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**“Better together”**

**Co-production for resilient and  
 legitimate Flood Risk Governance:**

**A Bremen Case Study**

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Master Thesis Environmental and Infrastructure Planning, Water and Coastal  
 Management

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## Colophon

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## Abstract

The growing flood risk due to climate change and growing urbanisation increasingly threatens social communities, rendering flooding more and more of a societal issue. In order to build flood resilience, academia and policy assign increasing importance to the role of civil society and deem their active involvement essential for managing future floods. However, co-production in Flood Risk Governance (FRG) is still understudied in the literature and rare in practice. It is hampered by various barriers with questions being raised about its legitimacy. This thesis adds to the understanding of co-production for resilient and legitimate FRG by conducting a qualitative single case study research. A theoretical framework is developed synthesising the concepts of FRG, flood resilience, co-production and legitimacy. This framework is used to analyse the co-production of flood risk measures and the emergence of Germany's first storm surge partnership in the Pauliner Marsch and Im Suhrfelde (PM and IS) in Bremen. It is shown how the co-production of diverse flood risk measures in the case study area have enhanced the dimensions of adaptability and transformability of flood resilience while ensuring legitimacy. The conclusion is drawn that flood resilience and legitimacy go somewhat hand in hand in co-produced forms of FRG. Based on general lessons learned from the case study, recommendations for German authorities to promote co-production for resilient and legitimate FRG are formulated.

**Key words:** Flood Risk Governance, flood resilience, co-production, legitimacy, flood risk measures

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## List of Abbreviations

FRG – Flood Risk Governance

FRM – Flood Risk Management

FRMS – Flood Risk Management Strategy

FRMSs – Flood Risk Management Strategies

PM – Pauliner Marsch

IS – Im Suhrfelde



## 1. Introduction

### 1.1. Background

Floods are considered one of the greatest natural hazards in Europe (Feyen et al., 2012). The devastating effects such an event can have became evident in July 2021, when Western Europe was hit by devastating floods. In Germany alone, more than 180 people died (BMI, 2022). The consequential costs of the floods in this country now amount to more than 40 billion euros (Trenczek et al., 2022). But it was not only in Germany, also in parts of Belgium, France, the Netherlands and Luxembourg the storm caused severe damage (Schulzki-Haddouti, 2022). It is not possible to estimate the total number of people who lost their belongings in the flood disaster in July 2021. The number of people who had to leave their flats and houses and were accommodated elsewhere is also unclear, as is the amount of people who were unable to return even more than a year later (ibid).

Even if this event can be described as extreme, floods in Germany or Europe are no exception. On the contrary, with the risk of flooding increasing, disasters like the one in July 2021 could occur even more frequently in the future (IPCC, 2023). This is a consequence of climate change, the associated rise in sea level and longer or more intense precipitation, wherefore an increase in both the frequency and severity of floods has been observed and is predicted for the future (ibid). Growing urbanisation in coastal areas or along rivers adds further to the potential damage in case of a flood event (Vousdoukas et al., 2018; Zevenbergen et al., 2008). Urban areas are particularly exposed to the impacts of flooding due to their geographic location often along rivers or near the coasts, a high percentage of hardened surfaces, and large concentration of people and capital at risk (Zevenbergen et al., 2008).

The increasing flood risk due to climate change and growing urbanisation thus poses mounting challenges to social communities (Hemmati et al., 2020; Snel, 2021). As the incidents of July 2021 in western Germany reveal, flooding is becoming more and more of a social issue due to the rising potential damage to citizens, their homes, businesses and infrastructures. In order to deal with the increasing flood risk and related uncertainties, the concept of flood resilience has emerged as a promising framework (Karrasch et al., 2021; Restemeyer et al., 2015). It implies that a city with its community not only seeks to reduce the likelihood of flooding through technical defence, but also to reduce potential damage by adapting to flooding and, in addition, is able to learn and transform based on the experiences made (ibid). Given the increasing potential damage to civil society, policymakers increasingly recognise that managing flood risks is not just the sole responsibility of the state, but that building flood resilience also involves citizenry and requires its active participation in Flood Risk Governance (FRG; Johnson & Priest, 2008; Snel, 2021).

Citizens and other local actors can be involved in FRG in a number of different ways (Jann & Wegrich, 2017). They can contribute with their local knowledge to the agenda setting or the decision-making process, e.g., during the development of river basin management plan (see e.g., Petts, 2007). They can implement protection measures at property level and thus contribute to mitigating flood risk (Attems et al., 2020), or be involved in community or household flood emergency plans. In that the state and civil society jointly contribute to the provision of Flood Risk Management (FRM) services, these examples can be identified as co-produced forms of FRG (Mees et al., 2016). Following the preceding line of reasoning, flood resilience therewith asks for co-production in FRG.

Next to building resilience, legitimacy provides another normative agenda in FRG (Alexander et al., 2016). Understood as the extent to which flood politics, governance processes and resulting policies are acceptable to and accepted by civil society (Schmidt, 2010), legitimacy is considered a premise for good governance (OECD, 2015). Assuming that FRG is a shared responsibility between government and civil society, and that citizens who choose to settle in flood-prone areas should also contribute to damage reduction, co-production becomes a way to increase the legitimacy of FRG (Mees et al., 2016). Following the principles of solidarity and the "beneficiary pays", not only should taxpayers invest in the protection of residents of flood-prone areas, but the residents themselves should also contribute (ibid). Concurrently, however, with growing citizen engagement in FRG, concerns have been raised regarding its social impacts, potential inequalities and thus its legitimacy (Johnson et al., 2007; Kammerbauer & Wamsler, 2017).

One pioneer example where residents have become engaged in the delivery of FRG, and which has been intensively studied by Restemeyer et al. (2015), amongst others, can be found in Hamburg's HafenCity in Germany. This is currently one of the largest inner-city development projects in Europe, creating new attractive living space in the city (Restemeyer et al., 2015). In addition to legal changes to allow living outside the main dike line in the Hafencity, so-called *Flutschutzgemeinschaften* (flood protection communities) have been setup to operate the flood gates within buildings. All property owners within a building complex are automatically member of it and contribute to covering the costs for the construction, operation and maintenance of the basements as well as the flood gates (ibid). As Restemeyer et al. (2015) found, the willingness to contribute to FRG is less driven by flood risk awareness or the ambition to increase resilience but rather by the attractiveness of the location at the waterfront. Further, living at the waterfront in the HafenCity and participating in FRG as part of the flood protection communities involves considerable costs and thus requires certain financial capacity among private actors (ibid).



Studied cases like that of the HafenCity in Hamburg are so far rather the exception. Overall, research on co-production in FRG is still in its infancy (Mees et al., 2018; Mees et al., 2016; Mees et al., 2017). It is understudied in the literature and rare, complex, resource-intensive in practice (ibid). Various barriers exist that can hamper co-production for resilient and legitimate FRG. These include on the one hand a lack of knowledge, flood risk awareness as illustrated by the case of Hamburg, perceived responsibility and path dependencies reinforcing government-led flood protection (Mees et al., 2016; Mees et al., 2017; Snel, 2021). On the other hand, some actors may have better resources to co-produce than others, with housing in HafenCity, for example, requiring significant financial resources. In this context, concerns are voiced that co-production may reinforce social inequalities (Kammerbauer & Wamsler, 2017; Thaler & Priest, 2014).

Given the recency with which co-production has emerged in the study of FRG, more research and empirical insights are needed to better understand how co-production can enhance flood resilience and legitimacy in FRG. One very recent intriguing co-production initiative can be found in the establishment of Germany's first so-called storm surge partnership in the Pauliner Marsch and Im Suhrfelde (PM and IS) in Bremen (SKUMS, n.d.-g). This thesis aims to enrich the understanding about co-production for resilient and legitimate FRG through case study research by investigating the emergence of this coalition of local actors and the environmental authority co-producing measures to better adapt and prepare the flood-prone areas in the future.

## 1.2. Problem statement and research questions

Previous research showed that joint efforts and cooperation between state, market and civil society are needed to deal with the increasing flood risk and related uncertainties (Johnson & Priest, 2008; Meijerink & Dicke, 2008). In order to achieve flood resilience, growing attention is being paid to civil society and calls for co-produced FRG are becoming more frequent (Mees et al., 2016; Snel et al., 2020). This mode of FRG is, however, still rare in practice and understudied in the literature (Mees et al., 2016; Mees et al., 2017). More empirical knowledge is needed on the realisation of such collaborations and their potential contribution to promoting flood resilience and ensuring legitimacy. The aim of this thesis is therefore to expand understanding in this field and to ultimately develop recommendations for promoting co-production for resilient and legitimate FRG. To this end, a case study, located in the PM and IS, is examined. Stemming from the problem description and in accordance with the objective of this study, the main research question of this thesis is defined as follows:

*How can co-production enhance resilient and legitimate Flood Risk Governance, and what lessons can be drawn from the co-production in the Pauliner Marsch and Im Suhrfelde?*

Seeking to unravel the complexity of the main research question, following sub-questions were developed in order to ultimately answer the overarching research question.

- *How can co-production for resilient and legitimate Flood Risk Governance be conceptualised from a theoretical perspective?*
- *How can the co-production in the Pauliner Marsch and Im Suhrfelde be characterised?*
- *What measures or strategies have been co-produced in the Pauliner Marsch and Im Suhrfelde and in what way have these promoted flood resilience?*
- *How is legitimacy perceived and enhanced in the Pauliner Marsch and Im Suhrfelde?*

### 1.3. Theoretical approach

The theoretical framework and scope of this research centres on co-production for resilient and legitimate FRG. Accordingly, Flood Risk Governance (FRG), flood resilience, co-production and legitimacy form the four key concepts guiding this research. The theoretical approach builds on the shift from government-led flood protection to multi-actor FRG between state, market and civil society (see e.g., Snel et al., 2020). Along this shift, resilience has emerged as a crucial concept in order to deal with the contemporary societal challenges, such as the increasing flood risk (Restemeyer et al., 2015). This thesis adopts the conceptualisation by Restemeyer et al. (2015) and defines flood resilience in terms of robustness, adaptability and transformability. Following key scholars, flood resilience attributes specific importance to the role of societal stakeholders and calls for its engagement in building flood resilience (Restemeyer et al., 2015; Snel et al., 2020). In that vein, flood resilience calls for co-production in FRG. Co-production in this work is defined after Mees et al. (2016) and Mees et al. (2018), characterised by its participation entry point, the interaction between state and society, the role and type of societal input and the distribution of costs and benefits. The fourth concept guiding this study is that of legitimacy. Aside enhancing flood resilience, co-production in FRG is argued to drive more legitimate FRG (Mees et al., 2016; Mees et al., 2017). Following Scharpf (1999) and Schmidt (2010), the concept is understood threefold, encompassing the input, throughput and output legitimacy. Synthesis of these four concepts finally leads to the theoretical framework through which the empirical analysis is guided.

#### 1.4. Research strategy

This thesis comprises a qualitative single case study in the PM and IS in Bremen. Within the two flood-prone green zones, a diverse set of actors and different usages meet (SKUMS, 2020d). As part of the project BRESilient and continuing with the storm surge partnership, co-production processes have been initiated to develop ideas and measures together with the local actors to raise awareness of flood risks and promote adapted land use in the long term, that is, to make the area and its community more flood resilient (SKUMS, n.d.-d). Given their function as floodplains but simultaneously diverse sports and recreation areas, the PM and IS offer an intriguing case in order to examine how co-production processes can enhance flood resilience and legitimacy. Empirical case study evidence is obtained via interviews, documentation and observations. The conceptual framework provides the relevant theoretical insights and structure to analyse the co-production processes in the PM and IS in terms of flood resilience and legitimacy.

#### 1.5. Relevance

##### *Scientific relevance*

Academic debates in FRG assign increasing importance to the role and active involvement of civil society for building flood resilience and dealing with the increasing flood risk (Hegger et al., 2016; Restemeyer et al., 2015; Snel et al., 2020). In this context, the concept of co-production has been introduced in FRG (Mees et al., 2018; Mees et al., 2016). While flood resilience appears as an argument for co-production, concerns have been voiced that the increasing involvement of civil society may raise social inequalities and therewith issues for legitimacy of FRG (Kammerbauer & Wamsler, 2017; Thaler & Priest, 2014). Other scholars, conversely, argue that community engagement is likely to enhance legitimacy in FRG (Magnette, 2003). Mees et al. (2017), amongst one of the first proponents of co-production in FRG, showed through a literature review that under certain conditions co-production has the potential to enable resilience and legitimacy in FRG. Given the recency with which co-production has emerged in FRG, however, research on co-production for resilient and legitimate FRG still remains in its infancy. Building on the above findings, this thesis aims to expand knowledge on the relationships between co-production, flood resilience and legitimacy. It enriches academic research by synthesising the work of renowned scholars in a novel theoretical framework and adding an empirical case to the literature that is studied using the framework.

### *Societal relevance*

The increasing flood risk due to climate change and growing urbanisation poses mounting societal challenges (Hemmati et al., 2020; Snel, 2021). In order to better prepare and adapt communities to the increasing flood risk and therewith enhance flood resilience, the active engagement of civil society is arguably inevitable (Hegger et al., 2016; Restemeyer et al., 2015; Snel et al., 2020). Policymakers increasingly acknowledge the need for co-produced forms of FRG (Mees et al., 2016). In practice, however, co-production is very complex, resource-intensive and often hampered by various barriers (Mees et al., 2018; Mees et al., 2016; Snel, 2021). The societal relevance of this research therefore relates to providing empirical evidence on co-production and its implications for enhancing flood resilience and legitimacy in FRG. The lessons learned from the case will provide public authorities with valuable insights and recommendations for promoting co-production for resilient and legitimate FRG.

### 1.6. Reading guide

This first chapter has so far presented the background, relevance and research questions from which this research has emerged. The further structure of the thesis is briefly outlined below. The next chapter, Chapter 2, provides the theoretical foundations on which this work is built. It discusses the four key concepts – FRG, flood resilience, co-production and legitimacy–, ultimately synthesising them into the theoretical framework. The theoretical framework will take on a central role and basis for the empirical analysis. Chapter 3 explains the methodology of this research. It introduces the qualitative case study as a research method, the case itself and the techniques for collecting and analysing the empirical case study evidence. After extending the case introduction, Chapter 4 presents the empirical case study results along the theoretical framework. Accordingly, the form of co-production is characterised, the co-produced measures and their implications for flood resilience are presented, and the way legitimacy is perceived and enhanced is explained. Finally, Chapter 5 provides answers to the research questions, draws conclusions and offers recommendations on co-production for a resilient and legitimate FRG. Furthermore, the theoretical and methodological approaches are reflected upon and an outlook on further research is given.

## 2. Towards resilient and legitimate Flood Risk Governance through co-production

This thesis aims to better understand how co-production enhances resilient and legitimate FRG. To that end, this chapter lays the theoretical foundations on the basis of which the theoretical framework is developed. The theory builds against the transformation of roles and responsibilities in FRM. As part of this transition, Snel et al. (2020) identify two key developments. The shift of state organisations away from centralised power towards the involvement of market actors and civil society marks a first step toward FRG. Flood resilience, according to Snel et al. (2020), demarcates an even further shift in FRG, in which increasing attention is paid to the specific role of civil society and their active engagement in the delivery of FRG.

Inspired by Snel et al. (2020), this chapter first introduces the transition towards and the concept of FRG in Section 2.1., followed by the conceptualisation of flood resilience in Section 2.2. Interpreting the involvement of citizens in the planning processes or the implementation of FRMSs as co-production in FRG, the shift towards flood resilience arguably asks for co-produced forms of FRG. This leads to the concept of co-production to be explained in Section 2.3. Subsequently, the fourth concept of legitimacy is interpreted in Section 2.4. These four key concepts of FRG, flood resilience, co-production and legitimacy are all multi-faceted and open to multiple interpretations, necessitating close scrutiny of each of these individual concepts. This thesis draws on the work of renowned scholars in each field to explain how the concepts are conceptualised. While laying down the main theoretical foundations of this work, the synthesis of the concepts in Section 2.5. finally leads to the theoretical framework through which this work is guided.

### 2.1. Toward Flood Risk Governance

Since the industrialisation, hard flood protection, consisting of large-scale physical measures like dikes and dams has remained the predominant traditional approach to managing floods (Snel et al., 2020; Tempels & Hartmann, 2014). These technical defence measures aimed at reducing the probability of flooding. The underlying notion was that floods can be prevented and controlled (ibid). Hence, this safety-based control paradigm is based on an engineering perspective, whereby technical defence infrastructure is installed to withstand a flood event (Johnson & Priest, 2008). Considering flood protection as a public service provided by the government, this paradigm to managing floods takes a state-centred approach (ibid). Governmental institutions are responsible to ensure that floods do not severely affect national safety, economic development or human welfare, while the civil society acts as a mere recipient of these services (Snel et al., 2020). Living beyond the dikes – or other defence infrastructures, people tend to a sense of safety that is provided by the state and encourages urban development in floodplains (Hartmann & Scheibel, 2016; Tempels & Hartmann,

2014). Paradoxically, however, the area behind the levee or dam is still at risk of flooding, whereby the consequences of a flood increase with growing urban development, number of people and amount of capital at risk, a problem known as the 'dike paradox' (ibid). Accordingly, both societal and market stakeholders have not been involved in developing and implementing strategies or measures against flooding and are often not aware of the flood risk, leaving their responsibility and contribution to be managing floods marginal.

The increasing flood risk due to climate change and growing urbanisation, however, places new demands on society while challenging the previous approach of flood protection (Penning-Rowse et al., 2006). Consensus has meanwhile grown that previous safety-based approaches are ill-suited to deal with the increasing flood risk and the associated uncertainties (Hooijer et al., 2004). Policymakers and academics increasingly acknowledge that floods cannot be averted by engineering measures alone and that absolute protection cannot be guaranteed by the state (Johnson & Priest, 2008; Penning-Rowse et al., 2006). Given these complex challenges and bottlenecks of previous approaches, a paradigm shift in European Flood Risk Management (FRM) from government-led safety-based towards governance-oriented risk-based approaches can be observed (Kaufmann et al., 2016; van Herk et al., 2014). This risk-based approach not only aims at reducing the probability of flooding but also its consequences (ibid). This entails complementing structural defence measures with non-structural, or 'soft' measures to reduce the effects of flooding (ibid). The complementation with non-structural or "soft" measures requires communication and cooperation with market actors and civil society, necessitating the involvement of non-state actors and thus raising crucial questions about the existing roles and responsibilities in FRM (Johnson & Priest, 2008; Meijerink & Dicke, 2008). More attention is given to interaction between actors pertaining to the state, the market and civil society. While viewing floods as manageable rather than controllable or preventable, policymakers and academics increasingly call upon the application of general principles of governance in the management of flood events, that is, cooperative arrangements and a shared distribution of power between governmental organisations, market actors and civil society (Hegger et al., 2014; Johnson & Priest, 2008). This shift reflects a wider societal transition from government to governance in Europe since the 1990s (Rhodes, 1996). From this debate, governance emerges as a concept that acknowledges that the public sector is not the only controlling actor when it comes to the solution of societal problems.

Governance presents a widely contested concept. However, there is consensus that it encompasses the dynamics of governing in the pursuance of a collective goal (Lange et al., 2013). Theoretical debates revolve around the configuration of actors (public, private, societal), the distribution of roles, responsibilities, power and institutional structures (Driessen et al., 2012). The ongoing shift from

government to governance follows anything but a clear unidirectional shift. Rather, different forms of governing coexist (Lemos & Agrawal, 2006). Centralised forms of governance typical of traditional forms of state decision-making can be distinguished alongside other forms of governance (e.g., decentralised, public-private, interactive and self-governance; see Driessen et al., 2012). In this sense, Bell and Hindmoor (2009) argue that while the state adopts diversified governance strategies, it remains a key actor.

The concept of FRG signifies a specific form of risk governance which Renn et al. (2011, p. 233) described as “the translation of the substance and core principles of governance to the context of risk and problem-solving”. Risk management is exercised through risk governance. Going beyond this, “it refers to the totality of actors, rules, conventions, processes, and mechanisms concerned with how relevant risk information is collected, [analysed], and communicated, and how regulatory decisions are taken” (Renn et al., 2011, p. 233). The term ‘flood’ further specifies the type of risk under study and distinguishes it from other contemporary risks (Alexander et al., 2016). A FRG arrangement accordingly encompasses the actor configurations, rules, resources and discourses through which the flood risk is managed (ibid).

However, FRG involves more than just a descriptive tool for a complex, interacting network in which collective binding decisions are made around the societal issue of increasing flood risk. Like (risk) governance, FRG seeks to provide both a conceptual as well as normative basis for how to deal responsibly with the rising flood risks and related uncertainties in particular (Renn et al., 2011). It is argued that FRG is most successful when governmental actors collaborate with market stakeholders and civil society to jointly collect, analyse, communicate, and make decisions about flood risk (ibid). Success can thereby be framed in terms of the normative aims. One key normative agenda that has been established in order to deal with the increasing flood risk and related uncertainties is flood resilience, further driving the transition in FRG (Snel et al., 2020).

## 2.2. Flood resilience

The concept of resilience has a long-standing history, with the first scientific adoption dating back to Francis Bacon in the 1600s (Alexander, 2013). Since then, the concept has proliferated across diverse fields (Alexander, 2013; Carpenter et al., 2001; Cote & Nightingale, 2012; Nunes et al., 2019). The historical evolution of the literature on resilience thinking reveals a shift in the dominant perspective, that is, from technical resilience to ecological resilience, and finally to social-ecological or evolutionary resilience (Wardekker, 2021). The latter interpretation of evolutionary resilience has meanwhile established as a promising framework for addressing contemporary societal challenges such as climate change, urbanisation and increasing flood risk (Restemeyer et al., 2015; Wardekker,



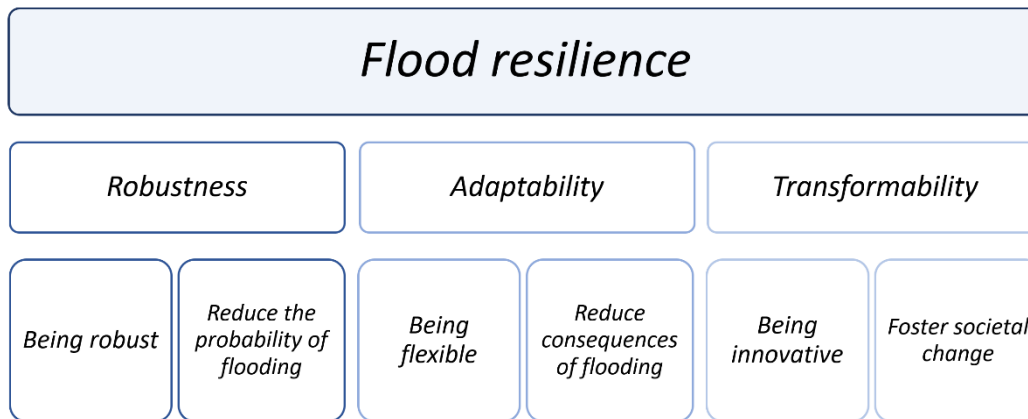


Figure 1: Conceptualising flood resilience (by the author; after Restemeyer et al., 2015)

2021). These problems are perceived as persistent or post-normal problems, that is, characterised by high uncertainty and complexity with interrelations across issues, time or spatial scales (Loorbach, 2010; Wardekker, 2021). Various authors attribute three characteristics to the concept of evolutionary resilience, that is, *robustness*, *adaptability* and *transformability*. While *robustness* refers to the ability to persist, absorb disturbances and withstand shock events, *adaptability* implies making adjustments to reduce the vulnerability of a system (Folke et al., 2004; Walker et al., 2004). *Transformability*, beyond this, is about transitioning to a new system “when ecological, economic, or social structures make the existing system untenable” (Walker et al., 2004, p. 5).

