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Should I Stay or Should I Go?
- A Q Method Analysis of (Im)Mobility Aspirations and Capabilities in the Aftermath of the 2021 Flood in Erftstadt, Germany

verfasst von | submitted by

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I. Abstract

English Version

As climate change intensifies, environmental hazards turning into disasters are becoming more common. One example of such a disaster is the severe flooding that hit Western Europe in July 2021. This thesis focuses specifically on the German town of Erftstadt, which was severely affected by the flood. In Erftstadt, the vast majority of residents returned to their homes after the flood, as is common in disaster settings. Immobility, as well as the non-financial aspects of the decision-making process to stay in a post-disaster context, are understudied areas in the literature. This thesis examines Erftstadt residents' perceptions of their (im)mobility aspirations and capabilities, as well as their place attachments and risk perceptions, using Q Method Analysis and the aspirations-capabilities framework. The analysis revealed three distinct viewpoints, which all share an attachment to the broader region. The differences between these viewpoints concerned homeownership, social bonds, mental health, and perceptions of risk. Homeownership status played a significant role: homeowners both aspired to and were capable of staying, while renters aspired to leave their pre-flood homes and were likewise capable of doing so. This highlights the interplay between aspirations and capabilities, as well as the limits of the framework. Additionally, social attachments and, in particular, family bonds played a role in staying, as did bonds with the biophysical environment; however, to a lesser extent. This thesis contributes to the growing body of work on disaster (im)mobilities, highlighting the perceptions of those affected by disasters in a world of increasing disaster risk.

Deutsche Version

Mit der Verschärfung des Klimawandels treten extreme Wetterphänomene, die zu Katastrophen werden, zunehmend häufiger auf. Ein Beispiel für eine solche Katastrophe sind die schweren Überschwemmungen, die Westeuropa im Juli 2021 trafen. Diese Arbeit konzentriert sich auf die deutsche Stadt Erftstadt, die von der Flut schwer getroffen wurde. In Erftstadt kehrte die überwiegende Mehrheit der Einwohner:innen nach der Flut in ihre Häuser zurück, wie es nach Katastrophensituationen üblich ist. Immobilität sowie die nichtfinanziellen Aspekte des Entscheidungsprozesses nach einer Katastrophe vor Ort zu bleiben, sind in der Literatur bisher wenig erforscht. Diese Arbeit untersucht die Wahrnehmung der Einwohner:innen von Erftstadt hinsichtlich ihrer (Im)Mobilitätswünsche und -möglichkeiten sowie ihrer Ortsverbundenheit und Risikowahrnehmung unter Verwendung der Q-Methode und des Aspirations-Capabilities Frameworks. Die Analyse brachte drei unterschiedliche Sichtweisen zum vorschein, die alle eine Verbundenheit mit der weiteren Region zum Ausdruck brachten. Die Unterschiede zwischen diesen Sichtweisen betrafen Wohneigentum, soziale Bindungen, psychische Gesundheit und Risikowahrnehmung. Der Status als Wohneigentümer:in spielte eine wichtige Rolle, da die Ergebnisse zeigten, dass Hausbesitzer:innen sowohl den Wunsch hatten als auch in der Lage waren, zu bleiben, während Mieter:innen den Wunsch hatten, ihre vor der Flut bewohnten Häuser zu verlassen, und ebenfalls in der Lage waren, dies zu tun. Dies unterstreicht das Zusammenspiel zwischen Aspirationen und Möglichkeiten sowie die Grenzen des Aspirations-Capabilities Frameworks. Neben dem Status als Hausbesitzer:in spielten auch soziale Bindungen, insbesondere familiäre, eine Rolle für den Verbleib sowie, in geringerem Maße, die Bindung zur biophysikalischen Umgebung. Diese Arbeit leistet einen Beitrag zu der wachsenden Zahl von Arbeiten zum Thema Katastrophen(im)mobilität und beleuchtet die Wahrnehmung der von Katastrophen Betroffenen in einer Welt mit zunehmendem Katastrophenrisiko.

II. Acknowledgements

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1. Introduction

In July 2021, dramatic pictures of flooding in Western Europe circulated the world. One of the most memorable images emerged from Erftstadt-Blessem, where a sinkhole formed and swallowed the surrounding fields and houses (Weitzel & Schiffer, 2022). By 2024, the cleanup operation had been completed, and most residents had returned to their former homes or to nearby areas. The return of residents after the disaster, rather than leaving the area, is not an isolated case; rather, it is a common reaction to being displaced by a disaster (Truedinger et al., 2023). However, climate change is making extreme weather events, which can turn disastrous, more common, thereby increasing the likelihood of another flood in Erftstadt in the future. So why do residents choose to stay?

Even within mobility studies, immobility is generally understudied as it is considered the norm and thus not worthy of exploration (Schewel, 2019). However, immobility can manifest in various forms and interact with mobility in different ways (Schewel, 2019; Zickgraf, 2018). The aspirations and capabilities of individuals and communities to stay or leave after a disaster have been particularly neglected due to a focus on neoclassical approaches, rational choice, and financial aspects (de Haas, 2021). While financial aspects do play a role in post-flood environments such as Erftstadt, the importance of place attachment and risk perception in relation to future floods should not be underestimated (Holley et al., 2022; Seebauer & Winkler, 2020). Thus, this thesis will explore the mobility aspirations and capabilities of residents who remained in Erftstadt three years after the flood. Rather than focusing on financial aspects, the aim is to understand constraints, attachments, and desires comprehensively. To achieve this, Q Method will be employed as it captures viewpoints in a participatory manner (Buckwell et al., 2020; Oakes, 2019; van Exel & Graaf, 2005).

As extreme weather events intensify and expand in affected areas, they pose an increasing threat to human life and infrastructure (Ludwig et al., 2023). While the effects of climate change on (im)mobility are generally studied more in areas closer to or farther from the equator, the Erftstadt study offers an opportunity to examine disasters in temperate climates (Piguet et al., 2018). Understanding how residents perceive the aftermath of disasters is crucial for saving lives (over 180 people died in the 2021 flood in

Germany alone) and for adapting physical and social infrastructure to the increased urgency (BMI & BMF, 2022). An environmental hazard, such as a flood, does not necessarily lead to a disaster; rather, a disaster occurs only when the hazard interacts with existing vulnerabilities, such as insufficient early warning systems or inadequately equipped infrastructure (UNDRR, 2007). Disaster is thus the social consequence of the hazard (Blaikie et al., 2014). Erftstadt can therefore serve as an example for raising awareness of residents' perceptions of their aspirations and capabilities in the aftermath of a disaster.

1.1 Purpose & Focus

The central focus of the thesis is to examine the interplay of aspirations and capabilities concerning (im)mobility decisions and the factors influencing them, including place attachment, risk perception and socio-economic factors. The central research question is: *What are Erftstadt's residents' subjective understandings of their (im)mobility aspirations and capabilities after the 2021 flood?* The overall aim is to understand Erftstadt's residents' own perceptions of their (im)mobility and how their aspirations, capabilities and other factors interact to lead them to decide to stay in the town three years after the flood. This research seeks to inform the further recovery and rebuilding process in Erftstadt by providing an understanding of these perceptions. Several sub-questions have been created to guide the research process in more detail.

- Exploring the factors:
    - Which factors can be developed from the studied viewpoints?
    - What characteristics do these factors have?
    - What are the similarities and differences between the factors?
- What kinds of aspirations and capabilities are present?
    - What does (im)mobility mean in this specific context?
    - What role do socio-economic factors play?
    - How do aspirations and capabilities influence each other?
- How does place attachment manifest itself in Erftstadt?
    - Which attachments are the most and least important?
    - How do place attachment, aspirations and capabilities interact?

1.2 Structure

After the initial introduction, which outlines the problem and research questions, the thesis proceeds to the main sections. To understand the subsequent findings and

discussion, the study area is first outlined, along with a regional-scale description of the flood that followed the low-pressure system Bernd in July 2021, and a detailed account of how the flood unfolded in the town of Erftstadt. The terms and theoretical thought behind this thesis are introduced by explaining the concept of (Im)mobility, focusing on the aspirations-capabilities framework, which guides this thesis, and finally on place attachment, which is a crucial part of the analysis and findings. The thesis then moves on to the state of the art, focusing on the themes that will emerge from the results and discussion. While the theoretical part was kept broader, the state of the art examines the concepts through a post-disaster and post-flood lens. It includes not only an examination of immobility, the aspirations-capabilities framework, and place attachment, but also risk perception, the literature on the 2021 floods, and the use of Q Method in this field. This is followed by a detailed description of the methods used in this thesis, including an overall explanation of Q Methods and the preparation process for the study, which covers expert interviews, sampling and the creation of the study setup. The fieldwork is then described, from participant selection to conducting Q-method in the field. The final part of the methods section describes the data analysis that followed the fieldwork; the statistical results are included here. The results section begins with a description of the statements used in the Q study, followed by an overview of the demographics of the study population. Next, the factors are explored in terms of their communalities and differences. This includes a detailed description of the three factors that emerged from the analysis. Following this, the nuances and contradictions of the results regarding the aspirations-capabilities framework, place attachment and gender dynamics are explored further. Finally, the discussion relates the findings to the literature, establishes connections and interprets the results. It further discusses the limitations of this thesis and makes recommendations for further research.

1.3 Study Area

Erftstadt is located in western Germany, in the state of North Rhine-Westphalia (NRW), in the Rhein-Erft district. It is situated approximately 20 km southwest of Cologne and 25 km northwest of Bonn, the former capital. Founded in 1969 as part of a municipal reorganization, the town is named after the Erft River, which played a significant role in the 2021 flood (Stadt Erftstadt, n.d.). Erftstadt has a population of 52,548 (2025), with the

districts of Lechenich (11,017) and Liblar (13,161) being the most populous. Erftstadt consists of 14 districts; the two most relevant for this study were Blessem (population 1,686) and Liblar, as most of the participants came from these districts (Stadt Erftstadt, 2025). Erftstadt covers an area of approximately 120 km^2 and has a population density of 438 inhabitants per square kilometre (2024), which is almost double the German average of 238 inhabitants per square kilometre (2021) (Destatis, 2025a; Stadt Erftstadt, n.d., 2025). The town lies at around 100 m above sea level in the Jülich-Zülpicher Börde, an area characterized by fertile loess soils (Bezirksregierung Köln, 2025; LEADER Region Zülpicher Börde e.V., n.d.). Erftstadt has a temperate climate, with average highs of 19.2°C in July and lows of 3°C in January. August is the month with the most average precipitation, at around 64 mm per month on average, while January has the least, at around 35 mm per month on average (1991–2020) (Meteostat, 2025). The city's main bodies of water relevant to flooding are the Erft River, the Mühlengraben, and the Rotbach. Erftstadt is also home to several lakes, including the popular Liblarer See recreational lake. These lakes are the result of lignite mining in the region (Stadt Erftstadt, n.d.). Erftstadt also borders the Naturpark Rheinland nature reserve, which is characterized by its many lakes, floodplains and forests (Naturpark Rheinland, n.d.b). The Erftstadt area experienced frequent flooding in the past, leading to the regulation of the Erft River in 1890. However, the area continued to experience flooding after the measure was implemented. The most severe recent floods prior to 2021 occurred in 1926 and 1961 (Esser, 2022).

2. 2021 Flood

In mid-July 2021, severe flooding and heavy rainfall hit Western Europe, affecting Germany, Belgium, the Netherlands, France and Luxembourg. In Germany alone, over 180 people lost their lives, and more than 800 were injured. This was the most destructive event in Germany since the Hamburg storm surge of 1962 (BMI & BMF, 2022). The states of NRW and Rhineland-Palatinate (RP) were the worst affected in Germany, with additional damage occurring in Bavaria, Baden-Württemberg and Saxony. At least 133 people died in RP and at least 47 in NRW in connection with the event (bpb, 2021). Around 20,000 households and 7,000 businesses in NRW alone were affected, with an estimated

damage cost of around 12.3 billion Euros (BMI & BMF, 2022). The worst of the devastation was felt along the Ahr and Erft, tributaries of the Rhine, in the northeast of the Eifel low mountain range. The Ahr valley in RP was the area hit most severely (Mohr et al., 2023).

The region surrounding Erftstadt started experiencing heavy rainfall on July 13th, and subsequent flooding began in the late hours of July 14th (Erftverband, 2021; Mohr et al., 2023). After being blocked by a quasi-stationary anticyclone on July 12th, the low-pressure system Bernd slowly moved westward over the area, resulting in heavy precipitation in Western Europe (Mohr et al., 2023). The whole area received around 130 mm of rainfall over these days, with parts of the Erft catchment area recording up to 180 mm per day (Erftverband, 2021). For comparison, the monthly average for this area since 1990 has been below 70 mm (BMI & BMF, 2022). This led to extreme flooding of the Erft and its tributaries, including Rotbach, Mühlengraben and Swist (Erftverband, 2021). Additional factors contributing to the severity of the event were moderate soil moisture conditions due to high precipitation in the preceding month, dense development in proximity to rivers, a lack of retention areas, and substantial impervious surface coverage hindering water absorption into the soil (BMI & BMF, 2022; Mohr et al., 2023). While southern, eastern and northern Germany are more regularly affected by floods, floods in western Germany are less common (Ludwig et al., 2023). At all gauging stations in the upper Erft catchment, the measured water levels were significantly higher than those considered in the most extreme flood scenario in the flood hazard maps – HQ_{extrem} (1.5 times the level of a 100-year flood) (Bündnis Hochwasserschutz, n.d.; Erftverband, 2021). Generally, flood protection measures are not designed to withstand an HQ_{extrem} event (LfU Bayern, n.d.).

More recent floods, such as the 2021 flood, contain considerably more large debris and sediment due to anthropogenic changes (Ludwig et al., 2023). Fluvial sediment delivery alone increased by over 200% between 1950 and 2010, primarily due to mining activities such as gravel and sand extraction (Syvitski et al., 2022). However, analysis of debris from the 2021 flood revealed that only a small portion was natural material, with most consisting of industrial materials such as vehicles and construction materials (Ludwig et al., 2023), thereby creating a more hazardous flood. As Erftstadt lies within a lignite mining area, its landscape is highly anthropogenically modified (Lehmkuhl & Stauch, 2023). Open-surface mining, such as lignite or gravel mining, creates steep

slopes and makes the landscape prone to rapid change (Tarolli & Sofia, 2016; Xiang et al., 2018). Erftstadt itself was also home to a gravel mine in Blessem. This open pit was approximately 60 m deep and located around 20 m east of the Erft (Lehmkuhl & Stauch, 2023). On July 16th, the gravel pit developed into a sinkhole as heavy rainfall combined with the Erft River and its tributaries created a torrent heading towards the pit. This eroded the pit, the surrounding fields, and three adjacent houses. Four additional houses were severely damaged and later demolished (Weitzel & Schiffer, 2022). Following the incident, the gravel pit was criticized for having an insufficient flood protection embankment and impermissibly steep slopes. As of November 2025, the investigation is still ongoing (Zumbé, 2025a).

The severity of the disaster was not only a result of the flood's intensity but also the consequence of inadequate warning systems and insufficient large-scale evacuations. Despite weather forecasts being issued by agencies such as the Deutsche Wetterdienst (the German Meteorological Service) two days before the flood, warning of an extreme or very unusual event and predicting extreme rainfall. The public was informed too late or inadequately about the extent of the situation. Consequently, many people in the affected areas were caught out by the rapidly rising floodwaters, unable to move to safer areas or failing to recognize the imminent danger. This led to risky behaviours, such as trying to rescue belongings from basements (Mohr et al., 2023). The flood also demonstrated that current flood hazard maps must be revised, as they did not accurately reflect the flooding of the Erft and Ahr, which exceeded the century flood level by up to seven times (Ludwig et al., 2023). Overall, the situation during and immediately after the flood was difficult to monitor, which made it challenging for crisis management and emergency services to work effectively (Mohr et al., 2023).

The flood caused severe damage to all areas of life, including infrastructure such as roads and railways, as well as buildings, industry and household goods. The 2021 flood caused around 46 billion euros' worth of damage across Europe, 33 billion of which was in Germany alone, making it the most expensive disaster in German history. Around 8,2 billion of this was insured, as only around half of residential buildings were insured (Mohr et al., 2023; Munich Re, 2022). Around 57 percent of all damages in Germany were associated with RP and 41.5 percent with NRW (BMI & BMF, 2022). Reconstruction is ongoing and will take years to complete (BMV, 2021, 2022).

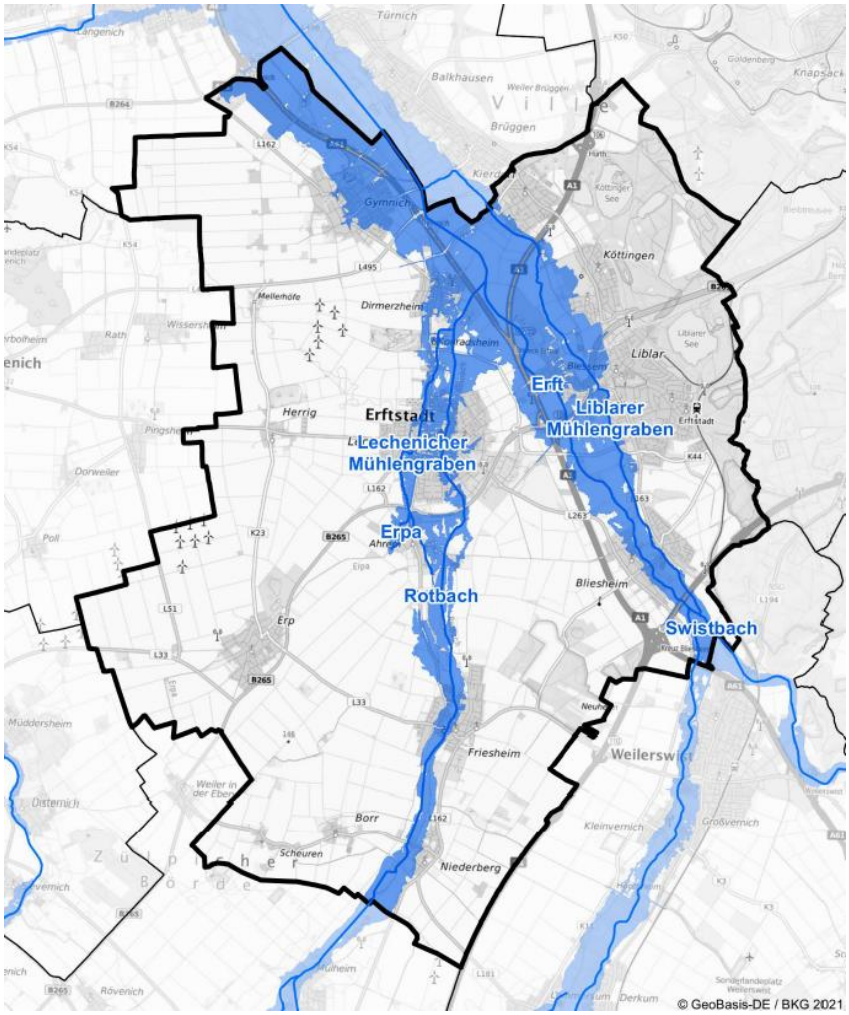
At the federal and state levels, the government has provided various support programmes for individuals and communities affected by the floods. The most prominent of these are the “Soforthilfen” (instant aid) and “Wiederaufbauhilfen” (reconstruction aid) (BMI &BMF, 2022). In July 2021, the federal government decided to contribute up to 400 million Euros to the “Soforthilfen” provided by the affected states (BMI & BMF, 2022). The North Rhine-Westphalian government initially provided 65 million euros to municipalities, 36 million Euros to businesses, and 102 million Euros to private households in the form of “Aufbauhilfe 2021”. In addition to the “Soforthilfen”, the “Wiederaufbauhilfen” are intended to provide long-term funding for the rebuilding process. Through the national solidarity fund “Aufbauhilfe 2021”, the federal government provided up to 30 billion euros in September 2021. Funds are distributed based on the extent of the damage. This funding scheme covers up to 80 percent of costs for residents, institutions, or companies. In cases of hardship, this amount can be increased to 100 percent (BMLEH, 2024). Furthermore, by January 2022, around 278 million Euros in donations had been collected across Germany through the “Aktion Deutschland Hilft” campaign. At the state level, the “NRW Hilft” campaign gathered around 17 million Euros in donations by March 2022 (BMI & BMF, 2022).

