Rainproof Rivierenbuurt: a common local responsibility

Key words: ***Rainproof, Climate adaptation, Participation, Local Network, Co-governance, Responsibility Gap***

Master´s Thesis for the Environment and Society Studies programme

Nijmegen School of Management - Radboud University

Midas van der Zande

18-10-2021

Abstract:

In reaction to the growing amount of heavy precipitation events, Amsterdam Rainproof was founded in 2014 to enhance local climate change adaptation in Amsterdam with regard to rainwater issues. Amsterdam Rainproof are initiating a pilot project in which they aim to create a local network consisting of the local government, residents and private organisations with the purpose of efficient rainwater adaptation. Their strategy is to stimulate local participation among the residents and private organisations in the Rivierenbuurt. This research will be a contribution to the Rainproof project, by studying the degree of awareness and sense of responsibility among the residents and local organisations, with regard to the rainwater issue, as well as the degree of residential participation and their expectations of the degree of government participation in the adaptation practices. The perspective of the local government and relevant private organisations will be studied in order to comprehend the local context. The purpose of the research is to find out how to stimulate the neighbourhood participation to improve local rainwater adaptation.

Content

Chapter 1: Introduction 4
1.1 Research aim and research question 5

Chapter 2: Literature review and theoretical framework 6
2.1 Rainproof climate adaptation 6
2.2 Governance and responsibility gap 8
2.3 Local participation & co-governance 9
2.4 Comparative perspectives 11
2.5 Theoretical framework 13

Chapter 3: Methodology 19
3.1 Research strategy 19
3.2 Research design and methods 19
3.3 Positionality 22
3.4 Validity and reliability 22

Chapter 4: Analysis 23
4.1 Issue description 23
4.2 Institutional context 25
4.3 Actor description 28
4.4 Participant observations 31
4.5 Initiatives and regulations 33
4.6 Local awareness and sense of responsibility 38

Chapter 5: Conclusion 43
5.1 Limitations and recommendations 45

References 46

Annex 49

Chapter 1: Introduction

Urban floods are becoming normal events in which we are helpless.
Multiple recent studies have found that the amount of heavy or extreme precipitation events occurring globally is growing as a result of increasing greenhouse gasses (Niyogi et al., 2017). Due to an increasingly extreme rainfall intensity, higher frequencies of floods are being experienced in urbanized areas. Westra et al. (2014) explain that floods resulting from rainfall events are highly dangerous and very damaging, causing high costs with an estimation of 70 billion dollars globally in 2011 alone. Urban areas have a lower absorbing capacity as a result of the high levels of grey infrastructure, overloading the capacity of the drainage system with the abundant rainwater. It is therefore a critical topic that must be included in urban planning policies (Westra et al., 2014). According to the PBL Netherlands Environmental Assessment Agency (2010) Amsterdam, like most other cities, consists of predominantly grey infrastructure such as concrete, steel and pavement. The high density population, the predominance of grey infrastructure and the fact that several parts of the city are located below sea level increase the risk for flooding in Amsterdam (PBL Netherlands Environmental Assessment Agency, 2010).

The adaptive possibilities to reduce this issue are within reach for anyone who wants to contribute. According to Nalau, Preston and Maloney (2015), such climate risks are mainly being responded to with climate adaptation. Due to the varying scales of climate risks it is difficult to determine when it becomes a local issue. Depending on the scale of the issue, local residents have a sense of responsibility for a particular issue or not. However, also with local climate issues such as extreme precipitation events the sense of responsibility will be mainly allocated to governmental organisations, rather than local residents and private organisations taking responsibility in their neighbourhood. Nalau, Preston and Maloney (2015) emphasize that global issues such as climate change, of which heavy precipitation events are a result, require national as well as international cooperation. The adaptation of such issues starts locally. Local initiatives together build towards large scale climate adaptation with global affection, that can have a mitigative effect too. In order to enhance the local climate adaptation processes of rainwater issues a cooperation between residents, local government (or municipality) and private organisations should be effectuated (Nalau, Preston & Maloney, 2015).

Nalau, Preston and Maloney (2015) argue that the responsibility of adaptation practices must devolve to the local level for initiatives to be more manageable and locally applicable. In addition, not only the scope of adaptation must shift to the local scale, the approach must also change from a top down structure towards more bottom up input. According to Dirix et al. (2013), top down approach to climate adaptation has not been able to achieve the necessary change thus far, arguing for a more multi-level governance structure. On the contrary, Aina et al. (2019) note that the role of central governments as well as a top down approach to climate issues remain very relevant and important in adaptation processes. According to Mees et al. (2019), on the one hand, citizens' initiatives often lack effectiveness regarding their intended goals. This might however be due to a lack of support by local government officials. On the other hand, there is also a large share of private space on which the influence of the local government is limited, but also their acting capacity as a whole in terms of budgets and skilled workers lacks capacity (Mees et al., 2019).