While developing a framework for assessing the flood resilience of cities, Restemeyer et al. (2015) applied the above described three-fold conceptualisation of evolutionary resilience to the context of flooding (see Fig. 1). As part of their framework, they identified measures and policy instruments, institutional structures as well as human capacities favourable for enhancing robustness, adaptability and transformability.

*Robustness* demands that a city is able to persist and withstand a flood event (Restemeyer et al., 2015). Measures to increase robustness include structural flood protection structures such as levees, dams, and storm surge barriers, as well as spatial measures such as river widening (ibid). Aimed at reducing the probability of potential flooding, robustness has been the key principle of the technocratic flood control paradigm. The implementation of technical defence infrastructure requires engineering and planning know-how, political and financial support, but also social acceptance (ibid). However, since complete flood protection cannot be guaranteed, flood resilience goes beyond being robust.

*Adaptability* seeks to adjust and prepare the hinterland, that is, the physical environment for flooding, in order to reduce the consequences in case of potential a flood event (Restemeyer et al., 2015). Measures and policy tools to adapt the environment include preventing vulnerable land use in flood-prone areas, designating areas with controlled flooding, promoting flood-resistant buildings

and infrastructure, establishing warning and evacuation systems, or flood insurance and recovery funds (ibid.). Adaptability demands expert knowledge about options for adaptation and vulnerability reduction, while local knowledge may be valuable, such as in identifying socially accepted retention areas. Beyond that, adaptability asks for financial support as well as a population that is willing to invest into own precautionary measures (ibid). In this sense, changing the physical environment and enabling controlled flooding also asks for adjustments to the social sphere. It demands a change in people's thinking, collaboration across different sectors, thus adding a social dimension to FRM. People in the city must have knowledge of what to do to save their lives and property. This turns FRM into a social task of interdisciplinary cooperation (water management, spatial planning and disaster management) which requires the willingness of citizens to actively engage in FRM (ibid).

In that vein, *transformability* entails the societal transition that is required to enable an adaptation of the physical environment. More specifically, it implies the shift in people's mindsets from "fighting the water" to "living with the water" (Restemeyer et al., 2015). Transformability presupposes well-informed citizens prepared for flooding and property owners flood-proofing their houses. For these reasons, measures aimed at raising awareness, building knowledge and empowering non-state actors to contribute to FRG become key (ibid). The transformation to "live with the water" entails a societal learning process that continuously embraces new observations to find purposeful solutions to manage flood risk. It demands a long-term future vision, creativity, openness to new knowledge, new interdisciplinary networks and mutual trust between public and private stakeholders (ibid). In addition, agents of change may be crucial to drive the transition, while disasters or shock events can be interpreted as windows of opportunities (Gupta et al., 2010; Huitema et al., 2011).

#### *Five Flood Risk Management Strategies (FRMSs) to enhance flood resilience*

To protect urban areas from flooding, different types of FRMSs have been developed, which focus either on the probability of flooding or the potential consequences of flooding. Academics and policymakers increasingly view a diversification, coordination and alignment of FRMSs as critical to enhancing flood resilience. In this vein, Hegger et al. (2014, p. 4128) argued, "a resilient urban agglomeration is one in which several different FRMSs are applied simultaneously, linked together and aligned, whereby it is assumed that this application and combination of multiple strategies increases society's capacity to cope with flood risks in an effective way". Following European policies, they distinguish between five types of FRMSs, these being: *flood defence, flood risk prevention, flood risk mitigation, flood preparation and flood recovery* (ibid, see Tab. 1).

Table 1: Five FRMSs to enhance flood resilience (adopted from Hegger et al., 2014, 2016)

Strategy: Flood	Explanation with examples:	Timing:	Focus: Reducing
Defence	Flooding can be prevented through defence infrastructures such as dikes, storm surge barriers, or giving the	Before the flood event	Probability of flooding
Risk prevention	Negative impacts of flooding can be prevented through proactive spatial/land use planning with building only outside flood-prone areas		Exposure to floods
Risk mitigation	Consequences of flooding can be mitigated by smart-design measures in flood-prone areas such as flood-proof building	After the flood event	Consequences of flooding
Preparation	Consequences of flooding can be reduced through preparation for a flood event via warning systems, or emergency/evacuation plans		
Recovery	Recovery after a flood event can be enhanced by reconstruction plans, compensation or insurance systems		

With the basic idea of “keeping people away from the water”, *flood risk prevention* seeks to reduce the exposure of flooding through proactive spatial planning, i.e., prohibiting or preventing the development in flood-prone areas (Hegger et al., 2014; Hegger et al., 2016). *Flood defence* corresponds to the traditional engineering approach (discussed in 2.1.). This strategy aims to reduce the probability of flooding through hard flood protection measures such as dikes or dams (ibid). The underlying notion is “keeping water away from the people”. *Flood risk mitigation* considers smart design measures within the area at risk in order to mitigate the consequences of flooding (ibid). These measures include spatial orders, constructing flood compartments, or (regulations for) flood-proof building. *Flood preparation* aims to mitigate the consequences of flooding by preparing for a flood event (ibid). This can be achieved by developing flood warning systems, disaster management or evacuation plans. *Flood recovery* allows for proper and rapid reconstitution after a flood event. Measures comprise reconstruction or rebuilding plans, compensation and insurance systems (ibid).

Along with the broadening of scope, FRG has expanded accordingly, embracing new rules, resources, actors, discourses, and coordination mechanisms at multiple levels (Hegger et al., 2014). Flood resilience pays particular attention to the role of civil society, expecting citizens to prepare themselves and take adaptation measures. By calling for the active involvement of civil society, the paradigm shift towards flood resilience arguably drives a trend towards co-produced forms of FRG (Mees et al., 2016).

### 2.3. Co-production

The concept of co-production enjoys a long legacy in the literature on public administration but has only recently entered the academic arena of FRG (Mees et al., 2016). Among the first proponents were Parks, Brudney and England (Brudney & England, 1983; Parks et al., 1981). Since then, it has been widely applied with different interpretations. Some authors limit the use of the term on instances where citizens both produce and use services (Fotaki, 2011; Mees et al., 2018; Mees et al., 2017), while others also incorporate citizen participation in decision making into its definition (Albrechts, 2013; Mees et al., 2016). Prerequisite for co-production is some form of interaction between civil society and public authorities (e.g., a regulation issued by the government; Mees et al., 2016). This way, the concept demarcates itself from self-governance, under which citizens or communities provide public goods or services independently of government action (Driessen et al., 2012). Therewith, co-production refers to the relationship between the state and civil society, which includes individuals or households but also organised groups of individuals working together in communities or NGOs (Mees et al., 2016).

#### *Forms of co-production in FRG*

Following the shift toward flood resilience, co-production has gained momentum in FRG over the past years, albeit the extent and forms represented differ across countries (ibid). The policy cycle (Crabbé & Leroy, 2008; Jann & Wegrich, 2017), reveals four different stages in the FRM process - agenda setting, decision making, including the formulation of options and choices, the implementation of decisions and their evaluation-, each of which provides an "entry point" through which citizens can be involved in FRM. On this basis, Mees et al. (2016) conceptualised co-production as a threefold umbrella term encompassing *co-planning*, *co-delivery*, and *comprehensive co-production*. *Co-planning* relates to the participation of citizens in the decision-making process of FRM measures, e.g., the development of river basin management plan (ibid). More intensive forms may also concern agenda setting. *Codelivery* describes the engagement of citizens in the implementation of flood risk measures, such as flood control measures at the household level (ibid). Thereby, the actors contribute to the implementation with their human or material resources, that is, for example, their time, knowledge and expertise including specific skills, manpower or technical devices (Mees et al., 2018). *Comprehensive co-production* encompasses citizen participation at all stages of the policy cycle, that is, in agenda setting, decision making, implementation and evaluation of FRM measures (Mees et al., 2016). For example, the development of a FRM plan can be the product of collaboration between citizens and authorities with responsibilities for these respective groups delineated therein. Other authors also add the category of *co-funding*, that is, the engagement of non-state actors in FRG by financially contributing to it (see e.g., Bovaird et al., 2015; Mees et al., 2018). This does not include

general taxes but expects some form of area- or issue specific financial contribution (Mees et al., 2018). Co-funding can be combined with co-delivery if the co-producing actors are also to implement the measures (ibid).

Further categorisation can be made in terms of the interaction between governments and civil society, the role and type of citizen input and the distribution of costs and benefits (ibid). These three typologies are complementary and can help to better capture the form of co-production observed. As emphasised earlier, co-production requires a form of *interaction between state and civil society*. This form of interaction can either be *hierarchical, incentivised* or *deliberative* (ibid). *Hierarchical co-production* implies that authorities legally enforce societal or market actors to take flood risk measures (e.g., building regulations regarding floor heights). In the case of *incentivised co-production*, governmental actors aim to encourage civil society to engage in FRG through financial or non-financial incentives, e.g., subsidies or awareness-raising (ibid). If the co-production processes launched are not the result of uni-directional communication or influence but are built on multi-directional dialogue between state and non-state actors, this can be referred to as *deliberative co-production* (ibid).

The *role and type of citizen or societal input* can either be *complementary* or *substitutive* to governmental action (see e.g., Ostrom, 1996). As the name implies, in *substitutive coproduction*, citizen efforts replace actions that would otherwise have been taken by state actors (Mees et al., 2018). This way, governments often aim to reduce costs, that is, increase efficiency. Several authors, however, argue that complementary co-production is more effective (see e.g., Mees et al., 2017; Ostrom, 1996). As Mees et al. (2017) highlight substitutive co-production is contrary to the aim for resilient FRG. Instead, policymakers should advocate complementary forms of coproduction and aim to increase return on investment rather than reduce costs in pursuit of the goal of efficiency (ibid).

Another distinction can be made with respect to the *distribution of the costs and benefits* (see e.g., Bovaird et al., 2015). Depending on whether co-production is individually or collectively provided or enjoyed, Mees et al. (2018) distinguish four different types of co-production (see Tab. 2). *Philanthropic collective co-production* refers to cases where flood risk measures are implemented due to collective coordinated action (ibid). Common examples here are volunteering fire brigades. *Philanthropic individual co-production* implies that co-production is provided individually but collectively enjoyed (ibid). Often the providing individuals also benefit from their action themselves, but this is not necessarily the case. Ideological reasons might also drive them to co-produce (ibid). Citizen monitoring of water levels is one example for this form of co-production. *Private individual co-production* means that the services are both individually provided and enjoyed (ibid). Prominent examples here are property-level protection measures, such as dry flood-proofing through watertight

basement windows (Attems et al., 2020). *Private collective co-production* comprises subsidised property-level protection measures which are collectively funded but installed on individual level (Mees et al., 2018). These examples correspond to different FRMSs, confirming that co-produced forms of FRG are essential to realise specific FRMSs and build flood resilience.

Policymakers seek to co-produce with society for different reasons. In accordance with the previous line of argumentation, policymakers promote co-production in FRG as a means to increase flood resilience (Mees et al., 2016), as the engagement of civil society is deemed essential for diversifying FRM strategies and thus improving flood resilience (Hegger et al., 2014; Snel et al., 2020). Beyond that, Hegger et al. (2014) argue that building resilience requires legitimate FRG. While some scholars show that co-production can enhance legitimacy (e.g., Magnette, 2003), others emphasise that this also poses new challenges for legitimate FRG (e.g., Alexander et al., 2016).

#### 2.4. Legitimacy

The concept of legitimacy is commonly considered as a key principle of 'good governance' (European Commission, 2001; OECD, 2015), and has been subject of numerous studies on democracy, justice, policy making and governance in general (Héritier, 1999; Magnette, 2003; Suchman, 1995), but also more specifically in relation to FRG (Alexander et al., 2016; Mees et al., 2017; Mees et al., 2014; Pettersson et al., 2017). Various definitions have been developed by the different scholars, leaving the term somewhat ambiguous and complex, without any agreed set of legitimacy criteria (Alexander et al., 2016).

Two famous scholars in the debates on the concept of democratic legitimacy are Scharpf (1999) and Schmidt (2010). Scharpf (1999) established the two normative criteria of input legitimacy with an emphasis on government by the people and the legitimacy of the policy output with an emphasis on government for the people legitimacy for assessing the legitimacy of the EU. Complementing this twofold conceptualisation and filling the grey gap that remains between input and output, Schmidt (2010) introduced a third normative criteria focusing on procedural aspects of legitimacy, that is, government with the people. Following this three-dimensional conceptualisation, legitimacy in this work is understood as the extent to which input politics, throughput processes and output policies are acceptable to and accepted by citizens (Scharpf, 1999; Schmidt, 2010).

*Legitimacy on the input* side relies on mechanisms translating the will of the people into political decisions (Scharpf, 1999). If these mechanisms are assessed by the people to be "democratic" or "good", then input legitimacy is ensured (Boedeltje & Cornips, 2004). According to Scharpf (1999), input legitimacy refers to the participatory quality of the process leading to laws and rules. According to the notion of interactive construction, legitimacy is built through the discourse practices which

follow from the communicative processes involved in elections and other forms of interactions between the public and civil society (Schmidt, 2010). These may contribute to the construction of a sense of collective identity or a collective political will in a “public sphere” (ibid). Popular votes or direct election of representatives are examples of procedures that aim to ensure input legitimacy of political decisions (Boedeltje & Cornips, 2004). Proponents of citizen participation, however, argue that electoral institutions are inadequate instruments of democracy because they fall short of providing true opportunities for citizens to effectively influence policymaking (in: Boedeltje & Cornips, 2004). According to these scholars, interactive policymaking, that is, co-production, helps to link citizens' preferences to the content of public policy and could reduce social exclusion (ibid). Drawing on these arguments, co-production in FRG may thus enhance the legitimacy of the policy input.

*Legitimacy on the output* is about the (perceived) effectiveness of policy (Scharpf, 1999). It can be understood as a performance criterion focusing on the ability of institutions to govern effectively for the people, that is, to promote the common good of a community, the well-being of the people (ibid). Output-oriented legitimacy has both an objective as well as a subjective component (Boedeltje & Cornips, 2004). The objective component relates to the extent that policy outcomes succeed in effectively managing collective social problems such as the increasing flood risk (ibid). Assuming that in the modern network society no single actor, neither in the public nor in the private sector, is capable of solving dynamic and diversified problems alone (Kooiman, 1993), the involvement of stakeholders is deemed essential for solving complex social problems due to their local and expert knowledge (Boedeltje & Cornips, 2004). Thus, public participation can increase the effectiveness of policy outcomes. This is consistent with the argument that diversification of FRM strategies, necessitated by the increasing flood risk, calls for the involvement of different stakeholders (cf. Section 2.2). The subjective component of output legitimacy is concerned about the acceptance or satisfaction of citizens with the policy outcome (Boedeltje & Cornips, 2004). It is assumed that actors are more likely to be satisfied with the result if they reach their own goals and recognise their own preferences in the outcome policies (in: Boedeltje & Cornips, 2004). Thus, it is argued that stakeholders are more likely to be satisfied with the outcome of a policy if they have been involved in the processes that led to that policy output (ibid). Followingly, co-production in FRG may not only enhance input-oriented but also output-oriented legitimacy.

According to Schmidt (2010), *throughput legitimacy* centres “on what goes on inside the “black box” of the political system, between the input and the output” (Schmidt, 2010; p. 7). This procedural performance criterion refers to the quality of the governance processes of the institutions and actors involved in policymaking. This quality can be evaluated not only by the efficiency but also the



accountability, transparency, and inclusiveness or openness to civil society (ibid). Accountability is commonly held as a crucial feature when considering legitimacy (Pettersson et al., 2017). It implies that citizens have the opportunity hold governmental actors accountable, that is, to oversee authorities by obliging them to justify their actions and decisions (Hahn, 2011). Paramount for accountability is the transparency (Ahrens & Rudolph, 2006). To that end, citizens and political representatives need to have access to information, in addition to which the governance processes and the resulting decisions should be public (Héritier, 2003). Inclusiveness and openness to civil society are reflected in the interactive processes through which civil society can directly influence policymaking (Schmidt, 2010). Openness means that citizens, whether as individuals or in organised groups, have access to the policymaking and can thus be determined by the extent of opportunities to become involved (Schmidt & Wood, 2019). Inclusiveness demands that policymakers are open to all such interested individuals or groups, balancing their interests in in such a way as to ensure equal representation (ibid). Adopting the perspective of interactive construction, throughput legitimacy concerns “the ideational constructions and deliberative processes” that enhance the above-mentioned criteria of accountability, transparency, inclusiveness and openness to civil society (Schmidt, 2010, p. 8). Accordingly, throughput legitimacy centres on the quality of the relationship between actors (ibid).

Albeit distinguishable, the mechanisms enhancing input, throughput or output legitimacy are interdependent in the sense that the increase or decrease of one of these mechanisms - may it be output, input or throughput - has an impact on the functioning of the other two mechanisms – “for better or for worse” (Schmidt, 2010, p. 9; see Fig. 2).

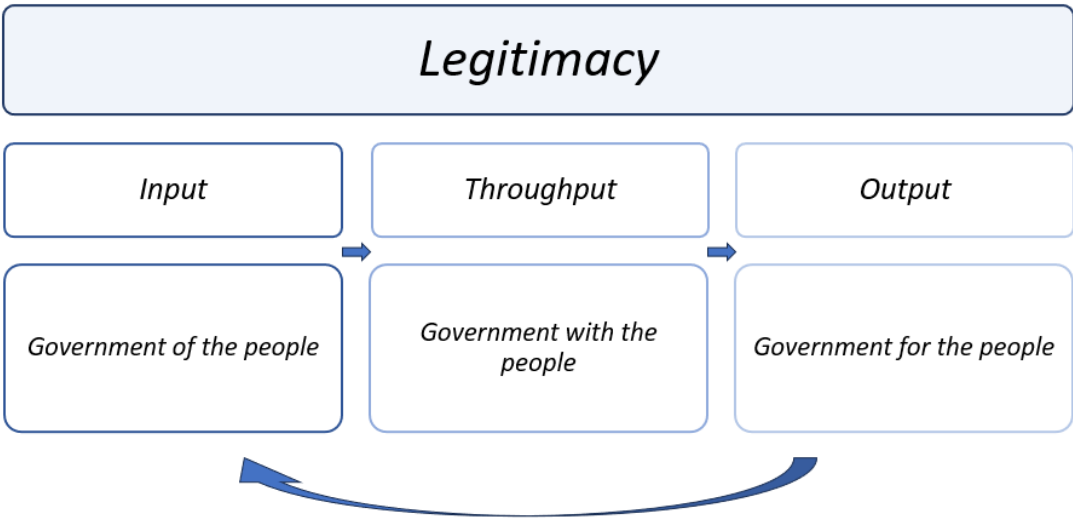


Figure 2: Conceptualising legitimacy (after Scharpf, 1999 and Schmidt, 2010)

## 2.5. Bringing together: Co-production for resilient and legitimate Flood Risk Governance

### *A tentative framework after Mees et al. (2017)*

Based on an extensive literature review, Mees et al. (2017) showed that co-production in FRG can improve both resilience and legitimacy, with these two success indicators being strongly intertwined. The success thereby depends on several crucial conditions, which they addressed in a tentative framework. These conditions relate on the one hand to qualities or capabilities societal actors need to possess, and on the other hand to recommendations for policymakers to strengthen enabling conditions for civil society. Their main findings are briefly outlined below.

Following Mees et al. (2017), residents must have sufficient risk awareness, perceive personal risk responsibility and believe that they are able to take effective action. Sufficient knowledge, economic and social capacities of the of the exposed community are identified as key factors in establishing these basic preconditions (ibid). Concerning social capacities, various authors refer to as social capital, emphasising the importance of networking (in: Mees et al., 2017). Networking facilitates the spread of knowledge distribution of shared meanings and collective flood risk awareness within civil society (ibid). Through interaction with governmental bodies, information between state and society actors can be shared (ibid). This enhances the process of social learning, a key factor for enhancing transformability (see Restemeyer et al., 2015).

In the absence of these prerequisites, citizens will not be able to co-produce as intended by public policymakers, thus hampering resilience to flooding (Mees et al., 2017). Efforts to establish risk aware understanding as well as shared responsibilities while empowering actors in their capacities are thus critical. Based on their literature review findings, Mees et al. (2017) identified these basic conditions and the factors that enable them to be closely related to the conditions for legitimate FRG. For co-production in FRG to be legitimate, they recommend policymakers to provide a clear distribution of responsibilities, to invest in the social and economic capacities of vulnerable populations and promote bottom-up co-planning. The latter aspect implies the involvement of civil society in the decision-making, which, according to Mees et al. (2017), allows to better respond to its needs.

Figure 3 shows the tentative framework by Mees et al. (2017). This tentative framework is arguably complex which is why this study does not draw on it for the empirical case analysis. Instead, the next section presents a novel theoretical framework on co-production for resilient and legitimate FRG, through which the empirical findings of this research are guided. Notwithstanding, the literature

review findings by Mees et al. (2017) provide an interesting point of discussion for the results of this thesis.

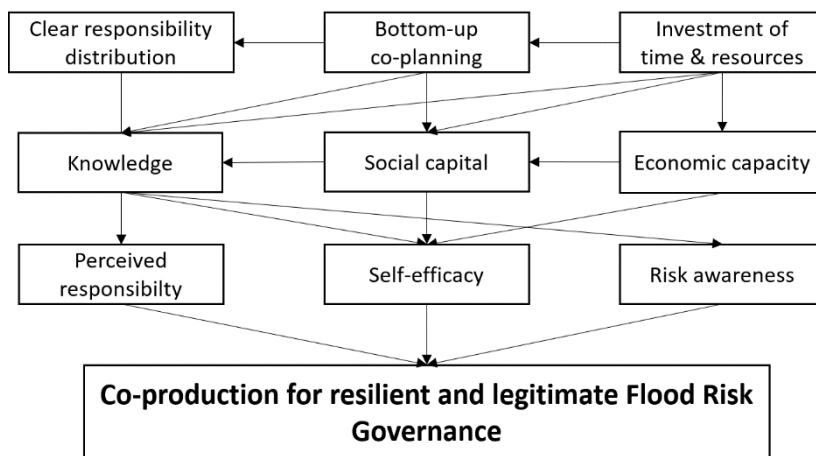


Figure 3: Tentative framework after Mees et al. (2017)

### Theoretical framework

The literature review presented in this chapter provides the theoretical underpinnings to finally embed the research in a theoretical framework. This framework synthesises the four guiding concepts and illustrates the answer to secondary research question 1: *How can co-production for resilient and legitimate FRG be conceptualised from a theoretical perspective?* What follows in the remainder of this chapter briefly summarises the theoretical findings before deriving and explaining the theoretical framework based on them.

The increasing flood risk renders flooding more and more a social issue. While previously the opinion was held that it is the sole responsibility of the state to protect people from flooding, more holistic governance-oriented approaches are nowadays called for (Kaufmann et al., 2016; van Herk et al., 2014). These more holistic approaches do not only focus on reducing the probability of flooding but also its consequences, for which efforts beyond the state are required (ibid). FRG therefore calls for new cooperative agreements between state, market and civil society (Alexander et al., 2016; Hegger et al., 2014). Amidst these developments, the concept of flood resilience has become established on FRG agendas (Karrasch et al., 2021; Restemeyer et al., 2015). It ascribes particular importance to the involvement of civil society in the management of floods, thus calling for co-produced forms of FRG (Mees et al., 2016; Snel et al., 2020). While robustness may be realised solely by the state, the characteristics of adaptability and transformability make the active involvement of civil society arguably imperative to improving flood resilience (Hegger et al., 2016). The same applies to the FRMSs: While flood defence may be provided solely by the state, flood risk mitigation or flood preparation demand engagement of citizen in flood-proof building or emergency plans, for example

(Hegger et al., 2014; Snel, 2021). Accordingly, co-production of flood risk measures or management strategies is deemed essential for enhancing flood resilience. In order to be effective, these co-produced forms of FRG should be acceptable to or accepted by civil society. As a key principle of good governance, legitimacy thus constitutes another crucial normative agenda and condition for co-produced forms of FRG (Alexander et al., 2016; Mees et al., 2016; Mees et al., 2017).