As climate change is a reality, not just a threat, rising temperatures and other changes will intensify environmental events such as floods and fires (Ludwig et al., 2023). The probability and intensity of rainfall are expected to increase, potentially leading to more frequent and severe disasters resulting in a high number of fatalities and (economic) losses (Ludwig et al., 2023; Mohr et al., 2023). Therefore, these issues must be investigated and addressed from different disciplinary perspectives (Mohr et al., 2023).

2.1 Timeline of the Flood in Erftstadt

To understand the aspirations, capabilities and attachments of the people of Erftstadt, it is important to be familiar with the timeline of the flood catastrophe and how it unfolded on the ground. Some participants were affected by the heavy rain, while others were affected by the subsequent flooding. While Wednesday, July 14th, was characterized by heavy rain and the first local alarms, the early hours of Thursday, July 15th, saw the situation turn dire for the worst-affected areas as flood waves hit the town (see Fig. 1). The sinkhole in Erftstadt-Blessem developed on Friday, July 16th (Bürgerforum Blessem-Frauenthal e.V., 2022). While no deaths were reported in Erftstadt itself in direct connection to the flood, the rebuilding process, both physically and socially, is still ongoing (Weitzel & Schiffer, 2022).

Figure 1: Extent of the Flooding in Erftstadt (Source: Bezirksregierung Köln, 2021)



The most important events are listed below for a detailed understanding (Bürgerforum Blessem-Frauenthal e.V., 2022; Weitzel & Schiffer, 2022)

Table 1: Timeline of the Flood Event in Erftstadt

Date	Time	Event
14.07.2021	01:27 p.m.	The Erftverband informs the media about a century flood in the Rhein-Erft District
14.07.2021	02:28 p.m.	Repeated warnings from the German Weather Service of a heavy rain event
14.07.2021	02:56 p.m.	The fire department is informed about the severe weather
14.07.2021	afternoon	Heavy rain
14.07.2021	05:55 p.m.	First backups in the sewer system
14.07.2021	07:26 p.m.	The Erftstadt Fire Department triggers a city-wide alarm
14.07.2021	~10:00 p.m.	First evacuations
14.07.2021	10:37 p.m.	The Steinbach Dam overflows (nearby dam)
15.07.2021	01:15 a.m.	Evacuation of the hospital completed
15.07.2021	01:30 a.m.	Power blackout; first flood waves
15.07.2021	04:18 a.m.	In the neighbouring city of Weilerswist, the fire department triggers the emergency alarm: the River Erft is no longer dammable
15.07.2021	06:58 a.m.	The dam wall of the Steinbach Dam threatens to break; the surrounding villages are evacuated
15.07.2021	08:50 a.m.	General alarm triggered in Erftstadt; evacuation begins for Blessem and Bliesheim
15.07.2021	11:00 a.m.	Flood wave impacts major roads and highways in Erftstadt
15.07.2021	02:09 p.m.	State of emergency declared in the Rhein-Erft District
15.07.2021	03:44 p.m.	Helicopters are used to rescue people in Erfstadt
15.07.2021	11:00 p.m.	Water levels begin to drop at the Steinbach Dam
16.07.2021	~04:00 a.m.	Second flood wave hits Blessem; subsidence at the gravel pit; undercutting and collapse of nearby houses

17.07.2021	~10:00 a.m.	Rescue of Erftstadt residents completed; water levels in the city begin to recede
17.07.2021	04:47 p.m.	Ban on entering Blessem due to life-safety risk; area secured
19.07.2021	09:44 a.m.	"Non-critical water level" reached at the Steinbach Dam
19.07.2021	06:56 p.m.	Residents of Blessem are informed that they may collect personal belongings in the upcoming two-hour time slots
22.07.2021	08:00 a.m.	Residents and helpers allowed to access Blessem; entry ban lifted except within 100m of the pit
23.07.2021	09:00 a.m.	State of emergency lifted

2.2 Post-Flood Preparedness in Erfstadt

At the time of the fieldwork in June and July 2024, several measures were underway in preparation for a potential future flood. Most notably, a 2.5 km stretch of the Erft was renaturalized, creating a bed more than twice as long, allowing the river to flow more naturally. This project, the largest renaturalization project in NRW at the time, was concluded in October 2025 and is allowing the river to flow more naturally, which should reduce the risk of flooding (Zumbé, 2025c). In addition, the flood paths alongside the river are scheduled for restoration in 2026 (Zumbé, 2025b). In 2024, planning was underway for the Steinbach Dam in nearby Euskirchen, which threatened to break during the flood. In September 2025, it was announced that reconstruction could begin in 2027 (Steinicke, 2025). All municipalities around the affected rivers in the region (Erft, Swist, Veybach, Rotbach and Neffelbach) planned to create a coherent regional flood protection concept by 2025. Currently, no public information is available on the final concept (Düster, 2024). Overall, progress towards making Erfstadt more flood-resilient is evident, but more work remains.

3. Theoretical Concepts and Frameworks

3.1 (Im)mobility

Although migration and mobility in all their variations, especially international migration, receive considerable attention, most people stay where they are (Zickgraf,

2018). Currently, only about 3.6 percent (2020) of the world's population is international migrants (IOM, 2024). Rough estimates from the beginning of the 21st century put the worldwide percentage of those living outside their birth region at around 12 percent (in 2005) (Bell & Charles-Edward, 2013). Looking to the other side of the mobility continuum, Schewel (2019) defines immobility as:

> spatial continuity in an individual's center of gravity over a period of time. Immobility is never absolute, as indeed all people move in their everyday lives — to school, to work, to the market. [...] [I]mmobility may be distinguished by continuity in one's center of gravity, or place of residence, relative to spatial and temporal frames. (p. 329)

The spatial frame here considers the physical boundaries within which the individual is considered immobile, on a larger scale, such as a country, or on a smaller scale, such as a street or a house. Moving within the same city might be considered mobile on a local scale, however, immobile on a national scale. The temporal frame refers to the designation of a time period in which (im)mobility is assessed: over generations, over an individual's lifetime or a specific period. Defining individuals or communities as mobile or immobile, thus, depends on the framing and context (Schewel, 2019).

Mobility studies are generally under-theorized, with most existing theories based mainly on neoclassical thinking and simplistic push-and-pull models, which are insufficient to explain mobility patterns and processes. Such approaches also implicitly or explicitly assume that individuals, households, or communities make rational choices regarding their finances and utility. This focus on economic drivers overlooks the social processes of mobility, as well as the role of structure and policy (de Haas, 2021). Furthermore, push-and-pull models lack a coherent framework and focus more on the individual factors that contribute to people's mobility status (Schewel, 2015; Skeldon, 1990). Even within mobility studies, a mobility bias can be observed, with disproportionate attention given to migration and mobility in both theoretical and empirical terms, rather than to immobility (Schewel, 2019). As a sedentary lifestyle is considered the norm, migration is seen as the exception (Gaibazzi, 2010). However, mobility and immobility are inextricably linked, and neither can be understood without the other (Zickgraf, 2018).

Moreover, the social component of (im)mobility cannot be underestimated, as people are part of social groups and make decisions based on their social environment, which influences their (im)mobility decisions (de Haas, 2021). With the "mobility turn," Urry (2000) and Sheller and Urry (2006) sought to shift the narrow view of (im)mobility, placing mobility and fluidity at the centre of all research. Immobility does not mean the absence of mobility, but rather represents only part of the spectrum of mobility, which, like all types of mobility, is relative. It is therefore important to consider the whole spectrum, as all (im)mobilities are part of the same places, spaces, and networks (Zickgraf, 2018). Mobility and immobility are not simple economic calculations, but a complex web of economic and non-economic factors, aspirations, and capabilities. Households and individuals may choose to stay even in the face of economic reasons and (environmental) risks (Adams, 2016; Schewel, 2019). People do not act (economically) rationally, but are influenced by their environment, their worldview, the messenger of the information, and the structures which influence their perception of and response to environmental risks such as flooding (Oakes, 2019)

3.2 Aspirations-Capabilities Framework

The aspirations-capabilities framework departs from conventional push-and-pull models and neoclassical perspectives, allowing for an analysis of the nexus between (im)mobility, (in)voluntariness, and processes of social transformation. The framework also challenges the dichotomy between voluntary and forced mobility and immobility, offering a more nuanced understanding of the interplay between structure and agency. The approach also aims to encompass all forms of (im)mobility as an umbrella framework (de Haas, 2021; Schewel, 2019). Furthermore, it prevents the alienation of immobility studies from migration studies (Stockdale & Haartsen, 2018)

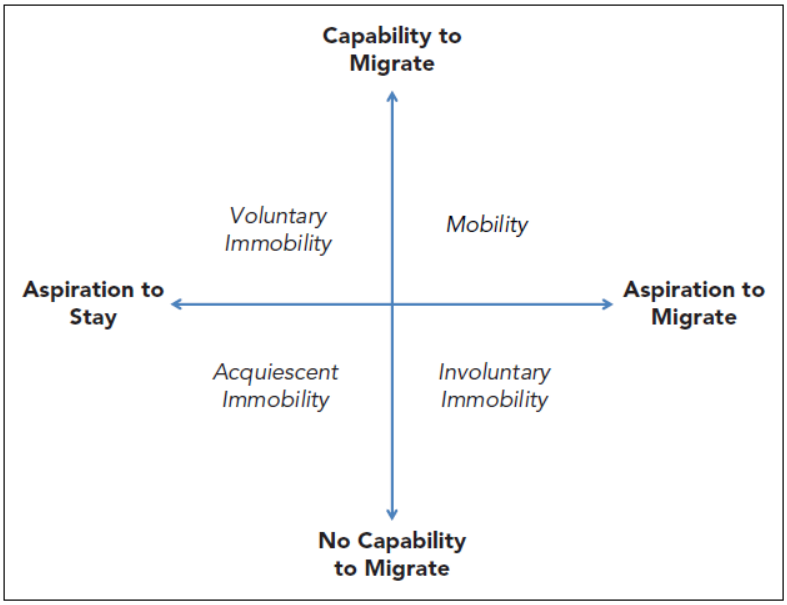
Drawing on Sen's (1999) capabilities framework, de Haas (2021) defines human mobility as "people's capability (freedom) to choose where to live – including the option to stay – rather than the act of moving itself. Moving and staying then become complementary manifestations of the same migratory agency" (p. 31). Here, the term "capabilities" emphasizes the freedom to stay or move, with freedom of choice being more important than the actual act (de Haas, 2021; Sen, 1999). Conditions that limit this ability can include structural barriers (e.g. policies), personal and demographic

characteristics (e.g. age, gender and education), and household characteristics (e.g. social networks and financial resources) (Black et al., 2011; Foresight, 2011; Zickgraf, 2018). Financial resources are most commonly mentioned (Foresight, 2011). Furthermore, "agency" is hereby defined as follows: "[a]gency reflects the limited – but real – ability of human beings (or social groups) to make independent choices and to impose these on the world and, hence, to alter the structures that shape and constrain people's opportunities or freedoms" (de Haas, 2021, p. 14). Lastly, "structures" are defined by de Haas as "patterns of social relations, beliefs and behaviour" (de Haas, 2021, p. 14). Agency and structure, including dimensions such as gender, class, ethnicity, and networks, reinforce existing or perceived hierarchies and inequalities that limit people's freedom and opportunities (de Haas, 2021). Looking specifically at the dimension of gender, norms such as women bearing the majority of care work, often with a connotation of inevitability and a natural role, result in constraints on women's agency (De Jong, 2000; Haberkorn, 1981; Hugo, 1981; Mahler & Pessar, 2001). Considering the role of gender within the (im)mobility context and in relation to aspirations and capabilities is also an opportunity to move away from simplistic explanations and towards the multifacetedness of the decision-making processes of staying or leaving (Lutz, 2010). While there is a general focus on people's capability to stay or move, less attention is paid to their aspirations, wishes, and desires. This neglect stems from a focus on trapped populations, e.g., Black & Collyer (2014), where aspiration is undisputed (Zickgraf, 2018).

According to Schewel (2019), the aspirations-capabilities framework offers two explanations for why people choose to stay where they live: "(1) that a person lacks the capability to move or (2) that staying is a voluntary (or acquiescent) preference" (p. 338). To fully comprehend the web of (im)mobility aspirations and capabilities, a division into different ideal (im)mobiles is helpful. This overview (Fig. 2) is inspired by Carling (2002) and de Haas (2003, 2006, 2014) but branches out and expands along the spectrum of voluntariness, aspirations, and capabilities. Involuntarily immobile people, as highlighted by Black & Collyer (2014), are in a particularly vulnerable situation, especially in the case of disasters, due to their lack of capabilities to move. "Voluntary immobility" is at the other end of the capabilities spectrum, as those who remain in place voluntarily have the resources and opportunities to migrate; they do not desire to do so. In these cases, non-

economic reasons for staying play a particularly significant role and are often overlooked (Schewel, 2019). The (im)mobility type "acquiescent immobility" was coined by Kerilyn Schewel (2019) to describe those who are unable and unwilling to move from their place of residence, implying acceptance of the situation. Further research into the formation of (im)mobility aspirations is needed to understand how these decisions to stay are formed and how the inability to move may influence desires (de Haas, 2021).

Figure 2: (Im)mobility Categories of the Aspirations-Capabilities Framework (Source: Schewel, 2019 p.335)



Three critiques of the aspirations-capabilities approach are often mentioned: that it is individualistic, that it neglects forced migration, and that it separates immobility and mobility (Schewel, 2019). First, the critique of an individualistic perspective is raised not only against this approach but also against Sen's (1999) capabilities approach (Robeyns, 2005; Zickgraf, 2018). While the approach does study individuals, an inherent part of it is the embeddedness of individuals in their households and communities. Moreover, it is a valuable complement to household studies, which are often conducted in mobility studies (Schewel, 2019). Second, while forced mobility is not a specific category within the aspirations-capabilities approach, (in)voluntariness, like (im)mobility, is a spectrum, meaning that forced and voluntary (im)mobility are not theoretically distinct and include constraints and choices (Carling, 2002; Carling & Schewel, 2018). Thus, the approach can be applied along the entire spectrum of choice (Schewel, 2019). Finally, the approach is

accused of treating immobility and mobility as fundamentally distinct. However, the approach focuses on interconnectedness and considers it a spectrum (Schewel, 2019). The aspirations-capabilities approach offers an interesting way to study (im)mobilities holistically, accounting for the surrounding constraints, choices, enablers, and structures. Particular attention is also paid to non-economic factors, moving away from neoclassical models towards a more nuanced understanding of human (im)mobilities.

3.3 Place Attachment

Place attachment can, in broad terms, be defined as "an emotional or affective bond developed towards places" (Blondin, 2021 p.292). The concept is generally understood to be a positive bond with the place, and can encompass various scales of place, from a park bench to a neighbourhood, to cities or even entire continents (Blondin, 2021; Gustafson, 2013). It can refer to feelings of familiarity and comfort within one's home environment, attachment to community and social networks, and spiritual connections to the land (Ahsan et al., 2021; Farbotko & McMichael, 2019; van der Geest et al., 2019). It can also include the aspiration to remain within a place that reflects one's values, identity, and knowledge systems (Yates et al., 2022). Blondin (2021), drawing from Raymond et al., (2010), categorizes place attachment into three dimensions: place identity and dependence, social bonding and biophysical bonding.

Place identity and dependence refer to the personal reliance and connection to a place, meaning practical dependence as well as symbolic dependence (Blondin, 2021; Mishra et al., 2010; Raymond et al., 2010). In practice, this entails daily place-specific activities, such as walking in a particular area, as well as a symbolic or spiritual connection to the place, its landmarks and heritage (Stedman, 2003). Social bonding concerns the place as a space for social interaction, community, and family (Mälgand et al., 2014). Biophysical bonding concerns the surrounding living. Lastly, the dimension of biophysical bonding refers to connections with the surrounding environment, including flora and fauna, waterbodies, which are perceived in a positive light (McMichael & Katonivualiku, 2020; Sebastien, 2020; Stedman, 2003).

In general, residents of more rural areas display stronger biophysical bonding than those of urban areas, as biophysical non-human elements tend to have more importance to rural inhabitants (Blondin, 2021). In earlier publications, biophysical bonding is referred

to as “nature bonding”. In accordance with Blondin (2021), the term “biophysical” is used instead to move away from the sentiments and depoliticizations that underly the term “nature” (p. 293). When considering these dimensions, it is important to note that they are not meant to be viewed as distinct but rather as overlapping categories (Blondin, 2021).

(Im)mobility, the aspirations-capabilities approach, and the concept of place attachment are closely intertwined. As Blondin (2021) puts it: “Place attachment can be maintained, reshaped, modified, and reimagined through mobility, and while it does not necessarily imply immobility, it may influence different forms of mobility.” (p. 292). Additionally, Zickgraf (2018), following Adams (2016) views place attachment as “perhaps the most underestimated in influencing (im)mobility aspirations” (p.79). In terms of risk perception and flood preparedness, place attachment is also an important concept for understanding the emotional connection that residents have to their place and the reluctance of some to move or change their behaviour even in the face of significant loss and harm (Mishra et al., 2010).

4. State of the Art

4.1 Immobility in a Post-Disaster Context

Currently, a growing number of researchers are examining the nexus of disaster and immobility; less attention is given to the post-flood context. The study of immobility in a general sense, and especially in post-flood contexts, is important because it highlights that mobility and migration to adapt to climate change and disasters are not the only solutions, thereby bringing in situ adaptation to the forefront (McNamara et al., 2018). Among the first studies of immobility, challenging the idea of a sedentary preference, a sedentary lifestyle as the norm, and therefore not worthy of study, was Hammar et al. (1997), who examined both why people leave and why they stay. Further early contributions were made by Jørgen Carling (2002), who first introduced the concept of involuntary immobility in his study of the culture of migration in Cape Verde. He found that young Cape Verdeans who wished to migrate but were unable to do so due to external constraints experienced frustration and a bleak outlook for the future.

Since then, the UK government's highly influential 2011 Foresight Report has coined the term "trapped populations" and has continued to shape the study of immobility. It highlighted those unable to migrate for various reasons, noting that they might be more vulnerable to climate risks and extremes than those able to move (Foresight, 2011). The concept of trapped populations, or involuntarily immobile populations, has since received the most attention in immobility research due to the extreme vulnerability (Black & Collyer, 2014; Nawrotzki & DeWaard, 2018; Zickgraf, 2018). While Black and Collyer (2014) considered involuntarily immobile people worthy of particular attention due to their vulnerability, this focus has implicitly assumed that voluntarily immobile individuals or groups are less vulnerable. However, this assumption has been criticized for overlooking voluntary immobility and its complexities (Adams, 2016; Blondin, 2021; Farbotko & McMichael, 2019; Transiskus & Gholamzadeh Bazarbash, 2024). Adams (2016) argued that the concept presumes that the population under study is homogeneous with respect to mobility, place attachment, and residential satisfaction. However, even within a single household, views, aspirations, and capabilities can vary drastically. Therefore, it has been recommended that researchers survey individuals across communities to capture this diversity. Similarly, it is important to consider who defines who is "trapped" and in need of mobility from risk (Zickgraf, 2018).

Furthermore, "immobile" does not necessarily mean "trapped". The reasons for both voluntary and involuntary immobility in the face of climate change and its impacts can vary widely across communities, households, and individuals (McMichael et al., 2021; Upadhyay et al., 2024). Involuntary immobility can result from a lack of resources to move and social and psychological factors (Ayeb-Karlsson, 2020a; Nawrotzki & DeWaard, 2018). Voluntary immobility, by contrast, tends to be associated with ownership of land and other local resources, or with place attachment (Mallick, 2019). Additionally, when voluntarily immobile people create protective and adaptive measures, such as building barriers or restructuring their living spaces, it demonstrates that, rather than being trapped, they are using the resources available to them to remain in place (Adams, 2016; Aragón-Duran et al., 2020; Kelman et al., 2019). McMichael et al. (2021) found that having the aspiration to stay, while simultaneously facing mobility barriers, is not mutually exclusive. Decisions to stay or leave often involve competing needs,

priorities, and values (Hauer et al., 2019; Murphy, 2015). Finally, Black et al. (2013) have argued for the right to stay—the right to immobility—even in contexts of disaster and high risk. Such principles align with broader human rights frameworks and the protection of Indigenous self-determination (Farbotko et al., 2020). It is important to note that even within the same community, experiences of immobility are not homogeneous, and gender often plays a particularly significant role. Gender roles, including expectations and responsibilities, can limit women's ability to migrate, thus making them immobile and more vulnerable to the effects of climate (Abbasi et al., 2019; Ayeb-Karlsson, 2020b).