This research argues for a more cooperative form of governing, with regard to the scientific debate about the preference between top down and bottom up governance, bringing top down and bottom up initiatives closer together and using the benefits of both strategies. There is some research on the formal institutional context with regard to climate change adaptation. To a lesser degree there is research about the informal institutional context in the process of climate adaptation (Trell & van Geet, 2019). This knowledge gap will be addressed in this paper. The main focus is on participation by actors from both the formal and informal context in climate adaptation, with regard to rainwater specifically, which develops into the form of a local network, addressing the issue in a cooperative manner. Furthermore, this research is of practical or societal relevance as well, as this research is conducted in consultation with Rainproof and the results of the research and the corresponding recommendations will be shared with Rainproof and other stakeholders who participated in this research such as the municipality, contributing to their goal to realize a more efficient and more participative approach of rainwater adaptation in the Rivierenbuurt.
Summing up, in this paper I will study how local residents and organisations can be included in a co-governance structure that provides them with the opportunity to make a contribution and have influence in the process, instead of solely relying on the government for adaptation of rainwater issues. Will increasing awareness of the issue and a local sense of responsibility result in a more shared responsibility and can this enhance local adaptation practices?

This research will address pluvial flooding as a societal issue, as described by Westra et al. (2014), that requires bottom up participation. The Rivierenbuurt in Amsterdam has been designated as an extremely urgent bottleneck area by Amsterdam Rainproof (from here on indicated as Rainproof) with regard to pluvial flooding due to its infrastructure. The combination of the scientific debate about governance structure and the societal character of this local issue has led to the formulation of this research. This study aims to contribute its results regarding the local awareness and willingness of participation to the theoretical body that emphasizes on creating a shift from predominantly top down governmental responsibility towards more bottom up citizen participation in the process of pluvial flooding adaptation. The focus of the research will be on the ‘Rivierenbuurt’ as the explorative main case, a neighbourhood located in the southern part of Amsterdam. Rainproof, being initiated with the goal to tackle rainwater issues in Amsterdam, has set the goal to create a local network in the neighbourhood in which the different actors are involved in rainwater governance, to become co-governing in the initiatives to create a rain-waterproof neighbourhood. The project has two concrete goals; implementing a (more) rainproof design of the public space and to create awareness among the local residents in this neighbourhood to motivate local participation, which ought to stimulate an increased rainproof design in the private space.

1.1 Research aim and research question

The aim of this research is to find out the degree of participation of the residents, private organisations and the local government in the Rivierenbuurt and their attitude regarding local rainwater adaptation practices. Awareness and the sense of responsibility with regard to the issue of rainwater play a crucial role. Furthermore, will be studied how to effectively create a local network of actors that cooperates in the form of co-governance,

in order to create a sustainable rain- and waterproof neighbourhood in the Rivierenbuurt, Amsterdam-Zuid, with a more shared responsibility rather than completely relying on governmental action. The conduct of the research has the aim of answering the main research question: *"How can local participation be increased in the Rivierenbuurt in Amsterdam in order to create a rainproof neighbourhood that is largely self-governed?"*

This research will be conducted in the working field of Rainproof, an initiative which originates from 'Waternet' or ´Waterschap Amstel, Gooi en Vecht', the organisation which holds the responsibility over the management of the complete water cycle of Amsterdam and its surrounding areas (Waternet, 2021). The aim of Amsterdam Rainproof, as the title suggests, is to develop Amsterdam into a rain waterproof city by providing a platform for all relevant actors, such as governmental institutions, private organisations and local residents in Amsterdam, while acting as a neutral central player. By doing so, Rainproof intends to improve and increase cooperation between the different actors in Amsterdam and to stimulate the sharing of knowledge and expertise in order to enhance the Rainproof initiatives.

This paper is divided into five chapters. Firstly, this introduction. Secondly, the theoretical body of the research will be discussed, followed by chapter three: the methodological substantiation of the research. Chapter four consists of the analysis of the empirical data, which will be closed off by the conclusion and recommendations in the fifth and final chapter.
In the following chapter there will be a discussion of the literature on the relevant (sub)topics in this research: climate adaptation in terms of rainwater issues, governance of such an issue and the division of responsibilities and participation on a local scale in a co-governing structure. Here the scientific debate is displayed and a basic understanding on the topics and definitions of terms is provided. This is followed by the theoretical framework, which consists of a discussion of the ladders of both citizen and government participation that will be used as conceptual models.

Chapter 2: Literature review and theoretical framework

2.1 Rainproof climate adaptation

The growing numbers of heavy precipitation events as a result of climate change increase pressure on the draining capacity of urban areas (Niyogi et al., 2017). In order to be sustainable, urban areas need to be able to function whilst also having adaptive resilience to cope with uncertain events. Stein et al. (2013, p. 502) define *climate adaptation* as follows: "climate adaptation focuses on addressing the impacts of climate change on natural and human systems". The impacts of climate change in this case are increased extreme precipitation events.
Due to the predominance of grey infrastructure in an urban area the permeability for the rainwater to be processed more slowly decreases, increasing the faster running streams of rainwater that need to be processed through a drainage system with a limited capacity (Westra et al., 2014). As Tokarczyk-Dorociak et al. (2017) describe, the natural ability of the area to process water in the soil is largely lost due to the hard surfaces. Overloading

the draining capacity of an area results in urban floods, filling the streets with (rain)water which causes traffic nuisance, street pollution and property damage (Westra et al., 2014). The lower-lying locations and basements in urban areas are extra prone to rainwater floodings. Besides this, urban areas are dependent on other physical features such as the soil type and its texture in particular, for the permeability of rainwater into the ground (Dai, Wörner & van Rijswick, 2018). In order to prevent these negative effects on a local scale the affected cities or areas require climate adaptive practices. Tokarczyk-Dorociak et al. (2017) underline the importance of both the aesthetic and functional value such measures taken by local governments, to maintain or improve the local quality of life for its residents. This way, addressing rainwater issues by shaping the space can be beneficial both environmentally and socially, and even economically by increasing the recreational value of the area (Tokarczyk-Dorociak et al., 2017).