### *Synthesising the theoretical framework*

Against this background, co-production for resilient and legitimate FRG can be conceptualised through three building blocks (see Fig. 4). The first layer centres around the complex web of actors in the governance triangle of state, market and civil society, that is, the governance triangle, involved in managing flood risks. With co-production as the focal point of this research, the focus is on the relationship between state and civil society. Since the way co-production is pursued has crucial implications for flood resilience and legitimacy, close examination of the form of co-production is essential. For a better understanding of the form of co-production, this work embraces the described distinctions and characterisations of the form of co-production by Mees et al. (2016) and Mees et al. (2018). Co-production is thus conceptualised according to four different criteria, namely 1) the participation entry point based on the policy cycle, distinguishing between co-planning, co-delivery and comprehensive co-production; 2) the type of interaction between state and society which can be hierarchised, incentivised or deliberative; 3) the role and type of societal input, either complementary or substitutive; and 4) the distribution of costs and benefits, with the co-produced services being provided or enjoyed either individually or collectively.

As part of their collaboration, state and societal actors co-produce flood risk measures. These measures correspond to specific FRMSs and bring with them certain implications for flood resilience, all of which is analysed in block two. Flood resilience is thereby conceptualised in three dimensions according to Restemeyer et al. (2015), with robustness, adaptability and transformability as key characteristics.

The third building block in turn examines how the co-produced measures enhance legitimacy of FRG. Like flood resilience, legitimacy is interpreted three-dimensionally. Here, the interpretations by Scharpf (1999) and Schmidt (2010) are adopted, that is, legitimacy is conceptualised in terms of input, throughput and output legitimacy. Input legitimacy is analysed based on the extent to which the political will of the people has been translated into political decisions and the associated participatory quality of the co-production. Throughput legitimacy is assessed by the transparency, accountability, inclusiveness and openness to civil society, as well as the quality of the interpersonal relations that shape the co-production processes. Output legitimacy is evaluated by the (perceived) effectiveness of the co-production.

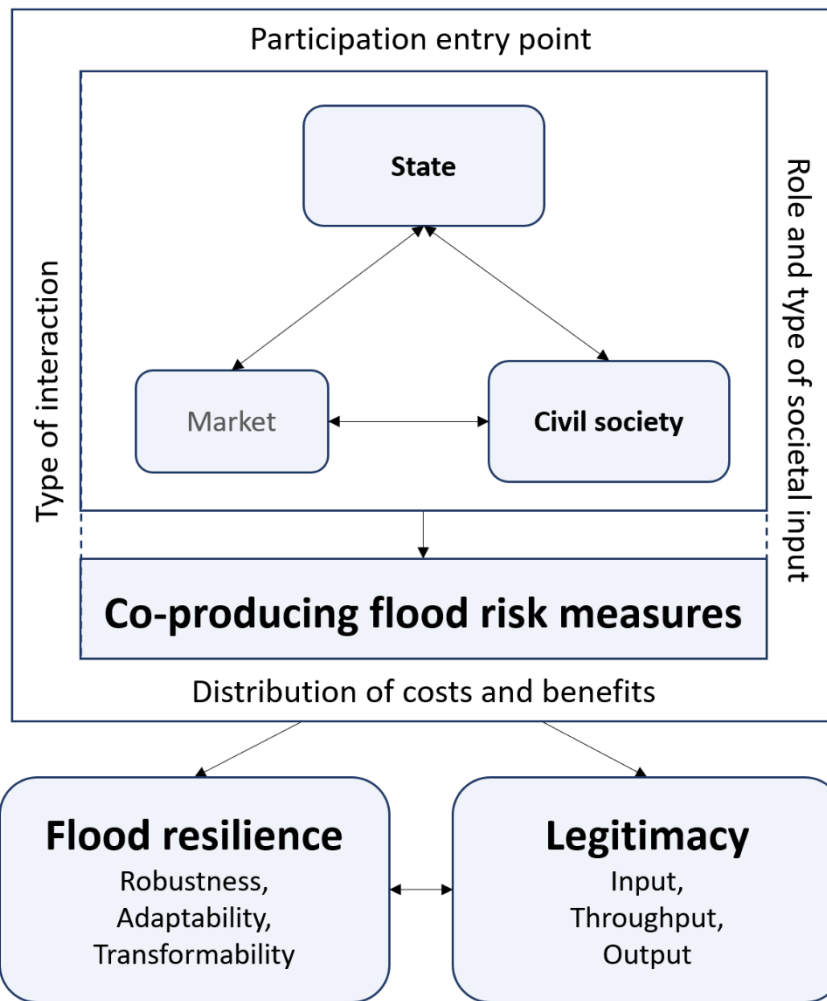


Figure 4: Theoretical framework for co-production for resilient and legitimate FRG (by the author)

### 3. Methodology

This research conducts a qualitative single case study in order to better understand how co-production enhances flood resilience and legitimacy in FRG. Linking the data collected as well as the conclusions to the initial question of the study, a well-structured case study design is crucial in order to yield meaningful results (Yin, 2018). The research design encompasses the research questions, the theoretical propositions, the case, the logic of linking the data to the theory and the way of interpreting the findings (ibid). While the research questions and theoretical propositions were discussed in Chapter 1 and 2, this chapter first introduces the case study as a research method while explaining the underlying rationales for the choosing this research methodology; second, defines the case under study; and third, presents the techniques used for collecting and analysing the data.

#### 3.1. Case study as a research method

Yin is considered a key scholar in developing the case study methodology (Baxter & Jack, 2008). He describes the case study as “an empirical research method that investigates a contemporary phenomenon (the “case”) in depth and within its real-world context, especially when the boundaries between phenomenon and context are not clearly evident.” (Yin, 2018, p. 15). He recognises a case study as favourable when a "how" or "why" question is being posed about current events over which the researcher has limited control. Seeking to answer a “how” question thus provides a first argument for choosing a case study as a research method. Furthermore, case studies are commonly used in social science disciplines, out of the desire to understand complex social phenomena (Baxter & Jack, 2008). Due to the socially complex nature of this research, with its focus on the relationships between public and societal actors in the FRG context, the case study was considered as an appropriate research method. While designing a case study, it is critical to clearly define and bind the case, that is, the unit of analysis (see section 3.2.). In this context, a key decision is to be made between a single or multiple case study design (Yin, 2018). This thesis adopts a single case study. The choice was made because it allows for a more careful study and a deeper understanding of the exploring subject (Gustafsson, 2017). Ultimately, the single case may significantly contribute to confirming challenging, or extending building knowledge and theory (Yin, 2018). As mentioned earlier, in real life settings, phenomena and context are not always clearly discernible. For this reason, Yin (2018) identifies two relevant features of case study research, that is, the prior development of a theoretical framework and the use of multiple sources of evidence become, both of which are elaborated on in Section 3.3.

### 3.2. The unit of analysis

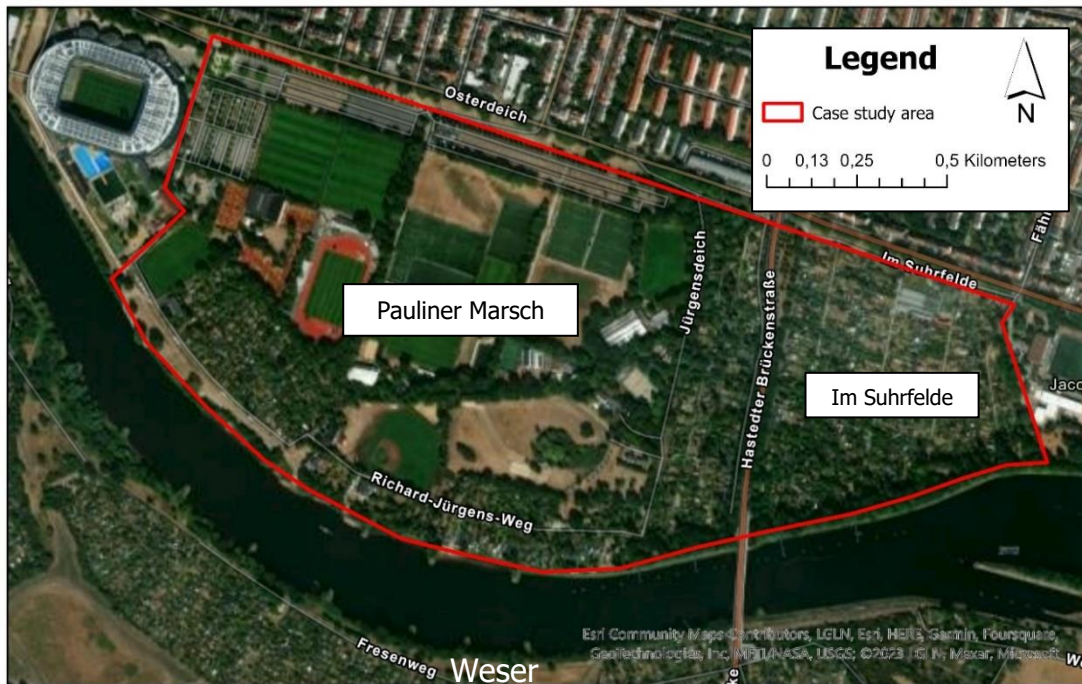


Figure 5: Spatial boundary of the Pauliner Marsch and Im Suhrfelde (created with ArcGIS Pro 3.0 by the author)

Determining the unit of analysis, that is, the case, is a critical task in designing case studies but presents a challenge for novice and experienced researchers alike (Baxter & Jack, 2008). Pitfalls occur if the defined research question or objective is too broad (ibid). In order to avoid this overloading, scholars advocate determining boundaries and therewith binding the case. Yin (2018) advocates setting spatial, temporal and other explicit boundaries. According to him, “the desired case should be a real-world phenomenon that has some concrete manifestation” (Yin, 2018, p. 31).

The spatial boundary of this case study is defined by the area of Pauliner Marsch and Im Suhrfelde (PM and IS) in Bremen (Germany; see Fig. 5). Both areas are located in the immediate vicinity of the Weser River, do not have proper flood protection, but are at the same time used by high number of people and with social substantial value (SKUMS, 2020d). Due to the high flood risk, various stakeholders of the area have jointly developed measures within the framework of the project programme “BREsilient” and continuing with a storm surge partnership to better prepare and adapt themselves and the area to floods (SKUMS, n.d.-a). It is these co-production processes in the PM and IS for FRG that manifest the case under study. In this respect, the unit of analysis is also determined by the theoretical scope, dedicated to co-production for resilient and legitimate FRG.

While studying governance processes, it is crucial to determine a timeframe, as people’s relationships and attitudes may change over time. They are likely to be influenced by contemporary issues. The project “BREsilient” was launched from 01 November 2017 to 31 July 2023, the storm surge partnership founded on 21 September 2022 (BMBF, 2023; SKUMS, 2022a). The results in this



thesis are based on the perspectives of the actors during the time the case study evidence of this research was collected. This timeframe extends from 26 April to 30 August 2023. While the initial focus was on collecting secondary data (documentation) to gain an overview, primary case study evidence (interviews, observations) was subsequently obtained to build a deeper understanding of the case under study.

### 3.3. Data collection and analysis

A key quality feature of the case study is the use of multiple data sources, that is, the triangulation of data (Graue, 2015; Yin, 2018). The use of multiple data sources, also known as data triangulation, ensures data credibility on the one hand and flexibility on the other (Graue, 2015; Yin, 2003). This enables the phenomenon to be viewed through a variety of lenses, in turn enabling many facets to be uncovered and the issue to be better understood (Baxter & Jack, 2008). As Yin (1990, p. 20) describes it, its “unique strength [lies in its] ability to deal with a full variety of evidence”. In the framework of this research, case study evidence was obtained through documentation, interviews and observations. Prior to collecting and analysing the case study evidence, a literature review was conducted in order to embed the case in a theoretical framework.

#### *Literature review*

As previously argued and further elaborated below, the prior development of a theoretical framework plays a crucial role in case study research as it helps in designing the case study and generalising lessons learned from it (Yin, 2018). The theoretical framework of this thesis was presented in the previous chapter and developed by means of a literature review. A literature review provides an account of what has been published on a topic by acknowledged scholars (Lane, 2022). However, it is not to be equated with a summary or descriptive list of the material available. Rather, it should be understood as discursive prose not merely describing or summarising one piece of literature after another but synthesising and evaluating it according to the guiding concepts of the study (Lane, 2022). Guided by the four key concepts of FRG, flood resilience, co-production and legitimacy, this thesis called upon the work of key scholars in respective fields including Restemeyer et al. (2015), Mees et al. (2016), Mees et al. (2018), Scharpf (1999) and Schmidt (2010) for developing the theoretical framework.

The theoretical framework derived from the literature review takes on a fundamental multi-functional role in this thesis. For one thing, the theoretical framework defines the scope of the study and creates a context for the research questions. For another, it structures the processes of data collection, analysis, interpretation and presentation and is ultimately used as a tool to generalise the findings of the case study. Due to the key role of the theoretical framework, the literature review was

conducted at an early stage. Scientific journals served as the main source of literature, which were related and linked to each other based on the different theoretical concepts.

### *Documentation*

Given our record-keeping society and the broad variety of documents (including paper and electronic), documentary data is arguably relevant to any case study topic (Yin, 2018). In contrast to observations and interviews, documents provide secondary data (Flowerdew & Martin, 2005). An advantage of using documentary evidence is that they can be reviewed repeatedly, its retrieval is usually flexible and independent from any other data collection techniques (Yin, 2018). On top of that, documentation is crucial for corroborating and augmenting case study evidence from other sources, such as the interviews and observations in this study. When reviewing documentation, potential bias needs to be considered (ibid). Assuming that documentation reports unmitigated truth is misleading. Instead, every document used is written with a certain purpose for a specific audience. By constantly seeking to understand the underlying objectives, the researcher can avoid the risk of being misled and is more likely to correctly interpret the content of documentary evidence (ibid).

Due to the large amount of published material related to the case study, also for this research, documentation was considered as important case study evidence. The documents reviewed comprised information boards, a brochure, flyers, the cooperation agreement of the storm surge partnership, presentation slides, documentation of workshops and internet pages. Their focus was on the measures co-produced as part of the project BREsilient and the initiation of the storm surge partnership. The analysis of the documentation was based on the initiation and development, type and content, as well as the addressees of these co-produced measures.

### *Observations*

Direct observations as a form of primary data were another source of case study evidence obtained in this research (Flowerdew & Martin, 2005). Observational data is valuable in providing additional information about the issue under study (Yin, 2018). By revealing important case characteristics to the observers, they can help to gain a deeper and closer understanding of the case and the issue under study (ibid). In the framework of this research, observational evidence was collected during the project's final conference, the presentation of the feasibility study on improving the drainage situation and during site visits in the PM and IS. During the site visits, photographs were taken. Spontaneous conversations were held with allotment gardeners and walkers to get an impression of the broad community's perspectives.

## Interviews

Interviewing presents another form of primary data collection (Flowerdew & Martin, 2005). Within an interview, the interviewer attempts to obtain information from the respondent through verbal exchange (Dunn, 2005). As this research centres on co-production for resilient and legitimate FRG, insights on the opinions and perspectives from public and societal actors involved in the case study area are key. Driven by the societal issue of increasing flood risk, interviewing thus provides an essential source of case study evidence in this research. Different types of interviews can be distinguished (ibid). In this study, semi-structured interviews were used for data collection. This interview type follows some specific, pre-determined order but still allows for flexibility as to how the informant addresses questions (ibid). The rationale for conducting semi-structured interviews was the benefit of having a clear structure that ensures the collection of relevant data while providing the flexibility to expand on interesting topics that the respondent raised in their answers.

Table 2: List of interview partners

Identifier	Function	Institution	Date	Form
R1	BREsilient project leader	Senator for Climate Protection, Environment, Mobility, Urban development and Housing (SKUMS)	08.05.2023	Face to face
R2	FRM expert	SKUMS	24.05.2023	Face to face
R3	FRM expert	SKUMS	07.06.2023	Google Meet
R4	Professor	University of Oldenburg (UOL)	30.08.2023	Google Meet
R5	Department head	Umweltbetrieb Bremen (UBB, environmental services)	22.05.2023	Face to face
R6	Director	Dike authority Bremischer Deichverband am rechten Weserufer (dike authority)	20.06.2023	Google Meet
R7	Representative	Gremium Beirat (advisory board of the parties in Bremen)	23.05.2023	Face to face
R8	Chairwoman	Gartenfreunde "Weserlust" e.V. (allotment garden association)	24.05.2023	Face to face
R9	Chairman	KanuSport-Freunde e.V. (canoe club)	12.06.2023	Google Meet
R10	Chairwoman	Kleingärtnerverein Peterswerder e.V. (allotment garden association)	04.08.2023	Google Meet

In total, ten interviews were conducted. Interviewees encompassed the BREsilient project leader, FRM experts, a researcher, a politician, as well as board members of sport and allotment garden associations, all of whom have been involved in the BREsilient project. A list of the conducted interviews can be found in Table 2. All interviews were conducted in German language based on an interview guide which can be found in Appendix A. The interview guide was designed along the

theoretical framework. Each interview was tailored to the respective respondent, that is, the questions were assembled from the guide, adjusted and expanded where necessary. Except for one interview, all interviews were recorded in consultation with the interviewee, subsequently transcribed and coded. The coding was performed using the software ATLAS.ti. Coding relates to the allocation of interpretative tags or labels applied to the transcripts based on the themes or categories relevant to the research (Cope, 2010). This helps to identify patterns and is done using a codebook, which is a collection of categories and codes and structuring the data analysis (ibid). The underlying codebook of this research can be found in Appendix B. It encompasses deductive codes prepared prior to data collection grounded in the theoretical framework and inductive codes developed on the basis of the interview transcripts.

### 3.4. Ethical considerations

Ethical considerations are important for the respect and protection of persons in any study (Arifin, 2018). In qualitative research in particular, they require careful deliberation given the profound nature of the research process (ibid). In this study, ethical considerations have been made through voluntary participation and informed consent, privacy and confidentiality. Participation in the interviews was voluntary. Before the interviews, the participants were informed about the research topic and expected questions. Only after the respondents had given their consent for the interview and its recording was this started. Privacy and confidentiality were preserved during the interview session, data analysis and dissemination of the findings through the following considerations. First, the names of the interview partners were anonymised. Second, the interviews were transcribed confidentially when alone. Third, the transcripts were stored carefully, accessible exclusively to the researcher and two research supervisors.

For a faithful analysis and presentation of the results, further considerations were made to with regard to the language and its meaning. When translating from German into English and vice versa, some of the meaning of words or expressions may be lost. This pertains to the translation of theoretical English terms, but also to certain German expressions used by the interviewees or in the documents. To prevent losing meaning through the researcher's translations and to reproduce statements of the interviews and documents as faithfully as possible, the following considerations were integrated. Particularly concise words or special terms are indicated in the original and translated version in the quotations in Chapter 4. A full version of the original direct German quotes from the interviews and documents with their translations is provided in Appendices C and D. Besides, all codes are given in both German and English in the codebook (cf. Appendix B).

## 4. Towards a resilient and legitimate storm surge partnership in Bremen?

In the previous chapter, a brief introduction to the case has already been given with the definition of the unit of analysis. This chapter first expands this introduction to ensure a thorough understanding of the case with its contextual factors, essential for analysing the case in relation to the underlying questions. Subsequently, the results of this research are presented following the five building blocks of the theoretical framework. These sections (4.2.-4.4.) provide the empirical case study evidence for answering the remaining research questions. By reflecting on these findings, a final answer to the questions is given in Chapter 5.1.

### 4.1. Introducing the case

This case introduction is fourfold. It starts by outlining the project programme BREsilient under which the co-production processes were initiated. Then it describes the case study area of the PM and IS, forming one of the project's four model areas. Subsequently, the chronological sequence of the project activities as well as the actors specifically for the model area of PM and IS are presented.

#### *The project: "BREsilient – Klimaresiliente Zukunftsstadt Bremen"*

By following up on the climate adaptation strategy of Bremen, the project "BREsilient – Klimaresiliente Zukunftsstadt Bremen" was launched with the aim of building climate resilience for Bremen together with different stakeholders (SKUMS, n.d.-a). Within four different model areas, actors from academia, administration and politics have worked together with local actors to develop recommendations for the implementation of concrete climate adaptation for the respective area, some of which have already been implemented (ibid). One of those model areas were the PM and IS, where the focus was on the co-production flood risk measures and around which this case study is centred (SKUMS, n.d.-d).

#### *The area: Pauliner Marsch and Im Suhrfelde in Bremen*

The PM and IS present two popular green zones located next to each other at the Weser River in front of the main dike line (SKUMS, 2020d; see Fig. 6). Only smaller levees serve as physical flood protection (SKUMS, 2020c). Therefore, the areas are designated as flood-prone and serve as retention areas for the city (ibid). Storm surges and inland floods are likely to occur more frequently and more intensely in the future as a consequence of climate change (IPCC, 2023). At the same time, however, the two zones are characterised by a high use and importance for the people in Bremen (SKUMS, 2020d). Various sports clubs, two allotment garden clubs, private allotment gardeners and gastronomy businesses have settled here (ibid). The area is also used by walkers, joggers and for other recreational purposes. Housing is legally prohibited (ibid). An exception is made for the so-called "Kaisenhaus" residents who were granted permanent residence in the housing shortage after

the war (ibid). Due to the diverse use of the PM and IS as a sports, recreational and partly also residential area not inconsiderable values have accumulated here. The complex setting and high flood risk justify or may even demand measures beyond the legal requirements, arguably explaining the selection as one of four model areas in the BREsilient project programme.

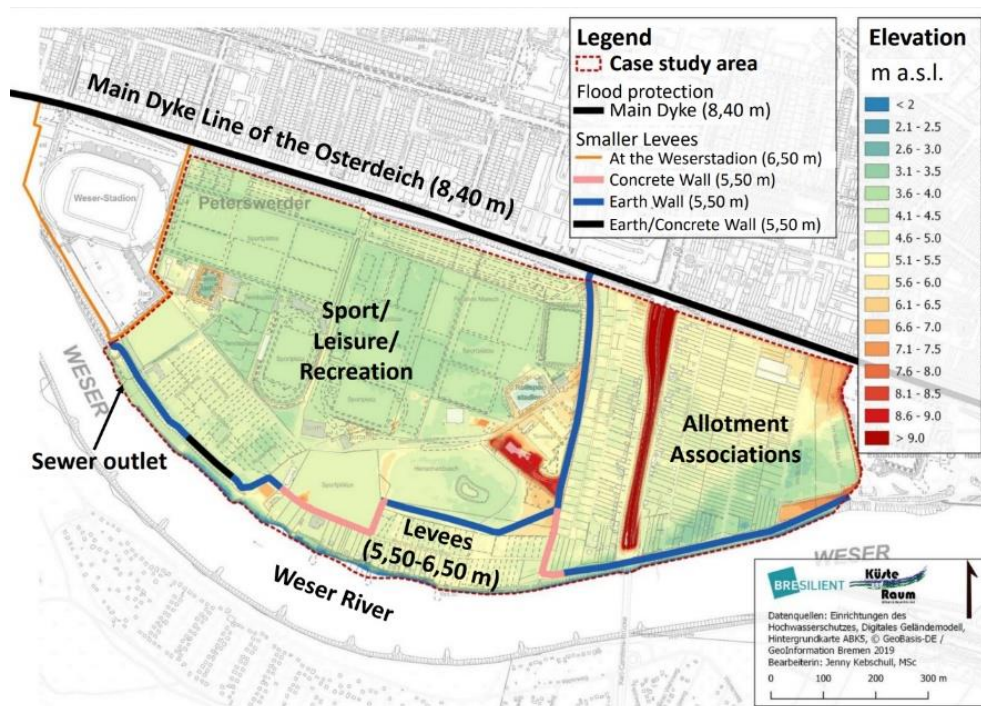


Figure 6: Overview of the Pauliner Marsch and Im Suhrfelde (modified from: SKUMS, 2020d)

#### Timeframe of the BREsilient project programme in the PM and IS

The project programme BREsilient started in November 2017 and ended in July 2023 (Wunsch et al., 2023). It was divided into two main phases, that is, a preceding research and development phase and a subsequent implementation and stabilisation phase (ibid, see Fig. 7). In the PM and IS, the research and development phase comprised a situation and risk analysis (SKUMS, 2020c, 2020d). For the situation analysis, the model area and the legal situation were described (SKUMS, 2020d). All actors involved were identified and their demands for dealing with flood risk were assessed through interviews. In a second risk analysis, flood risks were estimated for the PM and IS (SKUMS, 2020c). To this end, scenarios with different water levels were considered and the flood heights mapped in the model area (ibid).

