.

This conclusion on how to discuss residents' responsibilities as citizens vis-à-vis governments complements and extends arguments made in other recent advances to the debate on flood risk governance. Driessen et al. (2018) highlighted that the need to have a more open and inclusive debate on the normative starting points of flood risk governance would be in order. Uittenbroek et al. (this special issue) have studied perceptions of local governmental actors on citizen responsibilities in the adjacent domain of climate adaptation governance. Their findings suggest that local policymakers have an implicit understanding of the multifaceted nature of responsibility attribution, as they also – implicitly – distinguish between the legal or extra-legal allocation of tasks and the question of who is accountable. Clearly, a transparent, explicit and nuanced discussion of 'responsibility' will help societal debates move forward. In future research, our conceptualisation can serve as a basis for analysing residents' responsibilities vis-à-vis other types of societal actors (e.g., as consumers in the market and as members or addressees of civil society organisations; see Hegger et al., 2017). In addition, future research could focus on responsibility divisions in other institutional settings, policymaking and legislation on flood-related loss and damages, or other types of environmental disasters. Above all, the added value of perceived responsibility prompts an empirical analysis of residents' perceptions on responsibilities.

3.7 References

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Chapter 4

"Do the resilient things" Residents' perspectives on responsibilities for flood risk adaptation in England

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Abstract

Residents should take adaptive action to reduce flood risk – this claim increasingly resonates in the academic debate on flood risk management (FRM). Hence it must be assumed that a change in the division of responsibilities between actors involved is an imperative, i.e., beyond the public authorities, residents should become more responsible for their own flood resilience. However, residents' perspectives on their own and other's responsibility for adaptive action has not yet been explored extensively. In this contribution, we distinguish between four notions of responsibility in analysing the perspectives of residents regarding flood risk adaptation measures undertaken by public authorities, insurance companies and residents themselves. A qualitative study in England shows how residents perceive responsibilities for flood risk adaptation across the various notions and actors, including themselves. We found that residents have clear expectations and perceptions on how they think responsibility is divided among stakeholders and how they would like it to be. Additionally, the discourse on responsibility division in FRM raises questions and causes mismatches between the formal legal parameters and residents' perceptions. With the insights into residents' perceptions, opportunities arise to better inform and encourage them to take flood risk adaptation measures and thereby improve flood resilience.

4.1 Introduction

Floods are increasingly causing damage to private residential buildings. The approaches to protecting people and properties against floods have changed over the last century. Approaches to minimising floods have evolved over time "from government to governance" (Penning-Rowsell & Johnson, 2015; Snel et al., 2020a) and the importance of residents in managing flood risk is increasingly recognised (Lawrence, Quade & Becker, 2014).

This governance approach in flood risk management (FRM) has prompted a trend towards emphasising residents' responsibilities for managing their own risk and property rather than solely relying on large government-led interventions (e.g., Begg et. al. 2017; Bradford et al., 2012; Bubeck et. al., 2012). The rationale for residents' involvement in managing flood risk is multifold (Begg, 2018), but the relevant academic literature generally agrees on the following arguments for residents' responsibility (Snel et al., 2020a): [1] the risk of flooding is increasing significantly due to climate change, which necessitates an all-hands-on-deck approach, including residents; [2] sharing responsibility between public authorities and residents contributes to solving underlying problems like governmental capacity issues and lack of public funding; [3] the implementation of adaptation measures by residents reduces the financial damage caused by floods (Grothmann & Reusswig, 2006); and [4] only property owners can decide to adapt their homes, as no governmental organisation can implement measures on private properties (Snel et al., 2020a). These arguments justify greater attention to and recognition of individual responsibilities in FRM among academia and policy, resulting in the call for more residents' responsibility in flood resilience.

To reduce the impact of flood events, policies and regulations on FRM in the past years have increasingly proposed and required residents to take adaptive actions (Kuhlicke et al., 2020; Bubeck et al., 2017). This has been denoted the "behavioural turn" in FRM (Kuhlicke et al., 2020). Adaptive behaviour entails a huge variation of actions that residents can undertake to reduce individual flood risk (Rufat et al., 2020). In this contribution, we focus specifically on individual adaptive actions of these three categories: technical, financial, and behavioural actions. Technical measures aim to increase the physical resilience of buildings like property-level flood risk adaptation (PLFRA) (Attems et al., 2019; Jüpner et al., 2020), measures for financial resilient recovery include approaches as insurance schemes (Slavikova et al., 2020), and individual and collective adaptive behaviour includes monitoring flood forecasts, storing emergency supplies, or joining community emergency plans (Kuhlicke et al., 2020).

However, little is known about how residents perceive their own responsibility since residents have for a long time been the 'recipients' of FRM and have played less active roles in FRM processes. While academics and policy makers generally agree that residents need to take more responsibility, how residents envision their own and others' role in managing flood risk is often neglected (Rufat et al., 2020; Thaler et al., 2020). Insight into this is needed to motivate residents to take responsibility in flood risk adaptation.

Responsibility is conceptualised from the perspective of various disciplines, such as legal philosophy (Hart, 1968), environmental governance (Pellizzoni, 2004),

good governance (Mostert, 2014) and flood risk governance (Snel et al., 2021). The commonality of these conceptualisations is that responsibility can be divided into varying notions, types, dimensions or principles. Responsibility is not a straightforward concept, although it is often used in that way. Building on the conceptualisation of Snel et al. (2021), we identify four notions of responsibility, each having its own attributes: legal responsibility, accountability, moral responsibility, and desired responsibility. The added value of this categorisation is to analyse what the opinions of residents are concerning their own and others' responsibility in flood risk governance. Existing research on responsibility generally concludes that residents perceive public authorities to be responsible for managing floods (Lawrence et al., 2014; Raška et al., 2020; Terpstra & Gutteling, 2008). However, the concept of responsibility in FRM is not as black or white as the distinction between governmental or individual responsibility. The current insights bypass the nuances of the concept of responsibility, and therefore this contribution illuminates the concept and perceptions in more detail to determine what it means to be responsible from a resident's perspective.

The aim of this contribution is to understand how residents of flood risk areas perceive their own and others' responsibility in flood risk management. The perspective of residents is formulated based on in-depth interviews with English residents of flood risk areas surrounding Oxford, Great Yarmouth and Aldeburgh (Suffolk). English flood risk governance, similar to many European countries has multiple layers and includes a complex mix of national, local, private and individual actors (Alexander et al., 2016). This complexity is necessitated by a diverse overarching approach to FRM and the inclusion of a range of strategies adopted to tackle flood risks of different types. This diversity has been inherent within English FRM for approximately 70 years with a mix of spatial planning, insurance provision, flood warning and incident management, complementing flood defences and other structural approaches (Alexander et al., 2016; Johnson & Priest, 2008). In the context for this research, it is important to note that, although authorities, such as the Environment Agency (EA), have powers to construct and maintain flood defences, they hold no obligation to protect properties from flooding (EA, 2014). Under Common Law, the main legal responsibility for protecting property and land lies with the individual land/property owner. This, coupled with increasing attention given to the roles of communities and individuals for managing risk and enhancing societal resilience (e.g., EA, 2020; Defra, 2020), reinforces the need to better understand individuals' perspectives of their own flood responsibilities.

4.2 Conceptualising responsibility

Several researchers have quantitatively analysed responsibility distributions between residents and public authorities regarding FRM. Recently, Raška et al. (2020) showed how Czech residents perceive sharing responsibility and individually adapting to flood risk. Their results suggest that, from a residents' perspective, the governmental bodies at various levels are most responsible for FRM. In New Zealand, Lawrence et al. (2014) also found that residents perceive governmental organisations to be mainly

responsible for flood risk reduction. Additionally, residents of the Netherlands regard public authorities as primarily responsible for preventing and mitigating flood damage (Terpstra & Gutteling, 2008). These studies have provided useful insights into how responsibilities are perceived as being shared in varying governmental settings. Yet, it remains limited to the government-resident divide and it is not clarified how the concept of responsibility is defined.

In the conceptualisation of responsibility as used in this paper, we build on Snel et al. (2021), who have distinguished four notions of responsibility in flood risk governance following conceptualisations of responsibility made in varying disciplines. The four notions they distinguish are legal responsibility, accountability, moral, and perceived responsibility. Additionally, Snel et al. (2021) distinguish between grounds for attributing responsibility from which the various notions of responsibility arise. The attributes are a form of assigning responsibility. Grounds for attributing responsibility are [1] role, [2] causation, [3] liability, and [4] capacity (Hart, 1968). These attributes relate to an actor's manner of involvement in a flood event. Role relates to the responsibility that originates from having a certain place or office in an organisation. Causation and capacity relate to whether an actor has caused a flood event or had the capacity to minimise or prevent a flood. Liability relates to the duty to compensate for flood damage. Although these attributes are equally important, they are not equally divided across the notions. Specifically the attribute of role applies to all the notions because of the numerous actors that are affected by floods and involved in flood risk governance. They often have multiple roles as well (e.g. employee, community member, property owner).

Moreover, 'time of imputation' is considered to be crucial in attributing responsibility. Pellizzoni (2004) classifies 'time of imputation' as ex ante and ex post. Ex ante refers to responsibility before something has happened –having the obligation or duty to ensure that something is the case (Doorn, 2019; van de Poel et al., 2012). Ex post refers to responsibility after something has happened – the responsibility to compensate for damages (liability) or the obligation to account for what you did or decided (accountability). The four attributes complemented with ex ante and ex post distinctions are the building blocks of this conceptualisation and can be combined in four overarching notions of responsibility, namely legal responsibility, accountability, moral, and perceived responsibility.

In the context of flood risk governance, Snel et al. (2021) refer to moral responsibility as a moral obligation to not cause harm, to help within your capacities, and to take responsibility for flood risk based on varying roles, for example, as member of a community. In contrast, legal responsibilities are based on formally assigned duties (i.e., role) to mitigate flood risk and on liability—that is, the duty to compensate for flood damages. The notion that is closely related to the legal notion of responsibility is accountability (also see Pellizzoni, 2004). Accountability addresses the ex post responsibility of actors involved in flood risk governance. It is identified here as the external framing of responsibility (Mulgan, 2000). Whoever bears certain responsibilities, whether these actors are residents, governments, companies, or communities, should have to answer for how well, or whether, they actually executed those responsibilities (Bovens, 2007). This notion links with the attributes of role, causation and capacity. The fourth notion is perceived responsibility. Perceived responsibility refers to one's

actual understanding of who is responsible for what in flood risk governance, regardless of what the law or norms of morality might otherwise indicate (Wamsler, 2016). Perceived responsibility highlights disjunctions between formally expected behaviour and actual behaviour before, during, and after flood events. This notion emphasises the perceived role and capacity of actors in flood risk governance.

As the general focus of this contribution is on the perception of responsibility from a resident's perspective, we have reframed this notion of perceived responsibility as desired responsibility. Snel et al.'s (2021) conceptualisation of perceived responsibility encompasses not just how actors think that responsibilities are divided, but also how these responsibilities should be divided in their opinion. Therefore, besides the notions of legal responsibility, accountability and moral responsibility, we identified a fourth notion of desired responsibility, highlighting how individuals would like to see the division of responsibilities across the various actors (including themselves). This notion might differ significantly from, for instance, legal responsibility as the desired responsibilities may not align with current legally framed divisions of responsibility. Desired responsibility is important as it also emphasises how individuals would ideally, based on their experiences and knowledge, divide the responsibilities and what they desire other actors to do in managing floods. This evolved fourth notion of desired responsibility entails the attributes of role and capacity both in ex ante as ex post situations (see Table 4.1).

4.3 Methodology

Analysing residents' perception of responsibility requires an in-depth qualitative methodology to gain a better understanding of the reasoning behind how residents perceive responsibilities in FRM. Hence, this study is based on semi-structured interviews with residents of flood risk areas in England. These interviews have taken place between January and April 2019. Data is collected on the residents' perception regarding their individual potential to minimise flood damage and how they see their role and that of others in managing floods. The topic list was designed based on the conceptualisation of responsibility as detailed in the previous section. The respondents answered questions about their experience with floods, whether they had taken PLFRA measures for their home, what they regarded as the responsibility of public authorities and what they thought their own role as residents was in managing floods, what other actors they thought are involved in English FRM and what they would advise public authorities and their neighbours to do regarding floods. Additionally, scenarios were used to obtain insight into respondents' reasoning in varying situations relating to a flood event. This empirical research focused on residents' understanding of, for example, individual and governmental responsibilities for flood risk adaptation. All interviews were audio-recorded and transcribed. The transcriptions were analysed by a coding system based on the four notions of responsibility and the three categories of adaptive actions. These codes were comprehensive on an overarching level of analysis. Yet, the coding processes started from dividing respondents' statements into the four

Table 4.1 Overview of notions, attributes and operationalisation of responsibility in flood risk governance (Adapted from Snel et al., 2021).

Notions of responsibility	**Attributes** (Hart, 1968; Pellizzoni, 2004; Mostert, 2014)	**Theoretical understanding in the context of flooding**	**Empirical understanding in the context of flooding**
Legal responsibility Ex ante and ex post responsibility (Pellizzoni, 2004)	– Liability (ex post) – Role (ex ante)	– Legal liability: a duty to compensate for flood damage resulting from (in)actions in controlling flood waters – Legal responsibility: a duty to mitigate flood risk	Residents' perceptions of their own legal responsibilities and of public authorities and insurance companies; this includes when residents speak of rules and regulations, formal actions and things that an actor must do; additionally it entails what residents perceive as fact.
Accountability Ex post responsibility (Pellizzoni, 2004)	– Role (ex post) – Causation (ex post) – Capacity (ex post)	Accountability as the external aspect of responsibility. Those actors bearing responsibility should be answerable for this responsibility; they should be held to account.	Residents' perception of accountability regarding themselves, public authorities and insurance companies. This includes mainly living up to promises and guarantees made or perceived.
Moral responsibility Ex ante responsibility (Pellizzoni, 2004)	– Role (ex ante) – Causation (ex ante) – Capacity (ex ante)	Responsibility as moral obligation. Person A is responsible to person B to ensure that X.	Residents' perceptions of moral responsibilities of themselves, their community, public authorities and insurance companies. This includes mainly what residents expect from others and what they think of as the right thing to do.
Desired responsibility Ex ante and ex post responsibility (Pellizzoni, 2004)	– Role (ex ante and ex post) – Capacity (ex ante and ex post) – Causation (ex ante and ex post)	Desired responsibility describes how individuals ideally would like the notions of responsibility to be divided among themselves and others.	Residents' preferences for divisions of responsibility between themselves, public authorities, insurance companies and communities. This includes how residents would like responsibility to be ideally divided up in legal terms, and in regard to morals and accountability.

notions of responsibility based on the varying topics of the interviews. This lead to codes such as moral-trust, accountability-maps, legal-insurances and desired-measures. In a later stage these topics were categorised by adaptive actions (technical, financial, behavioural). Nonetheless, analysing the data and codes led to some grey areas of overlap and gaps in the theoretical conceptualisation. In Table 4.1, we have added a column on the empirical understanding of the notions to show how these discrepancies were dealt with. Additionally, this will be deliberated further in the discussion section.

The empirical data has been collected in multiple English communities that are at risk of flooding. England suffers from a range of different flood risks, with over 5.2 million properties estimated to be at risk from fluvial, coastal or surface water flooding and coastal erosion (EA, 2020). Regular flooding events affect large numbers of English properties and cause millions in economic damages (e.g., winter 2019/20, Cumbria, Yorkshire 2015/16, and SE England 2013/14). Additionally, growing evidence suggests an increase in flood risk under climate change scenarios and as a consequence of increasing urbanisation and other socio-demographic changes (HM Government, 2017). In order to provide an all-encompassing analysis of the perceptions of English residents who live in flood risk areas, we have selected three study locations which face various types of flood risk in residential areas. We specifically choose to select respondents from multiple locations to be able to provide results that are not limited to one specific type of flood risk. Oxford, Great Yarmouth and Aldeburgh and surroundings were chosen as study locations: Oxford mainly faces surface water flooding, Great Yarmouth is at risk of coastal flooding, and Aldeburgh and surroundings struggle with surface water flooding and fluvial flooding (see Figure 4.1).

We aimed at a sample of residents across a range of ages, who are at risk of a range of types of flood risk, and who either have experienced flood event(s) or have experienced the threat of floods. We conducted 21 extensive interviews of 60 to 90 minutes with residents of flood risk areas in Oxford, Great Yarmouth, Aldeburgh and their surroundings; of these 21 interviews, 12 respondents had not been flooded and 9 had experienced one or more flood events (See table A1 in Appendices for more detail on the respondents). The selection process consisted of contacting local flood action or community resilience groups of the study areas; through those initial contacts other respondents were approached via a snowballing method. Selection criteria consisted of living in a ground floor house that was in a flood risk zone designated as such by public authorities (see: "Check your long term flood risk" https://flood-warning-information.service.gov.uk/long-term-flood-risk/postcode).

Figure 4.1 Locations of Oxford, Great Yarmouth, and Aldeburgh.

4.4 Residents' perceptions of responsibilities

The empirical results of this study are summarised in Table 4.2. This table contains the key consensus perceptions of the respondents, which are divided between the four notions of responsibility and three categories of individual adaptive actions, namely technical, financial and behavioural. The table provides an overview of the overarching perspectives of respondents as paraphrased by the authors. These are the predominant perspectives; in case there were divergences among the residents, they are highlighted in the text. In addition, it is important to acknowledge the heterogeneity of residents as a sample group, none of them are the same. Yet, within this group of respondents, general consensus exists regarding the statements included in Table 4.2.

4.4.1 Legal responsibility

In England, formal legal responsibility for managing flood risk lies with the property-owner, although some Risk Management Authorities (RMAs) (including, the EA and local authorities) have permissive powers to undertake some flood protection activities. However, the majority of statutory functions by authorities relate to understanding risk (e.g. creating and updating flood maps), strategic and local planning for flooding, ensuring consideration of flood risk in spatial planning and responsibilities for flood warnings as well as for incident response and local recovery activities. Under common law, property-owners have responsibilities for managing their fluvial risk through riparian duties[5]. Additionally, there are requirements for disclosure of (certain

5 Applies to owners of land adjacent to rivers, other watercourses and the sea and permits landowners or residents from protecting their assets from flooding and erosion, subject to receiving appropriate planning and other permissions, and ensuring that it does not worsen flooding elsewhere. These also include flood-related duties such as; accepting flood flows onto land, clearing banks and structures (e.g. culverts) which may cause an obstruction and increase flood risk, allowing access to banks for inspection and maintenance and notifying RMA of any works being undertaken.

levels) of flood risk on property searches and recovery through the purchase of insurance (through a principally private market system[6]) remains the legal responsibility of the resident.

Respondents generally recognise they have a certain legal responsibility for protecting their home from floods, but they perceive public authorities as responsible for informing them about PLFRA measures and flood preparedness. Respondents appear aware of the legal requirement to inform potential buyers of the flood risk, but many also mention that they were not informed when they bought their house. One resident commented that, in their situation, this incongruity was due to changes to risk mapping. They stated, *"When I first moved in, I was not in the flood area [...] because the parameter came up to my next door neighbour's house, but I was not in the flood risk. The year later [...] they said: You are in the flood zone now, so you need to have flood insurance"* (Respondent 8).

Residents perceive insurance companies as having a substantial legal responsibility regarding financial recovery and they are aware of the formal rules and regulations that apply. Respondent 20 stated, *"[Insurance companies] won't take you and they don't have to take you, but your current provider has to continue to provide insurance, legally, for you"*. Respondents state that it can be difficult to get flood insurance when a property is at flood risk. Moreover, after a property has been flooded, the insurance company can change the premium and excess rates, but they cannot drop their clients. Multiple respondents state that the insurance companies raised the excess to the amount of money that they had claimed after the flood event. Respondent 12 remarked, *"When we went to reinsure, the actual cost hadn't gone up that much but the excess went to 20,000 pounds"*. Residents acknowledge that this falls within the legal rules and regulations of insurance companies.