Looking specifically at the flood context, Seebauer and Winkler (2020) found that decisions to stay or relocate after flooding are influenced primarily by cost and, secondly, by place attachment and anxiety about future floods. Generally, those with stronger place attachment opt for in situ adaptation following a flood (Holley et al., 2022), while young renters, particularly those dissatisfied with their general living situation, tend to move afterwards (Correll et al., 2021). In contrast, homeowners who implement adaptation strategies are significantly less likely to relocate. Buchanan et al. (2019) found that, however, if their wider community were to leave, property values were to decline, or flooding were to become more frequent, these homeowners might reconsider their decision to stay.

Designing policies to protect those who are immobile, whether voluntarily or involuntarily, is complex. Such policies must both minimize the risks associated with immobility, such as vulnerability to environmental hazards, and protect the right to remain while respecting individual agency. Effective policy development, therefore, requires close and sustained collaboration with local populations (Zickgraf, 2018)

4.2 Aspirations-Capabilities Framework in a Post-Disaster Context

The foundation for the aspirations-capabilities framework was laid by Carling's (2002) study of aspirations and abilities in Cape Verde, mentioned above. Hein de Haas further developed the approach in his studies of mobility patterns in Morocco (de Haas, 2003, 2006). de Haas' (2014) change from "ability" to "capability" represents a significant shift: "capability" was adopted from Amartya Sen's (1999) capability approach to highlight the influence of social transformation on aspirations and capabilities to move or stay. While usually a concept used in development studies, social transformation is

applicable in any socio-economic context (Schewel, 2019). The aspirations-capabilities framework allows a more holistic approach to the nexus of climate adaptation and mobility, and thus immobility. Before, frameworks such as migration-as-adaptation or migration-for-adaptation focused primarily on migration as an adaptation method, while not noticing the adaptive capacity of immobility (Scheffran et al., 2012). These frameworks had focused on barriers to migration, not on the capabilities to remain in situ (Schewel, 2019). The focus of prior research had primarily been on financial barriers to mobility, but not on social or psychological factors. The spotlight here was on the outcome of migration, not on the communities that stayed in place and their perceptions (Adams, 2016). The immobile communities thus present a research gap, especially their decision-making to stay even in the face of environmental risk as well as in post-disaster contexts (Bardsley & Hugo, 2010; Black et al., 2011; Haney, 2019). At the geographical level, most research on decision-making focuses on subsistence farming communities in the Global South, leaving a gap in decision-making processes in urban areas of the Global North outside the US (Bernard et al., 2024; Rhodes & Besbris, 2022). Here, the study of Erftstadt can contribute both to the gap in decision-making by understanding the aspirations and capabilities of those staying post-flood, as well as by being situated in an urban area in Europe.

In a post-flood context, Rhodes and Besbris (2022) found that households that stayed in the aftermath had planned to do so long-term prior to the flood. Their plans interacted with and were shaped by the constraints, which, together, then shaped the action — staying or leaving. These decisions on post-disaster mobility are influenced by risk perceptions, place attachment, and a mix of economic, political, and structural factors (Haney, 2019; Hunter, 2005; Massey, 1999). Windsong (2010) found that those with an especially strong emotional connection and staying aspiration are homeowners. Additionally, trust in political systems and nostalgic emotions were considered important aspirations to stay (Morrice, 2013; Reinhardt, 2015). Studying the aftermath of flooding in Calgary, Canada, Haney (2019) found that mobility decisions could not be explained by rational models such as a cost–benefit analysis or rational-actor models, but rather by place attachment, emphasizing especially neighbourhood networks. Additionally, these neighbourhood networks can create collective adaptive capacity; the bonds formed between residents in the aftermath of a disaster provide them with the capability to build

resilience together, navigate bureaucracy, and access relief funding (Adger, 2003; Aldrich & Meyer, 2014). Comparative findings from other post-disaster contexts, such as Californian wildfires, similarly show that aspirations to stay were connected to place attachment, especially to the natural and social environment, while capabilities to stay were strongly tied to financial resources, insurance payments, and relief payments, which favoured in situ rebuilding. The study also calls for publicly funded protection measures—when those are left solely to civic organizations and individual households, unequal access to and distribution of preparedness within and between communities can be exacerbated (Tinoco, 2023).

While aspirations and capabilities to remain in place after a disaster can vary, Upadhyay et al. (2024) note that, between cases that can clearly be categorized as voluntary immobile and involuntary immobile, some cases fall into neither category. These cases have the potential to transition to involuntarily immobile populations or individuals if they are not supported in their in-situ adaptation. Additionally, it is important to note that categorizations are difficult as the aspirations can be blurry, complex, shifting, and subjective (Erdal & Oeppen, 2018). An example of blurriness can be gender: if women have the aspiration to stay but also are restricted in their mobility due to norms and power structures, should they be categorized as voluntarily immobile? Did they have the capability to aspire beyond staying (Upadhyay et al., 2024)?

4.3 Place Attachment in a Post-Flood Context

The first conceptualization of place attachment is found in Fried's (1963) study of the attachment of forcibly displaced persons to their place of residence and the psychology associated with it. However, a more specific conceptualization is reached within Bowlby's (1988) Attachment Theory, where he describes people's emotional connection to places. Discussions of the concept of place attachment in post-disaster contexts, and more specifically post-flood contexts, take place across a variety of landscapes. The most prominent of these are coastal regions, due to the multiple hazards that affect these areas and to the strong attachment residents have to their environment. Other important landscapes that appear in the literature include urban, mountainous and riverine areas, with Erftstadt fitting into both the urban and riverine categories (Carone et al., 2025).

Generally, disasters such as floods can have a grave impact on places and their residents, causing collective trauma and loss. As a result, floods and their aftermaths can lead to disorientation but also foster resilience during reconstruction and the development of place-based communities (Carone et al., 2025; Morrison, 2024; Weir et al., 2023). When examining the impact of floods on community resilience, Carone et al. (2025) note that the existing research shows mixed results. On the positive side, floods can benefit communities by enhancing disaster awareness through local knowledge, boosting preparedness, and encouraging the adoption of adaptation measures. Chiang and Ling (2017) found that attachment to a place can strengthen a community's ability to cope with flood risks. Similarly, Faulkner et al. (2018) identified a strong link between increased community resilience and place attachment, rooted in people's connection to their environment. However, other studies suggest that place attachment can also weaken community resilience by reducing risk perception, lowering the inclination to implement local adaptation strategies, and fostering opposition to changes, especially relocations (Carone et al., 2025). De Dominicis et al. (2015) found a connection between place attachment and low risk perception, driven by optimistic bias and risk denial. Consistent with Carone et al. (2025), some literature highlights a mixed impact of place attachment on the resilience of flood-prone communities. Chan et al. (2022) emphasize that place attachment is a complex web involving various factors, making it highly personal and composed of specific memories, beliefs, emotions, and histories. Considering that place attachment is generally essential when designing and implementing adaptation measures. The lack of consensus on whether place attachment has a positive or negative influence on resilience suggests that universal recommendations should be avoided; instead, strategies should be tailored to each community (Carone et al., 2025). Cultural and environmental differences are critical for developing locally grounded approaches to risk management, adaptation, and mitigation (Pacheco et al., 2021). In this context, community spaces within rebuilding processes are vital for re-establishing bonds with the place and supporting social (Parrott et al., 2024; Sadeghloo & Mikhak, 2022).

Recently, the idea of place attachment has been shaped by the mobilities turn. Place attachment is no longer considered a sedentary concept centred on a single place, growing stronger the longer a person stays there (Di Masso et al., 2019; Lewicka, 2020).

The concepts shifted from static, fixed notions towards a more dynamic process of adaptation, reconstruction, and movement in tidal flows (Kim, 2021; Williams & Miller, 2020). Place attachment is now understood as a continuum rather than a linear progression with a web of diverse bonds that influence mobility decisions (Kothari, 2020; Whittle et al., 2014; Willcocks-Musselman et al., 2025).

Although research on place attachment has diversified over the years, there are still gaps where future research is needed. Currently, little is known about the effects of the different stages of a disaster on place attachment (Cox & Holmes, 2000; Harms, 2015; Silver & Grek-Martin, 2015). Longitudinal studies should be prioritized to capture the post-disaster context more holistically (Freibott-Kalt et al., 2025).

4.4 Risk Perception, Mental Health and Gender in a Post-Flood Context

Discussions of risk perception often overlap with immobility and, especially, place attachment, as perceptions of risk, including gender or mental health, are mentioned within those contexts, yet not in a central manner. The term "risk perception" is widely used in the literature; however, it often lacks a clear definition and is used in a broad sense (Mondino et al., 2020).

The long-standing idea that informed individuals will act accordingly in the face of a threat has been debunked (Kuhlicke et al., 2020; Lave & Lave, 1991). Often, residents do not receive the necessary information due to disinterest, underestimation of the threat, underutilization of the information, and distrust (Andráško et al., 2020; Bird, 2013; Box et al., 2013; Burningham et al., 2008; Lave & Lave, 1991). Within governments and authorities, the idea of "shared responsibility" has taken hold: governments, authorities, residents, property owners, and other stakeholders should share responsibility for flood protection, response, and recovery (Andráško, 2021; Henstra et al., 2019). This idea clashes with the general mindset of the population, with only a minority of residents taking action and most seeing the responsibility as lying with their government and other authorities (Bird, 2013; Henstra et al., 2019). Additionally, the public trusts and relies on public flood protection measures, preferring them to private measures (Bird, 2013). As people generally view floods as the result of human action, they blame their governments and authorities (Lave & Lave, 1991). Due to having overly optimistic expectations of the skills, capacities and services of their authorities, blame is placed here for a variety of

reasons, such as inadequate assistance or insufficient public protection measures (Box et al., 2013; Brilly & Polic, 2005; Działek et al., 2013). Thus, building trust between governments, authorities, and civil society is essential to spread information about floods, enable effective risk communication, and facilitate joint action on past and future floods (Andráško, 2021).

The topic of mental health plays into this nexus in multiple ways. Butler et al. (2018) show that interactions between authorities and residents shape both recovery and mental state, as public flood defence mechanisms can foster feelings of safety and support residents' ability to imagine a continued future in place. Looking at mental health in a post-flood context in a more general way, Cruz et al. (2020) find the affected populations to show higher rates of mental health issues, especially PTSD and anxiety. The most detrimental factors were identified as a loss of home, disruption of social structures and displacement. Fears, worries, anxiety and stress related to floods are typical responses to such disasters (Andráško et al., 2020; Dolák Klemešová & Andráško, 2015; Kuhlicke et al., 2020). These fears can be triggered by impulses or cues (e.g. rain) and can lead to a negative outlook on the future (Bird, 2013; Dolák Klemešová & Andráško, 2015). However, they do not necessarily lead to personal mitigation behaviour and increased flood awareness (Hansson et al., 1982; Miceli et al., 2008). When fear and stress coincide with (learned) helplessness, the result is likely to be a lack of personal protective behaviour, thus increasing vulnerability (Andráško et al., 2020; Hansson et al., 1982).

When examining the interplay between gender and flood recovery, the literature places women at the center, depicting them as organizers of home reconstruction, decision-makers of design choices, and providers of support to family, friends, and especially children in the aftermath (Harada, 2000; Sims et al., 2009). This includes creating temporary living spaces during the recovery period, which fosters a sense of normalcy in the aftermath (Harada, 2000). Sims et al. (2009) find that women are generally involved in both the emotional and practical aspects of the domestic recovery process. While acknowledging a clear gendered divide in the domestic recovery process, Sims et al. (2009) leave a detailed analysis of this divide open, partially alluding to women's more frequent part-time employment and the resulting increased time spent at home. While gender and age seem to affect mental health in the post-flood environment, the results

are inconsistent and often contradictory (Lowe et al., 2013). Generally, women were found to be more vulnerable, report a greater negative impact on their wellbeing, and perceive higher levels of risk (Andráško, 2021; Bird, 2013; Miceli et al., 2008; Tapsell et al., 2002). However, other studies, such as Phifer (1990), suggest that men are at a higher risk. Regarding the interplay of gender and age, Lowe et al. (2013) found that, in a post-flood environment, the older adults (65 and over) and men were at risk of physical health issues, while women were at risk of mental health issues. Song et al. (2025) conclude that the aftermath of the flood created an increasingly isolated environment for the older adults, who experienced a high number of mental health issues such as PTSD, anxiety and depression.

Due to inconsistent and sometimes contradictory results, further research is necessary on gender and other socio-demographic and economic determinants, particularly regarding how the intersection and embedding in post-flood contexts. Currently, the field's focus lies on risk perception, mental health, and the roles of authorities and governments (Andráško, 2021).

4.5 2021 Flood in Literature

When looking at both media and scientific literature on the 2021 flood, it becomes clear that the Ahr Valley, which was significantly affected, is at the center of attention. The literature on flooding in Germany was also mainly based in universities and institutions in Germany. Looking at the literature in the broad sphere of the post-disaster context of this particular flood and focusing more on the social side of science, an array of topics appears: Disaster Resilience, understanding the factors that contributed to the disaster, as well as building up resilience in particular regarding land management, infrastructure and planning was discussed by Birkmann et al. (2023). Studying the effects on health, including mental health, was taken up repeatedly, with some focusing on the healthcare system, finding that the system was severely affected as well as the mental health of the affected population (Augustin et al., 2024). Klör et al. (2025) found that the flood placed a mental burden on many of their participants 1.5 years after the event. Zenker et al. (2024) studied PTSD in those affected by the flood and found that women, those injured by the flood and persons feeling left alone after the flood showed the highest probability of developing PTSD. Studying the specific adaptive behaviour of homeowners in the context

of this flood, Meyer and Johann (2025) found that flood risk communications with home and property owners were ineffective; additionally, participants with a higher risk perception rated flood adaptations as more important. Truedinger & Birkmann (2025) studied the priorities of flood-affected households in the aftermath, finding that communication and a need for public information and education were important to the households, in accordance with Meyer & Johann (2025). The households also expected the government to greatly support them both financially and with information. Furthermore, Ommer et al. (2024) explored how citizens perceived responsibilities and found a need to clarify roles and responsibilities, enhance citizen involvement, create collaborative responsibilities between local authorities and citizens, and finally rebuild trust within the society. Looking at social infrastructure, Otto et al. (2025) highlight its necessity for coping, resilience, and rebuilding. Finally, Truedinger et al. (2023) assessed the motivations of Ahr Valley residents regarding their motivation to stay or move, similar to this thesis. Their results showed that property ownership status was the greatest influence, with tenants being significantly more likely to move, to a lesser extent, to place attachment (feeling of rootedness), and to believe the flood was an insular event. They found gender, age and income to be of very little influence on the mobility of the residents. Male Participants were slightly more represented in their study; they assumed that a reason for this was the conservative separation of duties, with men being responsible for aid applications and thus participating in their study.

Looking more closely at Erftstadt, a smaller but significant number of publications focus directly on the situation there. Blessem receives the most attention here. While some pieces provide a more general overview of the flood (e.g. Lehmkuhl et al., 2022; Manandhar et al., 2023), the effect of the flood on the healthcare system within the region (Wiesehahn & Kaifie, 2024) or look towards the effect on the region's archaeology (Schmidt et al., 2024), while mentioning Erftstadt specifically, some focus on the city more directly. Lehmkuhl and Stauch (2023) examine the technical aspects of the collapse of the Blessem pit, and Greiving et al. (2023) focus on risk-based land-use planning in the aftermath of the flood. With the focus in Germany mainly on the Ahr Valley, further exploration of urban areas, such as Erftstadt, is needed. While technical analysis of the situation has been conducted more frequently, the focus should be broadened to the human condition in this post-flood context, as this thesis does.

4.6 (Im)mobility, Disaster and Q Method

When looking at the nexus of disaster, (im)mobility, environment and the use of Q Method, four works appear. Notably, all four studies are associated with the United Nations University, Institute for Environment and Human Security, in Bonn, Germany, and focus overwhelmingly on Pacific Islands. Oakes (2019) studied mobility decisions across multiple Pacific Islands and found an inextricable link between people, their land and culture, and their decision to stay or leave the island in the face of climate change. He found a variety of standpoints, ranging from those feeling powerless to those letting fate decide to those willing to move. Also in the Pacific, specifically the Marshall Islands, van der Geest et al. (2019) highlight the dilemma of being prepared for the potential uninhabitability of the islands. They find a divide between Marshallese living in the Marshall Islands and those living in the United States, with the latter being more concerned about climate change and citing it as a factor in their mobility decisions. The third study, also located in the Pacific, examined two partial relocations in Fiji ten years prior: one government-assisted, one community-driven. They found that ten years after the relocation still shaped the lives of both those who stayed and those who relocated (Link et al., 2025). Finally, Ayeb-Karlsson (2020) focuses on how gender roles (im)mobilize people during cyclone strikes in Bangladesh, finding that female roles were limiting mobility, while masculine roles were seen as protective yet risky.

Q Method uncovers narratives and can be used to provide a nuanced understanding of situations and to inform people-centred policies (Link et al., 2025). As this work investigates personal views on aspiration, capabilities, place attachment, and climate change of those staying in Erftstadt after the flood, Q Method is a valuable tool to understand both individual viewpoints as well as the different narratives within the community.

5. Methods

5.1 Q Method

The practical basis of this research is a Q Method analysis, a methodology used to capture viewpoints, beliefs, and opinions on specific or combined topics by assessing

and categorizing similarities and differences within the perspectives of a given population (van Exel & Graaf, 2005). Q Method is considered to be a participative and reflexive qualitative-quantitative method, which explores correlations between the viewpoints of the participants, not between object variables (Buckwell et al., 2020; Oakes, 2019; Ockwell, 2008). A core principle of Q Method is that only a limited number of viewpoints on a specific topic exist within a group of people, meaning that if a "Q Set" ("Statements") is well composed, all viewpoints should be revealed (Brown, 1980). Q Method was first developed by William Stephenson in 1935 as an inversion of conventional factor analysis (R Methods). Q Method studies the viewpoints, not the population, in opposition to R Methods (van Exel & Graaf, 2005). Additionally, Q Method requires a smaller sample size, which, however, makes the results of Q Method less generalizable outside of the study setting (Amin, 2000; van Exel & Graaf, 2005).

Following the process proposed by van Exel and de Graaf (2005), based on Brown (1993), the study adheres to a five-step process: "(1) defining the concourse, (2) developing the Q sample, (3) selecting the P set, (4) conducting Q sorting, and (5) analyzing and interpreting the results" (p. 4). The concourse includes all statements on a specific issue made in expert interviews, academic publications, or any other topic-appropriate medium of communication. From this extensive amount of information, a representative, yet manageable amount of statements (or sometimes pictures) is selected, the "Q Sample" or "Q Set" (Oakes, 2019). The "P Set", the group of strategically sampled participants, is then asked to rank the statements ("Q Sorting") and explain their reasoning (Buckwell et al., 2020; Oakes, 2019; Watts & Stenner, 2012). To analyze the sort, factor analysis is employed. Finally, the individual viewpoints are summarized into a handful of narratives ("factors") (Oakes, 2019). Thus, the product of a Q Method is a set of distinct "factors" (narratives) composed of similar viewpoints on a given problem, which are then further analyzed (van Exel & Graaf, 2005).