Moreover, a three-fold workshop series „Pauliner Marsch – Überflutungsvorsorge gemeinsam gestalten / Shaping flood precaution together” was organised (SKUMS, n.d.-d). During the first workshop, the project, FRM in Bremen and the results of the initial analyses were presented (ibid). The adaptation measures proposed in advance by the stakeholders during the interviews were discussed and prioritised by the participants in small groups (ibid). This was done at three thematic islands, which built the three points of action and shaped the cooperation henceforth.

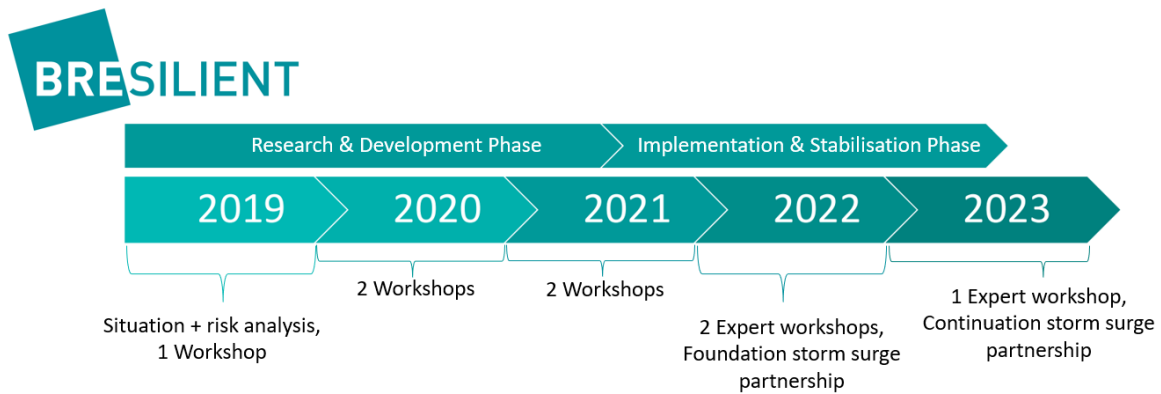


Figure 7: Timeframe of the BREsilient project programme (modified from Wunsch et al., 2023)

During the second workshop, the prioritised measure proposals of Action Points 1 and 2 were further elaborated and concretised with regard to their potential implementation (SKUMS, 2020b). Due to the Corona pandemic, the third workshop where the measures of Action Point 3 were to be further elaborated could not take place as planned (SKUMS, 2020a). As a supplementary workshop offer, a landscape architect and expert in sports facility construction was invited to discuss questions on possible economic damage, environmental impact, repair options and adaptation measures on sport pitches in the event of flooding (ibid).

After this first series of workshops, further (specialist) workshops were conducted as part of the implementation and stabilisation phase (see Fig. 7; Wunsch et al., 2023). During those, the creation of reporting chains was discussed in response to the stakeholders' concerns in order to ensure that storm surge warnings reach everyone in the PM and IS in time (SKUMS, 2019b). Besides, the participants exchanged ideas on the content to be provided in form of a brochure and on information boards (ibid).

On 21 September 2022, the so-called “Sturmflutpartnerschaft / Storm surge partnership” was founded in order to ensure the cooperation beyond the project period (SKUMS, 2022a, 2022c). This foundation was considered a milestone of the project and Germany’s first storm surge partnership (SKUMS, 2021b). Through annual meetings before the beginning of the storm surge season, “a permanent, regular exchange of information and experience in order to jointly identify problems and find common solutions and synergies” will be organised (SKUMS, n.d.-e, p. 1). In April 2023, the results of the hydraulic study on the drainage of the PM and IS were presented in an online conference (Gralle & Partner & Stadt-Land-Fluss Ingenieurdienste, 2023). The project’s final conference was held in May 2023, during which the results of all four model areas were presented and discussed (Wunsch et al., 2023).



### *Stakeholders involved in the project BREsiliant in the PM and IS*

The project BREsiliant was led by the Senator for Climate Protection, Environment, Mobility, Urban Development and Housing (SKUMS). Alongside the project leader, mandated by the Senator, two FRM experts from the authority were involved in the model area of the PM and IS. Together, they worked in cooperation with research partners and local actors (SKUMS, n.d.-b).

Main partner from the research consortium that was engaged in the PM and IS was the Carl-von-Ossietzky University Oldenburg (UOL; SKUMS, n.d.-c). Local institutions who have been actively involved in the project and are now members of the storm water partnership are primarily the allotment and sport associations. These include the Kleingärtnerverein Peterswerder e. V., Gartenfreunde "Weserlust" e.V., FC Union60 Bremen, KanuSport-Freunde e.V. Bremen, Bremer Kanu-Wanderer e.V., Segelverein Weser e.V., BTV 1877, Sportgarten e.V., Tennisverein Rot-Weiß e.V., Sport-Verein "Werder" v. 1899 e.V. and SV Werder Bremen GmbH & Co KG aA (SKUMS, n.d.-g).

Other institutions involved are the municipal environmental service (Umweltbetrieb, UBB), the municipal housing service provider (Immobilien Bremen) and the dike authority (Bremischer Deichverband am rechten Weserufer), all of whom are working on behalf of SKUMS. Private partners that supported the work in the study area were an interdisciplinary engineering and consulting services, a project management agency, a landscape architect with expertise in sports facility construction and a property protection consultant (ibid).

Not actively engaged in the project but with a use of the area are the members of the associations, the private allotment gardeners not affiliated to any association, the Kaisenhaus residents, as well as private people using the area for recreational purposes in their free time (SKUMS, 2020d; R1, R7). The core of the cooperation is centred between SKUMS and the sports and allotment association. In accordance with the literature on co-production and the theoretical framework, the focus of the following analysis is thus on the interaction of these public and societal actors.



## 4.2. Characterising the co-production in the Pauliner Marsch and Im Suhrfelde

In order to assess the impact co-production has on enhancing flood resilience and legitimacy, a thorough understanding of the form of co-production in the PM and IS is prerequisite. By characterising the form of co-production based on the four criteria Mees et al. (2016) and Mees et al. (2018) refer to in their studies, this section provides empirical case study evidence for answering secondary research question 2, that is: *How can the co-production in the Pauliner Marsch and Im Suhrfelde be characterised?* The characterising criteria concern the participation entry point, the type of government-citizen interaction, the type and role of citizen input as well as the distribution of costs and benefits.

### *Participation entry point*

The participation entry point refers to the phases of the policy cycle in which the local stakeholders are involved in FRG processes in the PM and IS through the project and the storm surge partnership. Involvement in agenda setting and decision making has been achieved by allowing local institutions to determine the measures to be co-produced in the initial interviews and workshops (see Section 4.1.). As discussed in the subsequent Section 4.3., some associations have started to implement some of the co-produced measures, thereby engaging in the delivery of FRG. Beyond that, project participants and now storm surge partners have been involved in evaluating action and progress made. After some stakeholders expressed that progress was too slow or small-stepped in the first phase of the project (research and development), this feedback was taken into account and changed in the subsequent implementation and stabilisation phase. The chairman of a sport club reported: “The process was not fast enough for us associations. First, a lot of fundamental things were worked out, which were relatively clear to us, until useful results were worked out for us. [...] But as I said, in the second part, everything was resolved in a very reasonable way and also came to a very good end” (R9).

Accordingly, the local institutions were engaged in all phases of the policy cycle, that is, agenda setting, decision making, implementation and evaluation of FRG. Based on the participation entry point(s), the collaboration in the PM and IS can thus be described as *comprehensive co-production*.

### *Government-citizen interaction*

The government-citizen interaction is concerned with the emergence or initiation of the co-production, that is, as to whether the interaction in the PM and IS was legally enforced, incentivised by the authority, or as to whether there were also initiatives undertaken by local actors.

With regard to the emergence of the project BREsilient, slightly diverging perspectives from state and society were revealed in the interviews. While one association board member experienced it the following way: “We are a group of about 8 or 9 associations in the Pauliner Marsch. [...] It was then that we made massive demands on the city and said, please, you have to help us. [...] Then, at some point, the city came up with the idea to say that they would make a research project out of it, BREsilient, and one of the four focal areas that this project was supposed to have [...] was the Pauliner Marsch” (R9). One of the FRM experts from SKUMS reported: “Before my colleague and me became active there, there was already the Round Table of the Pauliner Marsch, which was set up at the political level, where flood protection was always a topic, [...]. But the initiative to become active in this area, as we were, or in the way we have become with BREsilient, came from here. [...] Somewhere there was also the wish from the users, also from politics, also from our house, but everything was not that bundled. That only became possible with BREsilient. Before, there was not a single request from any of the users in either of the two areas as to whether we could do anything for them” (R3).

Although opinions diverge on the extent of initiatives by state and societal actors, both reports indicate that the co-production processes launched are not the result of uni-directional communication or influence but are built on multi-directional dialogue between SKUMS (state) and the associations (society). With respect to the type of state-non-state interaction, the cooperation processes in the PM and IS can thus be referred to as *deliberative co-production*.

#### *Type and role of citizen input*

The type and role of citizen input reflects whether the co-production of flood risk measures substitutes or complements governmental FRM activities in the area. Due to its legal designation as a flood-prone area or floodplain, the PM and IS “fall through the cracks in the implementation of the Flood Risk Management Directive” (R3). The FRM in Bremen is not obliged to take flood risk measures in the area (R2, R3). Followingly, the co-production processes in the case study area go beyond or supplement legal requirements. To put it in one of the FRM experts’ words: “That is, it does not replace anything, it is actually a plus of the Environmental Senate that is additionally provided for this area” (R2). Regarding the type and role of citizen input, the co-production in the PM and IS can thus be considered *complementary*.

#### *Distribution of costs and benefits*

The distribution of costs and benefits is interested by whom (individual or collective) in the PM and IS the co-produced services are provided and enjoyed. The different institutions have involved voluntarily in the organised co-production to better adapt and prepare the area and its community for future floods. They reported to have contributed “with questions, examples, demands, where we

need advice, what we still want to know” (R9) but also with “local knowledge” (R5). In that sense, they add as a collective to local FRG processes while the resulting benefits accrue to the whole community in the PM and IS. Major benefits mentioned in interviews were the “accumulation and the transfer of knowledge” (R9). Relating to thereto, enhanced flood resilience can be identified as another collective benefit, as presented in the next section. In general, the cooperation as part of the project BREsiliant and continuing with the storm surge partnership can thus be described as *philanthropic collective co-production*.

#### 4.3. Fostering societal change and adapting the Pauliner Marsch and Im Suhrfelde to flooding

This section provides the results for answering the secondary research question 3: *What measures or strategies have been co-produced in the Pauliner Marsch and Im Suhrfelde and in what way have these promoted flood resilience?* To this end, the measures that have been co-produced within the framework of BREsiliant are first presented. Next, it is explained in what way the different co-produced measures correspond to the five flood risk measures according to Hegger et al. (2014). This is followed by empirical case study evidence on how the co-production has enhanced the three dimensions of flood resilience, that is, robustness, adaptability and transformability.

##### *Flood risk measures that are being co-produced: 3 Points of Action*

Within the framework of BREsiliant, diverse measures have been co-produced in the PM and IS. These were based on the needs and suggestions of the actors interviewed during the initial situation analysis (see 4.1.2.). During the co-production processes, the measures were jointly prioritised and elaborated by the workshop participants. Three main points of action have been identified, that is, 1) Precautionary measures, 2) Information and communication measures and 3) Infrastructural measures.

##### *1) Precautionary measures*

For improving their self-precaution, the BREsiliant project leader reported, “there was a great need for advice. The associations in particular were very interested in knowing more about the level of protection of their areas and buildings and what measures they could implement themselves” (R1). In response, a property protection consultant was hired. Financed by SKUMS, all associations were given the opportunity to take advantage of individual consultations (SKUMS, 2019a, 2021a). Through the advice, they collectively came to the conclusion that the so-called “Nasse Vorsorge” (wet precaution) is the preferred strategy (see Fig. 8). That means, as one interviewee described, “that partial flooding is allowed and the damage that actually occurs is then tried to be minimised” (R9).

Some associations had already implemented measures for their own precautions before the project, others had not.



Figure 8: Strategies for flood risk precaution (in: Wunsch et al., 2023; modified by the author)

With the construction of a first floor, a canoe club had already taken a very effective wet precaution measure before the project, as the association's chairmen reported. „We built a first floor on our building 3-4 years ago. [...] This way, in case of flooding, we have the possibility to move the parts that are valuable and that should not be flooded to the first floor” (R9). After the consultation, the association additionally introduced a new lock system with electronic chips for the canoes. “If the water starts to rise so that these locks are flooded, they will break down” (R9), so that the canoe boats can float up. Other measures that have been taken up to reduce damage include elevating hazardous or toxic substances (fertilisers, pesticides used by allotment associations) or raising electrical sockets (R1, R8, R10).

## 2) Information and communication measures

As SKUMS reflected, the “transfer of knowledge was [another crucial] point” (R1). Thus, this second point of action seeks to strengthen the information and communication structure of flood risk, early warning and behavioural measures in case of a flood event (SKUMS, n.d.-a). In this context, different measures have been co-produced.

Information boards: In order to draw public attention to the project results, information boards were developed and installed in the PM and IS in the beginning of the year 2023 (see Fig. 9: top; SKUMS, 2022d, 2022e). The boards highlight “the risks posed by storm surges [...and provide] tips for precaution, behaviour and information sources” (SKUMS, 2022d). The content and location of the boards were collectively discussed and decided at one of the expert workshops (SKUMS, 2019b, 2022d).

Flyers: The results and essential information of the situation and hazard analysis of the project area were concisely summarised in two fact sheets (see Fig. 9: middle; SKUMS, 2020c; SKUMS, 2020d). “Alongside the description of the area and an analysis of land use and existing flood protection, the focus is on the risk awareness of the users and the presentation of flooding scenarios and damage



Figure 9: Co-produced information measures (frontpages of the information boards (top), flyers on the situation and risk analysis (middle), and the brochure (bottom); (SKUMS, 2020c, 2020d, 2022b, n.d.-f)

potential” (SKUMS, 2020e). They are available on the internet and can be ordered as a printed leaflet (ibid).

Brochures: A brochure was drafted in cooperation with stakeholders in the area, with the content discussed at one of the expert workshops (see Fig. 9: bottom; SKUMS, 2019b, 2022b). The product provides “with numerous recommendations for action and background information, including how to read a water level forecast” (SKUMS, 2019b). It has been distributed and displayed through the institutions and is also available on the internet (ibid).

Information chains: The creation of information chains was discussed in response to the stakeholders' concerns in order to ensure that storm surge warnings reach everyone in the PM and IS in time (SKUMS, 2019b; R1, R2). Though no information chain from SKUMS to the individual institutions was realised (see 4.4.), some of the association board members (e.g., KanuSport-Freunde e.V., Gartenfreunde Weserlust e.V.) reported in the interviews that

information chains have been established within the association (R1, R2, R8, R9). According to one interviewee, they forward flood information or warnings in WhatsApp groups or via mailing lists and inform their members in this way, provided they have agreed to this (R9). "Whoever wants to be informed will get the message from us. [...] This is not a compulsion. I now have 100 people who have said I would like to be informed " (R8).

Evacuation plans: Furthermore, interviews revealed that some association boards have started to develop, adjust or expand disaster concepts for their association in order to promote a quick evacuation in case of a flood (R1, R9). In doing so, they were supported by SKUMS and the property protection consultant (R1). One association board member reflected: "We are now at a point where we can say that we need to do exactly this and that. [...], we need five teams. Each team will be busy



for about an hour and consists of only two people. We only need ten people in the area in this case“ (R9).

Signposts at the association buildings: The chairwoman of an allotment garden association reported that in the future signs will be attached to the association building indicating the water level in case of a 5.50 m high flood in order to communicate the flood risk to the members. “We are still getting signs that we can install at the corners of the building to demonstrate, when the flood water rises above the 5.50 metres, how high the water level is here. To give the feeling: Hey, the water is here now and it's not about wet feet, it's really high” (R8). Regarding the development of the signposts, she reported: “Another representative of the canoe club came up with the idea. He wanted to put up such signs on his buildings and then told SKUMS about the idea. They immediately took up the idea and said that if other associations wanted to do the same, they would provide the signs“ (R8).

### 3) Infrastructural measures

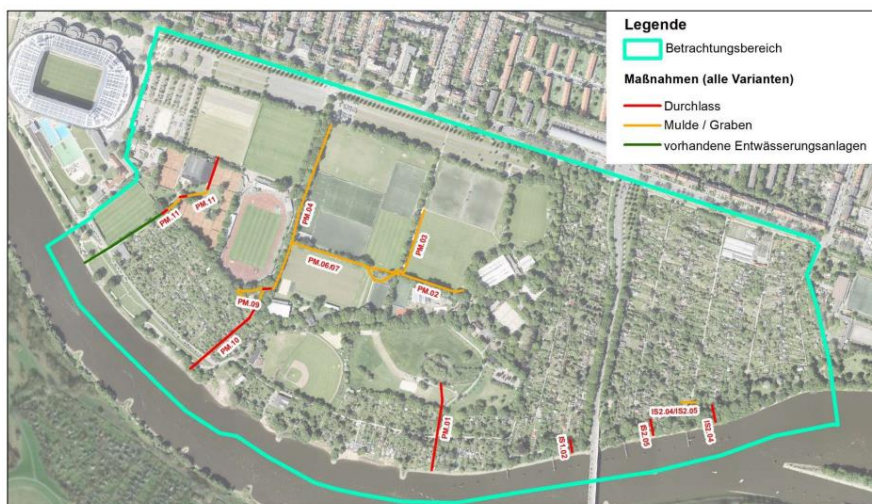


Figure 10: Variants analysed for improving the drainage situation in the PM and IS (Gralle & Partner & Stadt-Land-Fluss Ingenieurdienste, 2023)

This third action point revolves “improving the drainage performance of the areas "Pauliner Marsch" and "Im Suhrfelde" in case of storm surge or high water events leading to flooding of the two areas” (Gralle & Partner & Stadt-Land-Fluss Ingenieurdienste, 2023, p. 2). At present, only one water outlet exists in the PM and none in the area IS. According to the BRESilient project leader, local associations and organisations had expressed concerns about drainage performance of the areas in case of flooding. “How will the water get out again and will the one sewer even be able to cope with it?” (R1). As a response to these concerns, SKUMS commissioned engineering services to conduct a feasibility study to address these questions and to identify possible solutions that, “with the least possible restrictions on use for the area and while taking economic efficiency into account, would lead to a lead to a significant improvement in drainage performance” (Gralle & Partner & Stadt-Land-Fluss Ingenieurdienste, 2023, p. 2). Within the scope of the study, different variants were tested,

simulated and evaluated by means of model calculations (see Fig. 10). Costs were estimated (1.225 million to 1.532 million euro) and recommendations were given for efficient variants that were proven to significantly improve drainage performance (ibid).

Apart from this drainage issue, it was reported in the interviews that some artificial turf pitches were renovated as part of the project, so that they “no longer have microplastics, but a sand filling and are therefore better prepared in terms of environmental risk” (R1).

*Flood Risk Management Strategies*

The three points of action correspond to two FRMSs, that is, flood risk mitigation (through Action Point 1: Precautionary measures and Action Point 3: Infrastructural measures) and flood preparation (through Action Point 2: Information and communication measures). The focus of these co-produced strategies and measures is on reducing the consequences in the event of a flood and, beyond that, on sensitising and empowering local actors in the PM and IS. Due to the geographical location and the legal setting as a flood-prone or inundated area, flood defence measures are subordinate. Flood risk prevention also does not appear to be an appropriate strategy given the social value and high use attributed to the area. One interviewee expressed the wish for a future fund: "I would like to see a fund with money in it for disasters, for people who lose their belongings, and also for associations that lose their equipment” (R8). Such a fund would correspond to flood recovery but has not been realised. In a side note during an interview, SKUMS remarked that such a fund would not be possible (R3).

*Table 3: Co-produced measures and corresponding FRMSs in the PM and IS*

<b>Strategy: Flood</b>	<b>Co-produced measures in the Pauliner Marsch and Im Suhrfelde</b>
Defence	/
Risk prevention	/
Risk mitigation	Action Point 1: Property-level flood protection (advice) Action Point 3: Improving the drainage performance (not realised yet), renovation of sport pitches
Preparation	Action Point 2: Information chains, disaster concepts
Recovery	/

*Robustness*

The dimension of robustness would require the PM and IS to be able to withstand a flood event. This is, however, at odds with the designation of the two green zones as flood-prone areas and their function as floodplains. “There are also certain legal 'no-goes'. For example, raising the levees. That is simply not possible because it is a designated flood-prone area, which is used to be flooded” (R2). Not raising but strengthening the levees protecting the area was noted during the initial workshops

as part of Action Point 3 (SKUMS, 2019a). However, this measure was not concretised (R6). Accordingly, the co-production of robustness measures was less relevant in the PM and IS.

### *Adaptability*

Applied to the case study, adaptability implies the physical adaptation of the two green zones so that the consequences of flooding are being reduced and the area prepared for flooding.

On some level, adaptability has been enhanced by all three co-produced points of action. The wet precaution promoted through the property protection advice (Action Point 1) accurately reflects the underlying idea of minimising the potential damage in case of a flood. The precautionary measures realised by the different actors thus contribute to enhancing the adaptability of the PM and IS. Similar applies to the sports fields, which were renovated as part of the project (Action Point 3). Through the elimination of microplastics on certain sport pitches, it can be expected that in the event of flooding of the area, the overall damage will be limited. Implementing some of the simulated findings, as investigated in the feasibility study (Action Point 3), could contribute to improving the adaptability of the PM and IS. It has been shown that “in the event of a flood in the PM, the water would not have drained off until after 24 hours. In the area IM, the levee is a little higher but there is no sewer outlet, so the water would remain for at least a week, if not longer” (R9), causing considerable damage. By improving the runoff, as investigated in the feasibility study (Action Point 3), it may be expected that potential damage would be reduced. While these types of measures correspond to the strategy of flood risk mitigation, flood preparation is increased through the information chains as well as evacuation plans that has been set up within the individual associations (see Action Point 2). Promoting timely warning of actors and evacuation in the flood zone also helps to decrease potential consequences and foster adaptability.

Crucial for the co-production of these measures was the political and financial support of the project that enabled, amongst others, the property protection advice or the feasibility study. When looking at the course of the project, it becomes evident that especially in the second phase of the project efforts were stimulated and increased to improve the adaptability of the PM and IS. This seems logical and can be explained by the fact that before implementing flood risk measures the actors involved had to gain not only the essential knowledge but also the mind-set to be willing and able to take the respective flood risk measures (R4). This leads to the third dimension of flood resilience, i.e., transformability, which is necessary to achieve a physical adaptation of the case study area.