Residents generally perceive the maintenance, instalment and improvement of flood defences as the main legal responsibility of public authorities. This includes flood defences for river, coastal and marshland areas at flood risk. One of the respondents highlights the nuances in government's legal responsibilities in England: *"The EA has a role to maintain the river walls, but they say they haven't got a statutory duty to upgrade them, which is crazy. [...] The only people [who] are by law allowed to go on the river defences and repair them, is [the] EA"* (Respondent 11). Additionally, residents perceive public authorities to be responsible for drainage. This includes drainage channels like ditches that need to be cleared for water flows, and maintenance of street drainage relating to sewer systems. In Great Yarmouth, a surface water flood occurred in 2013 that exposed the problematic conditions of the drainage systems in the city. Respondent 2 explained, *"That was one of the issues; the [drain] was in a terrible state. [The mechanic] said you couldn't even see where the pipe was, it all rusted away completely. There was no pipe there, just a hole in the ground"*.

4.4.2 Accountability

English residents have a number of mechanisms to formally hold actors to account when they do not meet their responsibilities or in the case of private companies, the terms of any contract. Democratic processes permit some degree of accountability as

6 Although since April 2016 the maximum premium cost is capped via the governmental Flood Re scheme.

residents at the national or local level can express their displeasure when deciding to re-elect candidates. It is also possible for residents to gain access to justice, and ensure accountability for (in)actions, through the legal system. Accountability can be sought through claims of private nuisance, public nuisance or negligence. Additionally, public bodies can be subject to judicial review (e.g. Manchester ship canal company Ltd v EA, 2013).

Interviewed residents generally do not hold any actor accountable for a flood as a natural set of circumstances in itself. The consensus is that floods cannot be caused by an actor such as an organisation or individual. Nonetheless, the role or actions of such actors can influence the impact of a flood. Accountability as perceived by residents is therefore mostly evident in the attributes of capacity and role. Even though residents do not hold public authorities accountable for floods, they do perceive them as accountable for various other aspects such as poor maintenance of flood defences and drainage. Additionally, residents also perceive public authorities to be accountable for permitting continuous residential development in flood risk areas. Respondent 6 commented, *"A problem is that houses are continually built [on flood plains] because it's cheap. [...] It almost does not matter that houses are at risk of flooding and very vulnerable"*.

Public authorities are also held accountable for sharing incorrect information on flood risk and facilitating inadequate evacuation. Flood alerts and warnings are the main sources of information when the threat of a flood is increasing. Residents tend to dismiss the warnings more and more. Residents expect the public authorities to inform them on floods and hold them accountable when this provided information is incorrect, which negatively influences the credibility and impact of governmental flood risk communication.

Residents from all areas agreed that it is a legal responsibility of public authorities and insurance companies to correctly assign what properties are at risk. Accordingly, they perceive it to be an issue of accountability when either the risk is not correctly assigned to their property (details are overlooked) or when they disagree with the assigned risk level. The consequences of being in a flood risk zone include having increased premiums on (flood) insurance and possibly decreased property values. To illustrate, respondent 1 indicated, *"The trouble is that the EA use mapping which didn't take account of physical infrastructure flood defences. [...] They put out flood maps like that in which they put most of [Great] Yarmouth in blue and people living in Yarmouth say; [...] this is rubbish"*. As another example, in Oxford respondents disagree with the flood zones indicated on the maps. As one respondent put it, *"The property next door, their living room is exactly the same levels our house. But they're not in a flood zone"* (Respondent 20). Based on experiences and local knowledge, some respondents dismiss the official risk and deem the information provided as incorrect.

The perspectives on how residents themselves are accountable vary among the respondents, especially regarding the question of whether residents are accountable themselves for buying a house in a flood risk area. In general, the respondents who agree that they themselves are accountable were informed about the flood risk of the property before they bought it. And the respondents who tend to perceive themselves as less accountable were either not informed about the risk of flooding or their property was not yet recognised as being at flood risk when they bought it.

Additionally, the experience of being flooded is horrendous and traumatic, and, according to many of the flooded respondents, the insurance companies were not as helpful as expected. Residents do hold insurance companies accountable for the process and experience that residents as policyholders go through with them in the recovery phase. Respondent 20 emphasised, *"The biggest problem we had was with the insurance company"*. Different loss assessors make varying assessments of the damage or the insurance company does not want to pay out the claims upfront. In the words of one respondent, *"When we're trying to make the claim, they kept saying, we want to give you the money as a whole and we can't pay you until you've finished everything"* (Respondent 12). Only after Respondent 12 appeared on TV to state publicly that they were not receiving any money from the insurance company, they gave them an advance of 10,000 pounds.

4.4.3 Moral responsibility

Residents rarely talk explicitly about the moral reasoning behind actions and expectations; it is more an implicit notion. Respondents have diverse opinions when it comes to the reliance on governmental FRM. Not every respondent is as explicit, but a few of them clearly state that residents generally rely too much on public authorities to protect their property whereas others argue that it is a government's core responsibility to protect its residents, which it does not do sufficiently in their view.

The main component of the moral-notion is the role of the community before, during or after a flood. The consensus among residents is that they have a moral responsibility to their community. In Oxford, the younger men of the town help the neighbours with lifting their furniture up, and in Great Yarmouth residents go door-to-door to make sure the neighbours are informed and provide help. Additionally, flood risk is perceived as a collective community problem and residents who are not at risk should still assist. Some of the respondents perceive that residents who are personally not at flood risk should contribute to FRM either financially (via taxes or donations) or behaviourally (by helping neighbours). Moral responsibility is understood by residents, therefore, mainly as their role within a community and having the capacity to help their neighbours.

Another aspect of moral responsibility is the communal approach to PLFRA of terraced houses. Nearly all respondents, who live and do not live in terraced houses, have mentioned the difficulty of taking PLFRA measures for terraced houses. In those situations, PLFRA measures are only technically effective when implemented on multiple adjacent houses. Respondent 2 commented, *"If you're in a terraced house, the water is just going to go downhill through one house and into the next. So there is very little you can do as a resident individually"*. Respondents living in terraced houses state that they will take PLFRA measures when their neighbours will too. Yet, the morals of neighbours might not align fully (e.g., precautionary placement of flood gates when they are away), which makes terraced houses vulnerable even after PLFRA measures are installed. Respondent 20 highlighted this difficulty of new neighbours: *"[Our neighbour] said; I don't care if it floods. She just left everything and did not put her floodgates in. That is a personal choice. [...] However, we did receive a spare key. So my husband went in put the floodgates and the puddle sucker in. We said; if you're not going to do it, we will do it for you because we want to protect our property."*

4.4.4 Desired responsibility

The notion of desired responsibility entails what respondents would like as their own and other's responsibility. Residents acknowledge that public authorities are legally responsible for distributing the collective funds from taxes, but they generally would like to see additional funding being allocated to FRM. They desire the national government to provide financial means to the EA and local authorities so that they can implement plans to increase flood protection by, for example, heightening flood walls. Residents deem themselves legally responsible for the measures that apply to the home-level (as is formally the case) but desire public authorities to take on the large-scale resilience systems (which is not formally a legal responsibility of public authorities in England). However, this desired responsibility is not only about implementing and maintaining large flood defence measures, but residents also argue that public authorities should not allow the risk of flooding or the impact thereof to worsen. Residents worry about urban or residential development in upstream areas that might influence the flood risk of their property. Respondent 10 emphasises that *"[public authorities] should have a primary responsibility in terms of planning policy to make sure there is responsible development."*

Additionally, residents desire public authorities to provide help before, during and after a flood event. Before a flood, residents emphasise that public authorities should inform them on PLFRA. Respondents also mention that the information provided by alerts and warnings should be improved by tailoring the messages to the regional and local level instead of at the national or county level to prevent inaccurate warnings. After a flooding, respondents state that they did not receive help from the public authorities to the extent they would have liked to and expected. Respondent 16 expressed, *"Most of who had [been] directly impacted by the flooding did not really get any help from either the local authority or the police service at the time of actual flooding and then the local authorities afterwards in terms of clearing up". Another person stated, "The only thing that we had help with was from the county council, they came and took our fridge freezers and things away"* (Respondent 12).

Residents expressed one major desire for insurance companies. They would like insurance companies to assist in increasing the flood resilience of properties. This is especially worthwhile after a property is flooded and repairs have to be made. Residents who have been flooded have also shown interest in increasing the resilience of the property, but none of the insurances would contribute financially. Respondent 19 highlighted how the insurance industry is only willing to restore the property to its original value. Respondent 18 explained that they *"negotiated with the insurance company about giving us the money [to make the house] resilient, you know, do the resilient things. They were a bit stuffy about it."* Various respondents considered this short-sighted as both the insurance company and the resident would benefit from a higher level of flood resilience in the long run. Residents will experience less disruption/impact/damage from a future flood event and insurance companies have to cover less claims.

This section highlights how responsibility should be divided from residents' perspectives, both across the notions and between actors involved in FRM; and the key finding that with residents would like more assistance, which they perceive as part of the legal, moral or accountable responsibility of public authorities and insurance companies.

Table 4.2 Residents' perceptions of responsibility.

	Legal responsibility	Accountability	Moral responsibility	Desired responsibility
	Residents' perception of how responsibilities are legally divided.	*Residents' perception of who they hold accountable.*	*Residents' perception of what is the right thing to do.*	*Residents' perception of how they would like the responsibilities to be divided.*
Technical	Public authorities are responsible for managing floods, maintenance (and improvement) of flood defences and keeping the drains clear. **(Role ex ante)**	Public authorities are in general not accountable for causing a flood event. **(Causation ex post)**	Residents of terraced housing are responsible for collective PLP. **(Role ex ante)**	Public authorities should be responsible for the protection of houses at the non-individual/ communal level. **(Role ex ante)**
	Residents are responsible for PLP. **(Role ex ante)**	Public authorities are accountable for poor maintenance of flood defences and drainage. **(Capacity ex post)**		Public authorities should give residents of flood risk areas more advice on PLP pre and post flood. **(Role ex ante)**
	Residents are responsible for informing new owners of the flood risk to the property. **(Role ex ante)**	Public authorities are accountable for (residential) development in flood plains. **(Role/ Capacity ex post)**		Public authorities should not exacerbate flood risk. **(Role/capacity ex ante)**
		Residents are accountable for buying a house in a flood risk area. **(Role ex post)**		
		PLP companies are accountable for the quality of the measures they installed /supplied. **(Capacity/Role ex post)**		

	Legal responsibility	Accountability	Moral responsibility	Desired responsibility
	Residents' perception of how responsibilities are legally divided.	*Residents' perception of who they hold accountable.*	*Residents' perception of what is the right thing to do.*	*Residents' perception of how they would like the responsibilities to be divided.*
Financial	Public authorities are responsible for providing grants. **(Liability ex post)**	Insurance companies are accountable for paying up. **(Role ex post)**	Residents who live outside the flood zones have a moral responsibility to contribute to managing floods. **(Role/capacity ex ante)**	Public authorities should spend more money on flood defences. **(Role/capacity ex ante)**
	Public authorities are in charge of allocating budgets for FRM. **(Role ex ante)**	Insurance companies and public authorities are accountable for using and communicating incorrect flood risk maps. **(Capacity ex post)**	Insurance companies are responsible to financially contribute to sustainable long term PLP. **(Capacity ex ante)**	Insurance companies should financially contribute to PLP after a flood event. **(Role/capacity ex ante)**
	Residents are responsible for having insurance. **(Role/capacity ex ante)**			
	Insurance companies have to continue insuring existing clients. **(Liability ex post)**			
	Insurance companies can change premiums and excess rates for existing clients. **(Role ex ante)**			
	Insurance companies are allowed to deny new clients if they are at flood risk. **(Role ex ante)**			

	Legal responsibility	Accountability	Moral responsibility	Desired responsibility
	Residents' perception of how responsibilities are legally divided.	*Residents' perception of who they hold accountable.*	*Residents' perception of what is the right thing to do.*	*Residents' perception of how they would like the responsibilities to be divided.*
Behavioural	Public authorities are responsible for facilitating evacuation and rest centres. **(Role ex ante)**	Public authorities are accountable for sharing incorrect flood risk information. **(Capacity ex post)**	Public authorities and insurance companies are responsible to value local (lay) flood knowledge. **(Capacity ex ante)**	Public authorities should be responsible for communicating flood risk tailored to the regional and local level. **(Role ex ante)**
	Public authorities are responsible for informing residents about PLP and preparedness. **(Role ex ante)**	Public authorities are accountable for facilitating inadequate evacuation. **(Causation ex post)**	Residents are responsible for collaborating with and offering help to neighbours. **(Role/ capacity ex ante)**	Public authorities should be responsible to offer help after a flood event. **(Capacity ex ante)**
	Residents are responsible for signing up for alerts/warnings. **(Role ex ante)**			
	Residents are responsible for knowing how to act in a flood situation (emergency plan, who to contact). **(Role ex ante)**			
	Residents are responsible to decide if they want to evacuate or not. **(Role ex ante)**			

4.5 Discussion

To implement successful FRM, the engagement of a large number of stakeholders is necessary, for example, from public authorities, market stakeholders, and residents (Raška et al., 2020; Mees et al., 2016). Regardless of their experience with floods, residents recognise that they have a legal responsibility to minimise flood damage to their own homes. Even though this does not fully align with formal legal responsibility divisions in England, it does show that residents are aware of the role they can play in FRM. English residents are not oblivious to the expectations of policymakers. This indicates that the shift in academia and policy of involving residents more in flood risk adaptation (as demonstrated by e.g. Begg, 2018 and Snel et al., 2020a) is either not starting from zero (zero being; residents perceive themselves not responsible at all in any of the notions), or it indicates that the intentions of the shift have been gradually reaching the resident population.

Nevertheless, residents do not seem knowledgeable on what legal responsibilities formally come with owning a property, such as riparian duties. The results show that residents have a limited understanding of how their role is balanced in relation to that of the authorities. They desire public authorities to take on more legal responsibility than they do now, especially in allocating funding for flood defences, and implementing and maintaining those. This is similar to the findings in Raška et al. (2020), Lawrence et al. (2014) and Terpstra & Gutteling (2008) who have also found that residents of various countries perceive public authorities to be mainly responsible for FRM. Additionally, this contribution shows that residents desire more help in both preparing for and recovering from flood events. This help can be information on flood risk or (financial) assistance with implementing PLFRA measures and recovery. Residents' perception of moral responsibility also emphasises the importance of providing and receiving help at the community level. Beyond the duties of residents and public authorities, insurance companies also figure quite heavily into the discussion of responsibility; according to residents they play a large role in financial adaptive actions. Insurance companies have legal responsibilities, and residents wish they would take on a more moral responsibility as well by investing in PLFRA measures that would be beneficial over the long term. Multiple residents state that insurance companies show short-sightedness by being unwilling to contribute to making a property flood resilient instead of solely restoring it to its original pre-flood state. They argue that investing in PLFRA measures would save insurance companies money in the long run.

This study shows how residents understand their own and other's responsibilities in FRM and how this influences their actions. Residents do not acknowledge all their formal legal responsibilities and desire public authorities to fill in the gaps that arise. These insights highlight the barriers that might make it difficult to motivate residents to take responsibility in any of the notions or adaptive actions, such as PLFRA measures. Two obstacles for taking adaptive actions by residents can be formulated based on this study on responsibility division. On the one hand, a lack of awareness among residents concerning formal legal responsibilities presents a hurdle, while, on the other hand, they assume and desire public authorities and insurance companies to also have specific responsibilities. This indicates that residents do not seem to agree with how legal respon-

sibilities are formally divided. To successfully tackle FRM, it is important to collaborate between public authorities, insurance companies and residents instead of taking the stance of 'every man for himself'. A starting point would be to open up the responsibility debate while addressing the notions, adaptive actions and actors. This might increase awareness on who is responsible for what, and ideally such a debate might be a step towards residents taking (more) adaptive actions.

The conceptualisation of responsibility into four notions has proven useful as residents perceive responsibilities for either public authorities, insurance companies or themselves in all four notions. Yet, the four notions are empirically not always as clearly distinguishable as theoretically. Therefore, some adjustments were made to the interpretation. Specifically, the notions of accountability and moral responsibility have empirically returned a slightly different interpretation than we had theoretically anticipated. Accountability in this study occurred more in the shape of living up to promises made than holding elected officials to account or appointing blame. Moral responsibility was theoretically understood as a moral obligation but in this study more emphasis was placed on the role and added value of the community and it resides on the foundation of doing what is perceived as 'the right thing to do'. We have shown the added value of the conceptualisation of responsibility by Snel et al. (2021) in an English setting. Future research with more empirical insights from alternative contexts (other countries, different flood management arrangements) can further test, refine and strengthen this conceptualisation.

This contribution provided in-depth insights based on a qualitative study and we acknowledge that by its very nature the sample size of this study is restricted and would preferably be enlarged in follow-up studies, both quantitative and qualitative analyses would be of added value. With more empirical data, it would be possible to consider potential variations in residents' perceptions relating to contextual factors, such as the type of flooding, flood experience, or time of residence. These factors might influence residents' perceptions of responsibility. For instance, it is likely that living through a flood event shapes perceptions as it makes that residents experience the aftermath of such an event, what it entails and how it is organised. Which contextual factors cause nuances between locations would be an interesting topic for future research. Additionally, several questions arise from this contribution that will be interesting for further research, namely: how do residents' perceptions of responsibility relate to the formal legal division of responsibility? And what distinctions would residents make between the various levels of government (e.g. local, regional, national) regarding the notions of responsibility? Overall, the presented outcomes are closely related to the debates on flood risk communication and the provided insights can be used as an opportunity to inform and motivate residents better on taking adaptive actions.

4.6 Conclusion

The academic and policy debates on who has responsibility for what in FRM have recently taken a turn to more resident involvement. The perspectives of residents on their own and others' responsibility for adaptive action have not yet been extensively explored. In this contribution we have highlighted that mainly public authorities dominate the discourse on responsibility division. Public authorities acknowledge that residents' involvement is crucial when it comes to the growing ambition of minimising flood damage and increasing societal flood resilience (EA, 2020). Therefore, they often state that residents should take more responsibility. However, responsibility is a contested concept. In this paper, we have conceptualised responsibility and empirically demonstrated perceptions from residents on responsibility in FRM in order to fill the gap of how residents of flood risk areas perceive their own and others' responsibility. Table 4.2 provides an overview of this qualitative study on English residents' perceptions.

We found that residents have clear expectations and perceptions on how they think responsibility is divided and how they would like it to be. Residents assume varying actors to have a legal, accountability, moral, and desired responsibility. It is not just public authorities vs. residents; also insurance companies are perceived to have certain responsibilities, specifically regarding financial adaptive behaviour. It can be concluded that the discourse on responsibility division in FRM raises questions and causes mismatches between the actual legal parameters and residents' perceptions. Regarding accountability, residents recognise that public authorities, insurance companies, as well as residents themselves can be held accountable for, for example, providing misinformation on floods, unwillingness to live up to contractual agreements or knowingly buying a property in a flood risk area. Morally, flood risk is perceived as a collective community problem. So, residents seem to have quite some knowledge on legal, accountable and moral responsibilities of the main actors (i.e., public authorities and insurance companies) but their desired responsibility does not always concur. Residents would like public authorities to be more involved, but it is not that they assume public authorities to have sole responsibility on every notion of the concept. Yet, they would like an equal division between residents' and public authorities' responsibility in FRM. The lack of understanding of residents of the specifics of their own responsibilities and the perception that the public authorities have more responsibility than is formally the case in England, key findings highlighted by this research, are clear barriers to motivating action by those at risk. Through this increased knowledge of how residents perceive their responsibilities on the four notions in relation to that of other governance actors, can communities better prepare for flood events and recover more quickly. This involves active communication with residents and identifying ways to encourage them to take individual adaptive action. By presenting a nuanced view on how residents perceive flood-related responsibilities, we emphasise that comprehending what residents understand and desire as accountability and legal and moral responsibility provides lessons for more precisely targeted communication, triggering flood risk adaptation and ultimately societal flood resilience.