5.2 Q Set and Matrix

5.2.1 Expert Interviews

The initial starting point for the research was the exhibition "Die Flut 2021" (engl. The 2021 Flood) at the Erftmuseum KM51 at Gymnicher Mühle in Erftstadt (see Naturpark Rheinland 2023). The exhibition provided an overview of different thematic areas

regarding the Erft River and the 2021 flood: historical floods, flora and fauna, media coverage of the flood, and testimonials (Naturpark Rheinland, n.d.-a). In addition to this, the exhibition also displayed local publications on the flood and its effect on Erftstadt, including a self-publication titled “Stadt, Sand, Fluss” (translation “City, Sand, River”) (Bürgerforum Blessem-Frauenthal e.V., 2022) by a local collective gathering testimonials of residents and the city yearbook (Stadt Erftstadt, 2022). To refine the research questions and create the Q Set (Statements), a total of five experts were interviewed in four interviews. In selecting the experts to interview, it was important to include a range of perspectives from those knowledgeable about the community. The experts chosen were the manager of the Gymnicher Mühle, a member of the local citizens initiative “Bürgerforum Blessem-Frauenthal e.V.”, the head of the rebuilding unit of the city of Erftstadt and the heads of the local flood initiative “Hochwasser Initiative Erftstadt”. In addition, an informal conversation with a town elder took place. Each semi-structured interview provided a different set of knowledge to the research process:

The manager of the Gymnich Mühle brought an outsider's perspective and a scientific approach. As the museum also offers a range of educational programs, the interview provided insight into local education on climate change and flooding in the region. The second interview in the process was conducted with a member of the “Bürgerforum Blessem-Frauenthal”. This citizens’ initiative is a broader community organization, not just regarding the flood, and thus the interview offered a view into the community as a whole. Additionally, the member was involved in creating the aforementioned book “Stadt, Sand, Fluss”, and thus was able to share the process of collecting the testimonials and interacting with the community regarding flood stories. The head of the rebuilding unit of the city of Erftstadt was chosen as an expert, serving as a representative of the administration and knowledgeable about the entire rebuilding process, policies, and background information. Additionally, as government representatives, they interact with the entire community, not just certain groups and thus could provide a more holistic understanding of the situation. Lastly, an interview with the heads of the flood initiative “Hochwasser Initiative Erftstadt” was conducted. Just as the other citizens’ initiative, the flood initiative has an extensive network of residents interested in community matters. This interview provided insights into the community structures and their struggles with the flood.

The experts were all contacted via phone or email through their organization or workplace. After the initial contact, the experts were, if requested, provided a rough outline. The interviews were conducted over Zoom and Teams. They ranged from 40 to 60 minutes and were audio-recorded and transcribed using Word transcription software. Interview questions focused on the topics of aspirations, capabilities, facets of place attachment and climate change awareness. Additionally, they were asked about the role of their organization or workplace within the aftermath of the flood and were given space to speak about what they deem important in the context of the flood. All experts were informed about their rights and signed a consent sheet.

5.2.2 Q Set Sampling and Creation

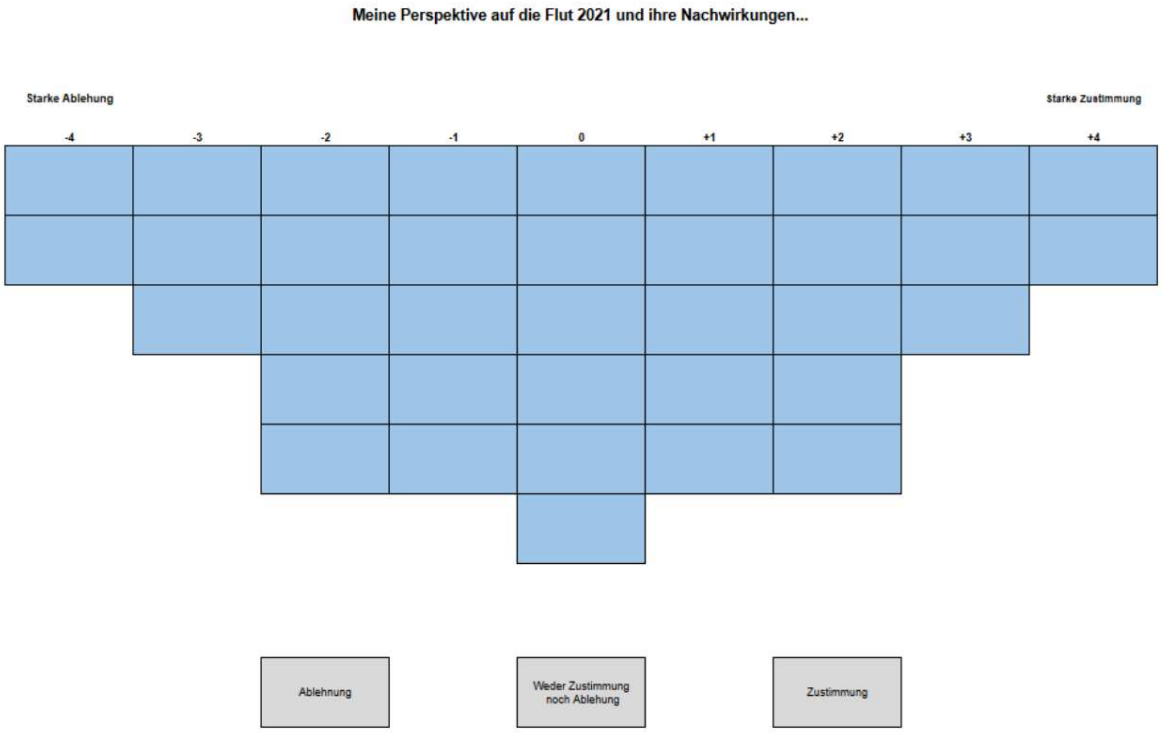
Using the interviews and impressions from the yearbook (Stadt Erftstadt, 2022), the testimonies (Bürgerforum Blessem-Frauenthal e.V., 2022), as well as a documentary on the flood made by local filmmakers (Sterk et al., 2024), statements making up the concourse were collected in a spreadsheet, noting the origin and the related theoretical framework. Furthermore, scientific literature (most notably: Blondin, 2021; de Haas, 2021; Oakes, 2019; Schewel, 2019; Zickgraf, 2018) was considered in the creation of the statements to include more theoretical concepts of immobility, the aspirations and capabilities framework, place attachment and risk perception and put the expert knowledge into context. This original list encompassed 88 statements, which were regrouped, organized, and sorted, leaving 34 final statements that made up the initial Q Set. With these 34 statements, two rounds of testing were conducted in preparation for the final interview process. The first round of testing was completed with two individuals from the area who were not personally affected by the flood, yet helped in the aftermath. The first round was crucial for assessing the comprehensibility of the statements as well as the instructions and design of the study. After this round, minor adjustments were made. The second round of testing was carried out with a flood-affected person in Erftstadt. After this round, two more statements were added (statement 35 “I perceive rain as a threat” and statement 36 “The flood affects me mentally”) as mental health and risk perception were not sufficiently considered in the original set of statements. In the end, a total of 36 statements were taken into the field. Generally, 40 to 50 statements are considered an appropriate Q Set; fewer statements are, however, possible (van Exel &

Graaf, 2005). Brown (1980) called the selection of the Q Set “more art than science” (Brown, 1980 p. 186). Q Sets in the nexus of disaster and (im)mobility ranged between 36 and 40 (Ayeb-Karlsson, 2020b; Link et al., 2025; Oakes, 2019; van der Geest et al., 2019). Thus, the 36 statements are an appropriately sized Q Set within this field.

5.2.3 Matrix Creation

After creating the Q Set and the Matrix, the grid on which the statements would be placed could be designed. The grid follows a quasi-normal distribution, ranking from -4 (strong disagreement, German: starke Ablehnung) to +4 (strong agreement, German: starke Zustimmung), creating a so-called forced distribution. This means the participant is asked to adhere to the researcher-provided matrix structure (Watts & Stenner, 2005). While this limitation on participants’ freedom has been critiqued, Brown (1980) assures that even a forced distribution provides enough room for expression. The kurtosis of the distribution generally follows a normal distribution, yet is flatter around the middle to leave more room for indecisiveness, as not all participants can be expected to have a strong and well-articulated opinion on their (im)mobility, place attachment and risk perception (van Exel & Graaf, 2005). Additionally, the grid was provided with a prompt: ‘My perspective on the flood 2021 and its aftermath…’ (German: Meine Perspektive auf die Flut 2021 und ihre Nachwirkungen…) to support the participants’ focus on the topic. After the addition of two more statements in the final round of testing, one spot each at +2/-2 was added, leading to the final matrix design (see Fig. 3).

Figure 3: Q Matrix



5.3 Fieldwork

5.3.1 Selection of Participants

The participants, the P Set, were selected through a combination of snowball and convenience sampling: Experts were asked for potential participants within their networks, a flyer with basic project information, including contact information, was created, and the researchers' personal networks were also activated. The flyer was posted to local Facebook and WhatsApp groups as well as community bulletin boards by the experts and other community members. WhatsApp groups, especially, are an important tool in Erftstadt, as they are a main channel of community organization there. In addition, the city of Erftstadt promoted the call on its website and social media, and contacted the local press and radio station. The Erft Museum also informed its visitors about the project. In most cases, the potential interviewee then contacted the researcher; the researcher only reached out directly to individuals if they had received their contact information from someone in their network. Through these different types of snowball sampling, as well as advertising in various media, a number of different people could be reached. The target group of participants was broad, with only the requirement

that participants be flood-affected residents of Erftstadt over the age of 18. The level of affectedness was not predefined and relied on the individual's self-definition. Communication with potential interviewees was mostly carried out via email, in some cases also via WhatsApp or phone calls. This procedure helped create a P Set in a way that Brown (1980) recommends: a structured sample of participants who are linked to the research problem, having a clear opinion on the problem. Thus, will be able to be sorted into a factor. After mainly receiving feedback from men over 50, an attempt was made to make the study more gender balanced by specifically asking participants to recommend my work to people outside this group, and by giving preference to younger people as well as women and non-binary people.

Generally, it is advised that the P Set be smaller than the Q Set, yet have enough participants to ensure four to five participants per viewpoint (factor), of which two to four can be expected (Brouwer, 1999; van Exel & Graaf, 2005). For this thesis, a total of 30 interviews and Q Matrices were conducted; however, only 27 participants were fully included in the research for various reasons and thus make up the P set. One was excluded because it was used to test the statements and the study design. Another interview was excluded because the participant did not actually live in the house affected by the flood. However, both interviews were used in the knowledge-gathering process. Finally, one participant was excluded entirely from the study because they were unable to fully comprehend the study design. P Sets in the nexus of climate change, disaster, (im)mobility ranged between 50 and 66 participants (Ayeb-Karlsson, 2020b; Link et al., 2025; Oakes, 2019).

5.3.2 Demographic Data Sheet

To collect data on the participants in a more structured and efficient way, each participant received a data sheet to record measures such as age, gender, employment status, household income and size, as well as data on their flood situation, such as level of affectedness. Recording this data in addition to the Q Sorts and interviews helped create a clearer picture of who the participants are and how each factor is made up. In larger study settings, Q Method is usually preceded by a quantitative survey: large household surveys are conducted, and then a smaller sample is selected from that pool to form a balanced Q set (e.g. Oakes, 2019; Van der Geest et al., 2019). The demographic

data sheet was created to generate demographic data on the participants, even though a household survey was not part of the study design.

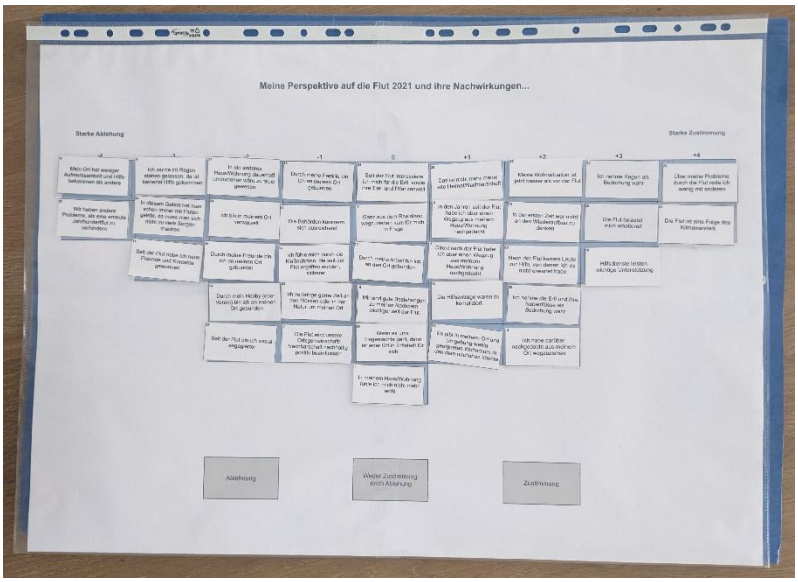
5.3.3 Q Sort Process

With a few exceptions, the Q Sorts and interviews were conducted in the respondents' homes, usually at the living room or garden table. This setting was chosen for several reasons: to make the participants comfortable by being in their usual surroundings and to make the process as easy as possible for them. In addition, a sense of their home and situation could be assessed. Since most people stayed in their homes, they had experienced the flood in their homes themselves provided a point of conversation. When interviews were not conducted at home, they were held at their place of work or volunteer work, only in three out of 27 interviews. Time slots were flexible, with interviews held between 8 a.m. and 9 p.m., weekdays and weekends, to accommodate participants' schedules. The interviews took place in June and July of 2024, before the school holidays, as many participants had school-aged children. The interviews, as well as the matrix and statements, were conducted in German. The English statements provided in this thesis are translations and are presented side by side with the original.

The interview was divided into four parts: first, the purpose of the interview and the research were explained; the consent form was signed; and the data sheet was completed by the participants themselves. In a second step, an unstructured interview took place in which the interviewees shared their experiences during and after the flood. While initial questions about their experiences were asked, it was up to the participants to decide which facets and how much they were willing to share. This part was not recorded, but notes were taken afterwards. These interviews lasted between five and thirty minutes, depending on the participant. The third part was the Q sort. Participants were given a stack of laminated statement cards to sort on the matrix, which was printed in A2 for good visibility and ease of placement. They were asked to first sort into three piles: agree, disagree, neither agree nor disagree, with most sticking to this task. They then sorted these three piles of statements onto the board, following the grid provided. Four participants did not comply, resulting in four unforced matrices in the results section. The final step was explaining their placements. Participants were asked to explain their placement of statements at the extreme ends of the matrix (+4, +3, -3, -4). In addition,

they were given the opportunity to comment on any other statements. During the explanation process, some participants realized that they had not placed the statements according to their views and changed their sort. This part was audio-recorded and partially transcribed. After the interviews, the final placement was photographed (see Fig.4). The participants did not receive any compensation for their participation. The Q Sort process followed the example of Oakes (2019).

Figure 4: Matrix, Participant 15



5.3.4 Community Events

In addition to the interviews, community events were attended. Although these events were not a direct part of the research process, they influenced the research, supported the study's acceptance within the community, and improved understanding of local structures. Three events were attended: a meeting of the Flood Initiative, a workshop for primary school children at Gymnicher Mühle, and a meeting of the Caritas Flood Café, a support space for flood-affected persons.

5.4 Data Analysis

The program used for this analysis, KADE, provides statistical outputs at different stages of the process of creating the factors. As these statistical outputs must be assessed before continuing with the next step of the analysis, this chapter will reflect this process and present the data alongside the description of the analysis. The data was analyzed using factor analysis. For this, all collected matrices were loaded in the program

KADE, the desktop version of the widely used Q Method program, KenQ. KADE provides statistical outputs as one goes along the process of creating the factors. Four of the Q Sorts were unforced, meaning the participants did not stick to the grid provided to them. Following Brown (1980), the Centroid Factor Analysis was used, and six extractions were taken. After this initial extraction, the scree plot showed potential in four factors (see Fig. 5). All factors with an Eigenvalue >1 were kept for the following Varimax rotation (see Table 2), which were those four factors (Watts & Stenner, 2012).

Figure 5: Scree Plot

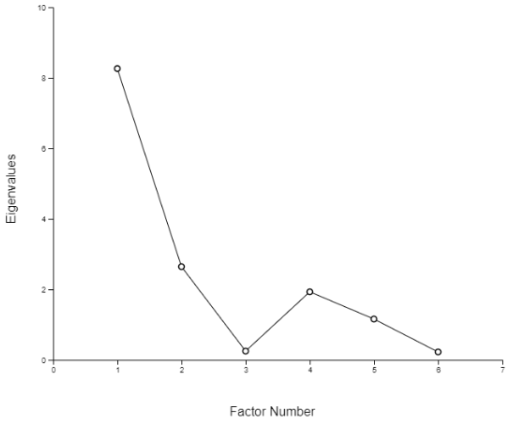


Table 2: Results after First Extraction

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Eigenvalues	8.2612	2.6442	0.2499	1.9303	1.1581	0.2247
% explained variance	31	10	1	7	4	1
Cumulative % explained variance	31	41	42	49	53	54

The Varimax rotation is an automated rotation, in contrast to the manual judgmental rotation, meaning the program uses the statistical data on hand to create a maximum of study variance (Watts & Stenner, 2012).

After the Varimax rotation and an auto flag process set at $P<0.05$ to ensure significance, Factors 1, 2 and 4 each contained participants, while Factor 3 remained empty. All, except two participants, were included in the auto-selection. After a thorough review of the additional material, one participant (P10) was added to Factor 4 manually, even though their factor loading lay below the threshold of $P<0.05$ for all factors. The other excluded participant (P23) presented a low factor loading across all Factors and could not, even after a thorough review, be included in any of them. This viewpoint is thus excluded from the analysis, as it did not share sufficient commonalities with any factor (Watts & Stenner, 2012). To avoid gaps in the numbering and present the results more clearly, Factor 4 will now be referred to as Factor 3. To ensure the distinctiveness of the factors from each other, the factor score correlation (see Table 3) must be considered.

Table 3: Correlation Coefficients between Factors

	Factor 1	Factor 2	Factor 3
Factor 1	1	0.3184	0.3276
Factor 2	0.3184	1	0.344
Factor 3	0.3276	0.344	1

The correlation coefficients between the factor scores lie between 0.3184 and 0.344 at a study size of 27 Q Sorts. These weak to moderately sized correlations were to be expected, as the P Set stemmed from the same place and asked about a specific event that they all experienced. Since Q Method allows freedom within factor creation, even higher correlations are not necessarily considered to be a concern, but depend on the context (Watts & Stenner, 2012).

Following the analysis, 26 out of 27 participants could be categorized into one of three factors. Factor 1 was by far the largest, comprising 15 participants. Factor 2 contained six participants, while Factor 3 comprised five (see Table 4).

Table 4: Participant Distribution among the Factors

Factor 1	P2	P3	P4	P5	P6	P8	P11	P12	P13	P21	P24	P25	P28	P29	P30
Factor 2	P14	P16	P17	P18	P19	P27									
Factor 3	P9	P10	P15	P22	P26										
No Factor	P23														

The number of Q Sets contained within Factor 1 makes it the most dominant viewpoint; however, Factors 2 and 3 are still distinct. This observation carries through to the other characteristics of the factors, as shown in Table 5.

Table 5: Factor Characteristics

Factor Characteristics	Factor 1	Factor 2	Factor 3
Number of Defining Variables	15	6	5
Average Reliability Coefficient	0.8	0.8	0.8
Composite Reliability	0.984	0.96	0.952
Standard Error of Factor Z-scores	0.126	0.2	0.219

The average reliability coefficient is 0.8 for all factors, suggesting high reliability. Composite reliability looks at the reliability within the factor itself. While all factors are statistically robust, Factor 1 is the most robust due to its high number of participants, and Factor 3 is the least robust yet still reliable. Finally, the standard error of the factors shows a similar pattern, with Factor 1 being the most precise and Factor 3 being the least precise. However, all factors meet Humphrey's rule, which considers a factor to be significant if the cross-product of its two highest loadings surpasses the standard error multiplied by two (Brown, 1980).