### *Transformability*

Prerequisite of the physical adaptation of the PM and IS, as described above, is the shift in the mindset of the people involved in the area. The latter is called for by the transformability dimension of flood resilience. Focusing on sensitising and empowering the stakeholders of the PM and IS, transformability can be identified as the focal point of the project programme BREsilient. Herein, Action Point 1 and 2 as well as the co-production processes (i.e., the workshops and other meetings) have laid out opportunities to enhance transformability. While the co-production processes and Action Point 1 were geared at the project participants and now storm surge partners in particular, Action Point 2 addresses the broader community of the PM and IS.

The knowledge that the area is at risk of flooding seems to have been present among all actors well before the start of the project. “In principle, it has always been clear to us that we live in a vulnerable area there. What was certainly not so clear to us was how we were going to deal with it” (R9). Through substantial knowledge building within the cooperation, the interviewed institutions report that a learning process on how to deal with the water has been stimulated. The property protection advice (Action Point 1) has proven particularly valuable in driving the learning process among the institutions towards a societal change. The chairman of a sport association reported: “Now we have learned through the consultation that it is not particularly sensible to try to seal off or protect the building so that you do not allow the water to seep in, but that it is better to prepare the building for this, the so-called wet precaution, that partial flooding is allowed” (R9). This testifies a shift in the mindset from “sealing off the building” (fighting the water) to “allowing partial flooding” (living with the water). Accordingly, the property protection advice has enhanced both adaptability and transformability. It has enhanced transformability through stimulating a learning process and mind-shift. This has empowered respective actors in their adaptive behaviour, so that they have started to adopt wet precautionary measures and therewith enhance adaptability.

Knowing how to save themselves and organise their belongings to be less damaged in case of a flood event, the institutions are likely to be less vulnerable to possible flooding. Yet the institutions are aware that the process of better adapting and preparing for floods takes time. In this sense, they seem to take a long-term future perspective, which is crucial for enhancing transformability. “This is by no means the end of the project for us. We have to keep mediating. And hope that everything that could still lead to a potential danger will be removed” (R8). Also the BREsilient project leader recognises that such co-production processes require time “as it is only now that storm surge partnership maturity is established” (R1), and is now expectant of future cooperation. “I’m curious to see how things will evolve now, but as I said, this is ultimately more of a kick-off and time will tell a lot of things. Let’s see in 20 years, maybe there will be mountains” (R1).

In order to sensitise the wider majority and thus promote a broader societal change – also among the private allotment gardeners, association members or other users – communication work beyond the association boards is crucial. In that regard, the co-produced information measures (Action Point 2) are expedient. On top of that, the association board members show a high level of commitment and responsibility in that they feel very committed to informing and sensitising their members. This is evidenced in the co-production of the information chains and signposts and has been further corroborated by the interviews (R8, R9, R10). In response to the question why they have decided to participate in the collaboration processes, the chairwoman of an allotment garden association answered: “It is the responsibility for my members. [...] Now, I have to communicate this threat to my members and sensitise them” (R8). This chairwoman shows not only high responsibility for her members but also for the private gardeners and in particular the Kaisenhaus residents who live in the parcels of her allotment garden association. “That is why I have an eye on both in my 400 allotment gardens – the classical allotment gardeners but also the people who live here” (R8).

The onsite visits and conversations to local people have revealed a very diverse picture of the extent to which the broader public has actually already been reached. For example, while some allotment gardeners are well aware of storing things higher up, others seem to be less informed. The board members have the impression that their work has certainly raised awareness to some extent, whilst also acknowledging that more work is also needed in the future (R8, R10). When asked about the impression that awareness of flood risks has increased among association members, the chairperson of an allotment garden association replied: “For some, yes, but until I reach the last one...” (R8). This affirms that enhancing a broad societal shift and therewith transformability takes time and long-term efforts.

#### 4.4. Enhancing legitimacy in the Pauliner Marsch and Im Suhrfelde

This section is dedicated to the results for answering the remaining secondary research question 4: *How is legitimacy perceived and enhanced in the Pauliner Marsch and Im Suhrfelde?* Legitimacy is thereby understood as the extent to which input politics, throughput processes and output policies are acceptable to and accepted by the actors in the PM and IS.

##### *Input legitimacy*

Input legitimacy, with respect to the case, concerns the translation of the will of the people in the PM and IS into decisions regarding the joint management of flood risk in the area. It can be assessed by the participatory quality or extent to which the collaboration as part of the project BREsilient and the storm surge partnership has managed to address people's demands and needs concerning flood risk precaution and adaptation.

With the aim of BREsilient and the storm surge partnership to jointly prepare for and adapt to the increasing flood risk in the PM and IS with the different local stakeholders, citizen participation logically took a central part. At the beginning of the project, stakeholders were identified through the situation analysis and subsequently invited to the project. Through the initial interviews of the situation analysis, people's demands for dealing with the local flood risk were collected and translated into the three points of action, which were jointly discussed, prioritised and elaborated in the course of the project (see 4.1). The BREsilient project leader commented about this initial phase: "In the first workshops, it was about: What is wished? What knowledge is there? What do the actors need?" (R1). Accordingly, the stakeholders' needs with respect to flood risk precaution and adaptation were addressed from the beginning of the project. All interviewed stakeholders confirmed that they felt that their opinion has been heard and taken into account in the collaboration (R7, R8, R9, R10). This is also illustrated through one project adjustment: While at the outset of BREsilient, the project model area only covered the PM, the decision was later taken to also embrace the area IM in response to the request by local stakeholders (R9; Wunsch et al., 2023). The chairman of a sport association confidently stated: "I dare to say that I was able to influence one or two things about the project" (R9). Similarly, a professor from the University of Oldenburg accompanying the project acknowledged the professional participation design by SKUMS. "It was all very professional and the administration engaged very well in this dialogue [with the participating social actors]" (R4). In this sense, addressing the needs and preferences of the local people in the co-production is likely to have played a key role in building input legitimacy in the PM and IS.

From the authority perspective, the participatory quality was rated to be high due to the great engagement of the local people. "It was really a tremendous commitment, and one could notice that this is simply important to the people" (R1). "What is really great is that everyone who was involved

was also very committed and really interested in improving the situation on the ground. It was formulated very clearly what the needs are and what is expected of us as an authority, and we have to deal with that as an authority” (R2). The actor network in PM and IS reflects a high sense of collective identity. The associations have already been well connected before the project through the Round Table of the Pauliner Marsch (Runder Tisch; R3, R8, R9). Through the co-production, the networking was further strengthened, especially with SKUMS. This has promoted the formulation of a collective political claims as outlined in the previous quote. Whilst the claim of aligning the scope and name of model has been followed up, the improvement of the drainage capacity of the PM and IS remains as one collective political claim (see *Output legitimacy*).

### *Throughput legitimacy*

Throughput legitimacy in the PM and IS refers to the quality of the co-production processes between the actors involved in the project BREslient and the storm surge partnership. This quality can be assessed based on the transparency, accountability, inclusiveness or openness to civil society and the quality of actors’ relationships that shape the co-production processes.

Given the vast amount of information published throughout the project, a high level of transparency was ensured. Correspondingly, the information measures (information boards, flyers, brochure; Action point 2) aided a high level of transparency. In addition, the project findings were made available to the interested public through the presentation of the results of the feasibility study on improving the drainage situation and the final conference of the BREslient project, where the results of all four model areas were presented (Gralle & Partner & Stadt-Land-Fluss Ingenieurdienste, 2023; Wunsch et al., 2023). During the interviews, the project participants and now storm surge partners affirmed that they have found also the collaboration processes to be very transparent. “I found the support in this process very good. The storm surge preparedness, this really very practical manual. There was information and guidance tailored to the individual actor” (R7).

At the beginning of the project, however, there was a divergence of views between the authorities and the private associations and organisations about the distribution of roles and responsibilities regarding the information chains (R1, R2, R4). The clarification of this initial conflict is evidence of a high degree of transparency, but also of accountability built during the co-production processes. In response to the local stakeholders’ expectations SKUMS would be responsible for informing the individual actors in the area in case of a potential flood event, it was explained in detail why the authority does not have the capacity to do so (R1, R2). Instead, different possibilities were outlined for stakeholders to inform themselves. “You can always call a flood risk centre here if you have any questions about this. As soon as there are uncertainties, you can call there” (R1). “Thankfully, [...] there are apps [and] the internet, you can now be warned by notifications” (R2). Beyond that, the

chairwoman of an allotment garden association reported that she was invited to the office of the FRM experts so that she could “get to know the office and how things work there” as a way to better understand why certain services are not feasible for the authority (R8). This instance illustrates how the authority is held accountable for its decision against an information chain from SKUMS to the individual actors in the PM and IS. By comprehensibly explaining and justifying this choice, SKUMS have clarified their and societal responsibilities while advocating self-precaution.

During the interviews, the local actors expressed that they all perceived the co-production processes, that is, the workshops and other meetings, as fair and handled with great mutual respect (R5, R7, R8, R9). The interpersonal relations and atmosphere during the collaboration processes were praised in particular. The different institutions reported that it has brought expert and laymen together on eye level, allowing to raise questions at any time. “High praise for this project, because it not only succeeded in networking and sensitising people, but also in involving them, at eye level” (R7). “The cooperation was absolutely fair. You could always ask questions as a layperson and I think that's very important” (R8). “There was no one who put him/herself above anyone else” (R5). The high level of respect and mutual appreciation fostered during the co-production processes is likely to have significantly contributed to enhancing the legitimacy of the throughput.

Albeit all project participants evaluated the quality of the co-production processes to be very high, one political actor from the advisory board of the parties in Bremen expressed some concerns regarding the inclusiveness. “The question is how much reaches the members [...]. Unfortunately, the population has been left out a bit, because the project was set up in such a way that the institutions were all contacted, but not, for example, all the private gardeners” (R7). SKUMS justified its decision to actively involve only the institutions and not the broad majority the following way. From the authority's point of view, efforts have been made “to reach everyone, but through the association level” (R3). According to one of the FRM experts, the co-production processes are about the people who have a direct interest in the area (R2). Inviting everyone to the workshops and other meetings “would go beyond the scope” (R2). Unlike the associations, the walker or occasional recreational user, however, is not directly affected by a potential flood event (R2). The BREsilient project leader added: “Now we have reached them through the information boards [and other information material]” (R1). With regard to the private allotment gardeners and Kaisenhaus residents, the authority commented: “We don't have the addresses of the people. [...]. We are an authority, but we can't really contact everyone for reasons of data protection” (R2). Instead, they built on the idea of involving “multipliers [the association boards] participating in each workshop, thus creating a certain continuity” and eventually sharing the knowledge (R1). This way, SKUMS had the impression that the private gardeners and Kaisenhaus residents have been reached and local interests equally

represented (R1, R2, R3). By opening the storm surge partnership to “all persons, associations, institutions, companies and facilities with a connection to the area”, inclusiveness and openness to civil society should also be guaranteed in the future (SKUMS, n.d.-g). As already elaborated in the previous section (4.3.), the board members indeed show a high responsibility for their members and are very committed in sensitising the wider public. This high sense of responsibility and commitment of the association's board supports SKUMS' idea of knowledge dissemination through multipliers to reach the wider public thus ensuring openness to civil society and equal representation of interests in the co-production processes.

#### *Output legitimacy*

Legitimacy on the output, applied to the case, is about the (perceived) effectiveness of the co-production to govern effectively for the people, that is, to effectively deal with the flood risk in the PM and IS.

Overall, the interviewed actors who have been actively involved in the cooperation were highly satisfied with the achievements made so far (R1, R2, R3, R5, R7, R8, R9, R10). The outcome of the project BREsilient with the foundation of the storm surge partnership is consensually considered a success by both the authority and local institutions, in that it has empowered local stakeholders and thus enhanced flood risk precaution and adaptation in the area. The participants expressed their gratitude and praise for the realisation of the project: “Very high praise for this project” (R7). “I would still like to express my thanks that this project was initiated” (R9). The chairwoman of an allotment garden association went so far as to state: “I think we have taken the maximum out of it, [...]” (R8). “There were great events and you could learn a lot from them. It was often necessary to do it this way. I can't imagine how it could have been done any other way than really working together on this project. To be given something by the city. I don't think that would have made sense” (R8). Also, the authority appears very satisfied with the outcome of the project and, moreover, expectant of the future progress in the framework of the partnership: “All in all, I'm really satisfied with the outcome. I'm really pleased that so many people are committed and I'm curious to see how it will evolve now” (R1). “I hope and think that we have now succeeded, that we have certain things to show and that we want to continue, so that this does not end after 5 years, but that we can continue this dialogue that we have opened up” (R2).

The social actors also show a certain expectation towards the future cooperation within the framework of the storm surge partnership. However, this expectation is more urgent or critical, stressing the importance of continuing efforts and future action. “Now it's a matter of maintaining it, so that it doesn't fall into oblivion” (R7). “We have to make sure that the storm surge partnership is not just a meeting where certain people report their knowledge about the current status, but where

there is a real exchange including mutual requirements to keep the knowledge about possible flooding cases permanently alive” (R9).

Especially the improvement of the drainage situation in the PM and IS presents a focal point of discussion where local actors are urging the implementation of measures (R7, R8, R9). The chairman of a sport club views the improvement of the drainage capacity as “most important measure where something must happen” (R9). “There is urgent need for action that, in the event of flooding, the water must disappear as quickly as possible” (R9). A representative of the advisory board of the parties in Bremen acknowledged, now that the project is over, “this is just one of many topics in the area. I am not sure whether the problems [drainage situation] that we have identified are going to be stringently dealt. There has been the project with a research team and funding. Now, it appears to hand somewhat in limbo, although it is particularly important to follow up on the results. [...]. That the drainage situation is now so uncertain, this is what I see as a negative or a deficiency” (R7). Nevertheless, any realisation is not yet certain. As the BREsilient project leader and the FRM experts emphasised, implementation will be a political decision (R1, R2, R3). Now that the project is finished and no more funds from the project are available, “it involves the question of financing. More precisely, of financing measures in an area that is actually meant to be flooded” (R2).

#### 4.5. The key results - in brief

This chapter presented the empirical results of the case study on the co-production of flood risk measures in the PM and IS, initiated by the project BREsilient and continued with the storm surge partnership. During the co-production processes, three points of action have been jointly developed by local stakeholders, that is, 1) Precautionary measures, 2) Information and communication measures and 3) Infrastructural measures. The co-production of these measures, corresponding to the FRMSs of flood risk mitigation and flood preparation, have enhanced flood resilience. Adaptability has been increased through wet precautionary measures, information chains and evacuation plans (Action Point 1 and 2) adopted by the involved institutions as well as through the renovation of sport pitches (Action Point 3). Transformability has been substantially fostered by sensitising and empowering local stakeholders through the collaboration processes and the property protection advice. Overall, the co-production was perceived legitimate. Addressing the demands and needs of the involved institutions and enabling work on eye level between expert and laymen has substantially contributed to the satisfaction with the collaboration and its interim outcomes. Some concerns have been voiced regarding its inclusiveness and future continuation as part of the storm surge partnership.

## 5. Conclusions and Reflections

The aim of this study was to expand understanding on co-production for resilient and legitimate FRG. For that purpose, a qualitative single case study was conducted, with the unit of analysis situated in the PM and IS in Bremen (Germany). This concluding chapter is fivefold. First, it offers the answers for the research questions. Based on the lessons drawn from the case, recommendations for public authorities are developed. The third section discusses the contribution to literature and reflects on the theoretical approach, while a methodological reflection is provided in the fourth section. Lastly, three suggestions for further research are made.

### 5.1. Answering the research questions

This section answers and reflects on the research questions underlying this thesis. For one thing, associated with the societal relevance, they offer the grounds for formulating recommendations for implementing forms of co-production to promote flood resilience and ensure legitimacy (see Section 5.2.). For another, the insights and the conclusions drawn herein further add to the academic relevance of this study (see Section 5.3.).

*How can co-production for resilient and legitimate Flood Risk Governance be conceptualised from a theoretical perspective?*

Co-production for resilient and legitimate FRG can be conceptualised through three building blocks. Since the way co-production is pursued has crucial implications for resilience and legitimacy, the first block centres around the relationship between state and societal actors in the FRG triangle and the realised form of co-production. Following Mees et al. (2016) and Mees et al. (2018), co-production can be conceptualised according to the participation entry point based on the policy cycle, the type of interaction between state and society, the role and type of citizen input and the distribution of costs and benefits. State and societal actors co-produce flood risk measures which correspond to specific FRMSs and bring with them certain implications for flood resilience, analysed in block two. Flood resilience can thereby be interpreted following Restemeyer et al. (2015), with robustness, adaptability and transformability as key characteristics. The third building block in turn examines how the co-produced measures enhance legitimacy of FRG, conceptualised according to Scharpf (1999) and Schmidt (2010) as input, throughput and output legitimacy.

*How can the co-production in the Pauliner Marsch and Im Suhrfelde be characterised?*

According to the different forms of co-production identified by Mees et al. (2016) the collaboration in the PM and IS can be identified as comprehensive co-production. Mees et al. (2016) refer to various authors arguing that codelivery should be accompanied by involvement in the decision-making



process in order to be successful, which pleads for comprehensive co-production. In line with this argumentation, Mees et al. (2017) call for bottom-up planning in their tentative framework. Already involving citizens in the decision-making is assumed to allow for better consideration and incorporation of societal needs, an imperative for effective co-production (ibid). This is confirmed by the co-production in the PM and IS where actors could influence project decisions and decide about the flood risk measures that are being discussed, prioritised and elaborated. Addressing the demands and needs has proven crucial for translating people's will into political decisions and enabling societal actors.

Applying the different typologies by Mees et al. (2018), the collaboration can be further characterised the following way. It emerged deliberatively with efforts to initiate the co-production by both SKUMS (state) and the local associations (society) and complements other governmental activities in the area. Besides, the collaboration can be described as philanthropic collective co-production, wherein the institutions collectively contribute to and the entire community benefits from the co-production.

*What measures or strategies have been co-produced in the Pauliner Marsch and Im Suhrfelde and in what way have these promoted flood resilience?*

Three points of action have been co-produced within the project programme BREsilient in the PM and IS. These encompassed 1) Precautionary measures, which essentially included property protection advice financed by SKUMS and offered to all participating associations; 2) Information and communication measures, encompassing information boards, flyers, a brochure, information chains, evacuation plans and signposts; 3) Infrastructural measures, in the context of which a feasibility study was carried out to improve the runoff capacity in the PM and IS. These three points of action correspond to two FRMSs, that is, 1) Flood risk mitigation and 2) Flood preparation.

Through the co-production of these measures or strategies, flood resilience has been significantly increased by enhancing adaptability and transformability in the PM and IS. In some respect, this supports the call by Hegger et al. (2014) for the diversification and alignment of the different FRMSs in order to foster flood resilience - albeit no combination of all five FRMSs is reached and the robustness dimension not strengthened. Given the geographical, legal and social context as floodplain with high societal benefits, this focus in the PM and IS appears reasonable. Besides substantiating the call by Hegger et al. (2014), the case thus shows that the co-production of FRMSs and building resilience requires an approach tailored to the context. This affirms the argument that "building resilience [... depends] on contextual factors" (Restemeyer et al., 2015, p. 47).

Adaptability has been enhanced through the wet precautionary measures, the information chains and evacuation plans adopted by the institutions, but also the renovation of sport pitches. The dimension of transformability can be identified as the focal point of the co-production. It has been enhanced through building knowledge and other competences of the involved actors in dealing with floods. In this way, a learning process has been stimulated. Project participants and now storm surge partners have experienced a shift in their mind-set on how to deal with the water. This in turn has stimulated them to take (wet precautionary) measures enhancing adaptability. Accordingly, the case corroborates, as Restemeyer et al. (2015) state, that achieving such a shift in people's mind-set to "live with the water", for which transformability asks, is prerequisite for improving adaptability. Although this research did not concentrate on their relationship, the case has shown that private partners with expertise, such as the property protection consultant, can also play a crucial role in empowering societal actors and stimulating them to take co-produced adaptation measures. These findings of sufficient knowledge, competence and attitude among societal actors as enabling factors for strengthening flood resilience in PM and IS not only substantiate the argumentation of Restemeyer et al. (2015), but also the framework of Mees et al. (2017). The latter lists knowledge, perceived responsibility and self-efficacy as necessary conditions.

Even if adaptability and transformability have been fostered, more action is needed as building flood resilience involves a long-term process and future perspective, as both SKUMS and the institutions in the PM and IS recognise and also academic scholars remark (see e.g., Restemeyer et al., 2015). "Partnership maturity" is established but needs to be maintained. The transformation to "live with the water" in the PM and IS is in progress, having reached the association board members. Now, they appear highly committed in sensitising the broader public. In that vein, they can be identified as agents of change in driving broader societal transition. Such change agents are in the literature regarded as critical to "make different actors collaborate and create long-term visions", crucial for the capacity to transform (Restemeyer et al., 2015, p. 50).

#### *How is legitimacy perceived and enhanced in the Pauliner Marsch and Im Suhrfelde?*

Overall, the co-production has been perceived legitimate. Input legitimacy has been enhanced through SKUMS by addressing demands and needs from the beginning on and translating these in the co-production of flood risk measures and further project decisions. This is in line with the findings of the literature review by Mees et al. (2017) stating that co-production should be guided by community needs. Highly engaged participants aided to formulate collective political will and translate this in political decisions. Transparency (through e.g., the information measures, Action Point 2) and accountability (through e.g., the clarification of responsibilities) has been ensured. Considered instrumental for legitimacy of the throughput (see Schmidt, 2010; Schmidt & Wood,

2019), these two criteria can be identified as factors which contributed to the legitimacy of the governance processes in the PM and IS. On top of that, the relationship and work on eye level between laymen and experts were greatly praised, leading to the conclusion that the quality of the social interaction during the co-production processes was another decisive factor enhancing legitimacy.

Regarding the inclusiveness and openness to civil society, diverging perspectives have been revealed. One critic has been voiced since the broader public has not been actively involved in the collaboration questioning in how far they have been reached. According to the authority, involving the broader public would have exceeded the scope of the project. This is in line with what is argued in the literature (Boedeltje & Cornips, 2004). While noting that “no single interactive process is free from inequalities in the distribution of influence” (p. 17), Boedeltje and Cornips (2004) thus call for the notion of representativeness, that is, the total population should be represented in the co-production. In line with this argumentation, Driessen et al. (1997) advocate a careful selection of participants (in: Boedeltje & Cornips, 2004). According to them only those stakeholders should be selected for participation who are integral for a successful policy implementation (ibid). SKUMS decided in that regard to invite the institutions as multipliers, disseminating their knowledge through communication chains and actor networks, especially since they also do not have addresses from the private allotment gardeners.

The academic literature further notes that if policy processes completely live up on the principle of fairness but are not able to produce effective outcomes, citizens might become dissatisfied or frustrated (Blaug, 1996 in: Boedeltje & Cornips, 2004). This is reflected by the participants in PM and IS who did not call for small-step but action-oriented processes. Based on the achievements of the project and the satisfaction with the project outcome, it can be claimed that BREsiliant with its results was generally perceived effective, thus ensuring output legitimacy. Assuming that pure fairness cannot be guaranteed and that citizens want processes to be effective, i.e., to address pressing social problems (such as flood risk), Boedeltje and Cornips (2004) advocate a trade-off between competence and fairness (ibid), in other words between effectiveness and inclusiveness. Considering the association boards as representatives of local interests and potential future change agents to drive a broad societal transition to “live with the water”, the participation format within the project and the storm surge partnership appears both inclusive and effective in terms of enhancing resilience.