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Chapter 5

More than a one-size-fits-all approach: tailoring flood risk communication to plural residents' perspectives

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Abstract

Many urban residences are insufficiently prepared for fluvial, pluvial or coastal floods, owing to a lack of accurate information on flood risk. This article analyses how risk communication can improve disaster risk reduction by overcoming the expert–layperson gap. Building on interviews in three cities in the Netherlands, it applies Q methodology to identify four perspectives on flood risk communication. To promote greater private residential involvement in flood risk adaptation, communication should address all four perspectives.

5.1 Introduction

Flooding is a serious threat to urban areas, particularly to private homes. In Europe, water authorities are obligated to provide flood hazard maps and flood risk maps, due to the EU Flood Directive (EC 2007/60) (European Commission, 2007; Priest et al., 2016). Yet Europeans rarely take flood adaptation measures, even though they could reduce the costs of flood damage by as much as 80% (Fournier et al., 2016; Grothmann & Reusswig, 2006; Hegger et al., 2016; Mees, 2017; Mees, Tijhuis, & Dieperink, 2018; Thaler & Hartmann, 2016). This implementation gap leads to extensive damage from floods (Loucks, Stedinger, Davis, & Stakhiv, 2008).

Why do residents not take these measures when flood risk information is available? There are at least four possible reasons for this implementation gap. The first is a misinterpretation of the available information on flood risk. For instance, flood recurrence intervals, which are based on statistical probabilities, e.g., 'your home is protected against a 1-in-250-year flood', can be misconstrued in such a way that people count on 249 years of safety after a flood event. Second, flood risk information is often not disaggregated below the city or regional level, much less to the level of individual homes. Even more fine-grained applications (such as the Dutch flooding website overstroomik.nl) only go to the four-digit zip-code level. Third, residents often perceive flood risk management as a governmental responsibility, because the government is responsible for dike maintenance and other flood defence works (OECD, 2015) or because they are not aware of how to reduce flood risk on their own. Fourth, while public authorities try to raise flood risk awareness through different kinds of communication methods, these are generally targeted at a flood-expert audience instead of the general public, whose experience regarding floods and flood risk is small and knowledge likewise.

One of the root causes of the problems mentioned above is that present-day flood risk communication is still originating from an expert point of view (Patt & Jüpner, 2013). It is based on the knowledge-deficit model (Burningham, Fielding, & Thrush, 2008; Faulkner, McCarthy, & Tunstall, 2010), which assumes that providing any kind of information to the public will give rise to understanding of individual risks. In this, it is assumed that experts (e.g., scientists) are 'right' and lay people are 'wrong', or at least lack the necessary knowledge to fully comprehend expert information (Hansen, Holm, Frewer, Robinson, & Sandøe, 2003). For instance, interpreting the mentioned flood recurrence intervals typically goes beyond the lay understanding of flood risks (Everett & Lamond, 2013; Meyer et al., 2012). As a result, lay people, including area residents, tend to understand flood probability as a guarantee of flood protection (Hartmann, 2011). When a proper translation from expert to lay knowledge fails, and residents distance themselves from responsibility, they hold the government accountable for flood risk management and protection. This may lead to difficulties in governing present-day flood risk, especially in urban areas. However, a great deal of the responsibility still rightly lies with the appropriate regional authorities. Our plea is therefore not aimed at a one-on-one shift of responsibility from the government to the resident. Rather, we suggest opening up the discussion first in order to take a more inclusive and encompassing approach to flood resilience.

To better understand the limited comprehension among residents of flood risk information, their perspective is used as the starting point for this empirical study. Instead of focusing on what information experts determine is crucial for residents, we aim to understand what type of flood risk communication and what information residents themselves need in order to make informed decisions. The resident as the focal point could help with choices about the risks that are of individual concern and augment the general public's perception of their own responsibility (Renn, 2014). To meet this objective, flood risk communication needs to shift away from strategies based on one-way information supply and education towards content and processes that help residents consider the trade-offs in adapting (or not) to flood risk (Árvai, 2014). With this in mind, we aim to answer the research questions, 'How do residents who are at risk of flooding interpret flood risk information, and how can flood risk communication be better targeted towards their needs?'

The next section provides an overview of the differences between expert knowledge and lay knowledge, as well as of the knowledge-deficit model, which relates to flood risk communication, risk awareness and disaster risk reduction. Following this, the empirical research in the three case study areas in the Netherlands is described. The empirical research consisted of structured interviews and Q methodology exercises with residents. Finally, the outcomes of the case studies are analysed. Cultural theory provides an effective theoretical framework for the interpretation of the empirical outcomes. The theory identifies four distinct rationalities (or cultures) according to which people perceive the world and from which they derive their actions: hierarchism, individualism, egalitarianism and fatalism. These four rationalities are mutually exclusive, and they represent contradicting views of the world. As every rationality is rational and consistent within itself, it is likely that each is represented in every social situation. Cultural theory moves away from the distinction between expert and lay and initiates more differences among lay people as well as experts. Cultural theory was not part of the conceptual framework for designing the research methods in this study; therefore it will be taken into consideration in the discussion section of this article. In the end, conclusions are drawn on how to overcome the implementation gap in flood risk communication.

5.2 Persisting challenges in flood risk communication

The knowledge-deficit model was the dominant perspective on the dissemination of scientific research in the 1980s. The model assumes that lay people lack sufficient knowledge, compared to experts, and that by providing the necessary expert knowledge to them, their knowledge deficiencies will decrease, which will influence their subsequent behaviour (Dickson, 2005; Hansen et al., 2003; Wynne, 1991). The knowledge-deficit model was developed as a means to reduce 'scientific illiteracy' (Miller, 1983), considering that ignorance causes a lack of societal support for various societal issues where scientific knowledge could play a role (Simis, Madden, Cacciatore, & Yeo, 2016). Underlying the knowledge-deficit model are two (positivistic) assumptions: first, that the information

formulated by experts will be identically interpreted by all individuals (Simis et al., 2016); and second, that once people are informed, they will adjust their perception and implement adaptation measures accordingly (Faulkner et al., 2010). This is not to say that the knowledge produced by experts is irrelevant and poorly translated per se, but rather that – for the reasons outlined before – residents have a very limited sense of what they should or could do with the information provided by experts. The model has been much criticised for its simplicity and its positivistic translation of scientific knowledge through a one-way, top-down communication process (Burningham et al., 2008; Faulkner et al., 2010; Goosen et al., 2014; Kirchhoff, Lemos, & Dessai, 2013; Miller, 1998; Petts & Brooks, 2006). Nevertheless, it is still implemented in present-day communication of scientific insights, including risk assessments (Dickson, 2005; Domingues, Santos, de Jesus, & Ferreira, 2018; Gustafson & Rice, 2016; Simis et al., 2016).

Over the years, risk communication in general has come a long way from the knowledge deficit model as the main perspective on communicating research results to the public. Nowadays, a resident's perception of risk is mainly understood as a social construct (Hartmann, 2010). This means that, within communities, risk perception is formed through networks of social processes with, for instance, neighbours and friends (Cole & Murphy, 2014; Faulkner et al., 2010). Therefore, the perception of risk includes personal experience but is also determined by cultural background, values, location, and demographic characteristics (Bradford et al., 2012; Cole & Murphy, 2014; Kashefi & Walker, 2009; Maidl & Buchecker, 2015).

However, current flood risk communication is still closely linked to the dated approach of the knowledge-deficit model (Simis et al., 2016). This is reflected in the objectives that are allocated to flood risk communication: raising risk awareness, transferring knowledge and providing (behavioural) advice (Höppner, Whittle, Bründl, & Buchecker, 2012). These objectives have hardly been realised over the years. This is primarily due to the one-way transmission of risk information to the lay public (Árvai, 2014; Höppner et al., 2012). Also, residents prefer to be informed regarding the likely impact and consequences of floods for their well-being and property (Bichard & Kazmierczak, 2012; Renn, 2014), instead of probabilities of flooding. It also matters that the information provided is actionable, because being informed about risks that are beyond your individual control raises anxiety rather than triggering adaptation.

Moreover, flood risk communication is expert-oriented. It remains dominated by a one-directional expert-to-lay perspective, inspired by the knowledge-deficit model, and fails to adequately communicate flood risk to residents in an effective way. The adherence to the knowledge-deficit model has not been effective in fostering behavioural change or public engagement (Moser, 2010). In other words, a translation of the expert's message should, among other things, aim to prevent misinterpretation of probabilities, communicate risk at an individual level, address individual responsibility and target the public audience. This requires transforming flood risk communication from a knowledge-deficit model perspective towards a lay perspective when attempting to communicate flood risk to the public.

5.3 Researching flood risk communication in the Netherlands

This article analyses how flood risk communication can overcome the implementation gap by concentrating on translating expert knowledge to a lay perspective. This objective is met by studying the flood risk perception and communication preferences of residents in three locations in the Netherlands: Dordrecht, Venlo and Zwolle. The Netherlands is characterised by its downstream location in the delta area of several main European rivers (Rhine, Waal and Meuse), which discharge into the North Sea. Due to this location, 26% of the country is located below sea level, and 59% of the country is susceptible to flooding, either by a river or by the sea (PBL, 2009). The Netherlands has extensive flood protection measures, of which dikes and pumping systems are most important.

The Netherlands is interesting for analysing flood risk communication, risk perception of residents, and their current knowledge of flood risk because of its location in relation to water and the expected consequences of climate change. The existing flood protection measures (i.e., dikes) are under pressure due to climate change prognoses, and Dutch governmental organisations are legally obliged and therefore committed to improve Dutch protection measures. However, they cannot take sole responsibility for flood risk management, as private homes will also be more susceptible to damage due to increased chances of floods. Therefore, flood risk communication is important to properly advise residents about their specific, individual situations and measures they can take. This also includes an appreciation of the types of flood people are susceptible to (e.g., fluvial or pluvial), which is illustrated in the rationale behind the case-study areas, as explained below.

Figure 5.1 The three case-study locations in the Netherlands.

5.3.1 Introduction of the case-study areas

Three sample areas were selected (Dordrecht, Zwolle and Venlo). They are located in the same larger delta area of the Netherlands and are roughly evenly distributed across the country (Figure 5.1). Dordrecht is in the south-west, close to the Port of Rotterdam; Zwolle is in the north, close to the Ijsselmeer; and Venlo is in the south-east, at 20 to 35 metres above sea level. These locations differ in local context, flood return periods, and existing flood protection (Table 5.1), representing the range of Dutch flood risks.

The city of Dordrecht is an island within the tributaries of two of the main Dutch rivers, the Meuse and the Waal. In general, the city's land is 4 to 5 metres below sea level, but it is surrounded by a main dike ring protecting against a 1-in-1000-year (sea and river) flood. Dordrecht is vulnerable to heavy rainfall, which causes local floods because the runoff peaks are higher than the drainage system is built to withstand, surface water storage capacity is inadequate and water absorption by the clay soil is limited. The city of Zwolle is in the estuary of the Ijssel and the Vecht. The latter is a rain-fed river, whereas the Ijssel is a tributary of the Rhine, which is a combination of a glacier-fed and rain-fed river. The residential areas in the city are susceptible to floods with a depth of 2 to 4 metres (Rijkswaterstaat & Ministerie van Infrastructuur en Waterstaat, 2019). Several of these neighbourhoods have experienced floods and related damage due to heavy rainfall in past years. The third case study is Venlo, which is in the Meuse River basin. In 1993 and 1995 the area suffered two 1-in-200-year floods, which led to evacuations of the neighbourhoods alongside the river (van Meijgaard & Jilderda, 1996). Up to then, no large-scale flood protection measures such as dikes were in place; so for the past few decades the regional water authority and the municipality have been collaborating to protect residents by building dikes along the Meuse, although these measures restrict the streams flowing into the Meuse and can cause local floods in times of heavy rainfall.

This research was conducted in several residential areas of the case-study locations, based on their experience with floods (either river floods or the consequences of heavy rainfall) and their position relative to sea level. See Table 5.2 for an overview of the demography of the case-study areas.

Table 5.1 Overview of the three case-study areas.

	Dordrecht	Zwolle	Venlo
Maximum water depth	4-5 m	2-4 m	1.5-3 m
Recent flood events	Pluvial	Pluvial	Fluvial
Scale of recent floods	Local	Local	Regional
River(s)	Meuse and Waal	IJssel and Vecht	Meuse
Flood probability in years	1:1000 to 1:3000	1:300 to 1:3000	1:100 to 1:300
Population	118,426	101,192	126,116

Table 5.2 Demographic information of the case-study areas (CBS, 2017–2018).

City	Population		Education Level x 1000 (age: 15-75)				Average Disposable Income per House-hold (€)
	Male	Female	Primary	Secondary	Tertiary	Unknown	
Dordrecht	58,577	59,849	25	36	26	1	39,200
Venlo	50,350	50,842	24	32	19	1	37,600
Zwolle	62,030	64,086	21	37	37	0	40,400
The Nether-lands (total)	8,527,041	8,654,043	4415	5447	4204	202	41,900

5.3.2 Methodology

The focus of this research is on residents, based on the assumption that improved flood risk communication with residents can have a substantial effect. Therefore, the participants in the case-study locations are homeowners or tenants of single-family houses in residential areas. To cover a broad range of respondents in the case-study locations, we combined two methods. First, structured door-to-door interviews were held in the selected neighbourhoods, collecting the responses of 69 residents in total (20 in Dordrecht, 36 in Zwolle and 13 in Venlo). Each interview lasted approximately 20–30 minutes and consisted of questions concerning the resident's perception of floods, their experience with floods, whether they have taken adaptation measures, their awareness of the flood-probability of their homes, and the perceived responsibility for reducing flood risk. In addition, their preferences regarding flood risk communication were examined through discussing a variety of methods ranging from interactive, face-to-face methods to static media such as websites and flyers. These communication methods encompass long-term flood risk information (as opposed to early-warning systems) with an emphasis on the level of individual homes. The questions were formulated based on a literature review. The interviews were transcribed, and the data were analysed.

Second, to acquire more in-depth insight into residents' perspective on flood risk communication, 18 of the 69 respondents also agreed to be interviewed in depth using Q methodology. Q methodology systematically reveals individual perspectives and groups them into shared perspectives using quantitative factor analysis (Raadgever, Mostert, & Van de Giesen, 2008). The factor analysis identifies the basic principal dimensions of respondents' perspectives (Kerr & Bjornlund, 2018). By employing Q methodology, this study combines quantitative and qualitative research methods (McKeown & Thomas, 2013). Since the aim is to overcome the implementation gap by concentrating more on translating expert knowledge to a lay perspective, Q methodology can highlight the various perspectives coexisting among Dutch residents. These different perspectives on how individuals prefer flood risk communication to be dispersed could facilitate a translation from expert to lay knowledge. It is important to understand that the focus is on identifying the various coexisting perspectives rather than generalising about how many residents hold a particular perspective.

The Q methodology adopted consisted of four steps. First, a Q-sample (or Q-set) was created. The sample is composed of statements extracted from the literature, interviews, or media. The statements in this study are formulated based on an analysis of the existing literature on flood risk communication, flood risk awareness and flood risk perception (Árvai, 2014; Bier, 2001; Bradford et al., 2012; Burningham et al., 2008; Höppner et al., 2012; Kasperson, 2014; Terpstra, 2011). The Q-sample consisted of a number of statements that covered the research issue, after which participants were selected by snowball sampling.[7] In the second step, Q-sorts were collected. Respondents ranked statements (i.e., the Q-sort) by assigning a value to each statement (Uittenbroek, Janssen-Jansen, Spit, & Runhaar, 2014). The Q-set consisted of 31 statements, and 18 interviewees performed the Q-sort. That is, they assigned each statement to one of 31 boxes in the Q-sort, which consisted of a 9-step scale from strongly agree (4) to strongly disagree (–4). Step three was a statistical analysis of the Q-sorts, namely a factor analysis. PQmethod software was used to run a principal component analysis (Schmolck, 2002). The statistical analyses run by PQMethod manually and automatically rotate the initial factors and provided the necessary outputs for step five (McKeown & Thomas, 2013). Step four was the interpretation of the factors. McKeown and Thomas (2013) refer to this as the task of distilling the core meanings hidden within the factors. We call factor groups perspectives, and the interpretation is explained in detail in the next section. The focus of the results section will be on the Q methodology outcomes, while the structured interviews provide context for Dutch residents' perception of floods.

5.4 Residents' preferences: Four different perspectives

Overall, the respondents perceived a flood event as unlikely to happen. Of the 69 residents, only 13 had taken some sort of measure (e.g., pump, garden drainage or sand bags), and most of these 13 had experienced a flood before. Yet, residents most commonly replied that they did not know what they could do individually to prevent flood damage. Responses ranged from 'there is nothing I can do' to prevent floods (respondents 1, 22, 33, 38, 40) to trust in current flood defence: 'I expect the dikes to be properly constructed' (respondents 8, 51), and further to 'I do not know what I could do' to prevent floods (respondents 7, 35, 52, 48). This complements the assertion that most respondents do not expect a flood to occur in their living area, at least not in the coming 5–10 years. Their preferences for how they would ideally be informed about their flood risk varied greatly (e.g., newsletters, websites, flyers, neighbourhood meetings, newspapers, TV, mobile applications or e-mails). Four perspectives are distinguished as outcomes of the Q factor analysis, which helps structure these diverse responses. Even though these four perspectives vary significantly, on some statements of the Q-sort, there was consensus among the entire sample group.

7 Snowball sampling has some limitations. It should be kept in mind that the respondents to the Q methodology might have more affinity with the topic than the average Dutch resident.

All respondents agreed to a certain extent that, in general, they personally do not need more information on flood risks (statement 18: −3, −2, −2, −1; see Table A2 in the Appendices). Moreover, all respondents were aware of the flood risks their properties face (statement 30: +4, +3, +4, +2). This might at first not seem in line with the tone of this article, as it could suggest that the respondents do not need more information on flood risk. However, to put these responses in perspective, first, multiple respondents commented that although they were aware themselves, their neighbours were not aware enough (respondents 1, 3, 7, 9, 10). They argued that most of their family, friends and neighbours were not as personally motivated to gather information on flood risk as they were. 'I am not the average Dutch resident on this topic', said respondent 1.

Second, statement 13 shows that all respondents are willing to use a website that informs them of flood risk (statement 13: +3, +2, +3, +3). In other words, even though the respondents claimed to be aware of their individual flood risk and did not think they needed more information on it, they were all interested in a website that would provide more information on it. And all said they would use such additional information sources to gain more knowledge of flood risk.

Beyond this consensus, the factor analysis presented four statistically significant perspectives on flood risk communication ('self-assured omniscient', 'acknowledged inexpert', 'insusceptible confident', 'insufficiently connected'). These perspectives are named after the characteristics of the empirical outcomes associated with each respondent group. A respondent defines a perspective when the loading is in excess of ±0.46 (Table A3 in the Appendices). The interpretation of these perspectives is based on the distinguishing statements. Table A2 shows the statements for each perspective with the corresponding scores. Some statements are unique to a factor, because they scored significantly differently compared to the other perspectives on that statement. These distinguishing statements, with a significance of $p < .01$, are shown in Table A2 (in boldface). These statements indicate a distinction between core and secondary values (Webler, Danielson, & Tuler, 2009).

5.4.1 Self-assured omniscient

The residents who shared this perspective on flood risk communication trusted their own knowledge of flood risks, which gave them confidence. They were also content with existing communication practices and the flood protection measures in place. They trusted that the government has taken the necessary precautions. 'I am confident the measures taken (i.e., dikes) [surrounding my home] are sufficient', said respondent 4.