Rainwater runoff is still often considered as wastewater, automatically looking for ways to dispose of the water in the sewers as quickly as possible. Tokarczyk-Dorociak et al. (2017) describe the case in Poland where the way of looking at rainwater management changed. In the early 1990s a researcher from the Warsaw University of Technology started analysing the potential of rainwater infiltrating directly into the soil, relieving the pressure on the drainage system that has a limited capacity. From then, rather than regarding rainwater as a threat, they started developing ways to process the abundant rainwater in a more efficient and, more importantly, environmentally-friendlier manner, using the water instead of discharging it directly, to improve the water balance in the area (Tokarczyk-Dorociak et al., 2017). This type of thinking increased during the early beginnings of the 21st century. The *Framework Water Directive* stimulated such thinking and actions throughout Europe by obliging the EU Member States to for actions to be focused on the rational use of water resources to reduce the effects of disturbed water balances (Tokarczyk-Dorociak et al., 2017). Furthermore, Tokarczyk-Dorociak et al. (2017) argue that adaptive solutions to rainwater issues must become obligatory for the reconstruction as well as new developments and constructions of urban space. However, these obligatory solutions should not be applied on a too large scale, but rather on a more local level.

In most situations the perception of abundant rainwater still remains negative. There is a theoretical gap on the climate effects that have a negative perception which, however, can have large benefits when the right measures are taken. Excessive rainwater is one of those climate effects that should be turned into a positive element. In this article the focus will be more on how the excessive rainfall can be addressed as part of adaptation.

The emphasis on a local level of climate adaptation is increasing due to the very different local contexts that are affected by the same issue that need to be addressed differently per location, regarding the varying local settings and circumstances. Nalau, Preston and Maloney (2015) argue that the variation of these issues on a small scale requires local application of solutions and adaptive actions due to a higher efficiency of tackling these issues on a local scale. However, the capacity to act on a lower scale is also lower because of a lack of (financial) resources and the internally fragmented local government as a result of the large number of internal departments, possibly slowing down the process of adaptation. The literature lacks to discuss such difficulties. Following the principle of subsidiarity, only the tasks for which the local governments lack the capacity

to take action effectively become the responsibility of the central authority, decentralizing governance as much as possible. Tokarczyk-Dorociak et al. (2017) state as well that the development of local standards with regard to rainwater management is recommended. According to Nalau, Preston and Maloney (2015, p. 90), however, there are many constraints for local governments that complicate efficient climate adaptive action such as “information deficit, economic/financial resources to undertake adaptation, institutional capacity, technological capacity, political challenges and societal trends.” In order to overcome such challenges local adaptation processes require the integration of governance approaches and participatory planning by including local communities and organizations in the governance process (Archer et al., 2013). However, this can lead to the question of responsibility due to an increase in actors, lacking a clear structure of roles between the actors.

2.2 Governance and responsibility gap

The governance of climate adaptation, with regard to rainwater issues, stretches over different scales and levels and shifts between different actors, even within organisations. To be able to discuss the issue of governance and responsibility a definition is required. Chaskin and Garg (1997, p.632) provide the following definition of *governance*: *“governance entails the creation or adoption of mechanisms and processes to guide planning, decision making and implementation as well as to identify and organize accountability and responsibility for action undertaken”*. Governance is both the structure as well as the process of the attempted action based on the goals and assumptions of a particular initiative.

In every aspect, just and effective policy making must be developed in consultation with the affected or involved local residents, being a core principle to neighbourhood governance of local issues (Chaskin and Garg, 1997). This belief notes that authority and the planning process ought to devolve to a local level at which the citizens are actively involved. Another key principle is the decentralization of the processes of social change into a more broad and interconnected network of stakeholders in order to improve long-term sustainable development (Chaskin & Garg, 1997). According to Stoker (2011) the responsibility of a local government is to help a community fulfil their needs by taking the role of network coordinator, referring to *networked community governance*. The aim of networked community governance is to meet the needs that a community defines for itself by pinpointing local issues, creating suitable solutions and having impact assessments to measure the favourability of its outcome to the community (Stoker, 2011). An important note is that the responsibility for adaptation of pluvial flooding in the Netherlands legally lies mainly with the local government and across different levels of government, such as regional water authorities, regarding the public space but with the local citizens when it concerns their private property (Mees et al., 2019). However, the literature is often still focusing on the division of legal responsibility from a top down perspective. While the discussion on governance on a lower scale as well as from the perspective of different actors is lacking. This research intends to draw more attention to the perspective of taking responsibility in governance of climate adaptation, rather than on the conflict of division of roles and responsibilities.

Juhola (2019) describes that climate adaptation should be considered as a wicked problem, lacking an obvious solution as well as an obvious division of responsibilities regarding the actions needed. The shift from a top down structure with government control to a more polycentric governance structure is causing more complexity for determining the division of responsibilities, creating a responsibility gap (Juhola, 2019). However, this responsibility gap can also occur with a top down hierarchical structure. Responsibility as a concept in governance has presently not been developed much, especially with regard to environmental topics, according to Juhola (2019). Simply put, there are three types of responsibility within adaptation; the development of policy, actively taking measures and financing the measures (Juhola, 2019). Besides the clear responsibility for the government to develop policy, is the polycentric character of governance creating an indistinctness of responsibility regarding both the financing of and the taking of adaptive action.