Beyond that, the future course of action will have a strong influence on the legitimacy of the co-production in the PM and IS over the long run. The way the storm surge partnership is realised and collaboration continued will probably play a crucial role on the perceived future legitimacy, just as

pending political decision given the expressed claims for urgent improvement of the drainage situation.

***How can co-production enhance resilient and legitimate Flood Risk Governance, and what lessons can be drawn from the co-production in the Pauliner Marsch and Im Suhrfelde?***

As advocated by Mees et al. (2016) and Mees et al. (2017), this study confirms through an empirical case that a comprehensive approach to co-production with deliberative efforts complementing governmental activities is beneficial for enhancing resilient and legitimate FRG. It has proven critical to address and respond to the demands and needs with respect to managing floods from the outset onwards. On the one hand, it facilitates the empowerment of actors to increase transformability and adaptability and therewith flood resilience. On the other hand, responding to the societal demands and needs allows to translate the collective political will into political decisions and thus build legitimacy. Mees et al. (2017, p. 12), in this regard, go so far to conclude “that in order to achieve resilience [...and] legitimacy, a comprehensive approach to co-production appears indispensable”.

Being deliberately initiated with the efforts of both SKUMS (state) and local associations (society), and complementing other state activities in the area, may also have played an important role in the co-production to improve flood resilience and legitimacy. In their literature review, Mees et al. (2017) found both characteristics being beneficial for resilient and legitimate FRG. The fact that the actors collectively contribute to and benefit from the co-production is likely to have fostered collective identity, which in turn seems to further favour resilient and legitimate FRG.

Besides transparency and accountability, working on eye-level between experts and lay people (societal actors) has proven crucial for ensuring legitimacy through the highly praised social quality during the co-production processes. Beyond that, co-production on equal footing and tailor-made advisory work have allowed for a high learning effect and empowerment of the actors towards a change in their attitude to "live with water", as the capacity to transform calls for. As argued by Restemeyer et al. (2015), the case has affirmed that such a change is a prerequisite for increasing adaptability: Before actors to adopt adaptation measures, their mind-set had to change respectively. In that regard, the case has shown that individual property protection advice can play a decisive role.

Further, the case has revealed that the selection of participants can have crucial implications for flood resilience and legitimacy. In the PM and IS, the different institutions have been regarded as multipliers, representing the interests of and disseminating knowledge to the broader public. It has been indicated that they act as societal agents of change driving a community-wide transition to “live with the water”.

Lastly, the case in the PM and IS has demonstrated that a long-term or future vision and continuous co-production efforts are crucial to ensure both flood resilience and legitimacy over the long run, yet another empirical evidence for the academic literature. In the PM and IS, it has taken time to build partnership maturity, strengthening the recommendation by Mees et al. (2017) for policymakers to invest in sufficient time. Now, the partnership maturity is to be maintained. The actors in the PM and IS show an expectant and prospective attitude. Future efforts will be decisive for the success of the storm surge partnership, that is, enhancing flood resilience and legitimacy over the long-term.

All the points raised may contribute to enhancing both flood resilience and legitimacy, which demonstrates a high interrelation between resilient and legitimate FRG, as already found by Mees et al. (2017). Therefore, the conclusion can be drawn that co-producing for flood resilience and legitimacy in FRG goes somewhat hand in hand.

## 5.2. Recommendations

Based on the lessons drawn from the case of the PM and IS, this section sets out five recommendations for designing co-production for resilient and legitimate FRG. The first recommendation is specifically tailored to the case, targeting the members of the environmental authority involved in the storm surge partnership to further enhance co-production for resilient and legitimate FRG in the PM and IS. This recommendation is as follows:

*Maintain the cooperation within the storm surge partnership in the same quality as it was at the end of the project BREsilient.*

It seems paramount to communicate to the stakeholders that the flood risk issue in the PM and IS will not fall into neglect, that efforts will not diminish, but that the dialogue will be maintained in an appropriate equitable way. This means, in other words, the cooperation on an equal footing between experts and lay people will continue, further enhancing flood resilience of the PM and IS. Creative ideas in this regard, i.e., for the annual meeting of the storm surge meetings have already been indicated during the interviews. Now it is a matter of realising them in the future.

The following recommendations are generally addressed to other German authorities in local FRM, aiming to enhance flood resilience and legitimacy through co-production with civil society. It should be emphasised that it is not possible to make strict generalisations from the case. As also the case of the PM and IS has shown, every co-production initiative is characterised and influenced by its contextual factors which are unique and related to certain complexities. Such contextual factors may include the geographical location or legal setting. While emphasising to take these into account, four recommendations are offered based on the case study findings from the PM and IS. These can assist German authorities in realising co-production for resilient and legitimate FRG.

*1. Address demands and needs of civil society from the beginning onwards.*

This implies a comprehensive approach to co-production which has proven crucial for enhancing flood resilience and legitimacy. On the one hand, responding to the societal demands and needs allows to translate the collective political will into political decisions and thus build legitimacy. On the other hand, it stimulates the empowerment of actors, enhances adaptive and transformative capacities, and therewith flood resilience.

*2. Ensure collaboration on eye level between expert and laymen.*

Collaboration on equal footing can be identified as another crucial factor for co-production in terms of enhancing legitimacy and flood resilience. For one thing, it is likely to have a decisive influence on the legitimacy of the co-production processes. For another, it may contribute to building flood resilience. That is, firstly by allowing for a high learning effect and empowerment, which fosters transformability, and secondly by stimulating actors to take adaptation measures in the area, thus strengthening adaptability. To that end, providing expertise through tailor-made advice on vulnerability reduction and adaptation options may be considered an effective option.

*3. Select participants carefully.*

A careful selection of participants for co-production may be pivotal in order to ensure an equal representation of the community interests and to achieve effective outcomes. Effectiveness in this context can be understood in terms of building flood resilience. While ensuring the representativeness of the entire community in the area, it might be highly valuable to select those participants having the potential to act as change agents. Not only are they crucial to represent interests from the broader public, but also to drive a community-wide transition to “live with the water”.

*4. Ensure continuing efforts and adopt a long-term vision.*

This is critical as building flood resilience and legitimacy requires long-term co-production processes. It takes time to build mutual respect and therewith “partnership or co-production maturity”. Similarly, sensitising and empowering local stakeholders and adapting the area requires time. A long-term vision, as called for by the transformability dimension, with continuing efforts can be crucial in order to enhance flood resilience but also to ensure societal satisfaction with the co-production (i.e., legitimacy) in the long run.

### 5.3. Contribution to the literature and theoretical reflection

This thesis has drawn on the literature of the concepts FRG, flood resilience, co-production and legitimacy. Co-production for resilient and legitimate FRG has so far received little attention in academic literature, which is why its exploration is still in its infancy. Bringing the four concepts

together, this study has expanded the understanding of how the co-production of flood risk measures can enhance flood resilience and legitimacy in FRG. It did so by synthesising the work of renowned scholars in a novel theoretical framework and adding an empirical case to the academic literature, that is, the establishment of the first storm surge partnership in Germany. In doing so, this work has confirmed and extended theoretical knowledge on co-production for resilient and legitimate FRG, as discussed in the previous section.

The literature review ensured a thorough theoretical understanding in advance. Understanding and conceptualising legitimacy has admittedly been a challenge due to the manifold interpretations and evaluation criteria. Nevertheless, this challenge was resolved. Ultimately, the literature review allowed the case to be embedded in a theoretical framework before the case study evidence was collected. The theoretical framework played a fundamental role and provided a comprehensive and valuable conceptualisation for analysing co-production for resilient and legitimate FRG.

#### 5.4. Methodological reflection

With the aim of better understanding how the co-production of flood risk measures enhances flood resilience and legitimacy in FRG, this study encompassed a qualitative single case study. This section evaluates and reflects on the methodological approach of this research.

The co-production in the PM and IS (Bremen, Germany) within the project programme BREsilient and the establishment of the storm surge partnership were chosen as the unit of analysis. The rationales for this choice were due to its intriguing contextual factors as floodplain with high societal value. These have spurred the co-production of flood risk measures beyond legal requirements and the establishment of the first storm surge partnership in Germany. The selection of the case did not disappoint, in that it provided inspiring and meaningful findings on co-production for resilient and legitimate FRG, albeit a longer timeframe might have yielded even more meaningful conclusions regarding the future of co-production within the framework of the storm surge partnership.

Overall, the data collection process was successful. The use of multiple sources of data contributed to the validity of this research. The documentation and observations were instrumental in gaining an in-depth understanding of the case. Besides, a diverse set of actors was interviewed. These proved all to be very open and forthcoming in their narratives. The semi-structured organisation of the interviews allowed for certain flexibility, so that the respondents could expand on interesting topics they raised in their answers. This way, the semi-structured interviews enabled diverse profound perspectives to be gained from the actors involved. However, one limitation has to be acknowledged with regard to the language and its meaning. With the unit of analysis situated in Germany, the analysed documentation and the interviews conducted were in German language, while the guiding

theory was studied in English. By translating from German to English and vice versa, there is the risk of words or statements losing meaning. This applies to the translation of theoretical English terms but also to particular German expressions used by the interviewees or in the documentation. To counter this, three considerations were made. First, particularly concise words or special terms are provided in the original and translated version in the quotations in Chapter 4. Second, the appendix provides all direct quotations from the interviews and the documentation in the original German and in the translated English version. Third, the codebook specifies the codes both in English and in German.

During the data collection, one pitfall occurred when the recording of an interview failed. To compensate for this, a detailed interview report was written afterwards and supplemented by e-mail correspondence. Another obstacle was encountered during the casual conversations with local people in the area during the site visits. Being in the back of their allotment gardens, the respective owners were difficult to approach. Given the spontaneity of the conversations, people seemed also less open and talkative. Therefore, a portrait of the broad majority could only be obtained to a limited extent. Nevertheless, the results and conclusions drawn can be evaluated convincing in that they contribute to the academic literature and provide recommendations for policymakers.

### 5.5. Suggestions for further research

Based on the lessons of this thesis, this work shall end with the following three suggestions for further research.

First, given the recency the storm surge partnership and the uncertainty regarding the improvement of the drainage situation in the PM and IS, future or long-term research (in or over ~10 years) would be intriguing in relation to the case studied to assess whether or to what extent the co-production has improved flood resilience and legitimacy over the long time.

Second, research on cases inside the main dike line appears crucial in order to examine the influence of the geographical context. Here, a multiple or comparative case study design might be interesting in order to compare cases located both inside and outside the main dike line for investigating how the location shapes the co-production of flood risk measures.

This work has indicated that social actors as agents of change can play a central role in co-production to enhance flood resilience and legitimacy in FRG. Therefore, third, it seems intriguing to further investigate the role of societal agents of change in co-producing for resilient and legitimate FRG.



## References

- Ahrens, J., & Rudolph, P. M. (2006). The importance of governance in risk reduction and disaster management. *Journal of contingencies and crisis management*, 14(4), 207-220.
- Albrechts, L. (2013). Reframing strategic spatial planning by using a coproduction perspective. *Planning theory*, 12(1), 46-63.
- Alexander, D. E. (2013). Resilience and disaster risk reduction: an etymological journey. *Natural hazards and earth system sciences*, 13(11), 2707-2716.
- Alexander, M., Priest, S., & Mees, H. (2016). A framework for evaluating flood risk governance. *Environmental Science & Policy*, 64, 38-47.
- Arifin, S. R. M. (2018). Ethical considerations in qualitative study. *International journal of care scholars*, 1(2), 30-33.
- Attems, M. S., Thaler, T., Genovese, E., & Fuchs, S. (2020). Implementation of property-level flood risk adaptation (PLFRA) measures: Choices and decisions. *Wiley Interdisciplinary Reviews: Water*, 7(1), e1404.
- Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The qualitative report*, 13(4), 544-559.
- Bell, S., & Hindmoor, A. (2009). *Rethinking governance: The centrality of the state in modern society*. Cambridge University Press.
- Blaug, R. (1996). New theories of discursive democracy: a user's guide. *Philosophy & social criticism*, 22(1), 49-80.
- BMBF. (2023). *BREsilient II – Klimaresiliente Zukunftsstadt Bremen – Umsetzungs- und Verstetigungsphase*. Retrieved 17.08.2023 from [https://www.fona.de/de/massnahmen/foerdermassnahmen/Klimaresilienz/bresilient\\_2020.php](https://www.fona.de/de/massnahmen/foerdermassnahmen/Klimaresilienz/bresilient_2020.php)
- BMI. (2022). *Bericht zur Hochwasserkatastrophe 2021: Katastrophenhilfe, Wiederaufbau und Evaluierungsprozesse*. Bundesministerium des Innern und für Heimat Retrieved from [https://www.bmi.bund.de/SharedDocs/downloads/DE/veroeffentlichungen/2022/abschlussbericht-hochwasserkatastrophe.pdf?\\_\\_blob=publicationFile&v=1](https://www.bmi.bund.de/SharedDocs/downloads/DE/veroeffentlichungen/2022/abschlussbericht-hochwasserkatastrophe.pdf?__blob=publicationFile&v=1)
- Boedeltje, M., & Cornips, J. (2004). *Input and output legitimacy in interactive governance* (No. NIG2-01). NIG Annual Work Conference 2004, Rotterdam. <http://hdl.handle.net/1765/1750>
- Bovaird, T., Van Ryzin, G. G., Loeffler, E., & Parrado, S. (2015). Activating citizens to participate in collective co-production of public services. *Journal of Social Policy*, 44(1), 1-23.
- Brudney, J. L., & England, R. E. (1983). Toward a definition of the coproduction concept. *Public administration review*, 59-65.

- Carpenter, S., Walker, B., Anderies, J. M., & Abel, N. (2001). From metaphor to measurement: resilience of what to what? *Ecosystems*, 4, 765-781.
- Cope, M. (2010). Coding Transcripts and Diaries. In N. Clifford, S. French, & G. Valentine (Eds.), *Key methods in geography* (2 ed., pp. 440-452). Sage Publications.
- Cote, M., & Nightingale, A. J. (2012). Resilience thinking meets social theory: situating social change in socio-ecological systems (SES) research. *Progress in human geography*, 36(4), 475-489.
- Crabbé, A., & Leroy, P. (2008). *The handbook of environmental policy evaluation*. Earthscan.
- Driessen, P., Glasbergen, P., & Verdaas, C. (1997). Interactieve beleidsvorming voor publieke werken. *Bestuurswetenschappen*, 374-391.
- Driessen, P. P., Dieperink, C., Van Laerhoven, F., Runhaar, H. A., & Vermeulen, W. J. (2012). Towards a conceptual framework for the study of shifts in modes of environmental governance—experiences from the Netherlands. *Environmental policy and governance*, 22(3), 143-160.
- Dunn, K. (2005). Interviewing. In I. Hay (Ed.), *Qualitative Research Methods in Human Geography* (2nd ed., pp. 79-105). Oxford University Press.
- European Commission. (2001). *European governance: a white paper*. Brussels Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52001DC0428>
- Feyen, L., Dankers, R., Bódis, K., Salamon, P., & Barredo, J. I. (2012). Fluvial flood risk in Europe in present and future climates. *Climatic change*, 112(1), 47-62.
- Flowerdew, R., & Martin, D. (2005). *Methods in human geography: a guide for students doing a research project*. Pearson Education.
- Folke, C., Carpenter, S., Walker, B., Scheffer, M., Elmqvist, T., Gunderson, L., & Holling, C. S. (2004). Regime shifts, resilience, and biodiversity in ecosystem management. *Annu. Rev. Ecol. Evol. Syst.*, 35, 557-581.
- Fotaki, M. (2011). Towards developing new partnerships in public services: Users as consumers, citizens and/or co-producers in health and social care in England and Sweden. *Public administration*, 89(3), 933-955.
- Gralle & Partner, & Stadt-Land-Fluss Ingenieurdienste. (2023, 26.04.2023). *BREsilient: Machbarkeitsstudie zur Verbesserung der Entwässerung der "Pauliner Marsch" und "Im Suhrfelde"*. Vorstellung der Machbarkeitsstudie zur Verbesserung der Entwässerung in der Pauliner Marsch & Im Suhrfelde, Online.
- Graue, C. (2015). Qualitative data analysis. *International Journal of Sales, Retailing & Marketing*, 4(9), 5-14.
- Gupta, J., Termeer, C., Klostermann, J., Meijerink, S., Van den Brink, M., Jong, P., Nootboom, S., & Bergsma, E. (2010). The adaptive capacity wheel: a method to assess the inherent

- characteristics of institutions to enable the adaptive capacity of society. *Environmental Science & Policy*, 13(6), 459-471.
- Gustafsson, J. (2017). Single case studies vs. multiple case studies: A comparative study. In
- Hahn, T. (2011). Self-organized governance networks for ecosystem management: who is accountable? *Ecology and Society*, 16(2).
- Hartmann, T., & Scheibel, M. (2016). Flood Label for buildings: a tool for more flood-resilient cities. FLOODrisk 2016-3rd European Conference on Flood Risk Management,
- Hegger, D. L., Driessen, P. P., Dieperink, C., Wiering, M., Raadgever, G., & van Rijswijk, H. F. (2014). Assessing stability and dynamics in flood risk governance. *Water Resources Management*, 28(12), 4127-4142.
- Hegger, D. L., Driessen, P. P., Wiering, M., Van Rijswijk, H. F., Kundzewicz, Z. W., Matczak, P., Crabbé, A., Raadgever, G. T., Bakker, M. H., & Priest, S. J. (2016). Toward more flood resilience: Is a diversification of flood risk management strategies the way forward? *Ecology and Society*, 21(4).
- Hemmati, M., Ellingwood, B. R., & Mahmoud, H. N. (2020). The role of urban growth in resilience of communities under flood risk. *Earth's Future*, 8(3), e2019EF001382.
- Héritier, A. (1999). Elements of democratic legitimation in Europe: an alternative perspective. *Journal of European public policy*, 6(2), 269-282.
- Héritier, A. (2003). Composite democracy in Europe: the role of transparency and access to information. *Journal of European public policy*, 10(5), 814-833.
- Hooijer, A., Klijn, F., Pedroli, G. B. M., & Van Os, A. G. (2004). Towards sustainable flood risk management in the Rhine and Meuse river basins: synopsis of the findings of IRMA-SPONGE. *River research and applications*, 20(3), 343-357.
- Huitema, D., Lebel, L., & Meijerink, S. (2011). The strategies of policy entrepreneurs in water transitions around the world. *Water policy*, 13(5), 717-733.
- IPCC. (2023). Synthesis Report of the Sixth Assessment Report. [https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC\\_AR6\\_SYR\\_LongerReport.pdf](https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_LongerReport.pdf)
- Jann, W., & Wegrich, K. (2017). Theories of the policy cycle. In *Handbook of public policy analysis* (pp. 69-88). Routledge.
- Johnson, C., Penning-Rowsell, E., & Parker, D. (2007). Natural and imposed injustices: the challenges in implementing 'fair' flood risk management policy in England. *Geographical Journal*, 173(4), 374-390.
- Johnson, C. L., & Priest, S. J. (2008). Flood risk management in England: a changing landscape of risk responsibility? *International Journal of Water Resources Development*, 24(4), 513-525.

- Kammerbauer, M., & Wamsler, C. (2017). Social inequality and marginalization in post-disaster recovery: Challenging the consensus? *International Journal of Disaster Risk Reduction*, *24*, 411-418.
- Karrasch, L., Restemeyer, B., & Klenke, T. (2021). The 'Flood Resilience Rose': A management tool to promote transformation towards flood resilience. *Journal of Flood Risk Management*, *14*(3), e12726.
- Kaufmann, M., Mees, H., Liefferink, D., & Crabbé, A. (2016). A game of give and take: The introduction of multi-layer (water) safety in the Netherlands and Flanders. *Land Use Policy*, *57*, 277-286.
- Lane, J. (2022). *Academic writing: What is a literature review?* Simon Fraser University. Retrieved 30.06.2023 from <https://www.lib.sfu.ca/about/branches-depts/slc/writing/assignments/lit-review>
- Lange, P., Driessen, P. P., Sauer, A., Bornemann, B., & Burger, P. (2013). Governing towards sustainability—conceptualizing modes of governance. *Journal of environmental policy & planning*, *15*(3), 403-425.
- Lemos, M. C., & Agrawal, A. (2006). Environmental governance. *Annu. Rev. Environ. Resour.*, *31*, 297-325.
- Loorbach, D. (2010). Transition management for sustainable development: a prescriptive, complexity-based governance framework. *Governance*, *23*(1), 161-183.
- Magnette, P. (2003). European governance and civic participation: beyond elitist citizenship? *Political studies*, *51*(1), 144-160.
- Mees, H., Alexander, M., Grapois, M., Matczak, P., & Mees, H. (2018). Typologies of citizen co-production in flood risk governance. *Environmental Science & Policy*, *89*, 330-339.
- Mees, H., Crabbé, A., Alexander, M., Kaufmann, M., Bruzzone, S., Lévy, L., & Lewandowski, J. (2016). Coproducing flood risk management through citizen involvement: insights from cross-country comparison in Europe. *Ecology and Society*, *21*(3).
- Mees, H., Crabbé, A., & Driessen, P. P. (2017). Conditions for citizen co-production in a resilient, efficient and legitimate flood risk governance arrangement. A tentative framework. *Journal of environmental policy & planning*, *19*(6), 827-842.
- Mees, H. L., Driessen, P. P., & Runhaar, H. A. (2014). Legitimate adaptive flood risk governance beyond the dikes: the cases of Hamburg, Helsinki and Rotterdam. *Regional Environmental Change*, *14*(2), 671-682.
- Meijerink, S., & Dicke, W. (2008). Shifts in the public–private divide in flood management. *International Journal of Water Resources Development*, *24*(4), 499-512.