After this, a more qualitative approach was taken to combine the data from the data sheets, interviews and factor analysis into the subjective understandings of the factors (Watts & Stenner, 2012). The interpretation of the factors loosely follows the approach of Watts and Stenner (2012), who advocate using a crib sheet containing the statements and their placement on the matrix to examine which viewpoints are polarized, and especially how they are polarized in relation to others. They rightly point out that, while there is plenty of work "that tells us *what* and *why* we are interpreting, there is very little that tells anyone *how* to do the job effectively" (Watts & Stenner, 2012 p.148). Since their guide was published, software has changed and been updated; however, guidance on Q remains limited. The program KADE, which was used in this study, did not exist at the time of publication, so the qualitative analysis differs from the recommendations. The analysis is guided by the data output available from KADE: consensus statements (statements that are ranked similarly across all factors), extreme statements (statements that are ranked -4,-3,+3,+4) and, most notably, distinguishing statements. Distinguishing statements are statements significantly ranked differently by a factor compared to the other factors. They are therefore a useful tool for interpreting individual factors, as well as differences between factors and their relationships (Watts & Stenner, 2012). To achieve a sufficient number of significant distinguishing statements, two thresholds were set at $P < 0.01$ and $P < 0.05$. While a crib sheet was used as general guidance for the analysis, as recommended by Watts & Stenner (2012), the aforementioned categories of statements (consensus, extreme and distinguishing statements) were the main focus as they are more concise and manageable than a crib sheet alone. After analyzing the placement data, the demographic data was included to provide a clearer picture of the viewpoints. However, it was important to include the demographic data second, so as not to influence

the formation of the factors (Watts & Stenner, 2012). Finally, some of the interview recordings were partially transcribed. With the help of field notes, they were used for a deeper qualitative analysis and interpretation of the factors (van Exel & Graaf, 2005). For this purpose, quotes were supplied from the interviews of the three highest loaders of any factor. In one case (Factor 2), the fourth-highest loader replaced the third, as otherwise two of the interviewees would have come from the same household. While it was generally not an obstacle to include multiple participants from the same household in the study, with such a small sample size of three interviews per factor, the representation of the factors should not be biased towards the experience of one household. The transcriptions were supported by Word transcription software. The partial transcripts were translated with the support of ChatGPT and DeepL.

6. Results

6.1 Statements

The statements (st.) were the first result of this Q Method process, being the product of the four expert interviews conducted as well as a consultation of the literature regarding the underlying theoretical framework of aspirations and capabilities, place attachment, as well as disaster and risk. Aspirations and capabilities together appear 26 times within the statements (aspirations eight times, capabilities 18 times), place attachment 13 times and the disaster, climate change and risk category appears six times. This division shows the focus of the study, the aspirations and capabilities framework, including the underlying concept of (im)mobility, being the most influential on the statements, place attachment coming second to it. Risk perception was included in the statements as well, yet to a lesser extent. Most statements have more than one category attached as concepts are intertwined. Within the themes, many different layers are represented, underscoring their multifacetedness.

Statements 1 to 5 were created to capture the different scales and temporalities of the desire to stay or leave. When did this desire arise, and which place were they thinking of leaving? – Was it their immediate living situation, their part of town, or perhaps even the wider area? These statements focused particularly on the theme of (im)mobility.

As neighbourhood relationships are essential to any place, Statements 6 and 7, as well as Statement 11, explored the changes to these relationships brought on by the flood. The experts repeatedly highlighted the amount of attention that Erftstadt and Blessem in particular received from the international media, as well as the large number of people from all over Germany who came to help. Statements 8 to 11 aimed to capture participants' perceptions of this attention. To uncover structural and governmental support, Statements 17, 18 and 34 were created to understand both the capabilities and the trust that participants had in the government. Here, the experts alluded to widespread distrust and frustration among residents regarding the government's handling of the situation. To capture perceptions of other support structures, such as official services like Caritas and AWO, as well as private citizens who helped, statements 10 and 19 were created. Statements 20 to 22 were designed to assess the financial circumstances and living situations of the participants. To incorporate the theoretical framework of place attachment, Statements 24 to 26 examined place identity, while Statements 28 and 29 examined perceptions of connection to the biophysical surroundings. Statements 13 to 16 and 27 focused on social factors of place attachment, such as family, friends and work. These social bonds create layers of dependence and can influence capabilities by providing and requiring physical and emotional support. As climate change plays an increasingly significant role in disasters every year, Statements 31 to 33 capture participants' perceptions of the connection between climate change, a broad concept usually perceived as an issue elsewhere, and their specific event. Finally, as risk perception and the effect of the flood on participants' mental well-being are closely intertwined, Statements 12, 23, 30, and 34 to 36 cover different facets, from the event's general effect on mental health to specific stressors and coping mechanisms.

Table 6: Overview of Statements

No.	Statement (German Original)	Statement (English Translation)	Theme
1	In meinem Haus/Wohnung fühle ich mich nicht mehr wohl	I no longer feel comfortable in my house/flat	aspirations / (im)mobility
2	Direkt nach der Flut habe ich über einen Wegzug aus meinem Haus/Wohnung nachgedacht	Immediately after the flood, I thought about moving out of my house/flat	aspirations / (im)mobility

3	Im Laufe der Jahre habe ich über einen Wegzug aus meinem Haus/Wohnung nachgedacht	Over the years, I have thought about moving away from my house/flat	aspirations / (im)mobility
4	Ich habe darüber nachgedacht aus meinem Ort wegzuziehen	I have thought about moving away from my place	aspirations / (im)mobility
5	Aus dem Rheinland ganz wegzuziehen, kam für mich in Frage	Moving away from the Rhineland completely was an option for me	aspirations / (im)mobility
6	Mir sind gute Beziehungen zu meinen Nachbarn wichtiger seit der Flut	Good relationships with my neighbours have become more important to me since the flood	aspirations / place attachment (social/community)
7	Die Flut wird unsere Ortsgemeinschaft/Nachbarschaft nachhaltig positiv beeinflussen	The flood will have a lasting positive impact on our local community/ neighbourhood	aspirations (community) / future
8	Mein Ort hat weniger Aufmerksamkeit und Hilfe bekommen als andere	My place has received less attention and help than others	capabilities (attention) / discourse / envy
9	Ich wurde im Regen stehen gelassen, da ist keinerlei Hilfe gekommen	I was left out in the rain with no help at all	capabilities (social/structures)
10	Nach der Flut kamen Leute zur Hilfe, von denen ich es nicht erwartet habe	After the flood, people came to help, from whom I did not expect it	capabilities (social / community)
11	Seit der Flut habe ich neue Freunde und Kontakte gewonnen	I have made new friends and contacts since the flood	capabilities / place attachment (social)
12	In der ersten Zeit war nicht an den Wiederaufbau zu denken	In the beginning, there was no thought of reconstruction	capabilities (mental health)
13	Durch meine Arbeit bin ich an den Ort gebunden	I am tied to the place through my work	capabilities / place attachment (financial/social)
14	Durch mein Hobby (oder Verein) bin ich an meinen Ort gebunden	My hobby (or club) ties me to my place	capabilities / place attachment (social)
15	Durch meine Familie bin ich an meinen Ort gebunden	My family ties me to my place	capabilities / place attachment (social / structures / financial)
16	Durch meine Freunde bin ich an meinen Ort gebunden	I am tied to my place through my friends	capabilities / place attachment (social)
17	Die Behörden kümmern sich ausreichend	The authorities take sufficient care of me	capabilities (structures)
18	Die Hilfsanträge waren zu kompliziert	The applications for relief were too complicated	capabilities (structures)

19	Hilfsdienste leisten wichtige Unterstützung	Support services provide important assistance	capabilities (structures)
20	Es gibt in meinem Ort und Umgebung wenig geeigneten Wohnraum, in den man umziehen könnte	There is little suitable housing in my town and surrounding area to move to	capabilities (structures / financial/ (im)mobility)
21	In ein anderes Haus/Wohnung dauerhaft zu umzuziehen wäre zu teuer gewesen	Moving to another house/flat permanently would have been too expensive	capabilities (financial / (im)mobility)
22	Meine Wohnsituation ist jetzt besser als vor der Flut	My housing situation is better now than before the flood	capabilities (living conditions)
23	Über meine Probleme durch die Flut rede ich wenig mit anderen	I don't talk much with others about my problems caused by the flood	capabilities (social) / discourse
24	Ich bin in meinem Ort verwurzelt	I am rooted in my place	place attachment (identity)
25	Das ist nicht mehr meine alte Heimat/Nachbarschaft	This is no longer my old home/neighbourhood	place attachment (identity)
26	Wenn es ums Eingemachte geht, dann ist jeder Ort in Erftstadt für sich	When it comes down to it, every village in Erftstadt looks out for itself	place attachment (identity) / community structures
27	Seit der Flut bin ich sozial engagierter	I've been more socially engaged since the flood	place attachment (social)
28	Seit der Flut interessiere ich mich für die Erft, sowie ihre Tier- und Pflanzenwelt	Since the flood, I've been interested in the Erft and its tributaries, as well as the flora and fauna in the river	place attachment (biophysical)
29	Ich verbringe gerne Zeit an den Flüssen oder in der Natur um meinen Ort	I enjoy spending time by the rivers or in nature around my town	place attachment (biophysical)
30	Ich nehme die Erft und ihre Nebenflüsse als Bedrohung wahr	I perceive the Erft and its tributaries as a threat	place attachment (biophysical) / risk
31	Die Flut ist eine Folge des Klimawandels	The flood is a consequence of climate change	climate change / risk
32	Wir haben andere Probleme als eine erneute Jahrhundertflut zu verhindern	We have other problems than preventing another 100-year flood	climate change / risk
33	In diesem Gebiet hat man schon immer mit Fluten gelebt, da muss man sich nicht zu viele Sorgen machen	People have always lived with floods in this area, so there isn’t much to worry about	climate change / risk

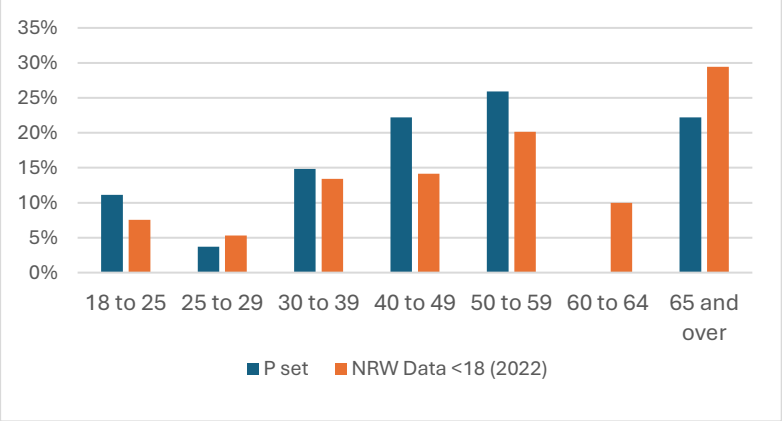
34	Ich fühle mich durch die Maßnahmen, die seit der Flut ergriffen wurden, sicherer	I feel safer because of the measures that have been taken since the flood	risk / trust / aspirations (safety)
35	Ich nehme Regen als Bedrohung wahr	I perceive rain as a threat	risk / capabilities (mental health)
36	Die Flut beeinflusst mich mental	The flood affects me mentally	capabilities / mental health

6.2 Demographic Data Results

The Demographic Data Sheets revealed that the 27 persons making up the P Set were 67 percent (18) male, 30 percent female (8) and 4 percent non-binary (1). In this regard, the P Set is not representative of the overall population in Erftstadt, with 52 percent women and 48 percent men (data from 2022). Data on non-binary people was not included in the data provided by the state of NRW (IT.NRW & Landesdatenbank NRW, 2024).

The participants average 49,6 years of age, ranging between 19 and 87. 44 percent of the participants were over the age of 50, official numbers state this to be slightly higher at 47 percent (IT.NRW & Landesdatenbank NRW, 2024). Fig. 6 shows the comparison of the age structure over the age of 18 between the P set and the actual adult population in 2022. It can be seen that the population of the P set is overall slightly younger and leaning especially towards the ages between 40 and 59.

Figure 6: Age Structure: P Set vs. Official Data



In some households, more than one member was interviewed, so the P Set comprises 22 households. Situations are experienced differently by each member of a household; all participants are viewed independently of their household, thus not

creating problems for the study. Household size ranged between one and five, with an average of three persons per household. The majority (56 percent, 15 participants) of the P Set were married, around 30 percent (8) were in a partnership, 11 percent were single (3), and 4 percent were widowed (1). At the time of the flood, more than half of the participants (59 percent, 16) lived in their own property. This figure increased slightly to 63 percent (17) in the aftermath and is significantly higher than the NRW average of 38,6 percent of households owning their own property (Destatis, 2025b).

Regarding monthly net household income, the P set is mixed (see Table 7):

Table 7: Net Household Income Distribution

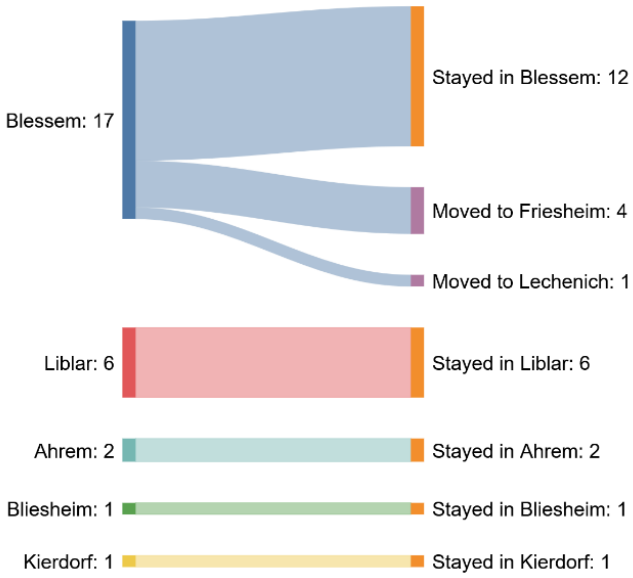
Net Household Income	Persons	Percentage
up to 2000 €	3	11%
2.000 - 4.000€	10	37%
4.000 - 6.000€	6	22%
6.000 - 8.000€	3	11%
8.000 - 10.000€	1	4%
more than 10.000€	2	7%
NA	2	7%

The largest group (37 percent) had a net household income between 2,000 and 4,000 Euros. The second largest group (22 percent, 6) earned between 4,000 and 6,000 Euros per month. Eleven percent (3) earned up to 2,000 Euros per month, while another 11 percent (3) earned between 6,000 and 8,000 Euros per month. Four percent (1) lived in a household with a monthly net income of between 8,000 and 10,000 Euros. Finally, seven percent (2) stated that their monthly net household income was more than €10,000, and another 7 percent (2) declined to answer. Looking at the whole population of Erftstadt, the average person has a yearly net income of 25,000 Euros per year or 2,083 Euros per month (Stadt Erftstadt et al., 2022).

Due to the study setup, only those remaining in Erftstadt were asked to participate, and thus only movement within Erftstadt could be recorded. A majority of participants, (63 percent, 17) lived in Blessem at the time of the flood. The second largest group came from Liblar (22 percent, 6), and other participants from Ahrem (7 percent, 2), Kierdorf (4 percent, 1) and Bliesheim (4 percent, 1). The biggest relocation movement was visible in Blessem, which was among the most affected parts of Erftstadt with a total of 5 persons

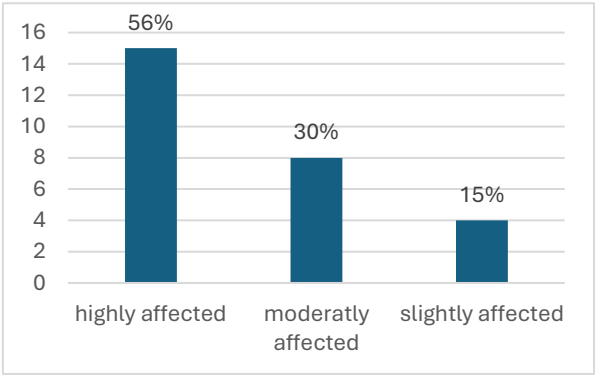
moving to other parts of the city, yet no one who permanently moved in Blessem, moved within. Permanent moving yet staying within the village limits occurred in two cases in Bliesheim and Liblar (see Fig. 7). Blessem was among the most affected by the flood and Liblar one of the most populated parts of Erftstadt.

Figure 7: Mobility of Participants within Erftstadt



As part of the data sheet, participants were asked to rate how affected they were by the flood. More than half of the participants (56 percent, 15) rated themselves as being highly affected, 30 percent (8) as being moderately affected, and only 15 percent (4) as being slightly affected (see Fig. 8). Affectedness was not predefined on the sheet to allow for different kinds of affectedness, e.g. physical, mental or financial.

Figure 8: Distribution of the Level of Affectedness



While the majority of participants moved temporarily (74 percent), only 26 percent of the P Set moved permanently, with an average time away of 7 months. The temporary time away from their home ranged between two weeks and over two years, with most either being at the lower end of the spectrum, up to a month or on the higher end of the spectrum, with more than 20 months, but rarely in the middle. While a temporary move did not seem to be affected by whether or not the participants lived in their own property or not, a clear trend can be seen when looking at those who permanently moved: all those who undertook a permanent move were previously renters, and none of those living in their own house at the time of the flood moved house.

By the time of the fieldwork in June and July of 2024, 22 percent had not yet finished the rebuilding process (6), the other participants had either finished their renovations (63 percent, 17) or the question was not applicable to their situation (15 percent, 4) as the flood did not cause any damage to their home, or they had moved out. Over half of the P Set (56 percent, 15) had insurance that covered the damage from the flood and rain, 30 percent (8) were uninsured, and 15 percent (4) did not state their insurance status, or the question was not applicable to them.

6.3 Overview of Factors

After the analysis, 26 out of the 27 viewpoints were sorted into three factors, each showing the subjective understandings of Erftstadt residents on their aspirations and capabilities regarding their (im)mobility, place attachment, and, to a lesser degree, risk perception. Factor 1 is by far the most dominant, comprising 15 participants; Factor 2, six participants; and Factor 3, five participants. The three factors each tell a different story about how Erftstadt's community perceive their situation three years post-flood.

Factor 1 "Staying Put, Holding On" is characterized by their intertwined aspirations and capabilities regarding (im)mobility: their aspiration to stay put, in their place, in their home, but also the need to stay primarily due to their financial situation, as homeownership is prevalent within Factor 1.

> *We're a family that moved in here and started renovating everything. And then we renovated a second time. At some point, the resources are just limited. For us, it was never really a question of moving away — it was just grit your teeth and push through.* (Participant 25)

In addition to being bound by property, Factor 1 is also characterized by strong attachment to place, especially family, as well as other social structures such as friends or hobbies: "*I am a big family person, that really ties me to this place"* (Participant 24). While climate change is viewed as a growing risk and the government is called to action to create measures for their safety, the future is Erftstadt:

> *Sure, I do feel safer because of the measures taken since the flood. But I really wish the city had done more [...]. You really have to take care of things yourself.* (Participant 5)
>
> *I'm just trusting that something will be done about it, because it would mean tearing down too many houses here. That's also uneconomical. I can't just depopulate the whole street because of that. That can't be the idea. It may make sense for some places and some areas, but I don't see that happening for my house.* (Participant 25)

Table 8: Overview Factor 1

Concept	**Key Characteristics**
Aspiration & Capabilities	Very low aspiration to leave their houses and places → low capability to move (financial abilities, property, social bonds) Critique of government action and measures
Place Attachment	Strong place attachment overall → especially social bonds: family, friends, neighbourhood
Risk & Climate Change Perception	Concerns about climate change → yet lower risk perception regarding potential threats
Demographic Represented by Factor	
Majority male (73 %)	
100% stayed in their pre-flood homes	
Majority (87%) property owners	

Factor 2 "Resettled and Determined"'s aspirations and capabilities regarding their (im)mobility are intertwined as well; however, Factor 2 aspired to leave their homes and were able to do so. In addition, they were able to improve their living situation.