Juhola (2019, p.3-5) describes different types of responsibility with regard to climate adaptation, among which "*responsibility as care*" and *"responsibility as accountability"*. The first typology, that of *care*, is a clearly top-down reasoned type of responsibility. This type is more anticipatory and is mostly being assigned to the government which is assumed to prevent disruptions in society that are caused by climate change, by proactively implementing measures (Juhola, 2019). The latter, that of *accountability*, is a type of responsibility where the role of the government is more decentralized and with a higher number of actors, shifting more towards governance. Here, adaptation is reactive to climate events. However, as Juhola (2019) explains, when it is not clear which actor holds responsibility, due to a lack of causal links, responsibility is spread automatically. This can result in more collaboration complications and a lack of decisive leadership.

Nalau, Preston and Maloney (2015) argue that adaptive action is more effective with a shared responsibility across different actors and scales of governments. Especially when tackling issues at the local level, in which local actors can contribute more, shared responsibility enhances local adaptation. However, a responsibility gap still often remains as a result of the different actors waiting for one another to take the main responsibility publicly. Arguing from a government perspective, damage and other possible consequences of heavy rainfall that are experienced locally are the responsibility of the owner or the affected, while the local affected population expects governmental support, allocating the government with the responsibility (Nalau, Preston & Maloney, 2015). To increase shared responsibility and local participation, the local government should take more responsibility in informing the local community of their possibilities in responding to the issue on an individual basis or on a community level, enhancing the possibility for a co-governing structure. This research contributes to the body of literature by focusing on the development of shared responsibility and local participation in climate adaptation and by pinpointing the difficulties and possibilities.

2.3 Local participation & co-governance

The participation role of citizens in climate adaptation is growing. As a result of this responsibilization, the role of governments requires a shift from a top down approach of regulation and steering into a more facilitating and collaborative role (Mees et al., 2019). Dutch local governments are developing incrementally into a more networking

stakeholder, stimulating citizen involvement which contributes to governmental action. As Mees et al. (2019) argue, the coproduction or *co-governance* of local citizens means a shift of responsibility with regard to public goods as well as services, enabling and facilitating more community participation and initiatives. The increased participation can help to lower the barriers to climate change adaptation such as constrained resources and capacities. The focus on *local participation* is important as the impact of issues such as heavy precipitation events are experienced on a local level as well as that the implementation of concrete measures of adaptation take place on the local level on which larger scale adaptation is building (Mees et al., 2019). In this perspective local citizens are perceived more as engaging subjects instead of objects part of a discourse, stimulating local cooperation between the citizens and the local government in order to serve the common good (Phadke, Manning & Burlager, 2015). Thus far, there still remains little literature available on how local participation can be achieved.

Birnbaum (2015) questions whether co-governance and participation in terms of environmental sustainability are not taken for granted too easily, possibly lacking a critical evaluation and empirical substantiation. However, he manages to name three benefits of a participatory or co-governing structure. The first benefit, or *epistemic advantage*, is that by exchanging and considering different arguments and information, contextual knowledge increases providing a more complete understanding. The second point, *social advantages*, reflects on improved communication and collaboration between government, stakeholders and community in order to create more trust and understanding, enhancing the governance processes. The last benefit describes that by including more actors in the governance network wider commitment can be stimulated, triggering a sense of responsibility (Birnbaum, 2015). However, this shared sense of responsibility is pivotal for the willingness of people to participate. So, to know how to stimulate a co-governing structure the sense of responsibility must be tested.

Hosseini et al. (2017, p. 114) provide a definition of *participation* as "*the mental and emotional involvement of individuals in group-based situations in order to cooperate with each other for achieving group goals and sharing responsibility*". According to Hosseini et al. (2017) many models of urban development lack a collectivist approach and a sense of involvement by relevant actors. Connecting the actors and involving them in the process of the improvement of urban issues would enhance their acceptance and sense of responsibility in the particular problem, hence the crucial role of participation (Hosseini et al., 2017). However, the crucial question remains how to connect actors and stimulate their involvement. This question is receiving more attention in this research.

Community-based adaptation, as used by Archer et al. (2013, p. 346), "*refers to the participatory identification and implementation of community-based development activities that strengthen the capacity of local people to adapt to climate change, and building on communities' expressed needs and perceptions to address local development concerns which underlie vulnerability"*. Archer et al. (2013) argue that local issues such as heavy precipitation events, resulting from large scale issues like climate change, need input on a community-level for adaptation actions as well as from agents and institutions from governmental and non-governmental sectors, creating multiscale governance with a comprehensive approach to address the issue.

Improvement of adaptation through more citizen involvement is also being argued for by Brink and Wamsler (2017). They explain that improvement of citizen knowledge with regard to climate issues and the inherent responsibilities enhances collective action. However, they mention four points that are important to keep in mind to achieve good interactive citizen - municipality cooperation, being; *proactive engagement and ownership, equity, nature-based approaches and solutions* and *systematic adaptation mainstreaming* (Brink & Wamsler, 2017). The first point describes the importance of raising awareness among residents about both potential adaptive measures and their own (legal) responsibilities. Point two points out that it is essential that the target audience is inclusive, reaching out to different types of people as well as people from varying residential types. The third point emphasizes the necessity of *nature-based approaches and solutions* for actual engagement and participation among citizens to work. The last point underlines that *adaptation mainstreaming* in municipal systems is needed, improving the internal organisation of municipalities, to facilitate the interaction better (Brink & Wamsler, 2017).