- Nunes, D. M., Pinheiro, M. D., & Tomé, A. (2019). Does a review of urban resilience allow for the support of an evolutionary concept? *Journal of Environmental Management*, 244, 422-430.
- OECD. (2015). *OECD Principles on Water Governance*. Retrieved from <https://www.oecd.org/cfe/regionaldevelopment/OECD-Principles-on-Water-Governance-en.pdf>
- Ostrom, E. (1996). Crossing the great divide: coproduction, synergy, and development. *World development*, 24(6), 1073-1087.
- Parks, R. B., Baker, P. C., Kiser, L., Oakerson, R., Ostrom, E., Ostrom, V., Percy, S. L., Vandivort, M. B., Whitaker, G. P., & Wilson, R. (1981). Consumers as coproducers of public services: Some economic and institutional considerations. *Policy studies journal*, 9(7), 1001-1011.
- Penning-Rowsell, E., Johnson, C., & Tunstall, S. (2006). 'Signals' from pre-crisis discourse: lessons from UK flooding for global environmental policy change? *Global Environmental Change*, 16(4), 323-339.
- Pettersson, M., Van Rijswijk, M., Suykens, C., Alexander, M., Ek, K., & Priest, S. (2017). Assessing the legitimacy of flood risk governance arrangements in Europe: Insights from intra-country evaluations. *Water international*, 42(8), 929-944.
- Petts, J. (2007). Learning about learning: lessons from public engagement and deliberation on urban river restoration. *Geographical journal*, 173(4), 300-311.
- Renn, O., Klinke, A., & Van Asselt, M. (2011). Coping with complexity, uncertainty and ambiguity in risk governance: a synthesis. *Ambio*, 40, 231-246.
- Restemeyer, B., Woltjer, J., & van den Brink, M. (2015). A strategy-based framework for assessing the flood resilience of cities—A Hamburg case study. *Planning Theory & Practice*, 16(1), 45-62.
- Rhodes, R. A. W. (1996). The new governance: governing without government. *Political studies*, 44(4), 652-667.
- Scharpf, F. (1999). *Governing in Europe: Effective and democratic?* Oxford University Press.
- Schmidt, V. (2010). *Democracy and legitimacy in the European Union revisited: Input, Output and Throughput* (Vol. 21). Freie Universität Berlin. [https://refubium.fu-berlin.de/bitstream/handle/fub188/18555/WP\\_21\\_November\\_Schmidt.pdf;jsessionid=EA62DEC8206951549CC85455D78DCADE?sequence=1](https://refubium.fu-berlin.de/bitstream/handle/fub188/18555/WP_21_November_Schmidt.pdf;jsessionid=EA62DEC8206951549CC85455D78DCADE?sequence=1)
- Schmidt, V., & Wood, M. (2019). Conceptualizing throughput legitimacy: Procedural mechanisms of accountability, transparency, inclusiveness and openness in EU governance. *Public Administration*, 97(4), 727-740.
- Schulzki-Haddouti, C. (2022). *Hochwasserkatastrophe Juli 2021: Gesamtzahl der Betroffenen bis heute nicht bekannt*. Retrieved 28.07.2023 from

<https://www.riffreporter.de/de/umwelt/hochwasser-betroffene-schaden-2021-deutschland-nrw-ahrtahl-rheinland-pfalz-sachsen-bayern>

- SKUMS. (2019a). Dokumentation des Workshops „Pauliner Marsch: Überflutungsvorsorge gemeinsam gestalten – Gefahren bewerten, Anforderungen priorisieren“ am 7.11.2019 im Bürgerhaus Weserterrassen. Pauliner Marsch: Überflutungsvorsorge gemeinsam gestalten – Gefahren bewerten, Anforderungen priorisieren, Bremen.
- SKUMS. (2019b). *Meldekettens und Infomaterial für die Pauliner Marsch: Rückblick auf Fachwerkstatt zur Sturmflutvorsorge*. Retrieved 01.07.2023 from <https://bresilient.de/2022/09/19/meldekettens-und-infomaterial-fuer-die-pauliner-marsch-fachwerkstatt-zur-sturmflutvorsorge/>
- SKUMS. (2020a). Dokumentation der Veranstaltung „Hochwasserangepasste Sportstätten“ am 1.10.2020 in der Pauliner Marsch. Bremen.
- SKUMS. (2020b). Dokumentation des Workshops „Pauliner Marsch: Überflutungsvorsorge gemeinsam gestalten – Anpassungsmaßnahmen weiterentwickeln“ am 13.2.2020 im Bürgerhaus Weserterrassen. Pauliner Marsch: Überflutungsvorsorge gemeinsam gestalten – Anpassungsmaßnahmen weiterentwickeln, Bremen.
- SKUMS. (2020c). Hochwasserrisikoversorge für die Pauliner Marsch - Gefährdungsanalyse. *Fact Sheet*. [https://bresilient.de/wp-content/uploads/2020/02/BREsilient\\_FactSheet\\_Gefaehrdungsanalyse-PM.pdf](https://bresilient.de/wp-content/uploads/2020/02/BREsilient_FactSheet_Gefaehrdungsanalyse-PM.pdf)
- SKUMS. (2020d). Hochwasserrisikoversorge für die Pauliner Marsch - Situationsanalyse. *Fact Sheet*. [https://bresilient.de/wp-content/uploads/2020/02/BREsilient\\_FactSheet\\_Situationsanalyse-PM.pdf](https://bresilient.de/wp-content/uploads/2020/02/BREsilient_FactSheet_Situationsanalyse-PM.pdf)
- SKUMS. (2020e). *Informationen aus dem Modellbereich „Pauliner Marsch“ kurz & knapp zusammengefasst*. Retrieved 02.07.2023 from <https://bresilient.de/2020/03/06/fact-sheets-informationen-aus-dem-modellbereich-pauliner-marsch-kurz-knapp-zusammengefasst/>
- SKUMS. (2021a). *Dokumentation zum Auftakt der Sturmflutpartnerschaft Pauliner Marsch/Im Suhrfelde* Auftaktveranstaltung der Sturmflutpartnerschaft Pauliner Marsch/Im Suhrfelde, Bremen. [https://bresilient.de/wp-content/uploads/2021/12/20211116\\_Auftakt-SFP\\_Dokumentation.pdf](https://bresilient.de/wp-content/uploads/2021/12/20211116_Auftakt-SFP_Dokumentation.pdf)
- SKUMS. (2021b). *Gemeinsame Sturmflutvorsorge: in der Pauliner Marsch wird eine Sturmflutpartnerschaft etabliert*. Retrieved 30.06.2023 from <https://bresilient.de/2021/12/16/gemeinsame-sturmflutvorsorge-in-der-pauliner-marsch-wird-eine-sturmflutpartnerschaft-etabliert/>
- SKUMS. (2022a, 21.09.2022). *Dokumentation: Gründung der Sturmflutpartnerschaft Pauliner Marsch/Im Suhrfelde und Jährlicher Austausch der Sturmflutpartnerschaft* Bremen.

[https://bresilient.de/wp-content/uploads/2022/12/20220921\\_Gruendung-und-Austausch-SFP\\_Dokumentation.pdf](https://bresilient.de/wp-content/uploads/2022/12/20220921_Gruendung-und-Austausch-SFP_Dokumentation.pdf)

- SKUMS. (2022b). Gemeinsam sicher! Informationen und Handlungsempfehlungen. *Brochüre zur Sturmflutvorsorge in der Pauliner Marsch & Im Suhrfelde*. [https://bau.bremen.de/sixcms/media.php/13/Brosch%c3%bcrcre\\_Sturmflutvorsorge\\_Pauliner%20Marsch.pdf](https://bau.bremen.de/sixcms/media.php/13/Brosch%c3%bcrcre_Sturmflutvorsorge_Pauliner%20Marsch.pdf)
- SKUMS. (2022c). Gründung der Sturmflutpartnerschaft Pauliner Marsch/Im Suhrfelde und Jährlicher Austausch der Sturmflutpartnerschaft. [https://bresilient.de/wp-content/uploads/2022/12/20220921\\_Gruendung-und-Austausch-SFP\\_Dokumentation.pdf](https://bresilient.de/wp-content/uploads/2022/12/20220921_Gruendung-und-Austausch-SFP_Dokumentation.pdf)
- SKUMS. (2022d). *Infotafeln machen auf Sturmflut- und Starkregenrisiken aufmerksam*. Retrieved 02.07.2023 from <https://bresilient.de/2022/12/19/infotafeln-machen-auf-sturmflut-und-starkregenrisiken-aufmerksam/>
- SKUMS. (2022e). Sturmfluten in der Pauliner Marsch und im Suhrfelde. *Infotafel*. [https://bresilient.de/wp-content/uploads/2022/12/BREsilient\\_PM\\_Infotafel\\_web.pdf](https://bresilient.de/wp-content/uploads/2022/12/BREsilient_PM_Infotafel_web.pdf)
- SKUMS. (n.d.-a). *BREsilient - Startklar für den Klimawandel*. Senatorin für Klimaschutz, Umwelt, Mobilität, Stadtentwicklung und Wohnungsbau. Retrieved 04.03.2023 from <https://bresilient.de/>
- SKUMS. (n.d.-b). *BREsilient: Klimaresiliente Zukunftsstadt Bremen*. Retrieved 03.07.2023 from <https://www.klimaanpassung.bremen.de/projekte/bresilient-20404>
- SKUMS. (n.d.-c). *Forschung vor Ort*. Retrieved 03.07.2023 from <https://bresilient.de/service/forschung-vor-ort/>
- SKUMS. (n.d.-d). *Hochwasserrisiko verstehen*. Retrieved 19.03.2023 from <https://bresilient.de/portfolio-item/pauliner-marsch/>
- SKUMS. (n.d.-e). Kooperationsvereinigung zwischen den Mitgliedern der Sturmflutpartnerschaft Pauliner Marsch & Im Suhrfelde.
- SKUMS. (n.d.-f). Sturmfluten in der Pauliner Marsch und Im Suhrfelde. *Informationstafel*. [https://bresilient.de/wp-content/uploads/2023/07/BREsilient\\_PM\\_Infotafel\\_web.pdf](https://bresilient.de/wp-content/uploads/2023/07/BREsilient_PM_Infotafel_web.pdf)
- SKUMS. (n.d.-g). *Sturmflutpartnerschaft Pauliner Marsch & Im Suhrfelde*. Retrieved 21.09.2023 from <https://umwelt.bremen.de/umwelt/wasserwirtschaft-hochwasser-und-kuestenschutz/sturmflutpartnerschaft-1712091>
- Snel, K. A., Witte, P. A., Hartmann, T., & Geertman, S. C. (2020). The shifting position of homeowners in flood resilience: From recipients to key-stakeholders. *Wiley Interdisciplinary Reviews: Water*, 7(4), e1451.



- Snel, K. A. W. (2021). *Flooded with Expectations - Exploring the Perspectives of Residents at Flood Risk*. [PhD Thesis - Research external, graduation external, Utrecht University]. In Planning co-op.
- Suchman, M. C. (1995). Managing legitimacy: Strategic and institutional approaches. *Academy of management review*, 20(3), 571-610.
- Tempels, B., & Hartmann, T. (2014). A co-evolving frontier between land and water: dilemmas of flexibility versus robustness in flood risk management. *Water international*, 39(6), 872-883.
- Thaler, T., & Priest, S. (2014). Partnership funding in flood risk management: new localism debate and policy in England. *Area*, 46(4), 418-425.
- Trenczek, J., Lühr, O., Eiserbeck, L., & Leuschner, V. (2022). *Projektbericht "Kosten durch Klimawandelfolgen": Schäden der Sturzfluten und Überschwemmungen im Juli 2021 in Deutschland. Eine ex-post-Analyse*. Bundesministerium für Wirtschaft und Klimaschutz (BMWK). [https://www.prognos.com/sites/default/files/2022-07/Prognos\\_KlimawandelfolgenDeutschland\\_Detailuntersuchung%20Flut\\_AP2\\_3b\\_.pdf](https://www.prognos.com/sites/default/files/2022-07/Prognos_KlimawandelfolgenDeutschland_Detailuntersuchung%20Flut_AP2_3b_.pdf)
- van Herk, S., Zevenbergen, C., Gersonius, B., Waals, H., & Kelder, E. (2014). Process design and management for integrated flood risk management: exploring the multi-layer safety approach for Dordrecht, The Netherlands. *Journal of Water and Climate Change*, 5(1), 100-115.
- Vousdoukas, M. I., Mentaschi, L., Voukouvalas, E., Bianchi, A., Dottori, F., & Feyen, L. (2018). Climatic and socioeconomic controls of future coastal flood risk in Europe. *Nature Climate Change*, 8(9), 776-780.
- Walker, B., Holling, C. S., Carpenter, S. R., & Kinzig, A. (2004). Resilience, adaptability and transformability in social-ecological systems. *Ecology and Society*, 9(2).
- Wardekker, A. (2021). Contrasting the framing of urban climate resilience. *Sustainable Cities and Society*, 75, 103258.
- Wunsch, J., Rolker, I., Herbeck, L., Müller, E., & Barde, H. U. (2023, 03.05.2023). *Schlüsselergebnisse der BREsilient-Modellbereiche: Modellbereich 3: Sturmflutvorsorge Pauliner Marsch & Im Suhrfelde*. BREsilient-Abschlusskonferenz, Bremen.
- Yin, R. K. (2003). *Case Study Research: Design and Methods*. Sage Publications, Thousand Oaks, London.
- Yin, R. K. (2018). *Case study research and applications : design and methods* (Sixth ed.). SAGE Publications.
- Zevenbergen, C., Veerbeek, W., Gersonius, B., & Van Herk, S. (2008). Challenges in urban flood management: travelling across spatial and temporal scales. *Journal of Flood Risk Management*, 1(2), 81-88.



## Appendix A – Interview guide

The following table contains the interview guide developed for the case study in the PM and IS. The guide encompasses questions for both governmental actors from the authority, as organisers of the project BREsilient and the storm surge partnership, as well as social actors from different institutions, as project participants and partnership members. Each interview was tailored to the respective respondent. Depending on the interviewee, the final set of questions was composed and individual questions were adjusted. Owing to the flexibility of semi-structured interviews, supplementary questions were asked at points of interest.

Table A: Interview guide

<b>Introduction</b>	<p>Vielen Dank, dass Sie sich heute die Zeit für das Interview genommen haben! <i>Vorstellung des Themas meiner Masterarbeit und was von dem Interview erwartet werden kann. Zur Auswertung der Daten würde ich das Gespräch gerne aufzeichnen. Erklärung des Umgangs mit den Daten.</i> Wäre daher Ihrerseits eine Aufzeichnung des Gesprächs ok?</p> <p>Das Gebiet Pauliner Marsch &amp; Im Suhrfelde ist Hochwasserrisikogebiet, zumal es vor der Hauptdeichlinie liegt. Gleichzeitig ist das Gebiet aber durch einen hohen Nutzen geprägt. Können Sie kurz darlegen, was sie mit dem Gebiet verbindet bzw. welche Interessen sie vertreten?</p>
<b>Form of co-production</b>	<p>Zusammen mit lokalen beteiligten Akteuren haben Sie Maßnahmen und Strategien zur Überflutungsvorsorge entwickelt. Wie ist die Zusammenarbeit entstanden? Wurde Sie allein von der Regierung im Rahmen des Projekts initiiert oder kam das Interesse von beiden Seiten?</p> <p>Ersetzt diese Partnerschaft den Hochwasserschutz in der Gegend, der sonst von dem Staat sichergestellt werden würde oder ist sie als komplementär zu staatlichen Hochwasserschutz zu sehen? Oder würde das Gebiet sonst gar nicht vor Hochwasser geschützt werden?</p> <p>Was würden Sie sagen, haben Sie zu dem Prozess beigetragen und inwiefern profitieren sie durch ihr Engagement und die Zusammenarbeit?</p>
<b>Flood resilience</b>	<p>Welche Strategien und Maßnahmen haben Sie zusammen mit den Akteuren entwickelt im Rahmen von BREsilient und/oder der Sturmflutpartnerschaft?</p> <p>Welche Maßnahmen wurden bereits umgesetzt? Und von wem? // Haben Sie bereits Maßnahmen umgesetzt, um sich oder Ihren Verein/Ihre Institution besser auf Hochwasser vorzubereiten?</p> <p>Wie bewerten Sie Ihr Wissen in Bezug auf Hochwasser bzw. Ihr Hochwasserrisikobewusstsein vor Start des Projekts und zu dem jetzigen Zeitpunkt?</p> <p>Fühlen Sie sich in für den Hochwasserschutz in der Pauliner Marsch verantwortlich? Hat sich dieses Verantwortungsbewusstsein durch die Zusammenarbeit verändert?</p> <p>Fühlen Sie sich in der Lage, Hochwassermaßnahmen zu ergreifen? Gleiche Frage hier: Denken Sie, Ihre Handlungsfähigkeit hat sich durch die Zusammenarbeit verändert?</p>
<b>Legitimacy</b>	<p>Für welche Aufgaben fühlen Sie sich als Behörde verantwortlich? Was erwarten Sie von den einzelnen Akteuren? Sind Sie der Meinung, dass die Verantwortlichkeiten klar dargelegt wurden bzw. den einzelnen Akteuren bewusst sind? // Wurde Ihrer Meinung nach klar (sprich transparent) dargelegt, was von wem während der Zusammenarbeit erwartet wird?</p> <p>Fühlen Sie sich durch BREsilient und die Partnerschaft besser vernetzt innerhalb der städtischen Verwaltung/mit den lokalen Akteuren (Vereinen, etc.)?</p> <p>Sie haben sich dagegen entschieden, im Rahmen vom BREsilient nicht die breite Mehrheit anzusprechen, sondern nur die Institutionen bzw. die Vereine. Warum?</p> <p>Haben Sie den Eindruck, dass das Projekt und die Partnerschaft die breite Mehrheit erreicht?</p>

	<p>Würden Sie sagen, dass Inklusivität gewährleistet wird? Sprich: Werden alle betroffenen Akteure bzw. deren Interessen einbezogen/bringen sich alle Akteure gleichmäßig ein? Welche Interessen sind womöglich über- oder unterrepräsentiert?</p> <p>Gab es bisher Konflikte während der Kollaborationsprozesse?</p> <p>Empfinden Sie die bisherige Zusammenarbeit als fair?</p>
<b>Closing</b>	<p>Das Projekt läuft jetzt aus. Wie planen Sie, die Zusammenarbeit in der Zukunft aufrecht zu erhalten?</p> <p>Sind Sie mit dem bisherigen Zwischenergebnis der Kollaborationsprozesse zufrieden?</p> <p>Wie würden Sie die Zusammenarbeit in der Pauliner Marsch insgesamt bewerten? Was würden Sie sagen, ist besonders gut gelaufen? Was denken Sie, könnte man in Zukunft noch verbessern?</p> <p>Das war es mit Fragen meinerseits. Gibt es Ihrerseits noch irgendwelche Anmerkungen oder Fragen?</p>

## Appendix B – Code book

The subsequent table provides the codebook compiled during the research process. The left column shows the code categories based on the theoretical framework. The right column shows the individual codes. The colouring indicates whether the codes were developed deductively or inductively, that is, based on the theoretical framework or the data collected. Depending on that, the original code was either in English or German language. To avoid the losing of meaning through the translation, both the English and German codes are given.

Table B: Codebook with the categories and corresponding deductive (blue) and inductive (green) codes

Categories	Codes (deductive / inductive )
<b>Form of Co-production</b>	Einbindungsphasen der Zusammenarbeit (involvement phases) Initialisierung der Zusammenarbeit (initialisation of the collaboration) Rolle der Zusammenarbeit Im Hochwasserrisikomanagement (role of the collaboration in FRM) Gewinn von und Beitrag zu der Zusammenarbeit (distribution of costs and benefits from the collaboration)
<b>Flood risk measures</b>	Nasse Vorsorge (wet precaution) Informationskette (information chain) Notfallkonzepte (evacuation plans) Verbesserung der Entwässerungsleistung (improving the drainage performance)
<b>Adaptability</b>	Schadensreduktion (damage reduction)
<b>Transformability</b>	Sensibilisierung (sensitising) Wissensvermittlung (knowledge transfer) Lernen (learning) Langzeitprozess (long-term process) Zukunftsvision (future vision)
<b>Input</b>	Umsetzung des kollektiven Willens (translating collective will) Bedürfnisse der Akteure (demands of the actors)

<b>Throughput</b>	<p>Transparenz (transparency)</p> <p>Rechenschaftspflicht (accountability)</p> <p>Klärung der Verantwortlichkeiten (clarifying responsibilities)</p> <p>Inklusivität (inclusiveness)</p> <p>Offenheit zur Gesellschaft (openness to civil society)</p> <p>Einbindung der breiten Mehrheit durch Multiplikatoren (engagement of the broad majority through multipliers)</p> <p>Faire Zusammenarbeit auf Augenhöhe (fair collaboration on eye level)</p>
<b>Output</b>	<p>Zufriedenheit mit dem Zwischenergebnis der Zusammenarbeit (satisfaction with the preliminary collaboration result)</p>

## Appendix C – Translated quotes from the interviews

In order to counter the losing or distorting of meaning through the researcher's translations, the following table contains all direct quotations from the interviews used in this paper in their original German version (right column) with their English translations (middle column). In addition, the identifier (ID, left column) indicates the person from whom the corresponding comment originates.

Table C: Translated quotes from the interviews

ID	English	German
<i>4.2. Characterising the co-production in the Pauliner Marsch and Im Suhrfelde (pp.33-35)</i>		
R9	<p>“The process was not fast enough for us associations. First, a lot of fundamental things were worked out, which were relatively clear to us, [...until] useful results were worked out for us. [...], but as I said, in the second part, everything was resolved in a very reasonable way in my opinion and also came to a reasonable end.”</p>	<p>Also es gab einen Konflikt, der in die Richtung ging, dass uns in den Vereinen der Prozess nicht schnell genug ging. Es wurde erst sehr viel Fundamentales erarbeitet, was für uns relativ klar war, bis dann so „Butter bei die Fische“ gemacht wurde und dann für uns brauchbare Ergebnisse erarbeitet worden sind. [...], aber wie gesagt, in dem zweiten Teil ist das für meine Begriffe dann alles sehr vernünftig aufgelöst worden und auch zu einem Ende gekommen, so wie ich denke, das eigentlich ganz vernünftig war.</p>
R9	<p>“We are a group of about 8 or 9 associations in the Pauliner Marsch. [...] It was then that we made massive demands on the city and said, please, you have to help us. [...] Then, at some point, the city came up with the idea to say that they would make a research project out of it, BREsilient, and one of the four focal areas that this project was supposed to have [...] was the Pauliner Marsch.”</p>	<p>Wir sind ein Zusammenschluss von etwa 8 oder 9 Vereinen in der Pauliner Marsch. [...] Wie ich eben schon sagte, ist die Grundaussführung gewesen, dass wir an die Stadt massive Forderungen gestellt haben, und gesagt, ihr müsst bitte uns helfen. [Ihr müsst auch für uns entsprechende Maßnahmen einleiten. Wir sind genauso bedroht.] Dann ist irgendwann bei der Stadt die Idee gekommen, zu sagen, wir machen daraus ein Forschungsprojekt, dieses BREsilient, und dort einer der 4 Schwerpunkte, die dieses Projekt haben sollte, war dann, die haben das irgendwie so schön genannt als Fallbeispiel oder so ähnlich, die Pauliner Marsch [...].</p>
R3	<p>“Before my colleague and me became active there, there was already the Round Table of the Pauliner Marsch, which was set up at the political level, where flood protection was always a topic, [...]. But the initiative to become active in this area, as we were, or in the way we have become with BREsilient, came from here. [...] Somewhere there was also the wish from the users, also from politics, also from our house, but everything was not that bundled. That only became possible with BREsilient. Before, there was not a single request from any of the users in either of the two areas as to whether we could do anything for them.”</p>	<p>Bevor meine Kollegin Imke Rolker und ich dort und tätig geworden sind, gab es schon etwas, das nannte sich Runder Tisch Pauliner Marsch. Das war auf politischer Ebene angesiedelt, wo es auch immer wieder um Hochwasserschutz ging, [...]. Irgendwo kam auch der Wunsch von den Nutzenden, auch von der Politik, auch aus unserem Haus, aber alles nicht so gebündelt. Das wurde dann erst mit BREsilient ermöglicht. Vorher gab keine einzige Anfrage von irgendeinem Nutzenden dort in den beiden Bereichen, ob wir irgendwas für sie tun können.</p>
	<p>Due to its legal designation as a flood-prone area or floodplain, the PM and IS “fall through the</p>	<p>Und dann haben wir einige Bereiche identifiziert in Bremen, wo ich gesagt habe, die fallen so ein</p>