> *It wasn't easy to get a house, so we're really glad – we have to knock on wood. It worked out well, and I think a lot of people had to stay behind because they just couldn't. And thank God we had the means, financially but also emotionally.* (Participant 17)

While almost all participants associated with Factor 2 left their pre-flood homes, they stayed within the town and while they do not feel rooted explicitly to Erftstadt, they expressed bonds to their families, connection with their biophysical surroundings and the overall region: "*It's not so much about the place, but more the bond with my parents, because I like spending time with them, and it's just important that we're here together*" (Participant 27). Climate change was viewed as a growing threat, and this viewpoint looked towards the government to protect them from the challenges ahead, but they found themselves disappointed. To feel prepared for a potential next flood, they stepped up and create security measures for themselves.

> *Right after the flood, I really started dealing with precautionary measures. Not ones to protect my property, but more to make sure I can take care of myself. Really making sure I have food, water, warmth, electricity – and in a way that the neighbours don't even notice [...] I don't want to end up in that situation again, standing there helpless with no options*. (Participant 19)

Table 9: Overview Factor 2

Concept	**Key Characteristics**
Aspiration & Capabilities	High aspiration and capability to leave their houses and places Higher living standard post-flood
Place Attachment	Strong family ties and high engagement with the biophysical world
Risk & Climate Change Perception	Concerns regarding government provided measures → creation of their own safety measures
Demographic Represented by Factor	
Mostly male (67%)	
All renters pre-flood	
Majority permanent move (83 %)	

Factor 3, "Uncertain place, uncertain climate", comprises viewpoints that initially aspired to leave their homes. In the long term, this aspiration played out differently for the participants, with some staying and putting this aspiration behind them, and others leaving. The most notable aspect of these viewpoints is the effect that the flood has had on participants' long-term mental health and perception of risk in daily life. Rain and bodies of water are viewed as threats, as well as the changes climate change will bring on:

> *Now, every time a flood warning comes in, I get nervous. I find myself staring at the water levels for hours*. (Participant 15)

Just now, my husband was sick, and then it rained heavily again… you can't imagine what that does to you. (Participant 26)

Although these viewpoints are greatly affected by their flood experience and concerns about their future due to climate change, they have not sought conversation with others about these topics: *"I actually don't like talking about the flood. I can't stand it. Even when others around me talk about it, I usually just leave at some point — it only stresses me out"* (Participant 15). Similar to the other factors, they do not feel safe with the flood protection measures created by the government so far, but they do view the administration more favourably:

And with the measures they tell us they've taken — you want to believe them, right? But you just don't know, not when it comes to an extreme weather event. (Participant 22)

The authorities took care of things reasonably well, I'd say. There was one person specifically assigned here, and he really did a good job. You could call him, and he'd come. That's worth acknowledging. (Participant 26)

This factor is also characterized by a lack of place attachment; while some social bonds with family members were evident in the interviews, no other social bonds, identity or connection to the biophysical environment were reported. Feelings of rootedness in Erftstadt and their respective parts of town were also low. However, a desire to stay in the general region was present: *"I'm not tied to any particular location. I don't have to stay here because of my work, my family, my friends, or my sports clubs, no. But I want to"* (Participant 22).

Table 10: Overview Factor 3

Concept	**Key Characteristics**
Aspiration & Capabilities	High initial aspiration to leave their house Strong negative effect of the flood on their mental health
Place Attachment	Low place attachment across all categories
Risk & Climate Change Perception	Strong perception of risk regarding rain, waterbodies and a potential flood More positive view on governments handling and measures
Demographically Represented by Factor	
Mostly female (60%)	
Older on average (58 years)	
Mostly renters (60%)	
Mostly stayed in their pre-flood homes (60%)	

6.3.1 Consensus Statements

While each Factor presents a distinct viewpoint, some statements were placed similarly across all factors, the so-called consensus statements:

Table 11: Overview Consensus Statements

No.	Statement	Sort F1	F2	F3
5	Moving away from the Rhineland was an option for me	-2	-2	-3
8	My place has received less attention and help than others	-3	-1	-2
10	After the flood, people came to help, from whom I did not expect it	4	3	3
12	In the beginning, there was no thought of reconstruction	-1	0	0
19	Support services provide important assistance	3	3	4
20	There is little suitable housing in my town and surrounding area to move to	1	0	1
26	When it comes down to it, every village in Erftstadt is for itself	0	-1	-2
27	I've been more socially engaged since the flood	0	-1	0

Most viewpoints were connected by their gratitude for the help and attention they had received from their community, especially from strangers from all around Germany who came to help.

> *Every street was full, people just poured into Blessem to help. We had strangers down in our basement shovelling mud out, people we didn't know, they just showed up because they wanted to do something, to help somehow.* (Participant 24)

Feelings of gratitude were also directed towards support services such as the German Red Cross, Caritas and the THW (Technisches Hilfswerk, engl.: *Federal Agency for Technical Relief*), who provided support in many different ways, from initial clean-up operations, legal and paperwork assistance, to long-term support groups.

> *We had the THW right here on our street. Their base was basically set up here. They came by every day, sometimes to help, sometimes just to check in on us, see how we were doing, talk with us. […] We're still good friends with a lot of the THW people who helped us.* (Participant 24)

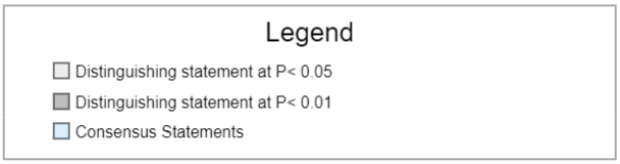
Additionally, they felt Blessem had received an overwhelming amount of attention; an often-mentioned example was the sinkhole in Blessem, which made it to the New York Times.

The consensus statements also showed a strong overall attachment to the area of the Rhineland across all factors: "*There's no way I'm moving away from the Rhineland, not even for college or anything like that. Because the mentality here suits me perfectly"* (Participant 22). While some viewpoints felt more rooted in their village or Erftstadt than others, moving away from the area was generally not an option. Other consensus statements were positioned around the middle of the matrix (-1 to 1), meaning the Factor's views were generally not too strong on them.

6.3.2 Factor 1: Staying Put, Holding On

Figure 9: Matrix Factor 1

-4	-3	-2	-1	0	1	2	3	4
2. Immediately after the flood I thought about moving out of my house/flat	8. My place has received less attention and help than others	17. The authorities take sufficient care of me	35. I perceive rain as a threat	22. My housing situation is better now than before the flood	11. I have made new friends and contacts since the flood	29. I enjoy spending time by the rivers or in nature around my town	19. Support services provide important assistance	10. After the flood, people came to help from whom I did not expect it
1. I no longer feel comfortable in my house/flat	3. Over the years I have thought about moving away from my house/flat	13. I am tied to the place through my work	34. I feel safer because of the measures that have been taken since the flood	18. The applications for relief were too complicated	20. There is little suitable housing in my town and surrounding area to move to	24. I am rooted in my place	15. My family ties me to my place	31. The flood is a consequence of climate change
	4. I have thought about moving away from my place	5. Moving away from the Rhineland completely was an option for me	12. In the beginning, there was no thought of reconstruction	27. I've been more socially engaged since the flood	14. My hobby (or club) ties me to my place	16. I am tied to my place through my friends	7. The flood will have a lasting positive impact on our local community/ neighbourhood	
		25. This is no longer my old home/ neighborhood	30. I perceive the Erft and its tributaries as a threat	26. When it comes down to it, every village in Erftstadt looks out for itself	23. I don't talk much with others about my problems caused by the flood	6. Good relationships with my neighbours have become more important to me since the flood		
		9. I was left out in the rain with no help at all	33. People have always lived with floods in this area, so there isn't much to worry about	28. Since the flood, I've been interested in the Erft and its tributaries, as well as the flora and fauna in the river	36. The flood affects me mentally	21. Moving to another house/flat permanently would have been too expensive		
				32. We have other problems than preventing another 100-year flood				



The first distinctive factor is called "Staying Put, Holding On". Examining the extreme and distinguishing statements makes clear that this factor expressed a clear aspiration to stay in both their homes (St. 2, 3) and their place (St. 4). They felt comfortable in their homes (St. 1) even after the flood and were rooted in their village (St. 24), placed importance on community within their neighbourhood (St. 6) and had a positive view of

the community. They believed that the flood experience could benefit the community as a whole in the long run (St. 7). In evaluating their own capabilities, they placed particular emphasis on the assistance and consideration they received from strangers, support services, and the press (St. 8, 10, 19). As well as feeling rooted within their place, they felt tied through family and local friends (St. 15, 16). Moving house was deemed not financially possible by this viewpoint (St. 20, 21): "*The house was ours. We don't own five houses — we only have this one. So there really weren't any alternatives*" (Participant 25). Criticism of the government's handling of the flooding and its aftermath was prevalent in this viewpoint (St. 17): *"Still, I feel like there's just no communication. You don't hear anything [...] That's a shame, really. They could include citizens much more — maybe someone out there even has a good idea"* (Participant 5). However, this viewpoint did not express a strong opinion on the difficulty of receiving government aid, which the other factors reported facing more difficulties with (St. 18). Discussions on the effect of the flood on this viewpoint's mental health were rather limited (St. 12, 23, 26). However, the mental health of family members or acquaintances was mentioned, the own struggle relativized in comparison to those severely struggling.

In terms of place attachment, this viewpoint is by far the most attached, as expressed through connection to their home (St. 1), their village (St. 24), the Rhineland (St. 5), family (St. 15) and friends (St. 16), as well as enjoyment of the surrounding biophysical world (St. 29). Despite the strong connection made between climate change and the flood (St. 31), perceptions of risk are relatively low compared to other factors, yet the threat of rain (St. 35), local rivers (St. 33), and the prospect of a future flood (St. 32) are still present for the viewpoint's participants: *"It's not like I panic when it rains, but it's always in the back of my mind. When it's pouring, I'm thinking: Hopefully nothing floods again"* (Participant 5).

As mentioned previously, Factor 1, "Staying Put, Holding On!", is the most dominant viewpoint. Factor 1 is predominantly male, at 73 percent - slightly above the overall percentage. Most participants represented by this viewpoint, 67 percent, also had children living within their household. Looking towards their (im)mobility decisions, while 60 percent moved temporarily, below the general P Set of 74 percent experiencing temporary mobility, they all returned permanently to their original housing. The property owner rate of 87 percent within this Factor fits with the return rate of 100 percent to their

pre-flood homes. Only two people lived in rented homes, one of whom rents from their parents. Most of the participants (ten out of 15) were from Blessem, with the rest from Liblar, Ahrem and Kierdorf.

6.3.3 Factor 2: Resettled and Determined

Figure 10: Matrix Factor 2

-4	-3	-2	-1	0	1	2	3	4
34. I feel safer because of the measures that have been taken since the flood	32. We have other problems than preventing another 100-year flood	5. Moving away from the Rhineland completely was an option for me	26. When it comes down to it, every village in Erftstadt looks out for itself	1. I no longer feel comfortable in my house/flat	3. Over the years I have thought about moving away from my house/flat	29. I enjoy spending time by the rivers or in nature around my town	19. Support services provide important assistance	22. My housing situation is better now than before the flood
13. I am tied to the place through my work	17. The authorities take sufficient care of me	14. My hobby (or club) ties me to my place	27. I've been more socially engaged since the flood	24. I am rooted in my place	7. The flood will have a lasting positive impact on our local community/ neighbourhood	31. The flood is a consequence of climate change	2. Immediately after the flood I thought about moving out of my house/flat	15. My family ties me to my place
	21. Moving to another house/flat permanently would have been too expensive	16. I am tied to my place through my friends	33. People have always lived with floods in this area, so there isn't much to worry about	36. The flood affects me mentally	30. I perceive the Erft and its tributaries as a threat	4. I have thought about moving away from my place	10. After the flood, people came to help from whom I did not expect it	
		23. I don't talk much with others about my problems caused by the flood	9. I was left out in the rain with no help at all	35. I perceive rain as a threat	20. There is little suitable housing in my town and surrounding area to move to	28. Since the flood, I've been interested in the Erft and its tributaries, as well as the flora and fauna in the river		
		25. This is no longer my old home/ neighborhood	8. My place has received less attention and help than others	12. In the beginning, there was no thought of reconstruction	6. Good relationships with my neighbours have become more important to me since the flood	18. The applications for relief were too complicated		
				11. I have made new friends and contacts since the flood				

Legend

- Distinguishing statement at P< 0.05
- Distinguishing statement at P< 0.01
- Consensus Statements

"Resettled and Determined" is the second distinctive factor within this Q Method Analysis. Studying the placements of the factor, it becomes clear that the main aspiration of this viewpoint was to leave their pre-flood home (St. 2, 3) and place (St. 4), while wanting to stay in the Rhineland (St. 5). Regarding their capabilities, they viewed themselves as financially able to move (St. 21) and conclude that their housing situation was better than before (St. 22). While this viewpoint does not rank the floods affect on their mental health very high (St. 36), they were however most comfortable out of all factors to express their feelings about the effects of the flood to others (St. 23). While Factor 1 also views the authorities and governments actions as lacking, this viewpoint

viewed the government in an even more negative light and felt abandoned by them (St. 17).

> *When I walk up along the Erft, I don't see anything that's been done. Any retention basins or something – haven't seen any of that. Everything looks just like before. And I think that's a shame, because there were announcements that something would really be done.* (Participant 27)

The feeling of abandonment by the government also ties in with this factors' feeling towards the flood's connection to climate change and perception of risk: they urged that preventing a potential next flood is important (St. 32) and did not feel protected by the measures taken (by the government) three years post flood (St.34). Due to not feeling safe at the hands of the government participants created safety measures for themselves from emergency rations over household reorganization to physical flood protection: "*We've made other preparations now – like an emergency backpack and that kind of thing, and the cat carriers are upstairs"* (Participant 17). Regarding this factor's attachment to their place, the data reveals strong family ties (St.15), yet no other strong social bonds. They did not feel especially rooted in their place (St. 24), bound by local friends (St. 16), work (St. 13) or hobbies (St. 14). The viewpoint, however, did express appreciation for their immediate biophysical environment (St. 28, 29).

> *I really enjoy spending time by the rivers or in nature. It's just beautiful here, you know? I treated myself to a bike this year, because I also need to process all of this somehow and finally put myself first again, instead of just the house [...]. And when I go across the street here, [...] and then into the fields, I can ride 15, 16 km just on dirt roads. And that's just great.*
>
> (Participant 19)

The participants behind this viewpoint were predominantly male at 67 percent, and all lived in rental homes at the time of the flood. Immediately after the flood, they moved temporarily, and except for one, they moved permanently as well. This behaviour is in stark contrast to the overall P Set, where only 26 percent moved permanently overall and only 41 percent were renters. After the flood one participant purchased a home and is now living in their own property, while the remaining five participants continue to live in rental housing. The majority, 83 percent, of the participants ranked themselves as strongly affected by the flood. Most, also 83 percent, stemmed from Blessem, one

participant from Bliesheim, and now live in Blessem, Lechenich, Bliesheim and Friesheim. This viewpoint presents the most financially mixed participants, including some with a net income of up to 2,000 Euros and some more than 10,000 Euros per month. Within this viewpoint also only one participant, 17 percent, reported living with their minor child, the least of all factors.

6.3.4 Factor 3: Uncertain Place, Uncertain Climate

Figure 11: Matrix Factor 3

-4	-3	-2	-1	0	1	2	3	4
9. I was left out in the rain with no help at all	5. Moving away from the Rhineland completely was an option for me	28. Since the flood, I've been interested in the Erft and its tributaries, as well as the flora and fauna in the river	24. I am rooted in my place	4. I have thought about moving away from my place	17. The authorities take sufficient care of me	35. I perceive rain as a threat	10. After the flood, people came to help from whom I did not expect it	31. The flood is a consequence of climate change
33. People have always lived with floods in this area, so there isn't much to worry about	14. My hobby (or club) ties me to my place	26. When it comes down to it, every village in Erftstadt looks out for itself	7. The flood will have a lasting positive impact on our local community/ neighbourhood	3. Over the years I have thought about moving away from my house/flat	21. Moving to another house/flat permanently would have been too expensive	18. The applications for relief were too complicated	36. The flood affects me mentally	19. Support services provide important assistance
	32. We have other problems than preventing another 100-year flood	22. My housing situation is better now than before the flood	11. I have made new friends and contacts since the flood	15. My family ties me to my place	20. There is little suitable housing in my town and surrounding area to move to	23. I don't talk much with others about my problems caused by the flood	2. Immediately after the flood I thought about moving out of my house/flat	
		16. I am tied to my place through my friends	13. I am tied to the place through my work	12. In the beginning, there was no thought of reconstruction	34. I feel safer because of the measures that have been taken since the flood	30. I perceive the Erft and its tributaries as a threat		
		8. My place has received less attention and help than others	1. I no longer feel comfortable in my house/flat	6. Good relationships with my neighbours have become more important to me since the flood	29. I enjoy spending time by the rivers or in nature around my town	25. This is no longer my old home/ neighborhood		
				27. I've been more socially engaged since the flood				

Legend
- Distinguishing statement at P< 0.05
- Distinguishing statement at P< 0.01
- Consensus Statements

The third and final factor is "Uncertain Place, Uncertain Climate". The factor expressed an initial strong aspiration to leave their homes immediately after the flood (St. 2); this desire died down over time or was met (St. 3, 4). The aspiration to stay in the Rhineland however was always present (St. 5). Examining their capabilities reveals a deep appreciation for the help they received from others (St. 9.10), support services (St. 19), and even the government (St. 17). They are the only factor that feels supported and even protected by government measures (St. 34). While the ranking is only slightly positive

(both ranked at +1), this viewpoint views them far more favourably than the other two factors. They also perceived their housing situation as worse than before the flood (St. 22) and felt overwhelmed by aid applications (St. 18), as well as being financially unable to move within the region (St. 20, 21). Out of all the factors, this viewpoint was the least attached to their place: except for a slight positive attachment to their biophysical surroundings (St. 29), they presented no strong place ties due to family (St. 15), friends (St. 16), hobbies (St. 14) or work (St. 13), nor a general rootedness within their place (St. 24). Generally, they felt that they no longer lived in their old neighbourhood after the flood (St. 25): *"It's not my old home anymore. Too much has changed — it just isn't the same"* (Participant 26). Concerns about climate change and perceptions of flood risk were greatest within this viewpoint. Worries about a potential next flood were high (St. 32, 33), rain and local rivers were viewed as a threat (St. 30, 35) and a clear connection between overall climate change and their situation was drawn (St. 31). They expressed deep affection to their mental health (St. 36): "*Light rain is fine. But as soon as it gets heavier, I get nervous and even have trouble falling asleep at night"* (Participant 15). However, they did not seek conversations with their peers about the flood (St. 23).

The demographic data reveals that this viewpoint was the only Factor representing a majority of female participants, at 60 percent. Additionally, the participants supporting this viewpoint were older on average (58 years, compared with the overall average of 47 years). None of these participants lived with children under 18, and they were generally part of a smaller-than-average household (two people). Regarding (im)mobility, this viewpoint had a mixed background: 60 percent lived in rental homes both before and after the flood. While 80 percent moved temporarily after the flood, 40 percent moved permanently. However, both of those who moved permanently lived in rental housing. The third person renting within this viewpoint reported being less affected and stayed in their pre-flood home. Participants from this factor came from Liblar, Blessem and Ahrem, and at the time of the interviews, they lived in these places as well as Friesheim.

6.4 Nuances and Contradictions

The creation of factors makes the results seem very clear and orderly, homogeneous within themselves and separate from each other. While the created factors are distinctive in both a statistical and a narrative sense, the lines are sometimes more

blurred than the distinct factors suggest. The contradictions and questions that arise when studying the factors and the collected data more closely will be discussed in this section.

6.4.1 Aspirations and Capabilities Focus

Looking back at the Theory Chapter (3.2 Aspirations-Capabilities Approach), Schewel (2019) presents her version of the four (Im)Mobility categories derived from the aspirations-capabilities framework. Next, the three factors will be sorted into these categories.

Factor 1, “Staying Put, Holding On”, can be categorized as “Acquiescent Immobility” due to their desire to stay in their homes and their low capabilities to leave them. This desire stems from an attachment to their homes (financial and identity-related), to family, to their social structures of friends and neighbourhood, and to their surrounding nature. However, as their capital is tied up in their homes, they are financially hindered from leaving and thus cannot move away: “*If the place is truly unlivable, you can’t sell it. Then it’s basically worthless, and you don’t have any capital to put into something else”* (Participant 5).