2.4 Comparative perspectives

To place the case of the Rivierenbuurt in context, this subchapter describes a few other cases for comparison. The provided comparative perspectives consist of similar cases where issues of adaptation, governance structures and awareness and responsibilities are the topics, but also new ways of adaptive thinking.

In one of the case studies by Bergsma, Gupta and Jong (2012) in Zaandam, regarding water nuisance, the results showed that the residents were highly aware of their responsibilities. Bergsma, Gupta and Jong (2012) explain that this is the effect of active informing of the citizens by the local government. However, the residents experienced some shortcomings in also being able to take their responsibility. One of which was a lack of municipal support, in both financial and technical ways. Other difficulties that the residents experienced is having limited knowledge or methods to gain knowledge about local water conditions due to lacking knowledge, having too little understanding of accountability and lacking technical support provided by the municipality (Bergsma, Gupta & Jong, 2012). These factors cause a debate about responsibility between the residents and the local government in Zaandam.

In another example, dissidence between the municipality and its residents was caused by the ‘case-by-case’ nature of acting by the municipality, in which some water problems were labelled ‘structural’ while others were labelled ‘incidental’. To explain, structural problems have officially defined responsibilities in contrast to the division of responsibility as regards incidental problems. As a result, the responsibilities are defined differently per case. Bergsma, Gupta and Jong (2012) state that despite that heavy precipitation events are increasingly occurring and thus are becoming structural issues, these natural events lack the qualification of a structural issue. They describe that this is due to the fact that “*there are no objective standards for deciding whether cases of water nuisance are incidental or structural”* (Bergsma, Gupta & Jong, 2012, p.17). This leaves the qualification of the issues of water nuisance to political subjectivity, allowing for not creating structural standards and keeping the subjective power, due to the incidental status of the issue. On top of that, in case of pluvial flooding the local government takes

action by trying to perform a first relief, according to them, to prevent disturbances to daily life and preserve quality of life in the area, which belongs to their responsibility. However, the interpretation of the residents is that the municipality is thus confessing to have failed in the first place to provide a proper drainage system. When it comes to their own property, the responsibility would legally be appointed to the residents, who thus benefited from these municipal measures (Bergsma, Gupta & Jong, 2012).
In this case of Zaandam it becomes clear that the municipality aims to take a facilitating or enabling role, in terms of the 'government participation model' in figure 3 that will be explained later in this article, in which they provide the residents with information to act independently. However, they seemingly fail to do so sufficiently. This is partly because of the regulative role that the municipality still has and is expected to have, which results in an unclear division of who is doing what, creating a responsibility gap. Due to this lack of communication, the trust and the degree of cooperation between the local government and the residents is low, affecting the city´s adaptive capacity (Bergsma, Gupta & Jong, 2012). In the case of the Rivierenbuurt communication is an essential element.

An example regarding water nuisance in Sweden shows a different way of adaptive thinking, where the plan is to use the heavy precipitation to their advantage. Orange (2021) recently explained this plan 'Rain Gothenburg' in the Swedish city of Gothenburg in an article for the Guardian. Rain Gothenburg is a plan by artist and designer Jens Thoms Ivarsson that is mainly focused on creating "Regn Lekplatsen " (rain playgrounds) in the city, where it rains about 40 percent of the days throughout the year (Orange, 2021). The playgrounds are constructed in a way that the rainwater, for example, is channeled into little rivers that can be controlled with sluices that can be used by the children to play with. The idea of these playgrounds is that rain does not intervene in being outdoors but, even more, makes it attractive to be outside. The idea of Thoms Ivarsson emphasizes on "rainpositive thinking", which is the thought of using what is now experienced as an unpleasant element into a positive and useful element, increasing the local liveability and at the same time creating a more sustainable and resilient environment (Orange, 2021). The aim of this project is to change the perspective of people regarding rainwater through the design of the area. In this project Rainwater nuisance is tackled through the playful spatial design in which the water is used. The design also tackles the issue of abundant rainwater that is flooding the drains by leading the water stream into a little delta area where the water eventually can sink into the ground, disconnected from the sewer system. This delta area can also have different types of vegetation creating more green that helps absorb the water and stimulating biodiversity (Orange, 2021). Notable here is that the design of the water management infrastructure is no longer only focusing on the practical use but uses the opportunity to have practical value as well as recreational and aesthetic value.
The Rain Gothenburg plan shows a different and more positive perspective on adaptation to increasing heavy rainfall. Its solutions could contribute to adaptation and at the same time benefit in an aesthetic as well as a social way. Such an approach to climate issues, with this type of thinking about adaptive solutions is widely missing in the body of literature. This research aims to draw attention to this type of adaptation.

Figure 1: Impression of Regnlekplatsen, derived from the Guardian (2021)

These cases show the difficulty of participation in adaptation and a cooperative structure of governing the issue of rainwater, but also the broad possibilities within adaptive solutions. Both are relevant for the Rivierenbuurt case, aiming to improve the adaptation in the neighbourhood with regard to rainwater in an integral and multi-actor cooperative way.

The next section will provide the theoretical framework that has been chosen to be used for the analysis. It will consist of two conceptual models of participation, one from the perspective of ´citizen participation´ and the other from the perspective of ´government participation´. They will be used in comparison with the other to help determine the present division of roles and the desirable division to create a (more) cooperative structure.