They do not see any need for the involvement of an expert. Respondent 11 argued that she was definitely not going to adjust her home, so there was no need for an expert to inform her. Face-to-face communication of flood risks was also unnecessary in the eyes of the residents associated with this perspective. Moreover, they were not interested in paying for expert advice or a detailed report on their personal flood risk. They were willing to use a website to gather more information on flood risks, although they expected it to confirm what they already knew. 'Even though I am aware of the high flood risk I am facing, I am not going to invest money to prevent a flood that could occur once every 100 years; I will worry about it then' (respondent 11).

This remark implied that they would react in the event of an acute threat of flooding. The fact that they faced, for instance, a 1% chance of flooding each year did not serve as a sufficient motivator to act now. Moreover, the self-assured omniscients were not interested in locally tailored flood risk information. They were aware of their personal flood risks and claimed to understand the current manner of flood risk communication in terms of the probabilities of flooding. They regarded flood probabilities as the best way of communicating flood risk.

5.4.2 Acknowledged inexpert

The residents who identified with this perspective were aware of the flood risks of their properties. In contrast to the self-assured omniscients, they did not believe that their properties were currently well-protected against floods. Therefore, this view was based on the awareness of the shortcomings of their homes from a flood risk perspective, which made the owners receptive to flood risk communication. Moreover, residents who shared this view appreciated personal contact in flood risk communication. They preferred to be informed face to face rather than looking for information on an online platform, and they trusted information provided by an expert more than a website with flood risk information. They were not willing to use a website to gather more information on their personal flood risk. Related to this preference for expert information in a face-to-face manner, respondents who defended this position did not see any need for a national campaign on flood risk management. Respondent 1, for instance, specifically attached more value to the tailored assessment of an expert than the more general information available on a website. He stated that websites do not improve the flood risk awareness of most people. Instead, people generally ignore the information or do not take the time to read it thoroughly.

The acknowledged inexperts were aware of the flood risk that their property faced but acknowledged that there was more to learn. Respondent 12 questioned, for instance, whether his knowledge was adequate. In addition, this group did understand what it meant for their home to be protected against a 1-in-1000-year flood, although they did not consider flood probabilities the best way to communicate flood risk. The mention of a 1-in-1000-year probability causes people to assume they will not experience such an event. While a flood of that magnitude is possible, the question remains whether it will actually happen (respondent 1). Also, respondent 8 acknowledged that communicating a flood probability of 1 in 1000 years or even 1 in 10,000 years causes people to wait and see what will happen. The acknowledged inexpert perspective represents the respondents who would like to be more informed and who said that the probabilities make people wait and see what will happen. However, this group did not want to wait and see, because they believed their properties were not well-protected at the moment.

5.4.3 Insusceptible confident

This third perspective encompasses the residents who were convinced of their own knowledge of flood risks and believed that enough information on flood risk is already available. They were not interested in using a website for flood risk information. Nor

were they willing to spend any time or money gathering more information. Essentially, these residents knew that they live in a flood-prone area, but they were not considering taking measures in any way. As respondent 14 explained, 'In my opinion, my home is adequately protected against floods. So, I do not see the need to spend money to improve that.'

Defendants of this perspective were strongly opposed to paying for information on a website or for a detailed flood report by an expert. They were only interested in flood risk information if it was free. 'In my opinion information on floods should be free of charge. That is the way it is supposed to be, considering I already pay taxes to the regional water authority' (respondent 17).

They considered the Dutch government the sole actor that should inform residents of flood risks and anticipated that since this information would serve a common good, it should be available free of charge. Also, they did not perceive flood probabilities as the best way to communicate flood risk. They deemed probabilities too abstract to grasp (respondent 14). However, it is important to be critical in regard to the rankings respondents assigned to these statements.[8] As an example, respondent 17 claimed in the ranking of statements to be aware of the flood risk of his property and to understand what it meant to be protected against a 1-in-1000-year flood, but explained the probability as 'it will happen once'.

This perspective of the insusceptible confidents was a passive view. The residents assumed themselves to be well informed and were therefore only interested in flood risk communication if it was delivered to their homes in a brochure. 'To visit a website, you personally have to take action, but if the flood risk information is delivered via the mail, you are immediately confronted', said respondent 17.

5.4.4 Insufficiently connected

The residents who held this perspective were open to flood risk communication. Compared to residents who subscribed to the other perspectives, who claimed that enough information is already available, the 'insufficiently connected' residents stated explicitly that they needed more information on personal flood risk. The respondents preferred above all to be informed via a website, first, because they did not perceive a visiting expert as more reliable than a website, and second, because in their opinion insufficient information was currently provided by the government. These residents would prefer to search for flood risk information on their own time. They would also like different scales of information: from general flood risk to individual adaptation measures. More than the other perspectives, the insufficiently connected residents preferred technical information on adaptation measures, and they were interested in the benefits of adaptations. Residents associated with this perspective also had a clear need for real-time flood information.

To inform residents adhering to this perspective, flood risk information should not consist of flood probabilities, because for them a probability of 1 in 1000 years is incom-

8 See the Appendices for a detailed overview of statements and rankings by perspective.

prehensible. In their opinion, communicating in probabilities is not the right approach. Flood probabilities 'are actual nonsense', according to respondent 3.

This perspective strongly suggested the need for a national campaign to inform them of flood risk. They thought that the government should play an important role in dispersing more information, which was, in their perspective, not currently the case. 'I think it is essential that people are more aware of flood risks, and you can to a greater degree work together' on minimising flood risk (respondent 3).

5.5 Discussion: Pluralistic perspectives on flood risk

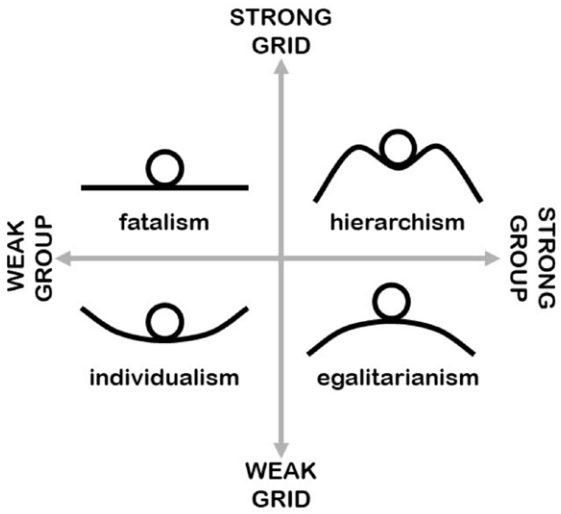
The objective of this article was to understand the perspective of residents in relation to existing and desirable flood risk communication. We find that, generally, residents interpret flood risk information in different ways than flood experts do. Moreover, one communication approach cannot address the disparate needs of such a diverse audience.

The most obvious finding of this study is the mismatch between residents' perception of flood risk versus that of the flood experts (water management). The latter ought to communicate flood risk in flood recurrence intervals and flood probabilities. For residents, it does not matter whether the probability is 1 in 100 years or 1 in 3000 years. Describing chances in terms of hundreds of years does not make it clear to lay people that a flood could occur tomorrow. Even the respondents who claim to understand flood probability cannot always explain it correctly. These findings are in line with Everett and Lamond (2013), Meyer et al. (2012) and Hartmann (2011), who argue that residents do not necessarily understand statistical probabilities and therefore these statistics should be avoided in flood risk communication meant for lay people.

The empirical outcomes provide insight into preferred communication methods. In general, residents are willing to visit a website for more information on flood risk, but they favour varying styles of communication. Whereas the 'acknowledged inexperts' have a clear preference for face-to-face communication, the 'insufficiently connected' desire a national campaign on floods, the 'self-assured omniscients' are only willing to take a short look at a website and prefer flood probabilities to communicate risk, and the 'insusceptible confident' residents would rather get flyers in the mail. Out of the four perspectives, the self-assured omniscient is best aligned with the current communication techniques (e.g., flood recurrence intervals). The mismatch goes beyond a juxtaposition of the 'expert' and the 'layperson', both in formulating flood risk and in the method used to inform residents. Therefore we conclude that a one-size-fits-all approach is not suitable for informing residents of flood risk.

This article is a step towards a better understanding of how floods are perceived by residents to design more tailored flood risk communication. We postulate a more bidirectional perspective on expert and lay knowledge, in which expert knowledge not only flows to the lay audience but also incorporates lay or local experience and feedback in subsequent expert judgements. This approach could increase and improve flood risk

Figure 5.2 Grid and group scheme of cultural theory (Hartmann, 2012, p. 12).



communication. However, the empirical findings reveal that this bidirectional perspective is not just a two-way communication between the two clear-cut groups of experts and lay people; given the plural perspectives on flood risk, adequate communication requires multiple directions of communication.

5.5.1 Insights through cultural theory

The empirical analysis shows that risk perception is not homogeneous within the group of residents (laypersons), as four different perspectives result from the Q methodology. None of these perspectives can be proven right or wrong; all are empirically true perspectives on flood risk. These multiple perspectives on risk can be analysed by applying the cultural theory of risk (Douglas & Wildavsky, 1992). The theory takes as a starting point four distinct rationalities (or cultures), according to which people perceive the world and from which their actions are derived: egalitarianism, individualism, hierarchism and fatalism (Hartmann, 2012; Schwarz & Thompson, 1990). These perceptions are placed in a matrix based on the level of 'grid' and 'group' (Figure 5.2). Group represents the level of attachment to social values such as democracy, frequency of interaction and equality, whereas grid represents valuation of autonomy, control and institutional integrity (Mamadouh, 1999).

People with an egalitarian worldview (weak grid, strong group) envision the world as on top of a hill, unstable enough that a small disturbance can destroy the equilibrium. Based on that notion, the world is constantly in danger, and it is necessary to respond quickly to possible disturbances. In addition, there is no room for experiments, because failure means the balance will be destroyed. From an egalitarian perspective, the results of an action are more important than the process, and worry or morality serve as reasons for taking action (Hartmann, 2012; Schwarz & Thompson, 1990).

An individualist's world view (weak group, weak grid) is more robust: the world seems to lie in a valley, so if a disturbance influences the equilibrium, it will always 'roll' back to the centre of the valley. Individualists can experiment, and each fault is also seen as an opportunity for benefit. They do not prefer to cooperate with others, but rather identify self-determination and individual liberty as important values.
Hierarchism (strong group, strong grid) is related to egalitarianism, as this world-view envisions the world to be on top of a hill but in a small dip, which makes for a relatively robust equilibrium. There are chances for trial and error, but only to a certain extent, because beyond the small dip, the equilibrium can be destroyed. Hierarchists prefer to determine boundaries by setting up rules and regulations, and, as the name suggests, hierarchy is important. People adhering to this perspective thrive on the notion that members of society give power to an institution and all members are equal in the process. Integrity is also essential in maintaining the equilibrium.

Fatalism (weak group, strong grid) is based on the idea that we cannot know how the world reacts and events cannot be influenced. The world can move freely both ways, and there is no 'falling down'. Fatalists do not believe in the world can be controlled. The strong grid is externally determined, and it is not possible for individuals (weak groups) to influence it. Fatalism is a passive rationality.

These four rationalities are mutually exclusive, and they represent contradicting views of the world. However, cultural theory postulates that, as each of these rationalities is rational and consistent within itself, it is likely that each rationality is represented in each social situation.

The four perspectives on flood risk communication that resulted from the factor analysis of the Q methodology match the description of the four rationalities almost perfectly, even though the methodology was not based on cultural theory. The 'insufficiently connected' perspective matches the rationality of egalitarianism, which believes in community-based solutions, common values, and trust. Residents adhering to this perspective are interested in technical information on what adaptation measures they can implement and their benefits. This relates to egalitarianism because the results are seen as more important than the process. In addition, these residents call for a national campaign on flood risks, which can be considered a consequence of their dissatisfaction with the current flood risk communication provided by the government. This situation causes them to worry and therefore to take action by acquiring information on adaptation measures.

The 'acknowledged inexpert' perspective fits individualism. The individualist believes in self-determination, which relates to the preference for face-to-face flood risk information and expert advice over non-tailored information on a website. Moreover, individualism supports individual liberty and freedom, as expressed in the acknowledged inexpert's explicit plea that no national campaign on flood risk should be initiated.

The perspective of 'self-assured omniscients' represents hierarchism, a rationality that stands for a belief in management and controllable situations. Residents associated with this perspective trust the measures taken by the government and therefore believe in (flood risk) management. They also recognise flood probabilities as the best way to communicate flood risk, as they believe that these chances can be controlled and accurately assessed. Moreover, they trust in rules and regulations; in their opinion, the

government is responsible for flood risk management. Therefore, they are not willing to pay for expert advice or a detailed report and see no need for face-to-face communication. This rationality also aligns with the perception of water managers (the experts).

The 'insusceptible confident' perspective corresponds to fatalism, a passive rationality that assumes the world is too complex and messy to manage. Residents associated with this perspective are aware of flood risk on their property and see no need for more information. This is in line with the assumption of the fatalist rationality that events cannot be influenced; the world is uncontrollable. Residents are not willing to pay for expert advice, a detailed report or the use of a website. Since the world cannot be controlled and events cannot be influenced, they are not willing to spend time or money on flood risk adaptation. They know they live in flood-prone areas but have no intention of taking measures.

5.6 Conclusion

This article aimed to analyse how residents interpret flood risk communication and how flood risk communication can be better targeted towards their needs. The empirical analysis indicates that within risk communication these four distinct perspectives prevail. These can be conceptualised through the four rationalities of cultural theory. Cultural theory explains that any solution that follows only one of the rationalities will only respond to people of one perspective. Other people will discard the solution as irrational (i.e., not matching their own rationality). A solution that deliberately considers all four rationalities has a better chance of acceptance by a larger public. But because the rationalities are mutually exclusive, it will never be perceived as a perfectly rational solution; it can only exist as an ideal to model a best-of-both-worlds solution. This puts flood risk communication strategies at a crossroads: the question arises whether to target one of the four rationalities at a time, to maximise the impact on that select group, or to try to find an ideal communication strategy that addresses all four different perspectives, knowing it will not fully appeal to any of them.

The currently dominant knowledge-deficit model in flood risk communication only responds to the 'self-assured omniscient' perspective (the hierarchism rationality). It does not respond to the other three perspectives. These results challenge the way risk communication is currently done: from an expert point of view and by appealing to one of the four perspectives. This study has emphasised the need for a deliberate choice to tailor the intended message to the targeted audience. At the same time, we should not forget that residents' perceptions, whatever the rationality may be, are influenced by aspects such as experience of floods and geographical living conditions.

This article cannot provide a recipe for what tailored bidirectional risk communication might look like; rather it provides empirical evidence for the necessity of such an approach. Further research is required to design and test risk communication methods that do not depend only on the view of experts but keep in mind the communication preferences of the egalitarian, individualist and fatalist rationales as well. This study is based on a small sample; therefore further empirical testing of these

rationales is necessary to overcome possible selection bias. Most of all, we conclude that different communication styles are needed to better orient flood risk communication to the needs of residents; one approach to address all rationales is not suitable.

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Chapter 6

Tailored flood risk communication: residents' perspectives as starting point

Under Review

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Abstract

Flood risk is increasing in intensity and frequency and is therewith threatening the way of life in urban areas. Residents are increasingly expected to undertake flood risk adaptation measures to minimise flood damage to their property and increase the flood resilience of a community. By expecting residents to implement property-level flood risk adaptation (PLFRA) measures, their role as recipients is changing. Ultimately, residents will become key stakeholders. This shift in responsibility requires that residents are aware of the risk they face and their responsibility for minimising it. However, the concepts of risk and responsibility are subjected to pluralistic interpretations. Flood risk communication is a promising way to improve risk awareness and responsibility among residents of flood risk areas, but risk communication then needs to address these pluralities. This paper aims to understand how residents across countries prefer flood risk to be communicated to provide the basis for developing a communication strategy that manages to both raise awareness and informs residents about responsibilities. The results show four distinct sets of preferences for flood risk communication, and these four sets of preferences are likely formed by residents' perceptions of responsibility, their country of residence, and their experience with floods. Based on these distinctive sets of preferences, it can be concluded that the question why these different perspectives exist among residents should be addressed.

6.1 Introduction

Flood risk is increasing in intensity and frequency and is therewith threatening the way of life in urban areas. Damage from inundations on private homes can have severe impacts on residents (Kuhlicke et al., 2020; Rufat et al., 2020). Reducing flood risk is thus in the interest of residents living in flood risk areas. Residents can undertake many measures to increase the protection and resilience of their homes (see e.g., Attems et al., 2020). Accordingly, academic studies and policy both agree that a viable option for minimising damages and increasing community resilience is for residents to adopt flood risk adaptation measures for their homes independently (Holub & Fuchs, 2009; Mees et al., 2012; Osberghaus, 2015).

Greater reliance on individual actions has implications for the distribution of responsibilities in flood risk governance. In traditional flood risk management, implementing measures for flood protection was mainly a governmental responsibility, and residents were considered mere recipients of flood protection (Kuhlicke et al., 2020). By expecting residents to implement property-level flood risk adaptation (PLFRA) measures, their role changes. Ultimately, residents are becoming key stakeholders (Snel et al., 2020). This shift in responsibility requires that residents are aware of the risk they face, their responsibility in minimising it, and how they can do so (Rollason et al., 2018). Through risk communication it is feasible to make residents aware of risk, responsibility and potential adaptive actions, such as PLFRA (Charrière et al., 2012). However, the process of flood risk communication is subject to pluralistic interpretations, as are the concepts of risk and responsibility. This creates two key challenges for communicating flood risk: The first challenge is related to raising risk awareness and PLFRA, and the second is related to the understanding of responsibility.

First, the challenge for risk communication is to raise awareness regarding risk and PLFRA. Previously, the academic debate has largely been focused on residents' flood risk awareness and how to increase it. Still, residents are not commonly aware of the flood risk they face. For instance, in the United Kingdom up to 40% of the residents in flood risk areas have been unaware (Burningham et al., 2008), and a more recent study suggests that 31% of at-risk residents would not know what to do in the event of a flood (Rollason et al., 2018; Davies, 2015). Also in the Netherlands residents have a low perception of flood risk. Research shows that 35% of at-risk residents have never considered the possibility of experiencing a flood where they live (Gutteling et al., 2010). Raising awareness has been one of the main objectives of flood risk communication, in addition to transferring knowledge and providing (behavioural) advice on adaptive actions that may be taken to reduce risk, such as the adoption of PLFRA (Höppner et al., 2012). However, risk awareness is hampered by residents' pluralistic interpretations and understandings of risk (Hartmann, 2011) and the fact that communication strategies are not often tailored to the needs of residents (Snel et al., 2019).

Second, the concept of responsibility is contested and rarely used in a similar way by different actors. What it means to be responsible has many different connotations, and every actor pieces together their own and others' responsibility based on their own perception and experience. Additionally, there are various forms of responsibility that are often not clearly distinguished, such as moral responsibility or accountability. This

leads to miscommunication and scholarly confusion (Doorn, 2012; Giddens, 1999; Pellizzoni, 2004) and can hamper efforts to encourage adaptive actions.

Awareness of flood risk and the related responsibilities are the starting point for including residents in flood risk governance (Kievik & Gutteling, 2011; Höppner et al., 2012; Charrière et al., 2012). Raising awareness on the risk of flooding and the responsibilities that residents bear both require clear and well-organised communication strategies. There is a tension between the envisioned shift to residents becoming key stakeholders and their frequently lacking awareness of risk and responsibility. Even though flood risk communication is not the sole solution for this tension, it is a promising way to improve it (Kievik & Gutteling, 2011).