Secondly, Factor 2, “Resettled and Determined”, can be placed within the “Mobility” category. They aspired to leave their homes and, as renters with few financial ties to their homes, were able to do so. In addition to being financially able, they also felt less rooted. However, they were still socially tied to their places, especially through family bonds and their appreciation of their biophysical environment. As they remained in Erftstadt, they were able to maintain these connections and their bond with the local landscape, thus avoiding the need to sacrifice their attachments while changing places.

Factor 3, “Uncertain Place, Uncertain Climate”, cannot easily be placed into one of the four (im)mobility categories and seems to hover over the categories. Participants represented by this factor initially had a strong aspiration to leave, with some doing so and some staying. Those who left their homes before the floods can be placed in the “Mobility” category. It is more difficult to place those who stayed, but they could be placed in the space between “Involuntary Immobility” and “Acquiescent Immobility”. Although they stated that their desire to leave had diminished over time, they reported financial constraints and difficulties with aid applications. This raises the question: Can

you aspire to do something you know you are unable to do? The placement of Factor 3 on this (im)mobility diagram is further complicated by the fact that other themes played a larger role in its formation. While aspirations and capabilities regarding staying or leaving dominated the formation of Factors 1 and 2, participants falling under Factor 3 were more diverse in their (im)mobility aspirations and capabilities, yet bound together by statements about their struggles with mental health, lack of place attachment, and high perception of risk.

The difficulties with categorizing Factor 3 also have consequences for the placements of Factor 1 and Factor 2, raising the question of whether they were too easily placed. While they each fulfil the requirements of the aspirations and capabilities axes of the (im)mobility diagram, the same question as with Factor 3 must be asked: Can you aspire to do something you know you are unable to do? Factor 1 overwhelmingly represents homeowners, whose capital is tied to their homes; thus, they cannot leave. Factor 2 represents renters who are not tied to their homes, but who also have limited decision-making power regarding the future of the property in which they live. All three factors reveal that the participants' aspirations and capabilities are inextricably linked and highly challenging to untangle.

6.4.2 Place Attachment Findings

Turning attention to place attachment: Regarding the participants' place identity and dependence, Factor 1 stands out as indicating a stronger sense of rootedness than the other factors. However, there was a lack of data to explain why this was the case. Overall, work was not considered a binding factor. While there was a lack of data here as well, it should be noted that the Rhineland is an urban area where jobs are not necessarily tied directly to one's immediate place of residence. Additionally, post-pandemic work-from-home measures were mentioned.

Social bonds were considered the strongest attachment element, especially ties to family. Although there was a stark contrast in ratings between Factor 3 (placed at 0), Factor 1 (placed at +3), and Factor 2 (placed at +4), interviews with participants in Factor 3 revealed that family is a binding factor for them as well. This attachment was strengthened by the fact that most participants originated from Erftstadt or the surrounding area, meaning their families tended to live close by. Attachment to friends in

the local area presented a more divided picture: Factor 1 praised their local friendships, whereas Factors 2 and 3's friendship circles tended not to be as locally based. In these two Factors, the participants emphasized the close relationships they have with their widely dispersed contacts. The importance of neighbourhood relations was highlighted by participants of Factor 1; Factor 2 also communicated a positive connection to them, while Factor 3 viewed themselves as more distant from their immediate community. Overall, attachment due to hobbies or club membership did not appear to be a noteworthy aspect.

A general appreciation for and bond with the biophysical environment were present in all factors, with a slightly stronger attachment in Factors 1 and 2. Participants highlighted the surrounding nature as a binding factor and a place to find rest and calm. In conclusion, family bonds were by far the most important attachment, followed by their connection to their local biophysical environment.

6.4.3 Gender Dynamics

While gender was not a focal point of this study, it naturally came up during the research process. Factor 3 was the only predominantly female factor to emerge from the study, so gender must be considered when examining this factor more closely. This becomes especially apparent regarding the (negative) effect of the flood on participants' mental health. Factor 3 ranked Statement 36, "The flood affects me mentally," the highest at 3; Factor 1 ranked it at 1, and Factor 2 at 0. However, this difference becomes gendered when looking past the gender-imbalanced factors and considering the individual participants. In addition to the difference between factors regarding the placement of Statement 36, it can be observed that men, on average, ranked the statement at 0, non-binary people at 1, and women at 2. No women ranked this statement negatively, while a total of five men (28 percent of men surveyed) placed it in the negative section of the matrix, with some even placing it in the extreme section. Interestingly, the men who negatively ranked these statements were either younger than 25 years or 65 years and over, with those of older age ranking it in the extremes. While a larger number of men than women or non-binary people were considered in the study, this does not explain the substantial difference. A general trend observed among those who ranked Statement 36 closer to the negative end of the matrix was the tendency to compare themselves to

others, believing their struggles to be less significant than those of their family members or social circle. However, as the study was not focused on mental well-being and gender differences, this trend was not further explored. Interestingly, no clear gender divide could be observed when it came to talking about their struggles with their peers (St. 23).
A similar, albeit less distinctive, trend could be observed in terms of risk perception. Factor 3 scored concerns about rain (St. 35), local water bodies (St. 30), and a potential next flood (St. 33) the highest out of all the factors. A difference between genders was especially visible regarding Statement 35, "I perceive rain as a threat": while men on average rated it at -1, non-binary people and women rated it at 1. Among those who did not perceive rain as a threat, a trend could be observed: they spoke of the fears and anxieties of those around them, especially those struggling with their mental health in the aftermath, and found themselves less affected in comparison. However, the general sentiment on rain across factors and genders was: "*[Y]ou do perceive rain differently now"* (Participant 24).

In addition to the empirical data collected in matrices, data sheets and interviews, the community meetings and personal conversations provided a window into how the community as a whole and within families dealt with the flood. Alongside the Q sessions with participants and the expert interviews, many informal conversations were undertaken with a variety of residents, both in the lead-up to and during the fieldwork. Two community meetings were also attended, which made it possible to observe everyday conversation about the flood among affected persons, as well as gendered dynamics. Both community meetings, of the Flood Initiative (Hochwasserinitiative Erftstadt) and the Flood Café (Caritas Flutcafé), were attended by residents affected by the flood. The Flood Initiative, meeting about once a month, was composed mostly of men over 50. At this meeting, 14 people attended: 12 men and two women. The initiative's mission is to monitor government and city progress on flood protection, attending both internal meetings and city events to stay informed and push for change. Discussions were lively, with differing views on strategies and pressures to apply to officials. One member stated in an informal conversation afterward that, while he did not enjoy the meetings, he felt it was his duty to participate. The Flood Café, hosted weekly by Caritas, brought community members together to share experiences of the flood and rebuilding efforts, provide support, and create a meeting space. Conversations went beyond the flood, touching on

personal relationships and health. In contrast to the Flood Initiative, most attendees were women over 60.

As previously mentioned, 67 percent of the participants were male, as the recruitment process was unable to attract women to the same extent. While some households had partners of both genders who wanted to be interviewed, most only had one partner interviewed, who was usually a man. Participants acknowledged this observation in informal conversations and explained that, in their mostly heterosexual relationships, the man would generally take care of the rebuilding process, including insurance and aid claims, while the woman would take care of the day-to-day organization. Consequently, the man would have more knowledge about the flood. Additionally, different behaviours between genders could be observed during the recruitment process. Although participants were informed about the study and provided with contact information during both community meetings and one-on-one conversations, no members of the Flood Café could be recruited for the study, despite multiple members of the Flood Initiative taking part. Members of the Flood Café stated that their perspective would not be important to the study and seemed wary of being interviewed.

7. Discussion

7.1 Interpretation and Connections

Returning to the main research question of this thesis: *What are the subjective understandings of Erftstadt's residents regarding their (im)mobility aspirations and capabilities after the 2021 flood?*

Firstly, bearing in mind the work of Schewel (2019), immobility must be defined for this specific project: what does mobility mean within this thesis? The spatial and temporal frames of immobility were predefined in the research design, as the thesis only considered individuals who remained within the official city limits between July 2021 and July 2024 — from the time of the flooding until the conclusion of the fieldwork. Therefore, those who lived in Erftstadt prior to the flood and stayed there afterwards are considered immobile. While the study population is immobile at a macro level, individual (im)mobilities at a local level are more diverse. While some stayed in the same house,

others moved within their streets, and some even moved across town. Thus, it is not contradictory to place Factor 2 within the 'mobility' category of the four categories on the (im)mobility diagram, since mobility and immobility can coexist at different scales depending on the context (Schewel, 2019).

As discussed in Chapter 6.4.1, "Aspirations and Capabilities Focus," categorizing the factors according to Schewel's (2019), building on Carling (2002) and de Haas (2003, 2006, 2014), (im)mobility categories proved difficult. A similar observation was made by Upadhyay et al. (2024), who found that gender created blurriness between the involuntary and voluntary immobility categories in the Indian Himalayas. These norms and power structures regarding gender influenced the aspirations as well as capabilities so strongly that they cannot be viewed without considering the effect of gender. While gender does not appear to affect the Erftstädters' (im)mobility or their aspirations to stay or leave post-disaster, homeownership creates this blurriness in this context. Aspirations and capabilities are intertwined, as one needs the capability to aspire in the first place. As Homeowners are bound to their homes because their capital is tied up in their property, and insurance payments are tied to the affected home, do they have the capacity to aspire to anything beyond staying? A similar observation of binding homeownership was made by Tinoco (2023) when studying the Californian wildfires. How could they aspire to leave if it is outside the realm of their perceived possibilities? Can you aspire to something you cannot imagine? However, it is too simplistic to assume that homeowners are staying involuntarily, and renters are leaving involuntarily. Here, McMichael et al. (2021)highlight in their study of low-lying villages in Fiji and Tuvalu, that facing barriers to mobility and the aspiration to stay are not mutually exclusive. Owning a home usually involves envisioning staying in a place long-term. Thus, the aspiration to stay of Factor 1 also continues long-term plans and aspirations (Rhodes & Besbris, 2022; Windsong, 2010). Despite the difficulties of categorizing real-life viewpoints into four ideal categories, the aspirations and capabilities framework provides a useful heuristic tool for exploring the (im)mobility perceptions of Erftstadt's residents post-flood in a structured way. Furthermore, it is not necessary to fully disentangle aspirations from capabilities, or vice versa. Instead, it is important to understand that they are intertwined and dependent on each other.

Place attachment played a significant role in the aspirations of Factors 1 and 2 to stay in the town, with family creating the strongest bonds to place. Although social bonds

are categorized in this study mainly as place attachment, there is substantial overlap between the categorization of statements as place attachment or aspirations-capabilities: Family is a binding factor in the viewpoints, but also creates aspirations and capabilities. The aspiration to stay close to their loved ones, who give them the capability to stay by supporting them by rebuilding or helping with childcare, as well as preventing them from leaving due to the need for care or support, e.g., elderly parents. For Factor 1, neighbourhood connections and local friendships were also an important form of attachment, as well as a general sense of rootedness. By organizing themselves through organizations such as the Flood Initiative, they were able to build community resilience by holding their local authorities accountable regarding protection and rebuilding measures (Adger, 2003; Aldrich & Meyer, 2014; Carone et al., 2025; Morrison, 2024; Weir et al., 2023). This makes social bonds a key factor within the aspirations and capabilities framework (Haney, 2019; Massey, 1999). Factors 1 and 2 increased their communal and individual capabilities by preparing for a future flood and dealing with the aftermath of this flood. Additionally, Factor 1 and Factor 2 viewed the biophysical environment in and around Erftstadt — including its flora, fauna, and waterways — as a feature that anchored them to their home. They appreciated the calm and peace, as well as the opportunity to enjoy walks and bike rides. This connection also helped them to cope with the flood, its aftermath and the rebuilding process.

Until now, the topic of mental health has mainly been discussed in connection with Factor 3. This factor reported the most severe effects on mental health, with both rain and local water bodies being viewed as risk factors. Fears and trauma triggered by stimuli such as rain or high water levels, as noted in Factor 3 and also mentioned by other factors, are common responses to disaster (Bird, 2013; Dolák Klemešová & Andráško, 2015). The overall data revealed a gender divide regarding mental health, even outside the boundaries of the factors. While women generally reported a greater impact of the flood on their mental health than average, viewpoints expressed by young men and some older men negated any impact of the flood on their mental health. While Lowe et al. (2013) found that women and the elderly are generally at greater risk to their mental and physical health, and Factor 3 represented a predominantly female and older demographic, no definitive conclusions can be drawn about the role of gender and age in this context, as the study design covered mental health but did not focus on it sufficiently.

The theme of gender also arose in the context of the recruitment process, with men being much more willing to participate than women and non-binary individuals. Interestingly, Truedinger et al. (2023), who studied decision-making regarding (im)mobility in the Ahr Valley after the same flood, had a similar experience with recruitment for their study. They assumed that the traditional division of labour, particularly in the aftermath of the flood, where men were responsible for aid applications, led to their greater participation in the study. This thesis made a very similar observation, with informal conversations on this topic revealing that, within households, duties are conservatively separated, with men being considered more knowledgeable about the flood and thus participating in the research, even though specific "knowledge" was not required. Despite these gendered differences in the recruitment process, this study did not find differences in (im)mobility between genders, as Upadhyay et al. (2024) observed in their study of Himalayan communities in India, where the post-flood social environment appeared to be gender-segregated. While men dominate the policy discourse in Erftstadt, particularly in organizations such as the flood initiative, women seem to be taking care of the community and domestic sphere, creating normality in a post-flood world (Harada, 2000; Sims et al., 2009). As gender was not part of the study design, it was not examined systematically, as were other themes. However, these observations must be noted and should be investigated further in the future.

Risk was perceived differently across the different Factors. While Factor 3 generally perceived the risk of a new flood, rain and local water bodies the strongest and expressed fear and anxiety, perceptions of risk also played a role for the other factors. The other factors expressed their perceptions of risk in different ways: Factor 2 took private measures to mitigate flooding risk, and Factor 1 rebuilt their homes (more flood-safe). None of the factors expressed a sense of safety regarding the public safety measures created so far; however, Factor 2 expressed the greatest concern. Additionally, Factors 1 and 3 saw a stronger connection between climate change and the flood. While Factor 2 also saw this connection, they emphasized human error as the cause of the disaster. As they saw insufficient progress in public measures, they created their own. While Factor 1, as homeowners, focused on building flood protection measures such as flood gates, Factor 2, as renters, focused on mobile flood protection measures such as emergency rations and sandbags.

Overall, views on how the local and national governments handled the flood itself, its aftermath and the rebuilding process were unfavourable. Additionally, relief application processes were perceived as rather difficult, particularly by older residents. The government's actions in the rebuilding process, mitigation and adaptation were considered too slow, too bureaucratic and not inclusive of residents' input, with difficult communication overall. Such criticism of the government is common in post-flood contexts, as people generally view these disasters as the result of human action and governmental error (Lave & Lave, 1991). Furthermore, Bird (2013) and Henstra et al. (2019) demonstrate that residents favour public protection measures over private ones and consider the government responsible for them. If interactions between the government and residents are positive, however, and protection is provided, the recovery process and residents' mental health can improve significantly (Butler et al., 2018). While critical overall, most residents expressed gratitude towards a government that provides support, albeit not always in a timely manner.

In the local context, the results found in Erftstadt are similar to those of other studies on the same flood. As in the Ahr Valley, participants in Erftstadt also reported mental health issues related to the flood (Klör et al., 2025). Furthermore, similar to other regions, Erftstadt's residents, especially Factor 1 and 2, called for better information and citizen involvement, as well as faster progress in flood adaptation and mitigation measures (Meyer & Johann, 2025; Ommer et al., 2024; Truedinger & Birkmann, 2025). Truedinger et al. (2023), who studied the motivation of Ahr Valley residents to stay or leave, found similar results regarding decision-making: homeownership was considered by far the most influential factor in deciding to stay; however, place attachment was also considered a deciding factor in choosing to stay in place.

What does this mean for Erftstadt? Those who remained in Erftstadt three years after the flood generally wanted to stay due to their attachment to the place, in particular to their family and local friends, as well as to their neighbourhood and the surrounding biophysical environment. A sense of identity connected to the area was also important, especially for Factor 1, which represented over half of the study participants. Additionally, it was revealed that homeowners and renters have different aspirations and capabilities regarding their (im)mobilities, which highlights that their needs must be addressed in different ways by the authorities. Furthermore, mental health issues arising from the flood

and its aftermath are still evident in the community, even three years later. Therefore, sufficient long-term mental health support for the community is necessary. Perception of risks regarding a new flood was not high enough for a call for relocation to be made by participants; however, residents did not express feelings of safety. There was a clear demand for a faster implementation of public protection measures, as well as improved communication between residents and their government.

7.2 Limitations

Both the study design and the results have limitations that must be discussed in order to gain a critical understanding of the findings and their implications. Firstly, Q Method itself has a theoretical limitation: Q Methodology posits that a specific population has only a limited number of viewpoints on a given topic, which can be captured by a Q Set (Brown, 1980). These viewpoints are then categorized as distinctive and homogeneous. While it is possible to group viewpoints, the individuality of the people behind these viewpoints, who comprise the factors, must be highlighted, and differences even within the factors must be noted to fully comprehend the situation. Even though these individuals share views, they are not homogeneous.

While a P Set of 27 was sufficient to produce three distinct factors, other literature using Q Method in the context of climate change and immobility had P Sets containing approximately twice as many participants. Perhaps interviewing more participants would have enabled the creation of more distinctive, robust, and nuanced factors. As this is a thesis with limited resources, it was not possible to collect a larger P Set.

In hindsight, the statements could have been improved: Although two test interviews were conducted, conducting one or two more would have been beneficial to ensure the setup, explanations, and statements were as intuitive as possible. Throughout the fieldwork, certain limitations of the statements became apparent. For example, negatively phrased statements, such as Statement 12: “In the beginning, there was no thought of reconstruction,” proved to be complicated at times. This was because, when they were sorted into the negative section of the matrix, they had to be understood as double negatives. While this confusion could be resolved through communication during the sorting process or in the subsequent interview, it made the process more challenging for participants. Secondly, some details regarding time and location were lost:

Statements 1 to 4 sound very similar, differing only in the time frame (“over time” or “immediately after”) and the location (“home” or “place”). However, because they sounded so alike, some participants overlooked the small differences. In future studies, the wording should be more varied to make the statements more distinguishable. Thirdly, as is typical in Q Method, different interpretations of the same statement occurred here as well. While it was expected that participants would interpret statements to a certain extent differently, some statements could have been worded more clearly and concisely to reduce strongly varied interpretations. The most notable example was Statement 34: “I feel safer because of the measures that have been taken since the flood.” Some participants interpreted this as referring to government measures, while others interpreted it as referring to their own measures. Although the interviews shed light on how each participant interpreted the statement, this nonetheless made overall comparisons more difficult, which are essential in Q Method. To clearly communicate which measures were meant, and to understand how participants view their own measures compared with the government’s, it would have been helpful to split this statement into two.

Since Q Method is a participatory approach, participant involvement is crucial for the study. However, the setup and application of the Q Method proved more complex in practice than anticipated in theory. One interview had to be cut short, as the participant was unable to complete the process of independently sorting the statements. An age limit was introduced to exclude those under 18 years of age for ethical reasons; however, in future studies, an upper age limit should be considered.

On a final note regarding the limitations of Q, the use of Q method to explore subjective understandings of (im)mobility in Erftstadt yielded a very large amount of data, especially qualitative data. While this thesis was able to include most of the quantitative data collected, the qualitative data was too extensive to be represented adequately within this thesis. Therefore, some detail and exploration were ultimately lost in the process; however, the qualitative data could be further explored in future publications.

Although the financial constraints of the post-flood situation were not the focus of the study, they ultimately play a major role in decision-making processes regarding whether to stay or go, shaping both aspirations and capabilities. The financial situation was addressed through Statements 20 and 21, which touched on participants’ finances

regarding housing, along with the data sheet question on net household income. (St. 20: “There is little suitable housing in my town and surrounding area to move to” and St. 21: “Moving to another house/flat permanently would have been too expensive”) However, this was insufficient to adequately assess financial capabilities. This limitation was evident during the development of the research design; however, as household finances are complex and private, it was felt that no additional pressure should be placed on these questions, nor should they be the focal point of the study. Thus, the financial aspect of the decision-making process is underrepresented in the statements. Nevertheless, as homeownership was an important demographic feature of participants associated with Factor 1 and renting was associated with Factor 2, the financial aspect did emerge in the results, providing a more holistic view of aspirations and capabilities than initially predicted.