2.5 Theoretical framework

It is important to explore how to create a co-governing (community) network on a neighbourhood scale in the Netherlands, the extent to which citizen participation in terms of rainproof adaptation in the area is taking place and how to stimulate more participation and collaboration, in order to contribute to climate change adaptation. The "*Participation Society"* agenda, introduced in the Netherlands in 2013, underscores the growing emphasis on the participation of citizens (Mees et al., 2019). The goal of citizen participation is to create an increased local contribution to the tackling of larger scale issues such as climate change adaptation and in this case rainproof adaptation against heavy weather events. Community-based adaptation initiatives can contribute to urban climate governance by raising more awareness of risks and increasing the sense of responsibility among the local citizens through their involvement in the issue (Archer et al., 2013). Increasing local awareness is necessary to create a support base from which citizen participation can evolve. The "*ladder of citizen participation"*, introduced by Arnstein (1969), provides a categorisation of the role of the citizen in the planning process and the degree of participation, ranging from citizen non-participation to citizen control, as shown in figure 2. However, the terminology used in this ladder needs

detailed explanation or even more an alteration to create a more logical description per category that is more relevant to the present context. To adopt this conceptual model in this thesis my interpretation of this ladder will be given in combination with other more recent references to this model, providing a more logical version of the ladder. Arnstein (1969) does note that the ladder is a simplistic display that through its generalization lacks to provide a comprehensible image of the heterogeneity of subjects within each 'bloc' or category. The use of Arnstein's ladder provides the possibility to categorize local stakeholders such as residents, entrepreneurs and other organisations into different bloc's of citizen participation, helping to measure the degree of local participation or willingness to participate and describing the role of both the residents and the local government.

The term "*government participation"*, used by Mees et al. (2019), is a reversed perspective from public participation that emphasizes the government's role as participant in initiatives largely led by non-governmental actors and citizens. The role of the local government shifts more towards facilitative rather than as initiator and regulator. In this research will be explored how to create this situation of government participation on a neighbourhood level. Mees et al. (2019) provide a conceptual model in which the *"ladder of government participation"* and the corresponding roles are explained, as shown in figure 3. The government participation ladder serves as an analytical model that distinguishes the five ideal-typical roles for local governments in local non-governmental initiatives for adaptation in the Netherlands with flexible boundaries and possible overlap between the roles. The use of this model enhances the analysis of the involvement of non-governmental actors in local adaptation practices and the correlating desired role of the local government.

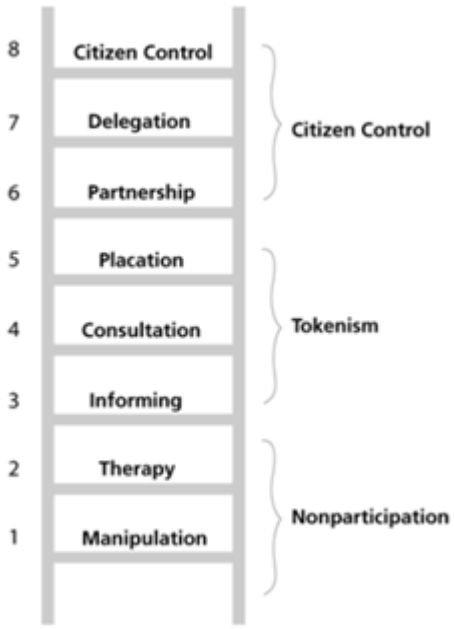

Figure 2: Ladder of citizen participation (Arnstein, 1969)

The ladder of Arnstein (1969) helps to describe the status quo as well as the desired degree of citizen participation in this research on participation in rainwater adaptation on

a neighbourhood scale. The ladder, as shown in figure 2, consists of eight levels that can be divided in three degrees of citizen participation: '*nonparticipation*', '*tokenism*' and '*citizen control*'. The first degree, nonparticipation, consists of two levels (1 and 2) of participation; '*manipulation*' and '*therapy*'. Arnstein (1969) explains that citizens in these levels are not stimulated to participate but rather informed or educated by 'powerholders'. The second degree, tokenism, consists of three levels (3, 4 and 5) of participation of more symbolic or superficial involvement of the citizen. In the third and fourth levels '*informing*' and *'consultation*' citizens are slightly more involved in the planning process by informing the citizens and allowing them to have a voice but lacking power to act on their views. In the fifth level '*placation'* citizens still lack power but are allowed to advise. The last degree, citizen control, again consists of three levels (6,7 and 8). These levels display the degrees of citizen power in different degrees of participation. The sixth level '*partnership*' allows the citizens to engage in trade-offs and to perform negotiations with the powerholders. In the last two, highest, levels *'delegated power'* and '*citizen control'* Arnstein (1969) describes that citizens are allocated with either a majority of decision-making power or with complete managerial power.