However, information on risk can be shared, and behaviour can be altered (Rollason et al., 2018; Ping et al., 2016; O'Sullivan et al., 2012). In other words, residents who respond to risk communication gain knowledge on flood risk, PLFRA and responsibility divisions. This paper uses residents' perspectives as the starting point for an empirical study to analyse how these challenges may be overcome via flood risk communication. It is crucial to analyse what the communication preferences of residents are to tailor communication strategies. Following a social constructivist approach, this paper aims to better understand residents' communication preferences across different localities in two distinct national contexts (England and the Netherlands). This provides the basis for developing flood risk communication (i.e., recognising residents' preferences and interpretations) that is able to raise awareness of risk and responsibility of residents.

6.2 Plurality in flood risk communication

Risk communication is subject to pluralistic interpretation. Research shows that residents' preferences regarding flood risk communication are very diverse, implying that it is impossible to develop one uniform communication method that can manage to inform and motivate all residents effectively (Snel et al., 2019). Also, it implies that notions on responsibility are varied. This section summarises the key insights from academic literature regarding pluralistic interpretations of risk communication in flood risk management.

The main aim of flood risk communication has generally been to raise awareness by transferring knowledge and providing adaptation advice (Höppner et al., 2012; Charrière et al., 2012). Despite this, difficulties in reaching these objectives still remain (Rollason et al., 2018) and result in different insights on how to improve (flood) risk communication. It has been argued that the ineffectiveness of communication is primarily due to the one-way transmission of risk information to the lay public, instead of a preferred two-way approach (Árvai, 2014; Höppner et al., 2012; Ping et al., 2016). In addition, research suggests that residents prefer to be informed regarding the likely impact and consequences of floods on their well-being and property (Renn, 2009; Bichard & Kazmierczak, 2012), instead of about probabilities of flooding, which are difficult to understand and whose significance is even more difficult to interpret (Snel et al., 2019).

Furthermore, it is also important that the information provided is actionable, because being informed about risks that are beyond your individual control raises anxiety rather than prompting adaptation (Bubeck et al., 2012; Everett & Lamond, 2013; Grothmann & Reusswig, 2006; Meyer et al., 2012). In the past, flood risk communication has often been developed from an expert point of view without taking the preferences of the intended target group into account (Patt & Jüpner, 2013). It is often considered to be a top-down matter, whereas the impact of communication strategies could be improved by adopting a more resident-centric focus (Ping et al., 2016). Yet, residents are rarely included in the development of such communication strategies and campaigns (Rollason et al., 2018). Effective flood risk communication strategies would thus need to be specifically tailored to residents' preferences (i.e., target group) (Snel et al., 2019).

Tailoring flood risk communication to the preferences and needs of residents is, however, not as easy as it might seem. A key challenge is that, as research has shown, residents prefer flood risk to be communicated in a variety of different ways (e.g., Martens et al., 2009; Ping et al., 2016). Specifically, Snel et al. (2019) have empirically shown four distinct preferences for flood risk communication extant among Dutch residents. The first group were called the 'Self-assured Omniscients' because of their confidence in their existing knowledge on flood risk and the trust they put in public authorities. They expect the government to inform them when it is necessary to undertake PLFRA, and until then they trust other protection measures in place. The second group prefers flood risk communication to be tailored to their local risk, and they acknowledge that they are not as informed as they would like to be, as they perceive their properties as not well-protected against floods. Therefore, this group was called the 'Acknowledged Inexperts'. The third group was considered fatalists. They assumed themselves to be well-informed, aware of the flood risk they face, and they state that there is nothing they can do to prevent a flood event. They were labelled 'Insusceptible Confident'. The fourth group was called 'Insufficiently Connected'. They believe they are not sufficiently aware of flood risk and would like more information, from general to individual risk and PLFRA. Based on these insights, flood risk communication can be better tailored to residents' needs. Yet, the difficulty of such a plurality of needs is that any communication strategy that addresses only one of the groups will be ineffective with the other groups and possibly entirely disregarded by them. A solution that deliberately considers all four rationalities has disadvantages as well, because it will never be fully tailored to the preferences of the specific groups. The study of Snel et al. (2019) is limited by addressing solely perspectives of Dutch residents. It fails to address the importance of contextual factors, such as country of residence, experience of floods or perceptions of responsibility division in flood risk governance.

In short, existing research shows plurality in how residents prefer flood risk to be communicated (e.g., Ping et al., 2016; Höppner et al., 2010). Yet, in contrast to previous studies that take one country as their focal point (e.g., Snel et al., 2019; Martens et al., 2009; Ping et al., 2016; Rollason et al., 2018), in this study, we perform a cross-country analysis of residents' perspectives. Additionally, it is of added value to determine whether country-wise contextualisation of communication strategies are needed and is useful in determining how these distinct preferences are shaped.

Figure 6.1 Geographical locations of the English case study areas.

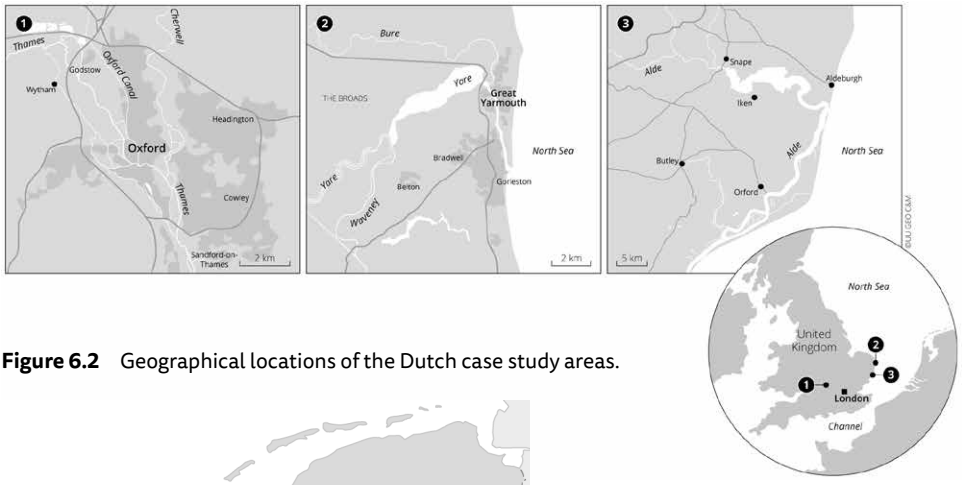

Figure 6.2 Geographical locations of the Dutch case study areas.

6.3 Methodology

To study the plurality of residents' preferences for flood risk communication across countries, an in-depth, predominantly qualitative research design is imperative. The selected countries are the Netherlands and England. Although to different degrees, both the Netherlands and England have a mix of flood risk management strategies (e.g., flood protection and mitigation, flood warning and response, spatial planning) and (at the time of data collection) both were subject to the EU Floods Directive. Furthermore, both countries are undergoing similar shifts in flood risk governance directing increased attention towards flood risk management at the local level and encouraging individuals to take more responsibility for their flood risk, including through the adoption of PLFRA.

In contrast, both countries are at different points along this journey and coming from very different starting points, which makes a cross-country analysis of residents' preferences interesting and insightful. The Netherlands is starting from a system with a high protectionist approach with strong governmental responsibilities, whereas England has long had a more diverse approach to management, acknowledging that not all flooding is avoidable and with legal responsibilities resting with individual property-owners (Hegger et al., 2017). As such, experiences of flood events in these countries are quite different. In the Netherlands, flooding is relatively rare, although pluvial flood events are increasing. The last widespread fluvial warnings occurred in the Meuse in 1995, although flooding was limited to local events. In England, flooding, and thus flood warnings, are much more common with flooding occurring somewhere in the country almost on a yearly basis[9] (large scale flood events are for instance, 2007: Yorkshire and the Midlands; 2013/14: South east and coastal flooding on East Coast; 2015/16: Cumbria and Yorkshire; 2019/20: various locations; Environment Agency, 2020). In 2019, there were 5,600 official flood warnings across England highlighting the need for effective communication (Environment Agency, 2020).

In both countries, three study locations were chosen in relation to varying types of flood risk. In that we address the perceptions of residents across the main types of flood risk: coastal, fluvial and pluvial. Great Yarmouth (England), Aldeburgh (England), and Dordrecht (the Netherlands) are susceptible to coastal flooding. River flood risk applies to Zwolle (the Netherlands), Venlo (the Netherlands), Dordrecht (the Netherlands), Oxford (England), and Aldeburgh (England). Pluvial flood risk applies to all study locations. Additionally, all locations have neighbourhoods at flood risk, and some of these neighbourhoods have experienced floods once or multiple times over the past years. Respondents, therefore, all live in flood risk areas, but while some have experienced flooding, others are still inexperienced in that area. This permits an analysis of the differences in preferences based on such contextual characteristics. Above all, flood risk communication addresses residents of flood risk areas in general, regardless of their flood experience; it is therefore also important to take both groups into account in this study.

To acquire more in-depth insight into residents' perspectives on flood risk communication, 18 English and 18 Dutch residents were interviewed using Q-methodology distributed across the six study locations. Q-methodology systematically reveals individual perspectives and groups them into shared perspectives using quantitative factor analysis (Raadgever et al., 2008). The factor analysis identifies the basic principal dimensions of respondents' perspectives (Kerr & Bjornlund, 2018). By using Q-methodology, this study combines quantitative and qualitative research methods (McKeown & Thomas, 2013). Q-methodology can highlight the various perspectives coexisting among English and Dutch residents as well as pinpointing any differences. It is therefore a fitting

9 Large scale flood events are for instance, 2007: Yorkshire and the Midlands; 2013/14: South east and coastal flooding on East Coast; 2015/16: Cumbria and Yorkshire; 2019/20: various locations (Environment Agency, 2020).

methodology for the aim of this study, namely to explore in depth individual preferences for flood risk communication (embracing plurality) in multiple risk contexts to improve flood risk communication strategies.

For this empirical study, we are building on the data collected and analysed in Snel et al. (2019), which focused on risk communication in the Netherlands and revealed the plurality in perspectives. Herein we combine and extend these data with English empirical evidence. The Q-methodology performed for this study consisted of four steps. First, a Q-sample (or Q-set) was created. The sample is composed of statements extracted from the literature, interviews with policy makers, and media. Corresponding to Snel et al. (2019), the statements in this study were formulated based on an analysis of the existing literature on flood risk communication, flood risk awareness and flood risk perception (Árvai, 2014; Bier, 2001; Bradford et al., 2012; Burningham et al., 2008; Höppner et al., 2012; Kasperson, 2014; Terpstra, 2011). The Q-sample consisted of 31 statements that qualify to identify the preferences of residents in flood risk areas concerning flood risk communication, after which 36 participants were selected by snowball sampling. Both in the Netherland and in England, the selection process started by addressing local actors who were involved in local flood risk management or general governance processes. Building on that, our initial contacts in the study locations connected us with their local contacts. Examples of such local actors are members of Flood Action Groups or town council members. Efforts were made to include residents who were flood experienced/inexperienced, as well as a range of other characteristics (e.g., age, gender, risk of flooding).

In the second step, Q-sorts were collected. Respondents ranked the 31 statements by assigning a value to each statement (Uittenbroek, Janssen-Jansen, Spit, & Runhaar, 2014). In total 36 respondents performed the Q-sort. That is, they assigned each statement to one of 31 boxes in the Q-sort pyramid, which consisted of a 9-point scale from strongly agree (+4) to strongly disagree (–4).

The third step consisted of a statistical analysis of the Q-sorts, namely a factor analysis. PQmethod software was used to run a principal component analysis (Schmolck, 2002). The statistical analyses run by PQMethod manually and automatically rotate the initial factors to provide the necessary outputs (McKeown & Thomas, 2013). Four factors were selected based on their eigenvalues (factors with an eigenvalue greater than 1,00 are considered significant), then variance was explained in the next step (total ideally above 50%) and a proportional distribution of respondents across the factors was established.

Step four was the interpretation of the factors. McKeown & Thomas (2013) refer to this as the task of distilling the core meanings hidden within the factors. This process is mostly based upon the factor loadings, the Z-scores, and distinguishing statements per factor. Additionally, the reasoning that respondents provided for their (dis)agreement with certain statements during the interviews was used to distil the core meaning of the factors.

The Q-sorts were collected as part of semi-structured interviews conducted with each of the English and Dutch respondents; each interview lasted between 60 to 90 minutes. These interviews were transcribed and coded by using MAXQDA. In other words, besides implementing the Q-methodology, respondents were also asked questions to gather information about, for example, their experience with floods,

perception of responsibility division and about whether they had taken PLFRA measures. This additional data, which was collected in addition to the Q-sorts, was useful for providing insight into the contextual factors that influence how respondents sorted the Q-statements.

All in all, this analysis has led to four significant "factors" that represent groups of residents who share similar preferences for flood risk communication. The factors are in this study referred to as perspectives. In the following section, these perspectives are presented based on the similarities and differences that resulted from the factor analysis. The data is enriched with qualitative analysis of the semi-structured interviews. In the analysis presented herein, findings concentrate on one combined dataset including both Dutch and English respondents. An initial comparison of the separate Dutch and English analyses showed no meaningful similarities or differences. Consequently, an analysis with the English and Dutch data combined was performed, which led to interesting insights that indicate why respondents share certain perspectives.

Table 6.1 The 31 statements that were used as the Q-set in this study.

Statements Q-Methodology	
1.	I prefer face-to-face information sharing over an online information platform.
2.	A website with information on protection measures is only complete when I can get specific information on the benefits of implementing protection measures.
3.	I think that a website or mobile app should be available to inform me about different flood risks in the region.
4.	I have the need for real-time information on flood risk.
5.	I am willing to pay for advice of experts on how I can best protect my house against flooding.
6.	I am only interested in information on my flood risk if it is free.
7.	My home is well-protected against flooding.
8.	I think it is problematic that information about the flood risk of my home is freely accessible online.
9.	Now I know I live in a flood-prone area. I am going to gather more information on flood risks and protection measures.
10.	The government informs me sufficiently about the flood risk in my region.
11.	I am willing to use my address details to determine via a website or mobile application what flood risks I am facing.
12.	I understand what it means when my home is protected against floods of 1-in-100-years.
13.	I would use a website or mobile application that informs me on flood risk.
14.	In my opinion there is already enough information on my personal flood risk available.

15. I think flood probabilities are the best way of informing me about flood risks.
16. Only a government has the necessary credibility to inform me about flood risk.
17. I want more information on flooding than just a calculation of the chance that my home can flood.
18. I have the need for more information on flood risk.
19. A website or mobile application would be useful for gathering information on my personal flood risk.
20. I am willing to pay money for a detailed report on the flood risks of my home.
21. Flyers that are sent to my home address to inform me on my personal flood risk are a suitable form of risk communication.
22. Existing flood maps showing risk in the region are easy for me to understand.
23. Information on flood risk needs to be repeated regularly before I realize what the possible consequences are.
24. I think a website or mobile application with information about my flood risk provided by an insurance company is trustworthy.
25. On a website or mobile application I want to be able to ask my questions about flood risk, the consequences and prevention.
26. In my opinion, websites or mobile applications improve the communication between flood experts and citizens.
27. I think a website or mobile application should be available to inform me about technical flood protection measures regarding my home.
28. I would only use a website or mobile application on flood risk if it is free.
29. Information about my personal flood risk provided by experts is more reliable than that provided by a website or mobile application.
30. I am aware of the flood risk to my property.
31. I have the need for a national campaign on flood risks to raise my awareness of possible consequences.

Table 6.1 Overview data per perspective.

	Respondents	Country of Residence	Experience	Responsibility Resident/Government
"Localists" ***Perspective 1***	1	**England**	N	50/50
	6	**England**	N	50/50
	9	**England**	N	20/80
	10	**England**	N	50/50
	11	**England**	Y	50/50
	12	**England**	Y	100/0
	13	**England**	Y	50/50
	17	**England**	Y	50/50

	Respondents	Country of Residence	Experience	Responsibility Resident/Government
"Sufficientists" ***Perspective 2***	2	**England**	N	20/80
	3	**England**	N	30/70
	15	**England**	N	50/50
	22	**Netherlands**	Y	0/100
	27	**Netherlands**	N	20/80
	28	**Netherlands**	Y	0/100
	29	**Netherlands**	Y	10/90
	31	**Netherlands**	Y	0/100
	32	**Netherlands**	N	0/100
	33	**Netherlands**	N	20/80
	35	**Netherlands**	Y	0/100
	36	**Netherlands**	Y	40/60
"Imperfectionists" ***Perspective 3***	4	**England**	N	25/75
	5	**England**	N	50/50
	7	**England**	N	0/100
	8	**England**	N	30/70
	21	**Netherlands**	N	50/50
"Conventionalists" ***Perspective 4***	16	**England**	Y	60/40
	19	**Netherlands**	N	50/50
	20	**Netherlands**	N	50/50
	23	**Netherlands**	N	0/100
	24	**Netherlands**	Y	0/100
	25	**Netherlands**	N	30/70
	26	**Netherlands**	N	20/80
	30	**Netherlands**	Y	50/50
	34	**Netherlands**	N	20/80

6.4 Different perspectives of residents on flood risk communication

Four distinct perspectives on flood risk communication resulted from the empirical fieldwork. Each perspective represents a distinct set of preferences. Before the specific characteristics of the four groups are emphasised, statements that constitute

consensus amongst all four groups are highlighted. First, all groups showed some disagreement with the statement that their home is well-protected against floods. Additionally, all the groups emphasised that they want more information on flooding over and above the calculation of the chance that their homes can flood. Regarding the method of risk communication, all groups acknowledged that they would use a website or mobile application that informs them on flood risk. Also none of the groups deemed it problematic if information about the flood risk of their homes would be freely accessible online. Respondent 4 explains that there is "definitely no reason why it should be a problem. If it implies that other people would be able to tell and then they might not want to buy my house, then again, I totally disagree that one should be trying to hide the fact [that your property is at flood risk]. I think that is an ethical thing."

Beyond this consensus, the factor analysis presented four statistically significant perspectives on flood risk communication: these respective perspectives are hereafter labeled as Localists, Sufficientists, Imperfectionists and Conventionalists. These perspectives are each named after the characteristics of the empirical outcomes associated with each respondent group. The interpretation of these perspectives is based on those statements that distinguish the group. Some statements are unique to a factor because they scored significantly different as compared to the other perspectives on that statement, i.e., distinguishing statements. These statements indicate a distinction between core and secondary values (Webler, Danielson, & Tuler, 2009)

The English and Dutch respondents adhere to one of these sets of perspectives and each set entails a shared perspective on how the group would prefer that flood risk is communicated to them. In this section these sets of preferences are explained based on their typical components and their similarities and differences in relation to the other sets. On top of the distinctions between these preferences, we enriched the results with contextual data on the specific respondents adhering to the sets, such as their flood experience, how they divide responsibilities in flood risk management, and PLFRA measures taken (See Table 2). The four sets of preferences are highlighted below.

6.4.1 Perspective 1: "Localists" – Preferring locally provided information

Using flood probabilities as a form of flood risk communication, such as protection against a 1-in-a-100-year flood, is understandable for this group of respondents, although they do tend to explain it in different ways. Respondent 12 understood it as *"a disastrous event where you have to leave your home and have it completely refurbished. [...] You see them on the television. People sitting on the tops of their roofs waiting to be rescued, that sort of thing."* Respondent 9 explained that *"it might happen tomorrow. I get it, but it is kind of meaningless, isn't it?" And Respondent 6 claimed that "it means that on the big average, they expect us to go through this experience once every hundred years. [But] everybody knows that 1-in-a-100 doesn't mean that at all. We're talking mathematics not flood risks."* This group strongly agrees with the statement that they understand what a return period of 1-in-a-100-year means, but, based on contextual data, they are ambiguous in their explanations. This raises questions whether there is a common and correct understanding. Yet, whether it is fully understood or not, these respondents state strongly that their homes are not well-protected against floods.