As previously mentioned, this study experiences a notable gender imbalance, with 67 percent of participants being male and thus disproportionately representing their viewpoint. However, this issue seems not to be uncommon in this particular region and flood context, as Truedinger et al. (2023) faced a similar challenge in their study of the same flood in the Ahr Valley. Nevertheless, this overrepresentation also mirrors the community structures in Erftstadt. As a result, the perspectives and realities of women and non-binary individuals are less visible in both the study and the broader public discourse. Although efforts were made to include women and non-binary individuals, limited success was achieved due to the conservative division of post-flood responsibilities and assumptions about which knowledge is deemed valuable.

To gather a diverse group of participants, various recruitment methods were used: multiple organizations were contacted, community members shared flyers both offline and online, and advertisements appeared in the local newspaper and were promoted on the local radio station. However, more active community members were generally overrepresented, both because they were more likely to learn about the study through multiple channels and because they were more willing to participate and share their views. Additionally, the experiences of those heavily affected by the flood due to mental or physical health challenges were underrepresented, as these issues hindered their ability to participate, despite their experiences being frequently referenced by other participants.

During the fieldwork, two community events and one educational session on the Erft were attended. However, due to time and location constraints, not all of the invited events could be attended, including a documentary premiere, an exhibition opening, and Flood Remembrance Day. Although immersion was not a formal part of the research design, it provided a better understanding of the community, its views, and its structures. Nonetheless, growing up in the area meant that an inherent understanding of the region's culture and community dynamics was already present.

This research design defined immobility as staying within the town limits of Erftstadt. It did not consider those who moved to neighbouring towns, which could sometimes be closer than moving across town. Although a more open definition of immobility might have produced interesting results, this definition was selected to establish clear boundaries and effectively communicate the target audience for the call for participants.

Finally, the results of this study cannot be generalized beyond the specific study setting. This is due to two reasons: first, the nature of Q makes generalization difficult, and second, the study design was limited (Amin, 2000). Most Q studies, such as those by Oakes (2019) and van der Geest et al. (2019), involved larger household studies from which Q participants were selected. This allows for a wider range of perspectives and a better representation of community opinions, making the findings more generalizable than those of the P Set in this study. Therefore, the results should primarily be used to understand the post-flood context in Erftstadt, especially regarding the subjective views of individuals more engaged in the community.

7.3 Future Research

The body of work on immobility, particularly regarding the aspirations and capabilities framework, has been expanding in recent years. However, more work can and needs to be done. This thesis found a blurriness between immobility categories and thus reached the limitations of the aspirations and capabilities framework. Additional research is required to refine the existing framework or even develop a new one with categories that can accommodate such complexities, enabling a more comprehensive study without fragmenting relationships that should be considered as whole units.

Regarding Q method, much research remains to be done. Currently, Q is rarely used to study immobility and climate change, especially not in post-disaster settings. However, Q method, as a participatory approach to understanding a community's perceptions, can be valuable for exploring decision-making processes, aspirations, capabilities, place attachments, risk perceptions, and other aspects such as gender or injustices. Additionally, Q has not been applied in the context of immobility and climate change in the Global North and has predominantly been applied in the Pacific (e.g. Oakes, 2019; van der Geest et al., 2019). Therefore, more research should be conducted outside this particular geographic area.

While gender emerged during fieldwork and was acknowledged in the results, the research design did not include it. Thus, findings regarding gender could only be observational and not conclusive. In addition, it was challenging to gather literature on similar cases in the Global North. Generally, gender dynamics in the Global North at the household level, especially in post-disaster contexts, remain under-researched, thus hindering understanding of how gender shapes experiences, aspirations, and capabilities there.

Plenty of research can also be conducted in Erftstadt: since this thesis only examined those who remained in Erftstadt after the flood, a valuable comparative study could examine those who moved out of Erftstadt, whether to distant locations or nearby towns. Such a study could offer insightful results regarding place attachment. To build on this work, an investigation into the policy landscape and the responsibilities of Erftstadt, as well as the federal and national governments, regarding flood protection, mitigation, and response, could be undertaken. When combined with the findings of this thesis, this could lead to targeted policy recommendations for different government levels to improve preparedness and enhance communication between authorities and citizens.

8. Conclusion

This thesis examined the subjective understandings of Erftstadt residents' (im)mobility aspirations and capabilities in the aftermath of the 2021 flood. These understandings were analyzed using Q Method and yielded three overarching factors: Factor 1, "Staying Put, Holding On", Factor 2, "Resettled and Determined", and Factor 3,

“Uncertain Place, Uncertain Climate”. Although characterized by differences, certain similarities emerged between the viewpoints, such as gratitude towards aid organizations and volunteers, and the aspiration to remain in the region. In terms of their (im)mobility, the studied population was immobile at the regional and national scale, yet showed greater diversity in their (im)mobility on a local scale. Overall, family was considered the most important attachment across all factors; to a lesser extent, bonds with the biophysical environment were exhibited.

The differences among the factors centred on homeownership, social bonds, mental health, and perceptions of risk. Homeownership played an essential role in distinguishing Factors 1 and 2, with Factor 1 associated with homeownership and Factor 2 with renting. While within both factors, their aspirations met their capabilities: Factor 1 aspiring to stay and being able to stay and Factor 2 aspiring to leave and be able to leave their pre-flood homes, the question was posed whether they could aspire otherwise? These findings show the interwoven nature of aspirations and capabilities, thereby pushing the aspirations-capabilities framework to its limits.

Factor 3 highlighted the effects of the flood on residents’ mental health, showing the need to provide psychological and community support continually. Additionally, Gender emerged as a theme in the results due to the gender imbalance in participant recruitment, pointing out the need to study gender roles in Global North post-flood contexts. Regarding Erftstadt, a next step could be to analyze the responsibilities of different levels of government concerning flood adaptation, mitigation, and response. In combination with the results of this thesis, targeted policy recommendations for preparedness and improved communication could then be developed.

So, why did they stay? Homeownership and place attachment are the short answer. All in all, this thesis highlights the perspectives of those who remained in Erftstadt after the flood, highlighting post-flood perceptions in a world of increasing disaster risk.

9. References

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10. Appendix

Appendix A: Crip Sheet Factor Overview

No.	Statement (German original)	Statement (English translation)	F. 1	F. 2	F. 3
1	In meinem Haus/Wohnung fühle ich mich nicht mehr wohl	I no longer feel comfortable in my house/flat	-4	0	-1
2	Direkt nach der Flut habe ich über einen Wegzug aus meinem Haus/Wohnung nachgedacht	Immediately after the flood, I thought about moving out of my house/flat	-4	3	3
3	Im Laufe der Jahre habe ich über einen Wegzug aus meinem Haus/Wohnung nachgedacht	Over the years, I have thought about moving away from my house/flat	-3	1	0
4	Ich habe darüber nachgedacht aus meinem Ort wegzuziehen	I have thought about moving away from my place	-3	2	0
5	Aus dem Rheinland ganz wegzuziehen, kam für mich in Frage	Moving away from the Rhineland completely was an option for me	-2	-2	-3
6	Mir sind gute Beziehungen zu meinen Nachbarn wichtiger seit der Flut	Good relationships with my neighbours have become more important to me since the flood	2	1	0
7	Die Flut wird unsere Ortsgemeinschaft/Nachbarschaft nachhaltig positiv beeinflussen	The flood will have a lasting positive impact on our local community/ neighbourhood	3	1	-1
8	Mein Ort hat weniger Aufmerksamkeit und Hilfe bekommen als andere	My place has received less attention and help than others	-3	-1	-2
9	Ich wurde im Regen stehen gelassen, da ist keinerlei Hilfe gekommen	I was left out in the rain with no help at all	-2	-1	-4
10	Nach der Flut kamen Leute zur Hilfe, von denen ich es nicht erwartet habe	After the flood, people came to help, from whom I did not expect it	4	3	3
11	Seit der Flut habe ich neue Freunde und Kontakte gewonnen	I have made new friends and contacts since the flood	1	0	-1

12	In der ersten Zeit war nicht an den Wiederaufbau zu denken	In the beginning, there was no thought of reconstruction	-1	0	0
13	Durch meine Arbeit bin ich an den Ort gebunden	I am tied to the place through my work	-2	-4	-1
14	Durch mein Hobby (oder Verein) bin ich an meinen Ort gebunden	My hobby (or club) ties me to my place	1	-2	-3
15	Durch meine Familie bin ich an meinen Ort gebunden	My family ties me to my place	3	4	0
16	Durch meine Freunde bin ich an meinen Ort gebunden	I am tied to my place through my friends	2	-2	-2
17	Die Behörden kümmern sich ausreichend	The authorities take sufficient care of me	-2	-3	1
18	Die Hilfsanträge waren zu kompliziert	The applications for relief were too complicated	0	2	2
19	Hilfsdienste leisten wichtige Unterstützung	Support services provide important assistance	3	3	4
20	Es gibt in meinem Ort und Umgebung wenig geeigneten Wohnraum, in den man umziehen könnte	There is little suitable housing in my town and surrounding area to move to	1	1	1
21	In ein anderes Haus/Wohnung dauerhaft zu umzuziehen wäre zu teuer gewesen	Moving to another house/flat permanently would have been too expensive	2	-3	1
22	Meine Wohnsituation ist jetzt besser als vor der Flut	My housing situation is better now than before the flood	0	4	-2
23	Über meine Probleme durch die Flut rede ich wenig mit anderen	I don't talk much with others about my problems caused by the flood	1	-2	2
24	Ich bin in meinem Ort verwurzelt	I am rooted in my place	2	0	-1
25	Das ist nicht mehr meine alte Heimat/Nachbarschaft	This is no longer my old home/neighbourhood	-2	-2	2
26	Wenn es ums Eingemachte geht, dann ist jeder Ort in Erftstadt für sich	When it comes down to it, every village in Erftstadt looks out for itself	0	-1	-2
27	Seit der Flut bin ich sozial engagierter	I've been more socially engaged since the flood	0	-1	0
28	Seit der Flut interessiere ich mich für die Erft, sowie ihre Tier- und Pflanzenwelt	Since the flood, I've been interested in the Erft and its tributaries, as well as the flora and fauna in the river	0	2	-2
29	Ich verbringe gerne Zeit an den Flüssen oder in der Natur um meinen Ort	I enjoy spending time by the rivers or in nature around my town	2	2	1
30	Ich nehme die Erft und ihre Nebenflüsse als Bedrohung wahr	I perceive the Erft and its tributaries as a threat	-1	1	2
31	Die Flut ist eine Folge des Klimawandels	The flood is a consequence of climate change	4	2	4

32	Wir haben andere Probleme als eine erneute Jahrhundertflut zu verhindern	We have other problems than preventing another 100-year flood	0	-3	-3
33	In diesem Gebiet hat man schon immer mit Fluten gelebt, da muss man sich nicht zu viele Sorgen machen	People have always lived with floods in this area, so there isn't much to worry about	-1	-1	-4
34	Ich fühle mich durch die Maßnahmen, die seit der Flut ergriffen wurden, sicherer	I feel safer because of the measures that have been taken since the flood	-1	-4	1
35	Ich nehme Regen als Bedrohung wahr	I perceive rain as a threat	-1	0	2
36	Die Flut beeinflusst mich mental	The flood affects me mentally	1	0	3

Appendix B: Expert Interview Guideline (German)

Persönliches Intro

- Wer sind Sie? Was ist Ihre Rolle/Position?
- Wie war Ihre Organisation von der Flut betroffen?

Organisation

An dieser Stelle werden einleitende Fragen über die jeweilige Organisation gefragt, die das Verhältnis von Institution und Flut betreffen
Beispielhaft für das Museum:

- Wieso hat sich das Museum dafür entschieden, eine Ausstellung zur Flut zu machen?
    - Wie ist der Prozess abgelaufen? Wieso wurden die Themenschwerpunkte so gesetzt?
    - Wie kommt die Ausstellung bei den Erftstädter:innen an? Was haben Sie für Reaktionen erfahren?
    - Wer kommt in die Ausstellung, wer nicht?
- Die Ausstellung schaut sich auch andere Flutereignisse und das Zusammenleben mit der Erft in der Vergangenheit an. Wie wurde früher mit Fluten (1419/1961/1981/2000er Jahre) umgegangen? Können Sie einen Vergleich sehen?

Flut Allgemein

- Wie nehmen Sie aktuell in der Stadt Diskussionen über die Flut wahr?
    - Haben die Themen und Stimmung sich über die Zeit verändert?
    - Gibt es noch das Bedürfnis, über die Flut und das eigene Erlebte zu sprechen, oder wollen die Menschen eher vergessen?

Aspirations/Capabilities - Einstieg

- War das Bleiben/Gehen/Umziehen eine große Debatte in Erftstadt?
    - Hat diese im öffentlichen Diskurs eine Rolle gespielt oder war dies eher privat oder unter Freunden?
    - Wie wurde im öffentlichen Diskurs über Personen gesprochen, die nach der Flut aus Erftstadt verlassen haben?

Aspirations

- Haben Sie sowohl nach der Flut als auch jetzt noch wahrgenommen, dass Personen aus Erftstadt den Wunsch geäußert haben, wegzuziehen?
  – Hierbei geht es explizit um den Wunsch
    - Welche Gründe wurden dafür genannt?
        - Eingehen auf Heimatbezug (Erftstadt, soziales Umfeld und Natur)
        - Praktische Faktoren (Job, Kinder, Haus, Alter, Versicherung…)
        - Risiko/Flut/Klimawandel
- Haben Sie sowohl nach der Flut als auch jetzt noch wahrgenommen, dass Personen den Wunsch geäußert haben, zu bleiben (im Haus/Wohnung) oder innerhalb von Erftstadt/dem Stadteil umzuziehen?
    - Welche Gründe wurden dafür genannt?
        - Eingehen auf Heimatbezug (Erftstadt, soziales Umfeld und Natur)
        - Praktische Faktoren (Job, Kinder, Haus, Alter, Versicherung…)
        - Risiko/Flut/Klimawandel

Capabilities

- Haben die Personen, die den Wunsch hatten, dies zu gehen, dies getan?
    - Was hat es ihnen ermöglicht zu gehen? Was hat sie davon abgehalten?
        - Eingehen auf Heimatbezug (Erftstadt, soziales Umfeld und Natur)
        - Praktische Faktoren (Job, Kinder, Haus, Alter, Versicherung…)
        - Risiko/Flut/Klimawandel
- Haben die Personen, die den Wunsch hatten, zu bleiben, dies getan?
    - Was hat es ihnen ermöglicht? Was hat sie davon abgehalten?
        - Eingehen auf Heimatbezug (Erftstadt, soziales Umfeld und Natur)
        - Praktische Faktoren (Job, Kinder, Haus, Alter, Versicherung…)
        - Risiko/Flut/Klimawandel

Place Attachment

- Haben sich die Gefühle/Wahrnehmung der Erftstädter gegenüber ihrer Stadt durch die Flut und die Zeit danach verändert? Auf welche Weise?
    - Gegenüber der Stadt, ihrem sozialen Netzwerken, der Erft, der Natur,…
    - Wandel von Prioritäten z.B. Familie
- Inwiefern sehen sich die Erftstädter:innen einem weiteren Risiko ausgesetzt?

    - Natur, Erft, Wasser als Risiko
    - Unterstützung von sozialen Netzwerken
    - Unterstützung von Politik, lokal wie auf Landes- und Bundeseben
- Wie wirkt sich die Risikowahrnehmung auf das Verhalten aus?
    - Wegziehen
    - Gründen von Initiativen etc.
- Wie haben sich die soziale Struktur und der Zusammenhalt in Erftstadt mit der Flut verändert?
    - Inwieweit hat die soziale und politische Infrastruktur die Menschen, die in Erftstadt geblieben sind, unterstützt?

Climate Change Awareness

- Haben die Menschen das Gefühl, dass sie zu ihrer Lebzeit noch einmal von einer ähnlichen Flut betroffen sein werden?
    - Wer hat das Gefühl, wer eher nicht?
    - Inwieweit beeinflusst dieses Gefühl die Haltung und Handlung der Menschen?
- Inwieweit spielt der Klimawandel eine Rolle im Diskurs zur Flut?
    - Empfinden die Menschen dies als Ursache und fühlen sich als Betroffene des Klimawandels?
    - Wenn ja, hat dies dazu geführt, dass Menschen ihre Praktiken oder Gewohnheiten geändert haben?
    - Hat dies zu einem veränderten Verhältnis zum Klimawandel oder zur Natur im Allgemeinen geführt?

Offene Frage

- Fehlt Ihnen noch etwas, wurde ein für Sie wichtiger Punkt/Thema nicht angesprochen?

Appendix C: Demographic Data Sheet (German)

Interview-Nr:
(nicht ausfüllen)

Fragebogen zur Masterarbeit: Flut 2021 in Erftstadt

In meiner Masterarbeit beschäftige ich mich mit den Nachwirkungen der Flut in Erftstadt und den Entscheidungsprozessen von Betroffenen. Konkret mit der Frage, ob Sie in Ihrem Zuhause bleiben, innerhalb des Ortes umziehen oder wegziehen wollen und können. Außerdem geht es um Ihre persönliche Bindung an den Ort.

Dieser Fragebogen dient als Hintergrundinformation für die Anordnung der Aussagen-Karten.

Ihre Daten werden anonymisiert, so dass keine Rückschlüsse auf Ihre Person möglich sind.

Alle Angaben sind freiwillig.

Datum:_____

Uhrzeit:_____

Angabe 1: Alter

Angabe 2: Geschlecht

- ☐ weiblich
- ☐ männlich
- ☐ divers
- ☐ keine Angabe

Angabe 3: Familienstand

- ☐ Alleinstehend
- ☐ Partnerschaft
- ☐ Verheiratet
- ☐ Verwitwet
- ☐ keine Angabe

1

Angabe 4: Kinder

☐ Ja
☐ Nein
☐ keine Angabe

wenn ja:

☐ minderjährig
☐ im Haushalt lebend
☐ ausgezogen

Angabe 5: Personenanzahl im Haushalt

Angabe 6: Höchster Bildungsstand

☐ kein Schulabschluss
☐ Hauptschulabschluss
☐ Mittlere Reife
☐ Fachhochschulreife
☐ Allg. Hochschulreife
☐ Abgeschlossene Berufsausbildung
☐ Diplom/Magister/Bachelor/Master
☐ Promotion
☐ anderer Abschluss:_____
☐ keine Angabe

Angabe 7: Monatliches Haushaltseinkommen (Netto)

☐ weniger als 2.000 €
☐ bis 4.000 €
☐ bis 6.000 €
☐ bis 8.000 €
☐ bis 10.000 €
☐ mehr als 10.000 €
☐ keine Angabe

Angabe 8: Während der Flut 2021 wohnhaft im Eigentum

☐ ja
☐ nein
☐ keine Angabe

Angabe 9: Aktuell im Eigentum wohnhaft

☐ ja
☐ nein
☐ keine Angabe

Angabe 10: Haus/Wohnung nach der Flut dauerhaft gewechselt

☐ ja
☐ nein
☐ keine Angabe

Angabe 11: Nach der Flut temporär ausgezogen

☐ ja
☐ nein
☐ keine Angabe

wenn ja, wie lange?_____

Angabe 12: Zu welchem Ort ordnen Sie sich zu (Heimatort) ?

Angabe 13: Aktuell erwerbstätig

- ☐ ja
- ☐ nein
- ☐ keine Angabe

Angabe 14: Grad der Betroffenheit

- ☐ weniger
- ☐ durchschnittlich
- ☐ sehr stark
- ☐ keine Angabe

Angabe 15: Wiederaufbauarbeiten abgeschlossen

- ☐ ja
- ☐ nein
- ☐ nicht zutreffend
- ☐ keine Angabe

Vielen Dank!