Collins and Ison (2009), however, discuss that the ladder of Arnstein is too dominant in the discourse of participation in climate change adaptation, limiting our thinking in the context of climate change policy to the struggle of power where citizens try to gain power and the government's aim to keep top-down control. Collins and Ison (2009) underline that this standard assumption of hierarchy in participation with the aim to gain control is not necessarily in line with people's motivation for participation. Opposite from the strong government control is self-initiation or management locally by a community due to neglect (Collins & Ison, 2009). They state that with the growing discourse of participation, the critical thinking of the participation practices has been lagging behind. This way, the advocacy and use of participation have the risk of improperly addressing climate adaptation lacking the desirable effects and outcomes (Collins & Ison, 2009). This needs a critical assessment of the participatory practices and their results. Furthermore, they suggest that, rather than focusing on the power structure as is the case with the ladder of Arnstein, should be focused on learning about the issue and creating awareness among the participating actors. This way a reconceptualization of the roles and responsibilities within the processes of climate adaptation takes place, which helps to reduce conflicts and opposition against governmental decisions (Collins & Ison, 2009). They also put emphasis on the importance of social features such as social values, local knowledge and local relationships, instead of the distribution of power presently. Crucial for participation in adaptive practices is to have knowledge about what are the possibilities as well as the constraints locally. But, as Collins and Ison (2009) mention, does the fact that issues differ also need to be taken into account as each issue requires an unique approach, which often only allows for particular ways of participation. The level of participation and the division of roles and responsibilities among the participating actors that are possible are, thus, dependent on the adaptive practices or initiatives that lie within the abilities of the citizens, rather than on their level of power (Collins and Ison, 2009). But also, is the division of roles and responsibilities becoming more clear in the process of participation or as a result of the process and related to their interest with regard to the specific topic. Other criticisms that Collins and Ison (2009) express about the use of Arnstein's ladder are the 'one size fits all' mentality, lacking any contextual

applicability, and the focus of participation on only one actor rather than placing it in a cooperative context between actors.

Rung	**Roles of local governments**	**Who initiates, coordinates and decides**	**Practices of local governments per role**
5	Regulating	Government regulates interventions by the community, so initiates, coordinates and decides (hierarchical government)	Policy making, organising traditional public participation such as hearings and citizen juries, checking, enforcing regulations, and sanctioning in case of noncompliance
4	Network steering	Government (co-) initiates and creates a network of public and private stakeholders; it coordinates the decision-making process. Decisions are co-decided in the network	Process coordination, fostering of dialogue and negotiation among stakeholders, mediation of interests, arbitrage of conflicts, trust building, creation of a level playing field through rules of the game
3	Stimulating	Active governmental stimulation of the initiation and continuation of community initiatives, coordinated and decided independently from government	Provision of structural (financial) support during a longer period

2	Facilitating/enabling	Self-initiated initiatives, coordinated and decided independently from government, with government interest in making them happen	Boundary spanning activities that facilitate free flows of ideas, people and resources, while maintaining a boundary between the initiative and its institutional environment; Process facilitation, helping the initiative to find its way in the municipal organisation, providing a (very) limited amount of resources and relevant information, schooling and other forms of capacity development
1	Letting go	Self-initiated, self-coordinated and self-governed initiatives without governmental help	None, government is not participating in any direct way, but indirectly by becoming ambassadors for such initiatives

Figure 3: Ladder of government participation and corresponding roles (Mees et al., 2019, p.200)

To take the prior mentioned criticisms into account this research uses an own interpretation of the ladder of participation by Arnstein by using the basic principles of the ladder but then applied to the context of local rainwater adaptation, in a cooperative setting, rather than focusing on the power structures.

Using in complement of Arnstein's ladder (1969), the ladder of government participation by Mees et al. (2019), as is shown above in figure 3, provides a different and more recent perspective to the context of the research by focusing on the role and degree of participation by the local government, despite being a similar model and functioning as a similar tool. Here the ladder is reflecting the degree of control from complete regulation to zero interference. However, this differs from the power struggle that is central in Arnstein's ladder, which Collins and Ison (2009) discussed, as it does not focus on power with regard to citizens, but it shows in which different ways the government, which is initially a controlling actor, can interfere in bottom-up action and initiatives. In this model the degree of government participation in community-based initiatives is described over five different levels. The first level *'letting go'* describes a situation with no role of the local government in the initiatives, regarding the initiation, coordination and governing of the initiatives. There is no top down interference with the citizen's initiative. In the second

level '*facilitating/enabling'* the community initiatives are completely independent. However, the local government here performs the role of stimulating and facilitating the initiatives if they are of common interest, for example, by providing a platform. Mees et al. (2019) give another example of 'rainwater guardians' (or translated as 'regenwacht') who are trained experts on the topic of rainwater by the local government to provide local residents with advice or knowledge on how to develop a rainproof roof or garden. This way the government is more informative and facilitating, leaving the responsibility with the citizen. In the third level, '*stimulating'*, the initiatives remain independent from government, but are actively stimulated by the government by means of structural (financial) support over a longer period, such as structural subsidies or tax reductions for green roofs or gardens (Mees et al., 2019). From level four '*network steering'* the role of the local government becomes evident. The government creates a local public-private network and participates in the initiation as well as coordination and decision-making of the initiative. This networking has the aim of turning all those to whom this topic is of interest into a partner, reducing hierarchy and creating participation and cooperation (Mees et al., 2019). In level five '*regulating'* the processes of the initiatives are controlled top-down by the government, in which participation by the community is promoted (Mees et al., 2019). This ladder gives structure to decide the degree of government participation and uses a more up to date terminology and logic. By combining both ladders of participation a more comprehensive image of a local situation can be described, which helps to emphasize the potentially needed changes.