Moreover, they stated that websites with flood risk information do not have to be free in order for them to use them. *"If it was there and if it was useful, it would help me keep safe. Why would I not want to pay for it?"* (Respondent 12). This aligns with the statement that they are not only interested in flood risk information when it's free. Respondent 12 stated, *"I think it's far too important to be worrying about the odd fee if there's a bit of a fee. So what? If it's free, fine, but I certainly wouldn't be only interested in it if it's free: definitely not. [...] I think it would be ludicrous to demand that it has to be free because it's too important to keep your home safe."* Respondents 9 and 17 expressed that they have already paid for flood risk information; so they have no issue with having to pay for such information.

Additionally, the respondents who share this perspective stand out from the other groups through (1) their need for real-time information and (2) their acknowledgement of the importance of local knowledge in communicating flood risk. Aspect (1) was brought up in regards to current river measurements on water levels and velocity (Respondent 17) and regular update-messages by phone or text (Respondent 11). Aspect (2) relates to the statement on whether they perceive governmental actors to be the only credible source of flood risk information. Respondents 13, 12 and 17, for instance, also rely on local knowledge from fishermen and farmers. *"The farmers who live in this area probably know as much about it than somebody in government"* (Respondent 12). Respondent 1 additionally mentioned local flood action groups as an example of a reliable source of flood risk information. Therefore, the respondents who share these preferences do not consider public authorities to be the sole providers of credible flood risk information.

The contextual data shows that this group of respondents, belonging to this set of preferences on flood risk communication, consists of only English respondents. So, besides the Q-analysis that shows that they share similar preferences on flood risk communication, they are also connected based on their country of residence. Moreover, they generally divide the responsibility for protecting properties from flood damage 50/50 between residents (themselves) and public authorities. In addition, half of the respondents have been flooded before.

This group of respondents further can be characterised as 'localists' because they articulated a clear need for more locally provided flood risk information, which applies both to their recognition of local sources as reliable providers of information as well as to their preference for home-delivered flyers. Besides that, they prefer information specified to the local level, such as real-time information. To summarise this group's communication preferences: they are interested in more information on flood risk, which is ideally building on local knowledge and shared with them through flyers, text messages or a phone call.

6.4.2 Perspective 2: "Sufficientists" – Trusting accessibility of sufficient information

The respondents adhering to this perspective explicitly stated that they do not have need for more flood risk information. Additionally, they are not willing to pay for flood risk information. Respondent 35 explained, *"in my opinion information on floods should be free of charge. That is the way it is supposed to be, considering I already pay taxes to the regional water authority."* Yet, Respondent 29 stated, *"Even though I am aware of the high flood risk*

I am facing, I am not going to invest money to prevent a flood that could occur once every 100 years; I will worry about it then." This also implies that respondents belonging to this group are not going to take PLFRA measures and do not need information on such measures. Moreover, respondents stated that if they needed it, enough information was already available. Respondent 15 said, *"personally, there's enough information [available] that you can research."*

Using flood probabilities, like 1-in-a-100-year phrases, to communicate the risk of flooding does not align with the preferences of this group. Even though they state they do understand what a 1-in-a-100-year flood risk means, they emphasised that these formulations do not work. Like Respondent 29 stated, *"I'll worry about it when there is an actual threat"*. Respondent 3 explained, *"That [1-in-a-100]-year means nothing to me, absolutely nothing. I work in it and I still don't understand it. How can you have three 100-year floods in a short period of time? It does not make any sense to me at all."* Respondents 32 and 35 agreed that flood probabilities are too abstract to grasp and give the impression that a flood will only happen once.

This group is the only one out of four that explicitly stated that they do not have a need for more flood risk information. They claimed that enough information was already available. Accordingly, flyers are not a suitable form of flood risk communication in their eyes and neither is a national campaign. The only form of communication that this group is willing to use is a website that informs them on flood risk in general and on the individual risk they face. Yet, these forms of information need to be free of charge.

This second perspective on flood risk communication was shared by respondents from both England and the Netherlands, and they self-reported mixed experiences with floods. Yet, the additional analyses also showed that all respondents perceived public authorities to have (nearly) full responsibility for protecting properties from flood damage. This might put their communication preferences in perspective in relation to the other three sets that are presented in this results section.

We have characterised this group as 'Sufficientists' because they are not interested in additional information on flood risk, and if they, in the future, might be in need of more information, they argued that enough is already available on the internet. They claimed to be aware of the flood risk that they face and acknowledged that their homes are not well-protected. Yet, many of them put their awareness in perspective by emphasising that they themselves are aware; however that their neighbours might not be sufficiently aware (Respondents 27, 28). This group is not open to additional flood risk communication strategies. To summarise this group in one sentence: they are not interested in more information on flood risk because they believe that enough information is already available.

6.4.3 Perspective 3: "Imperfectionists" – Acknowledging their limited experience

This group of respondents emphasised that they wanted to gain more information on the flood risk of their property as they acknowledged that they are not fully aware of the risk they face. They argued that the public authorities do not inform them sufficiently. They suggested that public authorities should play a bigger role in dispersing

information, which, in their perspective, was currently not the case (Respondent 21). They did not perceive public authorities to be the only credible provider of flood risk information and stated they did not perceive information provided by insurance companies as untrustworthy.

These respondents appeared to agree that enough flood risk information is not available, and although it might be available, *"it might not necessarily be very visible"* (Respondent 4). Flood risk communication should in their opinion be free of charge and it needs to be repeated regularly. Additionally, they explicitly stated that they do not understand what it means to be protected against a 1-in-a-100-year flood. Whereas the other perspectives in this analysis also addressed the shortcomings of these probabilities, this group completely disagreed with the use of such probabilities. They stated that flood probabilities *"are actual nonsense"*, according to Respondent 21.

Compared to the size of the other groups, fewer respondents adhered to the 'Imperfectionists' perspective, but what unites them beside their shared preferences for flood risk communication is their inexperience with floods. None of them had been flooded before, which is likely to influence their preferences for flood risk communication. The respondents did diverge in their answers regarding where responsibility lies for protecting properties from flood damage, residents or public authorities. Moreover, since this group consists of both English and Dutch respondents, country of residence does not seem to be an indicating contextual factor.

We characterised this group as 'Imperfectionists' because they acknowledged their limited awareness of flood risk and their limited understanding of flood probabilities. Also, the respondents of this group were the only ones who stated that flood risk information needs to be repeated regularly and *"messaging has to be varied enough to have impact"* (Respondent 7). They are also the only group that voiced slightly positive opinions about the added value of a national campaign on flood risk. To summarise this group into one sentence: Respondents acknowledged their limited awareness of flood risk and therefore need flood risk information to be regularly repeated, free of charge, and go beyond flood probabilities.

6.4.4 Perspective 4: "Conventionalists" – Preferring offline information by public authorities

Respondents that are part of this group expressed a clear need for more information, even though they stated they are aware of the flood risk to their property. Nonetheless, they did acknowledge that there is more to learn. Respondents questioned, for instance, whether their knowledge was adequate (Respondent 30). Additionally, Respondents 25 and 19 addressed that their friends or neighbours might not be aware enough. One stated, *"I am not the average Dutch resident on this topic"* (Respondent 19). This aligns with their responses to the statement whether they understand what a 1-in-a-100-year flood means. Respondent 26 acknowledged that communicating a flood probability of 1-in-100-years or even 1-in-1000-years causes people to wait and see what will happen. And Respondent 19 claimed that the mention of a 1-in-1000-year probability causes people to assume they will not experience such an event. While a flood of that magnitude is possible, the question remains whether it will actually happen in their lifetime.

This group prefers face-to-face information sharing to an online information platform. Accordingly, they stated that information provided by experts is more reliable than information on a website or mobile application. This group acknowledged that flood maps are not easy for them to understand. This might also influence why they prefer face-to-face information sharing, because websites or mobile applications on flood risk are often built around flood maps. The respondents were in general willing to pay for flood risk information. For this group, only public authorities are providers of credible flood risk information and information provided by insurance companies is perceived as untrustworthy. Yet, they are not interested in a national campaign on flood risk.

Besides their shared preferences for flood risk communication, the respondents who adhere to this set also shared a country of residence, a vast majority of this group's respondents lived in the Netherlands. They were divided in regard to their experience with floods and on whether they perceived the main responsibility for protecting properties from flood damage to be with the public authorities or with residents. Yet, they all perceived at least half of the responsibility for minimising flood damage at the property level to lie with public authorities.

This group is characterised as conventionalists because they are the only group that prefers the more conventional forms of communication, such as face-to-face flood risk communication. Also, they would only perceive information from public authorities as reliable and not accept information provided by other actors, such as insurance companies. To summarise this group in one sentence, respondents prefer face-to-face flood risk communication that is provided by public authorities and do not include flood maps, which are not easy to understand.

To conclude this results section, the Q-analysis has resulted in four significantly different sets of preferences on how flood risk should be communicated according to residents of flood risk areas in England and the Netherlands. The residents who adhered to these perspectives are named Localists (Perspective 1), Sufficientists (Perspective 2), Imperfectionists (Perspective 3), and Conventionalists (Perspective 4). In addition to the risk communication preferences of these groups, relevant contextual data was presented in this section. These data include respondents' experience with floods, their country of residence and how they perceive responsibility to be divided between public authorities and residents regarding protecting individual properties from flood damage. In the discussion, the added value of combining the Q-analysis with contextual data is addressed in more detail, and suggestions for future research are made.

6.5 Discussion and conclusion

Conclusions can be drawn on the communication preferences of residents and on the contextual factors that are relevant for flood risk communication.

6.5.1 Insights on communication preferences of residents

This empirical study resulted in four distinct sets of preferences for flood risk communication among residents at flood risk. This outcome emphasises the diversity in residents' preferences. An in-depth analysis shows that a generalised communication strategy will most likely fail to meet the intended objective of such a communication strategy. This study has highlighted the key preferences of residents, their similarities (e.g., they would all use a website or mobile application that offers information on flood risk do not think it problematic that their property's specific flood risk can be found online) and differences (e.g., whether they understand what it means to be protected against floods of 1-in-100-years, whether public authorities are the only credible providers of flood risk information, and whether enough information is already available).

As this study builds on the data used in Snel et al. (2019), we would first like to reflect on the results of Snel et al. (2019) in relation to the findings of this paper. In general, it is interesting that, both in the solely Dutch study as well as in the combined English and Dutch study, the outcome of the factor analysis resulted in four distinct perspectives. Additionally, similarities were revealed in communication preferences: the residents of both studies proved to be willing to use websites or mobile applications to gather information on flood risk, and respondents from both studies did not perceive it as problematic if the flood risk of their properties is freely accessible. These insights and general principles may be universal and define flood risk communication in varying national contexts, but certainly in England and the Netherlands. This analysis also confirms that the use of flood probabilities (flood return periods) is contested. Many perspectives state that they do understand what it means to be at risk for 1-in-a-100-year floods, but all perspectives acknowledge that such probabilities should not be the only form of flood risk communication available. Yet, the four perspectives of the Snel et al. (2019) study and the study presented here do differ notably from each other based on their communication preferences; the Dutch respondents were divided differently across the four perspectives (Localists, Sufficientists, Imperfectionists, and Conventionalists). These differences in distribution indicate that the factor analysis grouped the respondents differently and that is probably because some of the English respondents correlated in such a way that they formed a significantly different perspective (such as the Localists).

6.5.2 The influence of contextual factors

Besides addressing the universal communication preferences among English and Dutch residents, this study mainly highlights the differences in preferences among residents. This provides us with the opportunity to take a first step in determining why

the differences exist. In other words, we examined what contextual factors influence how residents prefer flood risk to be communicated. In our opinion this is a fruitful next step towards better tailoring flood risk communication to residents' preferences. Therefore, we propose future research directions based on this follow-up question: why are there four distinct sets of preferences regarding flood risk communication among residents of flood risk areas?

Apart from the Q-analysis highlighting the differences in preferences between the four groups, some differences also became visible in the characteristics of the individual respondents who are associated with each of the specific perspective groups. These contextual characteristics came to light through an analysis of the additional data collection as part of the broader semi-structured interviews that the Q-methodology was a part of. Specifically the following three factors turned out to be potentially signifying what might influence the preferences per perspective: prior experiences with a flood event, the country that respondents lived in, and how they divided responsibilities between residents and government for protecting properties from flood damage.

Country of residence – How residents prefer flood risk to be communicated might be influenced by their country of residence, as every country has various approaches to and experiences with floods. Based on some of the case- and country specific results that were outlined in the previous section, we can assume that path-dependently developed institutional aspects (e.g., cultural traditions and governance approaches related to flood risk management) to some extent may influence residents' communication preferences (Kaufmann & Wiering, 2017). In recent years in England, residents have more frequently faced the threat of a flood event (or seeing it in the news) than residents of the Netherlands. English residents might therefore have a stronger opinion on how they would want flood risk to be communicated. The Localists (1) are interested in more information on flood risk, which is ideally building on local knowledge and locally distributed. This group consists solely of English respondents. Therefore, this might indicate that the Localists (1) have experienced how more generalised (i.e., non-local) communication can turn out to be incorrect or not useful and, as such, this group might, therefore, attach more value to local knowledge than the others. The Netherlands has a longstanding tradition where public authorities are the main actors in flood risk management. The Conventionalists (4) consist of all Dutch respondents, except one. This group prefers face-to-face flood risk communication that is ideally provided by public authorities. Their country of residence might influence the Conventionalists' specific preference for governmental information on flood risk. Also, it makes sense that the country of residence plays a part in the preferences of residents (e.g., cultural traditions, governance approaches), and previous research has also highlighted this (Burningham et al., 2008; Bubeck et al., 2012; Terpstra & Gutteling, 2008).

Flood experience – Whether residents have experience with floods might influence how they prefer to receive flood risk communication. The Imperfectionists (3) acknowledge their limited awareness of flood risk and therefore state a clear need for flood risk information that is free of charge, repeated regularly and not solely focused on flood probabilities. The contextual data shows that none of the respondents adhering to this group have experience with floods. This might indicate that, because they have not been flooded before, they recognise that they lack a sense of urgency for increasing awareness

and taking measures. Therefore, they prefer flood risk information to be repeated regularly (so that they are reminded often), freely available (which increases accessibility) and more detailed than solely flood probabilities (as they are difficult to understand and do not provide the sense of urgency they would like). That the experience of having being flooded has an impact on the risk perception of residents has been concluded by varying authors, as outlined by Hopkins & Warburton (2015). It is therefore likely to assume that flood experience also influences how residents prefer flood risk to be communicated.

Responsibility division – Communication preferences of residents can be influenced by their perception of responsibility. In this case we asked respondents how they would divide responsibility between residents on the one hand and public authorities on the other hand. The Sufficientists (2), who are not interested in more flood risk information as they believe enough is already available, all place a strong emphasis on governmental responsibility. This might indicate that respondents do not perceive it as their responsibility and thus as unnecessary for them, as residents, to have more knowledge on the risk of flooding and PLFRA. They might argue that public authorities are responsible for flood risk management, and they expect to be informed when necessary. This final characteristic, that (perceived) divisions of responsibility may influence residents' preferences of flood risk communication is more novel. Evidence suggests that how residents perceive flood-related responsibilities influences their risk perception and motivation to take adaptive actions (e.g., Hopkins & Warburton, 2015; Wachinger et al., 2013; Snel et al., 2021). However, responsibility as both an exponent of flood risk communication preferences as well as one of the main topics to be addressed in flood risk communication, is a new insight. This calls for a better understanding how residents perceive responsibility to be divided in flood risk governance, after which flood risk communication can be tailored to these perceptions in order to address potential discrepancies.

These three contextual characteristics form an array of future research directions that will shed more light on what influences residents' preferences on flood risk communication and can improve flood risk communication development.

Finally, flood risk communication can be more effective in raising flood risk awareness, informing about adaptive actions, and addressing responsibilities if tailored to the communication strategies residents prefer. The four groups of perspectives provide a viable set of preferences that make it possible to devise better tailored flood risk communication that can increase flood resilience.

6.5 References

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Chapter 7

Conclusion and Discussion

The preceding chapters offered an analysis and evaluation of residents' involvement in flood risk governance processes and their perspectives on responsibility, risk communication and adaptive actions. This chapter covers a synthesis of the main findings and provides an answer to the main research question of this thesis:

> ***How can an enhanced understanding of residents' perspectives contribute to increasing involvement of residents in flood risk governance?***

To answer this main research question, the empirical insights presented in this thesis are discussed and supplemented with theoretical reflections on two main topics, namely the importance of residents' involvement in flood risk governance and their perspectives thereof. The research as presented in this thesis started from analysing the existing academic reasoning for residents' involvement in flood risk governance, to residents' perceptions of responsibilities and their preferences for flood risk communication. Five research questions will be answered in the section below, which is followed by the answer to the main research question, discussion of the findings, and recommendations for future research and policy making.

7.1 Synthesis of Research Findings

It has been the intensifying call from academics and policy makers to increase residents' involvement in flood risk governance that led to the first research question of this thesis. Why is it so important that specifically residents take flood adaptive actions? Not only academia has analysed residents' risk perception and motivations to protect, but also beyond academia, debates of the last three decades on how to deal with flood risk have increasingly allotted more responsibility to residents (Holub & Fuchs, 2009; Mees et al., 2012; Osberghaus, 2015). This led to research question 1 as posed in Chapter 2; ***why should residents be more involved in flood risk governance?*** In this thesis, the emphasis is on residents' taking adaptive actions on the household level (i.e., technical, financial, or behavioural). As Chapter 2 shows, four main categories of arguments emphasise why residents should be more involved in flood risk governance. The first category of arguments is related to climate change, which entails that the frequency and intensity of floods are increasing due to climate change. This requires an all-hands-on-deck approach regarding adaptation, which also includes residents. Second, academic research has shown that adaptive actions at the household level are effective in minimising flood damage (Fink et al., 1996). Residents of flood risk areas can reduce flood damage by as much as 80% through implementing property-level flood risk adaptation (PLFRA) measures themselves (Grothmann & Reusswig, 2006; Thurston et al., 2008; Everett & Lamond, 2013; Bubeck, Botzen, Kreibich, & Aerts, 2012). Third, building on the added value of adaptive actions, it is emphasised that solely residents in their role as property owners can take initiative or give consent for implementing PLFRA measures (Hegger et al., 2017; Mees et al., 2012). Fourth, dividing responsibilities is the final argumentation category that is distinguished. Sharing responsibilities among stakeholders can solve governmental capacity issues, lack of public funding, and legitimacy and awareness issues. Begg (2018) states that specifically the reductions in public funding have increased the pressure on government to increase residents' responsibilities in flood risk governance. Thus, residents should be more involved because of climate change, effective damage reduction at the property-level, necessary consent, and sharing of responsibilities.

Building on these insights of why residents should be more involved in flood risk governance, the emphasis on residents' responsibility raised follow up questions. In particular, as expressed in research question 2, ***how can responsibility in flood risk governance be conceptualised?*** Chapter 3 addresses this research question by distinguishing four notions of responsibility: legal responsibility, moral responsibility, accountability, and perceived responsibility. Legal responsibilities are based on formally assigned duties to mitigate flood risk and compensate for flood damages (liability). Moral responsibility is understood as a moral obligation to not cause harm, to help within your capacity, and to take responsibility for flood risk based on varying roles, such as a member of a community. Accountability addresses the ex post responsibility of actors involved in flood risk governance, meaning that whoever bears certain responsibilities should have to answer for how well, or whether at all, they executed those responsibilities. Perceived responsibility refers to one's actual understanding of who is responsible

for what in flood risk governance, regardless of what the law or norms of morality might otherwise indicate (Wamsler, 2016). Perceived responsibility is helpful to explain disjunctions between formally expected behaviour and actual behaviour before, during, and after flood events. Disentangling these notions contributes to structuring debates on responsibility division in flood risk governance both theoretically and empirically. Discussing responsibility divisions generally causes confusion as the interpretation varies per actor, but by emphasising the notions of responsibility, the concept becomes less abstract and less open to interpretation. These insights allow the debates and decision-making on the involvement of residents in flood risk governance to reconsider responsibilities and take especially the perceived notions into consideration, because the analysis has shown that what actors perceive as their own or as others' responsibility often does not align with the legally stated responsibilities.