	cracks in the implementation of the Flood Risk Management Directive”.	bisschen durch das Raster der Umsetzung der Hochwasserrisikomanagement-Richtlinie und dazu gehört die Pauliner Marsch (R3)
R2	“That is, it does not replace anything, it is actually a plus of the Environmental Senate that is additionally provided for this area.”	Das heißt, es ersetzt nichts, es ist eigentlich ein Plus vom Umweltsenat, dass man das dann noch zusätzlich für dieses Gebiet mithat.
R9 R5	They reported to have contributed “with questions, examples, demands, where we need advice, what we still want to know” (R9) but also with “local knowledge” (R5).	Beigetragen, denke ich, habe ich auf jeden Fall immer wieder mit Fragen, Beispielen, Forderungen, wo wir Beratungsbedarf haben, was wir noch wissen wollen, wo wir uns vorstellen können, wie es weitergeht (R9). Im Prozess haben wir unser Wissen und unsere Ortskenntnis eingebracht (R5).
R9	Major benefits mentioned in interviews were the “accumulation and the transfer of knowledge.”	Und konkret profitiert habe ich von der Wissensansammlung, der Wissensweitergabe durch die Objektberatung.
<i>4.3. Fostering societal change and adapting the Pauliner Marsch and Im Suhrfelde to flooding (pp. 35-42)</i>		
R1	“For improving their self-precaution, the BREsilient project leader reported, “there was a great need for advice. The associations in particular were very interested in knowing more about the level of protection of their areas and buildings and what measures they could implement themselves.”	Dann gab es einen ganz großen Bedarf an Beratungen, also die Vereine insbesondere waren sehr daran interessiert, einfach noch mehr zu wissen, wie überhaupt das Schutzniveau ihrer Flächen und Gebäude ist und was man dann an Maßnahmen selber umsetzen könnte.
R9	Through the advice, they collectively came to the conclusion that the so-called “Nasse Vorsorge” (wet precaution) is the preferred strategy. That means, as one interviewee described, “that partial flooding is allowed and the damage that actually occurs is then tried to be minimised.”	Jetzt haben wir eben gelernt durch die Beratung, dass es nicht besonders sinnvoll ist, zu versuchen, das Gebäude in dem Maße zu schützen, dass man das Wasser nicht eindringen lässt, sondern, dass es besser ist, man bereitet das Gebäude darauf vor, die sogenannte nasse Vorsorge, dass also teilweise überflutet werden kann und dass dann die Schäden eben versucht werden, zu minimieren, die dann wirklich auftreten.
R9	„We built a first floor on our building 3-4 years ago. [...] This way, in case of flooding, we have the possibility to move the parts that are valuable and that should not be flooded to the first floor.”	Wir haben vor 3-4 Jahren auf unser Gebäude einen 1. Stock gebaut. [...] dadurch haben wir im Falle einer Überflutung die Möglichkeit, die Teile, die wertvoll sind und die nicht überflutet werden, sollen, in den 1. Stock zu bringen.
R9	“If the water starts to rise so that these locks are flooded, they will break down.”	Wenn das Wasser droht, hochzusteigen, dass diese Schlösser überflutet werden, dann werden sie halt kaputt gehen, wenn man sie nicht vorher ausbaut.
R1	As SKUMS reflected, the “transfer of knowledge was [another crucial] point.”	Also genau, Wissensvermittlung war ein Punkt.
R8	“Whoever wants to be informed will get the message from us. [...] This is not a compulsion. I now have 100 people who have said I would like to be informed.”	Wer benachrichtigt werden möchte, der kriegt dann von uns die Nachricht. [...] Also es ist kein Zwang. Ich habe jetzt 100 Menschen, die gesagt haben, ich möchte informiert werden, weil ich davon direkt betroffen bin.
R9	“We are now at a point where we can say that we	Also wir sind jetzt so weit, dass wir eigentlich sagen

	need to do exactly this and that. [...], we need five teams. Each team will be busy for about an hour and consists of only two people. We only need ten people in the area in this case.“	können, wir müssen genau das und das und das tun. [...], wir brauchen 5 Teams, die sich darum kümmern und jedes Team wird etwa eine Stunde beschäftigt sein und setzt sich nur aus 2 Personen zusammen und das alles. Wir brauchen im konkreten Fall nur 10 Leute vor Ort.
R8	“We are still getting signs that we can install at the corners of the building to demonstrate, when the flood water rises above the 5.50 metres, how high the water level is here. To give the feeling: Hey, the water is here now and it's not about wet feet, it's really high.”	Wir bekommen jetzt noch Schilder, die wir an die Hausecken anbringen können, um zu zeigen, wenn das Wasser über die 5,50 Meter geht, wie hoch steht das dann hier? Auch um das Gefühl dafür zu bekommen, dass ich denen das zeigen kann: Hey, jetzt steht das Wasser hier und es geht es hier nicht um nasse Füße, sondern es geht wirklich hoch.
R8	“Another representative of the canoe club came up with the idea. He wanted to put up such signs on his buildings and then told SKUMS about the idea. They immediately took up the idea and said that if other associations wanted to do the same, they would provide the signs.“	Ein anderer Vertreter von den Kanufreunden, der Herr Köhler, der ist auf die Idee gekommen. Er wollte solche Schilder bei sich an den Gebäuden anbringen und hatte das Frau Herbeck dann auch gesagt und die hat die Idee sofort aufgenommen und hat gesagt, wenn andere Vereine das auch möchten, dann stellt sie die Schilder her, [...].
R1	According to the BREsilient project leader, local associations and organisations had expressed concerns about drainage performance of the areas in case of flooding. “How will the water get out again and will the one sewer even be able to cope with it?”.	[...], also es kam immer auch die Frage auf, wie ist es denn überhaupt, wenn wir überflutet werden? Wie kommt das Wasser dann wieder raus und schafft das denn überhaupt das eine Ziel?
R1	Apart from this drainage issue, it was reported in the interviews that some artificial turf pitches were renovated as part of the project, so that they “no longer have microplastics, but a sand filling and are therefore better prepared in terms of environmental risk.”	Ah, das könnte man noch als Maßnahme nennen. Denn in der Zwischenzeit von BREsilient wurden nämlich auch schon hier eben 2 oder 3 Plätze saniert und haben jetzt keine Mikroplastik mehr, sondern eine Sandverfüllung und sind damit auch schon, was das Umweltrisiko angeht, schon besser aufgestellt.
R8	“I would like to see a fund with money in it for disasters, for people who lose their belongings, and also for associations that lose their equipment.”	Also ich würde mir einen Fonds wünschen, wo Geldstand drin ist für den Katastrophenfall, für die Menschen, die ihr Hab und Gut verlieren, auch für die Vereine, die ihre Ausstattung verlieren.
R2	“There are also certain legal 'no-goes'. For example, raising the levees. That is simply not possible because it is a designated flood-prone area, which is used to be flooded.”	Es gibt halt auch von gesetzlicher Seite gewisse 'No goes', die einfach nicht gehen. Beispielsweise die Erhöhung der Verwallung. Das geht einfach nicht, weil es ein festgesetztes hochwassergefährdetes Gebiet ist, was dazu dient, überschwemmt zu werden.
R9	It has been shown that “in the event of a flood in the PM, the water would not have drained off until after 24 hours. In the area IM, the levee is a little higher but there is no sewer outlet, so the water would remain for at least a week, if not longer” (R9), causing considerable damage.	[...], die eine Erkenntnis, die auch in dem Projekt noch mal herausgearbeitet wurde, ist, dass der Ablauf bei einer eventuellen Überflutung in dem Gebiet der egedeichten Pauliner Marsch deutlich länger als 24 Stunden dauert, wenn man nicht weitere Maßnahmen ergreift. In dem Gebiet von Suhrfelde ist zwar die Eindeichung ein wenig höher, aber es gibt keinen Ablauf, das heißt, das Wasser bleibt dort mindestens eine Woche oder noch länger stehen, [...].

R9	“In principle, it has always been clear to us that we live in a vulnerable area there. What was certainly not so clear to us was how we were going to deal with it.”	Also vom Grundsatz her ist uns immer klar gewesen, dass wir dort in einem gefährdeten Gebiet leben. Dass, was uns sicherlich nicht so weit klar war, wie wir damit umgehen.
R9	One association board member reports, “Now we have learned through the consultation that it is not particularly sensible to try to seal off or protect the building so that you do not allow the water to seep in, but that it is better to prepare the building for this, the so-called wet precaution, that partial flooding is allowed”, [...].	Jetzt haben wir eben gelernt durch die Beratung, dass es nicht besonders sinnvoll ist, zu versuchen, das Gebäude in dem Maße zu schützen, dass man das Wasser nicht eindringen lässt, sondern, dass es besser ist, man bereitet das Gebäude darauf vor, die sogenannte nasse Vorsorge, dass also teilweise überflutet werden kann [...].
R8	“This is by no means the end of the project for us. We have to keep mediating. And hope that everything that could still lead to a potential danger will be removed.”	Wir müssen uns immer wieder vermitteln. Und hoffen, dass eben da alles beseitigt wird, was noch zu einer Gefährdung führen kann.
R1	Also the BRESilient project leader recognises that such co-production processes require time “as it is only now that storm surge partnership maturity is established”, [...].	[...], weil erst jetzt ist wirklich diese Sturmflutpartnerschaft-Reife auch da. Das wäre nach dem Anfangsworkshop noch nicht der Fall gewesen. Also ich glaube, das war wirklich die Zeit. Und das zeigt mir auch, so ein so ein Prozess braucht Zeit. Das ging ja jetzt über mehrere Jahre und die haben wir auch benötigt
R1	[...], and is now expectant of future cooperation. “I’m curious to see how things will evolve now, but as I said, this is ultimately more of a kick-off and time will tell a lot of things. Let’s see in 20 years, maybe there will be mountains.”	Ich bin gespannt, wie es weitergeht jetzt, aber wie gesagt, das ist letztendlich ja eher der Startschuss und vieles wird die Zeit auch noch sagen. Mal sehen in 20 Jahren, da entstehen vielleicht Berge.
R8	“It is the responsibility for my members.”	Es ist die Verantwortung für meinen Mitglieder.
R8	Now, I have to communicate this threat to my members and sensitise them.”	Also dieses Gefühl muss ich in alle erstmal reinbekommen. Die müssen sensibilisiert werden [...].
R8	“That is why I have an eye on both in my 400 allotment gardens – the classical allotment gardeners but also the people who live here.”	Und darum habe ich immer für meine 400 Gärten so ein Auge auf beide, die klassischen Kleingärtner, aber auch die Menschen und Familien, die hier leben [...].
R8	When asked about the impression that awareness of flood risks has increased among association members, the chairperson of an allotment garden association replied: “For some, yes, but until I reach the last one...”.	<i>Haben Sie seitens der Mitglieder bereits das Gefühl, dass deren Hochwasserrisikowissen und Bewusstsein gesteigert wurde?</i> Bei einigen auf jeden Fall, aber bis ich den letzten erreichte habe ....
<b>4.4. Enhancing legitimacy in the Pauliner Marsch and Im Suhrfelde (pp. 43-47)</b>		
R1	“In the first workshops, it was about: What is wished? What knowledge is there? What do the actors need?”	Also in den ersten Workshops ging es einfach viel darum, was wird gewünscht, was ist an Wissen da, was brauchen die Akteure?
R9	“I dare to say that I was able to influence one or two things about the project.”	Ich maße mir auch zu sagen, dass ich das ein oder andere an dem Projekt beeinflussen konnte.
R4	“It was all very professional and the administration engaged very well in this dialogue [with the participating social actors].”	Das war alles sehr professionell, auch die Verwaltung, die eben sich auf diesen Dialog sehr gut eingelassen hat.
R1	“It was really a tremendous commitment, and one could notice that this is simply important to	Also das war wirklich ein Wahnsinnsengagement, und man hat wirklich gemerkt, das ist den Leuten einfach



	the people.“	wichtig.
R2	“What is really great is that everyone who was involved was also very committed and really interested in improving the situation on the ground. It was formulated very clearly what the needs are and what is expected of us as an authority, and we have to deal with that as an authority.”	Also was wirklich toll ist, ist, dass alle, die beteiligt da waren, auch sehr engagiert waren und auch wirklich ein Interesse daran hatten, dass die Situation vor Ort verbessert werden soll. Es wurde wirklich auch, und das finde ich schon toll, sehr klar formuliert, wie die Bedürfnisse sind und was auch von uns als Behörde erwartet wird und damit müssen wir als Behörde auch umgehen.
R7	“I found the support in this process very good. The storm surge preparedness, this really very practical manual. There was information and guidance tailored to the individual actor.”	Die Unterstützung auch in diesem Prozess, die fand ich sehr gut. Die Sturmflutvorsorge, diese wirklich sehr praxisnahe Anhandgabe.
R1	“You can always call a flood risk centre here if you have any questions about this. As soon as there are uncertainties, you can call there.”	[...] wir zeigen euch, wie man sich informiert, aber es ist nicht möglich -und genau- und sie können sich bei Fragen dazu hier bei einer Hochwasserrisiko-Zentrale jederzeit anrufen. Sobald es Unsicherheiten gibt, können Sie da anrufen.
R2	“Thankfully, [...] there are apps [and] the internet, you can now be warned by notifications.”	Also es gibt dankenswerterweise, das war früher ja noch anders, Apps, es gibt das Internet, man kann sich inzwischen durch Benachrichtigungen warnen lassen.
R8	Beyond that, the chairwoman of an allotment garden association reported that she was invited to the office of FRM experts so that she could “get to know the office and how things work there” as a way to better understand why certain services are not feasible for the authority.	Die beiden Herr Wunsch und Frau Rolker, die sprachen mich dann an oder haben mich angeschrieben, sie würden mich doch gerne mal einladen, dass ich mal die Dienststelle kennenlerne, wie das da abläuft.
R7	“High praise for this project, because it not only succeeded in networking and sensitising people, but also in involving them, at eye level.”	Und sehr großes Lob an dieses Projekt, weil es nicht nur gelungen ist, die Leute zu vernetzen und zu sensibilisieren, sondern auch mit einzubinden, auf Augenhöhe.
R8	“The cooperation was absolutely fair. You could always ask questions as a layperson and I think that's very important.”	Die Zusammenarbeit war absolut fair. Also man konnte auch immer wieder nachfragen als Laie und das finde ich schon mal ganz wichtig, [...].
R5	“There was no one who put him/herself above anyone else.”	Es gab keinen, der sich über andere gestellt hat [...].
R7	“But the question is how much reaches the members [...]. Unfortunately, the population has been left out a bit, because the project was set up in such a way that the institutions were all contacted, but not, for example, all the private gardeners.”	Aber die Frage ist natürlich, wie viel kommt auch bei den Mitgliedern an [...]. Leider ist ja die Bevölkerung ein bisschen außen vor geblieben, weil das Projekt so angelegt war in der Pauliner Marsch, dass die Institutionen alle angeschrieben wurden, aber nicht zum Beispiel die ganzen Privatgärten, die dort auch ansässig sind.
R3	From the authority's point of view, efforts have been made “to reach everyone, but through the association level.”	Also meiner Wahrnehmung nach haben wir schon versucht, alle zu erreichen, aber über die Vereinsebene.
R2	According to the authority, the co-production processes are about the people who have a direct interest in the area. Inviting everyone to the	Also die breite Mehrheit, das würde das Ganze natürlich extrem sprengen, also, es ging auch wirklich um die Leute, die da vor Ort ein ganz direktes

	workshops and other meetings “would go beyond the scope”. Unlike the associations, however, the walker or occasional recreational user is not directly affected by a potential flood event.	Interesse haben, oder auch Flächen haben, die sie irgendwie, nicht unbedingt bewirtschaften, aber nutzen. Wenn man jetzt den Spaziergänger anspricht, der gerne durch das Gebiet läuft, dann nutzt er das Gebiet auch, aber im akuten Fall einer Sturmflut muss derjenige nichts machen, also die Vereine sind ja direkt von seinem Sturmflutereignis betroffen.
R1	“Now we have reached them through the information boards [and other information material].”	Jetzt haben wir sie erreicht eben durch die Schilder [...].
R2	“We don't have the addresses of the people. [...]. We are an authority, but we can't really reach everyone for reasons of data protection.”	Wir haben ja gar nicht die Adressen von den Leuten. [...]. Wir sind zwar eine Behörde, aber wir können aus datenschutzrechtlichen Gründen nicht wirklich alle erreichen.
R1	They built on the idea of involving “multipliers [the association boards] participating in each workshop, thus creating a certain continuity” and eventually sharing the knowledge.	[...] die Idee war, Multiplikatoren dabei zu haben, das heißt Personen, die sich jedes Mal an den Workshops auch beteiligen, um dann so eine gewisse Kontinuität zu schaffen.
R7	“Very high praise for this project”	Und sehr großes Lob an dieses Projekt, [...].
R9	“I would still like to express my thanks that this project was initiated.”	Auch [...], möchte ich mich trotzdem nochmal bedanken, dass dieses Projekt überhaupt initialisiert wurde, [...].
R8	“I think we have taken the maximum out of it.”	Ja, ich glaube, wir haben das Maximum rausgeholt, [...].
R8	“There were great events and you could learn a lot from them. It was often necessary to do it this way. I can't imagine how it could have been done any other way than really working together on this project. To be given something by the city. I don't think that would have made sense.”	Es waren tolle Veranstaltungen, man hat jede Menge lernen können dadurch. Es war auch oft notwendig, das so in der Form zu machen. Ich könnte mir gar nicht vorstellen, wie man es anders hätte machen können, als dass man wirklich gemeinsam an diesem Projekt arbeitet. Irgendetwas von der Stadt vorgegeben zu bekommen. Ich glaube, das wäre nicht sinnvoll gewesen.
R1	“All in all, I'm really satisfied with the outcome. I'm really pleased that so many people are committed and I'm curious to see how it will evolve now.”	Insgesamt aber bin ich wirklich zufrieden, wie das gelaufen ist. Es freut mich wirklich sehr, dass ich so viele engagiert haben. Ich bin gespannt, wie es weitergeht jetzt, [...].
R2	“I hope and think that we have now succeeded, that we have certain things to show and that we want to continue, so that this does not end after 5 years, but that we can continue this dialogue that we have opened up.”	Ich hoffe und denke, dass das uns jetzt doch gelungen ist, dass wir gewisse Dinge vorzuweisen haben und ja auch weitermachen wollen, also dass das jetzt nicht nach 5 Jahren endet, sondern dass wir diesen Dialog, den wir eröffnet haben, weiterführen können.
R7	“Now it's a matter of maintaining it, so that it doesn't fall into oblivion.”	Jetzt geht es eben darum, dass man weiter dranbleibt, dass es nicht in Vergessenheit gerät.
R9	“We have to make sure that the storm surge partnership is not just a meeting where certain people report their knowledge about the current status, but where there is a real exchange including mutual requirements to keep the knowledge about possible flooding cases	So und ansonsten muss man gucken, dass die Sturmflutpartnerschaft dann auch nicht nur eine Zusammenkunft wird, in dem bestimmte Leute ihr Wissen über den aktuellen Meldestand bekannt geben, sondern, in dem es wirklich zu einem Austausch kommt und auch die gegenseitigen

	permanently alive.”	Anforderungen, dort wirklich das Wissen über mögliche Überflutungsfälle permanent am Leben zu halten.
R9	The chairman of a sport club views the improvement of the drainage capacity as “most important measure where something must happen.“	An der Stelle ist sicherlich die größte Maßnahme, wo etwas passieren muss an der Geschichte.
R9	“There is urgent need for action that, in the event of flooding, the water must disappear as quickly as possible.“	[...], so dass man also an der Stelle relativ dringenden Handlungsbedarf hat, dass im Falle einer Überflutung das Wasser eben auch möglichst schnell wieder entschwinden muss.
R7	A representative of the advisory board of the parties in Bremen acknowledged, now that the project is over, “this is just one of many topics in the area. I am not sure whether the problems [drainage situation] that we have identified are going to be stringently dealt. There has been the project with a research team and funding. Now, it appears to hand somewhat in limbo, although it is particularly important to follow up on the results. [...]. That the drainage situation is now so uncertain, this is what I see as a negative or a deficiency”.	Und jetzt ist das eben wieder nur eines von vielen Themen in dem Gebiet. Ich bin nicht sicher, ob das jetzt auch stringent so weiterverfolgt wird, dass jetzt diese Mängel, die wir erkannt haben, behandelt werden. Es gab das Projekt mit dem Forschungsteam, das finanziert wurde. Jetzt mit dem Ende des Projekts, hängt es so ein bisschen in der Luft, obwohl es jetzt eben ganz besonders wichtig, die Ergebnisse auch weiter zu verfolgen. [...]. Das sehe ich als negativ oder als Mangel an, dass die Entwässerung jetzt so ungewiss ist.
R2	Now that the project is finished and no more funds from the project are available, “it involves the question of financing. More precisely, of financing measures in an area that is actually meant to be flooded.”	Das ist eine politische Entscheidung, weil da muss Geld für in die Hand genommen werden für ein Gebiet, das muss man ganz klar sagen, das eigentlich dazu dient überschwemmt zu werden.

## Appendix D – Translated quotes from the documentation

With the same purpose as the previous table, the subsequent one provides all direct quotations from the documentation referenced in this paper in their original German version (right column) with their English translations (middle column). In addition, the abbreviated source of the documentation from which the statement originates is indicated (right column). The complete citation can be found in the reference list.

Table D: Translated quotes from the documentation

English	German	Source
<i>4.1. Introducing the case (pp. 29-32)</i>		
Through annual meetings before the beginning of the storm surge season, “a permanent, regular exchange of information and experience in order to jointly identify problems and find common solutions and synergies” will be organised.	Mit der Sturmflutpartnerschaft wird ein dauerhafter, regelmäßiger Informations- und Erfahrungsaustausch stattfinden, um gemeinsam Probleme zu identifizieren und zuständigkeitsübergreifende Lösungen sowie Synergien zu finden.	(SKUMS, n.d.-e, p. 1)
<i>4.3. Fostering societal change and adapting the Pauliner Marsch and Im Suhrfelde to flooding (pp. 35-42)</i>		
The boards highlight “the risks posed by storm surges [...and provide] tips for precaution, behaviour and information sources”	Insbesondere werden dort die Risiken hervorgehoben, die durch Sturmfluten (Pauliner Marsch & Im Suhrfelde) bzw. Starkregen (Blumenthaler Aue) entstehen können und Tipps zur Vorsorge, Verhalten und Informationsquellen genannt.	SKUMS (2022d)
“Alongside the description of the area and an analysis of land use and existing flood protection, the focus is on the risk awareness of the users and the presentation of flooding scenarios and damage potential”	Neben der Gebietsbeschreibung und einer Analyse zur Flächennutzung und zum vorhandenen Hochwasserschutz steht insbesondere das Gefährdungsbewusstsein der Nutzer*innen sowie die Darstellung von Überflutungsszenarien und Schadenspotenzialen im Vordergrund der Faktenblätter.	SKUMS (2020e)
The product provides “with numerous recommendations for action and background information, including how to read a water level forecast”	Eine Broschüre mit vielen Handlungsempfehlungen und Hintergrundinformationen, u. a. zum Lesen einer Pegelvorhersage, [...].	SKUMS (2019b)
This third action point revolves “improving the drainage performance of the areas "Pauliner Marsch" and "Im Suhrfelde" in case of storm surge or high water events leading to flooding of the two areas”	Verbesserung der Entwässerungsleistung der Bereiche „Pauliner Marsch“ und „Im Suhrfelde“ im Falle von Sturmflut- oder Hochwasserereignissen, die zu einer Überflutung der Gebiete führen.	Gralle & Partner & Stadt-Land-Fluss Ingenieurdienste (2023, p. 2)
As a response to these concerns, SKUMS commissioned engineering services to conduct a feasibility study to address these questions and to identify possible solutions that, “with the least possible restrictions on use for the	Im Rahmen einer Machbarkeitsstudie sollen Antworten auf die folgenden Fragen ermittelt und Lösungsmöglichkeiten skizziert werden, die bei möglichst	Gralle & Partner & Stadt-Land-Fluss Ingenieurdienste (2023, p. 2)

<p>area and while taking economic efficiency into account, would lead to a lead to a significant improvement in drainage performance”</p>	<p>geringer Einschränkung der Nutzung unter Berücksichtigung der Wirtschaftlichkeit zu einer deutlichen Verbesserung der Entwässerungsleistung führen.</p>	
<p><i>4.4. Enhancing legitimacy in the Pauliner Marsch and Im Suhrfelde (pp. 43-47)</i></p>		
<p>By opening the storm surge partnership to “all persons, associations, institutions, companies and facilities with a connection to the area”, this should also be guaranteed in the future.</p>	<p>Die Mitgliedschaft in der Sturmflutpartnerschaft Pauliner Marsch &amp; Im Suhrfelde steht grundsätzlich allen Personen, Vereinen, Institutionen, Firmen und Einrichtungen mit Bezug zum Gebiet offen.</p>	<p>SKUMS (n.d.-g)</p>