This prompted the empirical analysis of residents' perceptions on responsibilities as formulated in research question 3; ***How do residents perceive responsibilities in flood risk governance to be divided?*** This question is addressed in Chapter 4 and formed the starting point of the empirical analyses of residents' perspectives in this thesis. The results showed that residents have clear expectations and perceptions on how they think responsibility is divided and how they would prefer this to be. However, in practice these expectations and perceptions do not align with, for instance, legal responsibilities for managing flood risk. The discourse on responsibilities in flood risk governance raises questions and causes mismatches. Such mismatches do not only occur regarding the actual legal parameters and perceived responsibility, but also regarding moral considerations and holding actors to account for their (in)actions. That residents are not fully aware of their own legal responsibilities and that they assume public authorities to have more legal responsibility than is formally the case are key findings highlighted by this chapter. On the one hand, these findings demonstrate clear barriers to motivating those at risk to take action. On the other hand, they highlight that these barriers should be overcome in order to ensure that communities are prepared for flood events and can recover more quickly. Overcoming the barriers regarding responsibility perceptions involves active communication with residents on risk, responsibility, and adaptive actions. Comprehending what residents understand and desire as accountability, legal, and moral responsibility provides lessons for more precisely targeted flood risk communication, which ideally triggers adaptive actions, and ultimately improves the overall ability of managing of flood risk.

In Chapter 5 this topic of targeted flood risk communication was put on the foreground by answering research question 4; ***How can flood risk communication be better targeted towards the preferences of residents?*** The empirical analysis indicates that preferences of residents on flood risk communication can be divided into four distinct sets, which can be conceptualised through the four rationalities of the Cultural Theory of Risk (fatalism, hierarchism, individualism, and egalitarianism) (Douglas & Wildavsky, 1992). Contemporary flood risk communication is dominated by the knowledge-deficit model, which only responds to one of the four perspectives, namely the hierarchism rationality, but does not match the preferences of the other three perspectives. These results challenge the way flood risk communication is currently predominantly performed: from an expert

point of view and by appealing to just one of the four perspectives. In contrast, this study emphasised the need for a deliberate choice to tailor the intended message to the targeted audience. At the same time, we should not forget that residents' perceptions, whatever the rationality may be, are likely influenced by contextual factors such as experience of floods or geographical living conditions. This chapter does not provide a recipe for what tailored flood risk communication should look like; rather it provides empirical evidence for the necessity of such an attuned approach. Most of all, it concludes that different communication strategies are needed to better adjust flood risk communication to the needs of residents; one uniform approach to address all preferences (rationales) is not suitable.

In Chapter 6 the perspectives of residents on flood risk communication are also used as the starting point. This chapter aims to better understand residents' communication preferences across different localities in two distinct national contexts (England and the Netherlands) by answering research question 5; ***How do residents across countries prefer flood risk to be communicated?*** In answering this question, it provides the basis for developing tailored flood risk communication (i.e., recognising residents' preference and the differences between residents' preferences and interpretations) that is able to raise awareness of risk and responsibility of residents. Awareness of flood risk and the related responsibilities are the starting point for involving residents in flood risk governance (Kievik & Gutteling, 2011; Höppner et al., 2012; Charrière et al., 2012). Raising awareness on the risk of flooding and the responsibilities that residents bear requires clear, well-organised, and tailored communication strategies. The empirical analysis shows that, also across countries, the communication preferences of residents can be divided into four distinct sets. The first group is called 'localists': they are interested in more information on flood risk, which is ideally building on local knowledge and shared with them through flyers, text messages, or a phone call. Second, 'sufficientists' are not interested in additional information on flood risk, and if they, in the future, might be in need of more information, they argue that sufficient information is already available. The third group, called 'imperfectionists,' acknowledge their limited awareness of flood risk and, therefore, they prefer flood risk information to be regularly repeated, free of charge, and go beyond flood probabilities. Fourth, the 'conventionalists' prefer face-to-face flood risk communication that is provided by public authorities and does not include flood maps, which are not easy to understand. These four perspectives on flood risk communication are not the same as presented in Chapter 5 because preferences and respondents are grouped differently and thus cannot be tied to the four rationalities of the Cultural Theory of Risk. Due to these differences in relation to Chapter 5, this chapter also aspired to indicate why the different sets of preferences exist. In other words, what are the contextual factors that influence how residents prefer flood risk to be communicated? Specifically, the experience of a flood event, the country that the residents live in, and how they divide responsibilities between residents and public authorities for minimising flood damage, turned out to be potentially signifying in regard to what might influence residents' preferences for flood risk communication. The emphasis on influential factors is a fruitful next step in better tailoring flood risk communication to resident's preferences.

In conclusion of the synthesis of the research findings, the main research question is answered.

> ***How can an enhanced understanding of residents' perspectives contribute to increasing involvement of residents in flood risk governance?***

By recognising the importance of residents' perspectives, approaches to increase their involvement can and should be better tailored to their wishes and needs. The main conclusion of this thesis is, that before residents can properly decide on taking appropriate flood adaptive actions (i.e., involve in flood risk governance), they need the necessary knowledge and information in order to make such decisions. In order to improve such decision-making abilities, it is important to communicate appropriately with residents about risk, responsibilities, and potential adaptive actions. Therefore, this thesis concludes, first of all, that flood risk communication that is tailored to residents' preferences is likely to improve their knowledge on risk, responsibilities, and adaptive actions. This includes a less expert-oriented approach and acknowledging plurality in residents' preferences regarding format and delivery. Second, it is crucial to openly address (perceived) responsibilities in flood risk governance and specifically in flood risk communication, as currently this is often overlooked. Third, aiming for enabling residents to make informed decisions might be the best way forward, because existing research has shown that no uniform success formula exists for motivating residents to take adaptive actions. The following section will address these conclusions in more detail, along with a discussion of theoretical considerations.

7.2 Discussion

In answering the main research question, three conclusions are drawn regarding contributions to increasing residents' involvement in flood risk governance. These three conclusions are discussed in detail in the following paragraphs.

7.2.1 Tailoring flood risk communication to residents' perspectives

Tailoring flood risk communication to residents' perspectives includes both tailoring to the lay-knowledge of residents, as well as to the plural perspectives on flood risk communication as shown in Chapters 5 and 6. The distinction between lay and expert knowledge in flood risk communication is most visible in the use of flood probabilities, in other words, flood recurrence intervals. This is phrased as 'your home is protected against a 1-in-250-year flood.' Interpreting flood probabilities typically goes beyond the lay understanding of flood risks (Everett & Lamond, 2013; Meyer et al., 2012). Such formulations can easily be misconstrued in such a way that people count on 249 years of safety after a flood event. Additionally, for residents, it does not matter whether the probability is 1-in-100-years or 1-in-3000-years. In other words, describing risk in terms of hundreds of years does not give the impression that a flood could occur this year or even

this week. As a result, residents tend to understand flood probabilities as a guarantee of flood protection.

The empirical analyses in this thesis have shown that residents are not a homogeneous group. They have varying preferences for flood risk communication. As a consequence, to tailor flood risk communication to the preferences of residents (i.e., the target audience) and not to the desires of experts, it is necessary to acknowledge the plurality of residents' preferences. One communication approach cannot address the disparate needs of such a diverse audience. Therefore, it is concluded that a one-size-fits-all approach is not suitable for informing residents of flood risk.

The empirical studies as presented in Chapters 5 and 6 resulted in four distinctly different perspectives. This shows that the plurality of communication preferences among residents can be categorised in at least 4 sets of preferences. As the Cultural Theory of Risk explains, none of these perspectives can be proven right or wrong and all are empirically true perspectives on flood risk (Douglas & Wildavsky, 1992). They are mutually exclusive, and they represent contradicting views of the world. Additionally, Cultural Theory explains that any solution that follows just one of the rationalities will only respond to residents of one perspective. Other people will discard the solution as irrational (i.e., not matching their own rationality/perception). Moreover, a solution that deliberately considers all four rationalities has a better chance of acceptance by a larger public, but because the rationalities are mutually exclusive, it will never be perceived as a perfectly rational solution. It can only exist as an ideal to model a best-of-both-worlds-solution. This puts flood risk communication strategies at a crossroads: the question arises whether to target one of the four rationalities at a time, to maximise the impact on that select group, or to try to find an ideal communication strategy that addresses all four different perspectives evenly, knowing it will not fully appeal to any of them.

This is a choice that is to be assessed per communication ambition, as each has different implications in different situations. Overall, when a proper translation from expert to lay knowledge fails and flood risk communication does not meet the preferences of residents, it is likely that residents distance themselves from the risk and responsibilities, and that they will hold the government responsible for flood risk management and providing protection (Mees, 2014; Biesbroek et al., 2010; Runhaar et al., 2012; Termeer et al., 2013; Wamsler & Brink, 2014). Addressing the varying responsibilities that arise in flood risk governance is the second main insight of this doctoral thesis and will be addressed in the following section.

7.2.2 Addressing responsibilities in flood risk governance

The topic of responsibility is rarely addressed in flood risk governance in general and flood risk communication strategies specifically. This causes a gap in flood risk communication as a (all-encompassing) source of information. Responsibility is conceptualised in Chapter 3 as being plural by nature. It has many different connotations and even more so across disciplines. To make sense of the diverse meanings of responsibility in flood risk governance, it is conceptualised into four notions (legal responsibility, accountability, moral responsibility, and perceived responsibility). However, the difficulty that arises is the plurality of how residents perceive respon-

sibilities to be divided in flood risk governance. In Chapter 4 the notion of perceived responsibility has been empirically analysed and the results show that residents assume varying actors to have legal, accountability, moral, and desired responsibilities. It is not just public authorities vs. residents; also insurance companies are perceived to have certain responsibilities, specifically regarding financial adaptive actions. These insights highlight two barriers that increase the difficulty for residents to acknowledge any of the responsibility notions, or to take adaptive actions, such as PLFRA measures. One, a lack of awareness among residents concerning their formal legal responsibilities presents a hurdle, while, two, they perceive and desire that public authorities and insurance companies have responsibilities too, which is often not in accordance with the assignment of legal responsibility.

However, perceptions of responsibility do not only provide barriers from residents' perspectives, but also potentially among the other actors involved in flood risk governance. When academics, policy makers, and practitioners lack understanding or acknowledgement that residents may perceive responsibility differently than they do, problems will arise in communicating responsibilities. Both in England and in the Netherlands, responsibility is a contested topic that is often evaded. As a consequence, responsibility divisions in flood risk governance are open to interpretations. This study has shown the importance of addressing these responsibilities clearly in order to prevent misinterpretations of who is responsible for what. A starting point would be to open up the responsibility debate while addressing the notions, actors, and potential adaptive actions. This might increase awareness on who is responsible for what, and ideally such a debate might be a step towards residents becoming able to make informed decision about taking adaptive actions. Residents can only make informed decisions about adaptation if it is clear to them how certain notions of responsibility are allocated in flood risk governance.

7.2.3 Enabling residents to make informed decisions

This thesis started out by stating that it takes an analytical step back regarding existing research by not aiming to analyse which factors influence residents' adaptive actions but by analysing why residents are crucial and what their perspectives are on (their role in) flood risk governance. This thesis concluded that the currently provided information is insufficient for informing residents about flood risk, responsibilities, and adaptive actions before they can make educated decision on taking adaptive actions. In line of that, this thesis argues that determining motivations for adaptation is jumping ahead. It neglects the gap of knowledge that exists between academia and policy on the one hand, and civil society on the other hand. Residents are crucial in managing flood risk, but they are either not aware of the risk that their properties face ("Flood probabilities are actual nonsense" according to respondent 3 in Chapter 5), of the responsibilities that fall on them (as respondents generally state in Chapter 4 and 5, public authorities are responsible for managing flood risk), or of the adaptive actions that they can take ("I do not know what I could do [to protect my property]" as stated by multiple respondents in Chapter 5). Therefore, this thesis argues that, before determining what factors motivate residents to take adaptive actions, it is important to increase their ability to make

informed decisions about such adaptive actions. Prior to making informed decisions, it is crucial for residents to be aware of (i) the flood risk that they face, (ii) the division of responsibilities among stakeholders, and (iii) the adaptive actions they can potentially take to minimise flood damage on their property. In addressing these three conditions, this thesis has evidently shown the importance of residents' perspectives for informed decision-making.

However, this thesis does not allow for making claims about the success rate or impact of improving information provision to residents. In other words, it is outside the scope of this research to draw conclusions on whether residents will actually decide to take adaptive actions when they know about the risk, their responsibilities and what actions they can take. That is why this thesis ends with a call to action to increase residents' ability to make informed decisions. Regardless of a success rate, I argue that it is an individual choice to decide about taking adaptive actions, and even if residents make an informed decision not to adapt, they know that they are taking a risk that might have consequences in the future. They are making a choice with the necessary information and might decide to take the risk.

7.3 Policy Recommendations

This section explicitly summarises the three main policy recommendations that derive from this thesis. Enhancing the understanding of residents' perspectives benefits the various stakeholders that are involved in flood risk governance and who aspire to increase residents' involvement, such as academics, policy makers, or climate adaptation consultants. These recommendations cover the central subjects of this thesis as they are inherently connected to the previous sections and chapters. The following sections include recommendations on improving the reasoning for increasing residents' involvement in flood risk governance, openly and clearly defining responsibility divisions among stakeholders, and tailoring flood risk communication to the preferences of residents.

7.3.1 Improve reasoning for residents' involvement

Currently, the main reasoning in academia and policy for involving residents in flood risk governance is not clear and convincing enough for residents of flood risk areas. Besides addressing responsibilities, this also entails a clear cut reasoning that addresses the urgency and coping capacity of residents in flood risk areas. As Chapter 2 concludes, a step forward might be to include the effectiveness of adaptive actions and the role that residents can play as private property owners.

7.3.2 Responsibilities in flood risk governance

This thesis recommends that public authorities openly communicate which actors have which responsibilities in managing floods and minimising flood damage. Recom-

mendations to address the complexity of the responsibilities are, most importantly, that responsibilities should be clear to all stakeholders involved in flood risk governance (i.e., government, market, and civil society); this is especially crucial when it comes to the division of legal responsibility. Moreover, responsibilities would ideally be deliberated on in a public debate in order to assess the responsibility divisions among stakeholders and gather insights and opinions from residents. Above all, it is only fair that residents of flood risk areas know what responsibilities are assigned to them in case of a flood event.

7.3.3 Tailor flood risk communication

In this study, it was reiterated that flood probabilities are not a suitable form of risk communication. Additionally, it is important to design flood risk communication strategies that are tailored to the preferences of the target group. As the studies in Chapter 5 and 6 show, there are very distinct communication preferences among residents of flood risk areas. This implies that in order to tailor flood risk communication, it is important to establish which group of residents is the intended target group and how this specific group can be addressed in the best way. The overall choice is to either develop a communication strategy that addresses all sets of preferences partially (which might mean that none of the residents feel addressed), or develop a communication strategy that is tailored to the preferences of one specific group (which means that the other groups of residents are not addressed at all with this strategy and will be in need of an additional communication strategy). Unfortunately, none of the choices is perfect as both go along with consequences.

7.4 Future research recommendations

This section builds on the research of this thesis by addressing future research angles. In other words, questions and subjects that arise from this study, which are viable research topics for further theoretical and empirical analyses of discipline such as, natural hazards, planning, (environmental) governance, law, or risk communication. The aspects of flood risk governance processes that require more exploration are, first, the concept of flood resilience and specifically its position in relation to flood risk governance, second, social justice and fairness considerations regarding responsibility divisions in flood risk governance, and, third, deepening the emphasis on perspectives, not only of residents, but also the perspectives of governmental and market stakeholders.

7.4.1 Flood resilience

Resilience is increasingly mentioned in flood risk literature (Fekete, Hartmann & Jüpner, 2019; McClymont et al., 2020). The concept of resilience has many definitions that are all largely based on Holling's (1973) definition as "a measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationship between populations or state variables." In other words, resilience entails the

ability of a system to absorb disturbances without irreversible consequences (Hartmann et al., 2019). For an area to be flood resilient requires reducing its vulnerability to floods while maintaining the basic functions of urban areas in the face of climate change (Klijn & Koppenjan, 2012). Based on the insights of this doctoral thesis into flood risk governance, it is worth discussing how flood resilience links to the other approaches to flood risk (i.e., traditional flood protection and flood risk management). Fekete et al. (2019) questioned what resilience really adds to flood risk management. They discussed whether resilience is just a trend and simply rebranding of the contemporary flood risk management strategies. Yet, McClymont et al. (2020) state that recovery after a flood event is the overarching feature of flood resilience in existing academic literature.

Based on the analyses of residents' perspectives in this doctoral research, I would like to emphasise that the significance of flood resilience becomes clear in the changes of residents' roles over time. In line with that, I will argue that the growing emphasis on flood resilience certainly indicates a new shift in approaches to flood risk. Additionally, future research should reconsider flood resilience and reflect on its significance regarding increased involvement of residents in flood risk governance. To explain this viewpoint, I will start from the operationalisation of flood resilience, as presented by Hegger et al. (2016).

The concept of flood resilience according to Hegger et al. (2016) distinguishes between three capacities; 1) the capacity to resist, 2) the capacity to absorb and recover, and 3) the capacity to transform and adapt. Analysing these three capacities, flood resilience seems to build on traditional flood protection and flood risk management approaches and adding a third capacity. The mentioned capacity to resist seems to be similar to the traditional flood protection approach, which mainly focuses on preventing flood events. In this approach, residents are mere recipients of the protection measures as provided by flood defences. Flood risk management can be linked to the second mentioned capacity of flood resilience, to absorb and recover, because on top of the capacity to resist, it aims to increase society's ability to live with water and floods (Hartmann & Driessen, 2017). This is envisioned in the basin-wide approach of flood risk management plans such as Room for the River in the Netherlands or Making Space for Water in England. In addition, flood risk management strategies emphasise the importance of non-structural measures, such as evacuation routes and warning systems. The role of residents is growing with the shift to flood risk management, but you can still mark their position as recipients.

The third mentioned capacity, the capacity to transform and adapt, is what specifically distinguishes flood resilience from flood risk management and traditional flood protection approaches. The emphasis on transformation and adaptation is currently clearly visible in flood risk governance debates. This capacity entails that society must be able to adjust to external drivers (e.g., flooding), but also to take advantage of opportunities provided by these external drivers (Hegger et al., 2016). This capacity of flood resilience is closely related to society's ability to learn, for example, about dealing with flood events. Even though this capacity is the most conceptual of the three, it bears a clear resemblance with the current emphasis on involvement of residents and motivating them to take adaptive actions. This is in clear contrast to residents' role in traditional flood protection and flood risk management approaches, where residents started as recipients of flood protection and management; but then residents become

key stakeholders in the ambition to adapt to flood risk and transform existing roles and responsibilities. Therefore, in my perspective, flood risk governance is currently gradually shifting towards a flood resilience approach, specifically regarding the growing emphasis on residents' involvement and adaptation.

This deliberation of flood resilience shows that resilience is not an isolated approach. It is a new strategy, building on the present and previous approaches to floods. However, the lines between the three strategies are blurry. One cannot pinpoint a clear moment in time when a transition was made from one to the other. This is generally only visible after a shift has been institutionalised. What I offer up for discussion is that academia and policymakers are slowly moving towards flood resilience approaches and moving beyond the narrower approach of flood risk management. The attention to 'involving residents' in the current debates is essential in this transition, and it could explain the mismatch between experts' expectations and residents' perceptions. It might indicate that the experts are already further along in this shift to flood resilience (and see the necessity of residents' involvement), whereas civil society is not aware that a shift is taking place in which their active involvement is required. Future research should aim to outline the concept of resilience and its use in flood risk governance and analyse whether we are again experiencing a shift in approaches to flood risk governance similar to the shift from flood protection to flood risk management as outlined by Hartmann & Jüpner (2014).

7.4.2 Social justice and fairness

The concept of responsibility has been one of the main subjects of this thesis. The emphasis has mainly been on how the concept can be clarified by distinguishing four notions of responsibility, and on how responsibilities are perceived to be divided among stakeholders in flood risk governance processes. However, closely related to defining responsibility is the question what a just or fair manner to divide responsibilities among actors would look like. Therefore, one of the limitations of this doctoral thesis is the lack of attention paid to concepts of justice and fairness. These concepts are closely related to responsibility and the division thereof in flood risk governance (Doorn, 2016). Flood risk management knows multiple inequality issues, specifically regarding the residents of flood risk areas. Residents have varying vulnerabilities and diverse capacities to prepare for and recover from floods, which can be linked, for instance, to age, income, and education (Forrest, Trell & Woltjer, 2020). This also applies to making informed decisions about taking adaptive actions. Many residents of flood risk areas are bound by, for instance, income in making such decisions. These nuances should play a bigger role in dividing responsibilities because as this thesis has shown, residents who are at flood risk are a heterogenous group. They vary greatly in their abilities to adapt to and recover from flood events.

Multiple concepts of justice, such as utilitarianism, egalitarianism, or libertarianism all define the 'just' or 'fair' in their own way. Thaler & Hartmann (2016) address the question of what should be protected against floods by focusing specifically on the allocation of protection measures, sharing costs for implementing such measures, procedural justice, and the liability for flood damage. Building on their insights,

I recommend future research to address the question of how responsibilities can be divided fairly, both across actors and among residents of flood risk areas.

7.4.3 Perspectives of other flood risk governance actors

For future research it would be relevant to highlight the perspectives of other actors involved in flood risk governance, such as public authorities and market stakeholders, for instance, insurance companies. This thesis focused on the residents' perspectives on flood risk, responsibility and adaptive actions, but that is only one of the three pillars of governance approaches. Therefore, it would be interesting to analyse the perspectives of policy makers (local to national level) and businesses. Ideally, such an analysis could lead to an in-depth comparison between their perspectives on the notions of responsibility as presented in Chapter 3, which could highlight the differences and similarities in perspectives between the actors. This would be of added value for academia and policy because it could paint the full picture of the perspectives in flood risk governance and it would potentially highlight gaps that need solutions.

Additionally, it would be of interest to analyse residents' perspectives in more detail by aiming to determine which contextual factors influence their perceptions. In this case, Chapter 6 specifically proposes relevant future research directions based on the outcomes of the Q-methodology.

In closing, this thesis addressed two main topics, namely the importance of residents' involvement in flood risk governance and their perspectives thereof. This thesis demonstrates that the perspectives of residents on risk, responsibilities, and adaptive actions are valuable. Insights gained from analysing residents' perspectives contribute to a better understanding of why they act or not, and these insights are often unanticipated. As residents are increasingly becoming vital stakeholders in flood risk governance processes, their opinions and perspectives should be taken into account. When academia and policy take residents' perspectives into consideration and tailor their flood risk strategies to these perspectives, a first of many steps is taken towards increasing residents' involvement in flood risk governance. Moreover, it can be prevented that any of the governance stakeholders is flooded with expectations.

7.5 References

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Appendices

Table A1 Background information per respondent (Chapter 4).

Respondent	Experience	Location	Gender	Age	Home for x years
1	N	Great Yarmouth	M	66-70	12
2	N	Great Yarmouth	F	56-60	21
3	Y	Great Yarmouth	M	36-40	unknown
4	N	Great Yarmouth	F	41-45	5
5	N	Great Yarmouth	M	56-60	20
6	N	Great Yarmouth	F	56-60	30
7	N	Great Yarmouth	M	>75	12
8	N	Great Yarmouth	F	31-35	8
9	N	Great Yarmouth	F	61-65	7
10	N	Aldeburgh	M	61-65	20
11	N	Aldeburgh	M	66-70	24
12	Y	Aldeburgh	F	51-55	12
13	Y	Aldeburgh	M	66-70	15
14	Y	Aldeburgh	F	46-50	15
15	Y	Aldeburgh	F	71-75	18
16	N	Aldeburgh	M	61-65	21
17	N	Aldeburgh	M	>75	3
18	Y	Oxford	F	66-70	30
19	Y	Oxford	M	46-50	14
20	Y	Oxford	F	46-50	5
21	Y	Oxford	F	51-55	15

Table A2 Statement scores by factor (Chapter 5).

	Self-assured ominiscient	Acknowledged inexpert	Insusceptible confident	Insufficient accesibility
1. I prefer face-to-face information sharing over an online information platform.	-3	**4**	-3	-1
2. A website with information on protection measures is only complete when I can get specific information on the benefits of implementing protection measures.	**-2**	0	1	3
3. I think that a website of mobile app should be available to inform me on different flood risks in the region.	3	2	-1	3
4. I have the need for real-time information on flood risks.	0	0	0	**4**
5. I am willing to pay for advice of experts on how I can best protect my house against flooding.	-1	1	**-4**	0
6. I am only interested in information on my flood risk when it is free.	**0**	-3	**4**	-3
7. My home is well protected against flooding.	1	-3	1	-1
8. I think it is problematic that the flood risk of my home is freely accessible online.	-4	-1	-1	-3
9. Now I know I live in a flood prone area, I am going to gather more information on flood risks and protection measures.	-1	-1	-3	0
10. The government informs me enough on the flood risk in my region.	1	1	-1	-2
11. I am willing to supply in my address details on a website or mobile application to determine what flood risks I am facing.	4	2	3	2

12. I understand what it means when my home is protected against a flood of 1 in 1000 years.	2	4	1	**-1**
13. I would use a website of mobile application that informs me on flood risk.	3	2	3	3
14. In my opinion there is already enough information on my personal flood risk available.	1	1	3	**-2**
15. I think flood probabilities are the best way of informing me on flood risks.	**2**	-3	-1	-4
16. Only a government has the necessary credibility to inform me on flood risk.	**-2**	1	2	2
17. I want more information on flooding than just a calculation of the chance that my home can flood.	0	2	2	1
18. I have the need for more information on flood risks.	-3	-2	-2	-1
19. A website or mobile application would be useful for gathering information on my personal flood risk.	3	**-1**	1	2
20. I am willing to pay money for a detailed report on the flood risks of my home.	-2	-2	**-4**	0
21. Flyers which are sent to my home address to inform me on my personal flood risk, are a suitable form of risk communication.	-2	-2	**2**	-2
22. Existing flood maps on risks in the region are easy to understand for me.	1	0	0	0
23. Information on flood risks should be repeated regularly before I realize what the possible consequences are.	-4	-1	0	-3
24. I think a website or mobile application with information on my flood risk provided by an insurance company is trustworthy.	-1	-4	-2	-4

25. On a website or mobile application I want to be able to ask my questions on flood risk, the consequences and prevention.	0	0	0	1
26. In my opinion websites or mobile applications improve the communication between flood experts and citizens.	2	0	0	1
27. I think a website or mobile application should be available to inform me on technical flood protection measures regarding my home.	2	3	**-2**	4
28. I would only use a website or mobile application on flood risk when it is free.	-1	-2	**2**	0
29. Information of my personal flood risk provided by experts is more reliable than my personal information on flood risk on a website or mobile application.	-3	**3**	-2	-2
30. I am aware of the flood risks on my property.	4	3	4	2
31. I have the need for a national campaign on flood risks to raise my awareness of possible consequences.	0	-4	-3	**1**

Table A3 Factor loadings per respondent (Chapter 5). The loadings in boldface type show which respondents associate with which perspective.

	Self-assured ominiscient	Acknowledged inexpert	Insusceptible confident	Insufficient accesibility
1	0,10	**0,73***	-0,01	0,01
2	0,18	0,36	**-0,58***	0,23
3	0,33	-0,12	0,00	**0,79***
4	**0,65***	-0,18	0,43	0,00
5	-0,14	0,32	0,10	**0,66***
6	0,00	**0,66***	-0,01	0,09
7	0,40	0,25	0,05	**0,72***
8	0,15	**0,71***	0,35	0,31
9	**0,83***	-0,08	0,14	0,16
10	0,20	0,26	**0,62**	**0,54**
11	**0,63***	**0,55**	0,12	0,08
12	-0,09	**0,57***	-0,18	0,45
13	**0,62***	0,39	0,12	-0,01
14	0,14	0,02	**0,71***	0,22
15	0,20	0,35	**0,69***	-0,16
16	0,38	0,41	0,05	0,36
17	**0,50**	-0,06	**0,63***	0,10
18	**0,69***	0,18	0,00	0,33
% expl. Var.	18	17	14	14

Summary

Flood events are increasing in terms of frequency and intensity due to climate change, urbanisation, and urban development in floodplains. As a consequence, approaches to managing floods have shifted from a focus on (technical) protection towards an assessment of risk (the product of the probability of occurrence times the extent of damage), which is referred to as flood risk management. The shift to flood risk management has instigated a more governance-oriented perspective on floods. This is related to the societal transition from government toward governance. Similar to the general governance notion, flood risk governance strives for cooperation among governments as well as market stakeholders, and civil society. Specifically for them to collaborate, analyse, communicate, make decisions about, and adapt to flood risk. Moreover, in the light of such governance approaches, residents (i.e. civil society) are to a greater extent expected to take adaptive actions to minimise the impact of flood events. This emphasis on the residents taking adaptive actions is relatively new and causes a rise in attention paid to how residents can be involved (i.e., to take adaptive actions) in flood risk governance in both academia and policy. This has led to the main research question of this doctoral thesis, namely; *how can an enhanced understanding of residents' perspectives contribute to increasing the involvement of residents in flood risk governance?*

The results show that the perspectives of residents are not easily determined and not at all homogeneous. Yet, through acquiring insight into residents' perspectives, the gaps in existing approaches to increase their involvement have become more clear. In other words, when residents' perspectives are taken into account, miscommunication can likely be prevented. Additionally, the results of this doctoral thesis have emphasised that the involvement of residents in flood risk governance also comes with many varying contextual aspects that influence residents' perspectives. Therefore, this thesis has addressed the complexity of increasing residents' involvement in flood risk governance and reduced that complexity through an enhanced understanding of residents' perspectives.

These insights on residents' perspectives contribute to involving residents more in flood risk governance by among others improving the overall reasoning for their increasing involvement. The top-down assumptions regarding the role of residents in flood risk governance have been an incentive for this research and the results specifically show the mismatches that can arise from such assumptions (e.g., unaligned perceptions of responsibilities or unfit flood risk communication). By recognising the importance of residents' perspectives, approaches to increase their involvement can be better tailored. This starts with the insights from Chapter 2, which concludes that the currently dominant reasoning for residents' involvement lacks the micro-level argumentation that addresses more specifically the role for residents and the added value of taking adaptive actions. This is complemented with the concept of responsibility as is discussed in Chapters 3 and 4, which emphasise that the topic of responsibilities in flood risk governance is currently inadequately addressed, and largely based on top-down assumptions. Additionally, it is highlighted that how residents perceive the division of responsibilities among stakeholders does not align with for instance the legal division of responsibilities. Also in Chapters 5 and 6 it is highlighted that specifically flood risk communication has mainly

been an expert-oriented endeavour. Yet, tailored flood risk communication can serve as a source of information through which residents can gain knowledge on flood risk, responsibility divisions, and adaptive actions. Such knowledge improves the ability of residents in flood risk areas to make informed decisions about taking adaptive actions. The main conclusion of this thesis is that before residents can properly decide on taking appropriate flood adaptive actions (i.e. involve in flood risk governance), they need the necessary knowledge and information in order to make such decisions. A great first step to improve such decision-making abilities is through communicating risk, responsibilities, and potential adaptive actions with a high regard for residents' preference and the differences between residents' preferences and interpretations.

Samenvatting

De frequentie en intensiteit van overstromingen en wateroverlast nemen toe als gevolg van klimaatverandering, verstedelijking en stedelijke ontwikkeling in overstromingsgebieden. Als gevolg hiervan is de aanpak van overstromingen veranderd. Waar voorheen de nadruk lag op (technische) bescherming, ligt die nu op het beperken van het risico van overstromingen. Risico wordt bepaald door het berekenen van de kans op een overstroming maal de impact ervan. Deze aanpak met een focus op het beperken van risico's wordt overstromingsrisicomanagement genoemd. De verschuiving naar overstromingsrisicomanagement heeft geleid tot een meer governance-gerichte kijk op overstromingen. Dit hangt samen met de transitie van government naar governance, die op meerdere beleidsterreinen plaatsvindt. Net als bij de universele notie van governance, streeft overstromingsrisico-governance naar samenwerking tussen overheden, marktpartijen en burgers. Specifiek wordt daarbij gestreefd naar het samen werken aan, analyseren van, communiceren over en aanpassen aan overstromingsrisico's. Een belangrijke verschuiving naar aanleiding van deze governance benadering is dat er in grotere mate wordt verwacht dat inwoners van overstromingsrisicogebieden adaptatiemaatregelen nemen om de gevolgen van overstromingen te beperken. Deze nadruk op inwoners is relatief nieuw en heeft als gevolg dat, zowel in wetenschappelijk onderzoek als in beleid, er meer aandacht wordt besteed aan hoe inwoners kunnen worden betrokken in overstromingsrisico-governance (oftewel, in het treffen van adaptieve maatregelen). Dit heeft geleid tot de centrale onderzoeksvraag van dit proefschrift: *Hoe kan een beter begrip van de perspectieven van inwoners bijdragen aan het vergroten van de betrokkenheid van inwoners bij het beheer van overstromingsrisico's*?

De resultaten tonen aan dat de perspectieven van inwoners niet eenvoudig te bepalen zijn en dat ze uiteen lopen. Echter is door vernieuwde inzichten in de perspectieven van inwoners duidelijk geworden dat er onvoldoende rekening wordt gehouden met deze perspectieven in de bestaande benaderingen om de betrokkenheid van inwoners te vergroten. Met andere woorden, wanneer rekening wordt gehouden met de perspectieven van inwoners, kunnen hiaten, zoals miscommunicatie, voorkomen worden. Daarnaast benadrukken de resultaten van dit proefschrift dat de perspectieven van inwoners beïnvloed worden door contextuele factoren, zoals eerdere ervaringen met overstromingen. In dit proefschrift wordt daarom de complexiteit van het betrekken van inwoners bij overstromingsrisico-governance behandeld en wordt die complexiteit verminderd door kennis over de perspectieven van inwoners.

De inzichten in de perspectieven van inwoners dragen bij aan het vergroten van de betrokkenheid van inwoners bij overstromingsrisico-governance. De top-down aannames met betrekking tot de rol van inwoners vormden het startpunt voor dit onderzoek. De resultaten laten de specifieke mismatches zien die uit dergelijke aannames kunnen voortvloeien (bijvoorbeeld, niet-overeenkomstige percepties van verantwoordelijkheden of miscommunicatie over overstromingsrisico's). Door het belang van het perspectief van inwoners te erkennen, kan de aanpak om hun betrokkenheid te vergroten beter worden afgestemd. Dit begint met de inzichten uit hoofdstuk 2, waarin wordt geconcludeerd dat de argumentatie op microniveau ontbreekt in de huidige dominante redenering voor betrokkenheid. Die argumenten op microniveau gaan bijvoorbeeld specifieker in op de

rol van inwoners en de toegevoegde waarde van het nemen van adaptatiemaatregelen. Daaropvolgend staat in hoofdstukken 3 en 4 het concept verantwoordelijkheid centraal. Daarin wordt benadrukt dat verantwoordelijkheden in overstromingsrisico-governance momenteel onvoldoende aandacht krijgen en grotendeels gebaseerd zijn op top-down aannames. Bovendien blijkt dat hoe inwoners de verdeling van verantwoordelijkheden ervaren niet aansluit bij bijvoorbeeld de wettelijke verdeling van verantwoordelijkheden. In de hoofdstukken 5 en 6 wordt tevens geconcludeerd dat de communicatie over overstromingsrisico's vooral een expert gerichte inspanning is geweest. Juist op maat gemaakte communicatie over overstromingsrisico's kan dienen als een bron van informatie. Zulke communicatiestrategieën bewerkstelligen dat inwoners kennis kunnen opdoen over overstromingsrisico's, verantwoordelijkheidsverdelingen en adaptatiemaatregelen. Dergelijke kennis verbetert het vermogen van inwoners in overstromingsrisicogebieden om weloverwogen beslissingen te nemen over het nemen van adaptatiemaatregelen.

De belangrijkste conclusie van dit proefschrift is dat voordat inwoners goed en wel kunnen beslissen over het nemen van passende maatregelen voor adaptatie (d.w.z. betrokkenheid bij overstromingsrisico-governance), zij de essentiële kennis en informatie nodig hebben om dergelijke beslissingen te nemen. Een geweldige eerste stap om dergelijke besluitvormingsvaardigheden te verbeteren, is door risico's, verantwoordelijkheden en mogelijke adaptatie maatregelen te communiceren met veel aandacht voor de voorkeur van inwoners en voor de verschillen tussen voorkeuren en interpretaties van inwoners.

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These four years have changed my life forever. They have given me a purpose, confidence, and expertise that I'll be building on throughout the rest of my life.

Curriculum Vitae

Karin Andrea Wilhelmina Snel was born on July 20th 1990 and spent her childhood in Montfoort, the Netherlands. She moved to Leiden in 2009 to start her bachelor's studies in Cultural Anthropology & Development Sociology at Leiden University. After completing the bachelor's degree, she searched for a new challenge with a more practical approach, which she found in the Master's program of Spatial Planning at Utrecht University (UU). During her Master's program, Karin joined the UU Honours program called the Young Innovators League, co-organised the AESOP 2014 conference at UU, and undertook an internship at Rho Adviseurs in Rotterdam. She graduated in 2015 and immediately took on a position as Lecturer in the UU Human Geography & Spatial Planning department. In 2017 she started her PhD candidacy. She worked on the JPI Urban Europe FLOODLABEL project, which consisted of a collaboration with Ghent University, BOKU in Vienna, and various Dutch, Belgium, German, and Austrian practitioners. This project steered her into the direction of flood risk governance research and specifically residents' roles in those processes. During her PhD, she was a visiting researcher at the Flood Hazard Research Centre of Middlesex University in London, she was PhD representative to the board of Human Geography & Spatial Planning department at UU, and she developed an online climate adaptation tool with the engineering company Witteveen+Bos based on her research findings, called Ikbenwaterproof.nl. Karin is currently a post-doctoral researcher on integrated approaches for flood risk governance at the department of Civil Engineering at the University of Twente.

Publications

Snel, K.A.W., Priest, S.J., Hartmann, T., Witte, P.A., & Geertman, S.C.M. (2021). 'Do the resilient things.' Residents' perspectives on responsibilities for flood risk adaptation in England. Journal of Flood Risk Management, 14(3), 1–14. https://doi.org/10.1111/jfr3.12727

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Flooded with Expectations

The involvement of residents is becoming a key aspect of flood risk governance processes. Residents of flood risk areas are increasingly expected to take adaptive actions in order to minimise the impact of flood events. This emphasis on residents' adaptive actions is relatively new and raises questions as to how residents can be motivated to do so. This PhD thesis addresses residents' perspectives on these changes in general and specifically on the division of responsibilities and the way flood risk is communicated. These resident perspectives are not easily determined and not at all homogeneous. Moreover, the involvement of residents in flood risk governance also comes with many varying contextual aspects that influence resident's perspectives. Yet, through acquiring insight into residents' perspectives, the gaps in existing approaches to increasing their involvement have become clearer. In other words, when residents' perspectives are taken into account, miscommunication can likely be prevented. This thesis addresses the complexity of increasing residents' involvement in flood risk governance and reduces that complexity by conveying a greater understanding of residents' perspectives.

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