Adding to this, Juhola (2019, p.3) provides the typology of six modes of governance which can be considered as a mix of both ladders of government and citizen participation: "*(a) self-governance, (b) governing by regulation, (c) governing by participation and partnerships, (d) governing by the provision of information, (e) governing by providing services, or (f) governing by incentives"*. Here the perspectives are mixed and approached from bottom-up perspective as well as from top-down perspective. From these typologies the degree of participation can be interpreted, however, here the focus lies more with the way, for example, rainwater adaptation is managed displaying the division of input and roles of the actors.

Blakeley (2010) adds that 'steering' governments, as mentioned in figure 3, are strongly active in stimulating local participation. However, she also mentions that the local participation does not directly mean local empowerment in the processes, as well as that the power of governments does not necessarily decrease when more other actors are being involved in the governance structure. In addition, Blakeley (2010) mentions that professionalizing citizen participation can also be seen as a top down strategy. So, the co-decisive nature of a network steering government, as mentioned in point 4 of figure 3, is a lot more top down controlled than it seems. Especially when looking at Arnstein's (1969) model in figure 2, where a co-decisive network would seem to correlate with point 6 'partnership', being indicated as 'citizen control', in reality control and the division of roles are expressed differently. As so, in the model of Mees et al. (2019), in figure 3, the role of a 'network steering' government with co-decisive aspects is only one rung away from the most regulative rung. Blakeley (2010) argues that this way participation has a limited potential and is more of a means to the government of controlling its residents, continuing governmental control rather than using participation to create a more cooperative relation. This dominant role of the government and the citizens' perception of

the government's role prevents citizens and non-governmental organisations from participation and involvement and thus from having a sense of responsibility.

In the next chapter the methodological choices made in this research will be discussed, along with a basic description of the case and the most important actors and features, and an explanation of my role during the process.

Chapter 3: Methodology

3.1 Research strategy

This is a qualitative research on the local governance of adaptation activities for rainwater issues and the degree of community participation in the Rivierenbuurt in Amsterdam-Zuid. Selecting the Rivierenbuurt in Amsterdam as the case is relevant due to the high density of residents, high percentage of urbanisation and due to the weather conditions in the area, with the Rivierenbuurt being one of the lower-lying areas. The research is conducted from an epistemological point of view and with an interpretivist approach, aiming to acquire knowledge about the social perception of the local subjects of study while being aware of my role as researcher. In order to comprehend the social context and interpret the social world within the Rivierenbuurt, the subjective meaning of action for those of the community has been studied (Bryman, 2016). It has been very important to be aware of my own personal values or beliefs while analysing and interpreting the data and formulating conclusions.

The goal of the study was to generate a theoretical claim through an intensive analysis of the degree of participation and awareness among the local actors in the Rivierenbuurt about how to create a local network for the governance of efficient rainwater adaptation, that can be applied to other cases. This research has mostly made use of an inductive, grounded theory approach, as the observations and findings have built towards the theoretical claim. However, like in most cases, this research has not been completely inductive but consists of deductive aspects as well, as there has been made use of theories as point of departure to reflect on during analysis and to relate to while drawing up the conclusions.

3.2 Research design and methods

This research is conducted in a case study design, carrying out an intensive and explorative study on the community in the Rivierenbuurt as case. The community in the was chosen as an exemplifying case, as described by Bryman (2016), with the aim to catch the daily life conditions that are representative for other neighbourhoods as well. However, to enhance the content of this research I have referred to other cases of local participation regarding rain nuisance or other topics with similar conditions such as solar energy, making use of comparison between this case and others. To provide a comprehensive collection of data I will use *triangulation* in this research. Bryman (2016, p.392) explains that triangulation "*entails using more than one method or source of data"* which better ensures the quality of the findings, limiting interpretation, and provides a more complete research. As such, I have applied different research methods to study the case and made use of different sources. The following research methods have been

used mainly to collect data: *collection of documents*, *interviewing* and *observation*. These types of data collection are methods often used in research with a grounded theory approach. Literature on grounded theory emphasizes on using a combination of methods to collect data (Backman & Kyngäs, 1999).

The collection of documents consists of official documents from private sources, produced by organisations such as Rainproof, as well as official state documents, from both national and local governments (Bryman, 2016). Statistical demographic information for example, among other things. Occasionally internet resources were used. For the relevance of the documents it was important to take the influence of the organisation and the contextuality into account.
Another important method is interviewing. The short interviews with the residents of the Rivierenbuurt cannot be considered to be representative for the neighbourhood as a whole, as the number of interviews is too low relative to the total population of the neighbourhood. To achieve representativeness the use of surveys would have been necessary, answered by a few hundred respondents. However, the interviews can be interpreted as illustrative or exemplary for the population. To increase the representativeness, but most of all the exemplary value of the results, the interviewees have been approached through a purposive sampling of the participants (Bryman, 2016). This selective sampling method allowed me to make choices within the field of interest of the research and place any necessary restrictions to define the research (Backman & Kyngäs, 1999). 85 residents were approached of whom some had no time to answer the questions, some turned out not to meet the requirements for the interview and some were not willing to cooperate. Of the approached residents, 55 were willing to answer my questions. All information drawn from the interviews and the content resulting from the conversations are used as data. Furthermore, three, more in depth, interviews have been conducted with active organisations within the neighbourhood, being the '*Natuur en Milieu Team Zuid' (NMT Zuid)*, '*Ondernemers Vereniging Rijnstraat*' and an official who works for the local government as well as for Rainproof. These interviews were conducted with different stakeholders on the rainwater issue within the Rivierenbuurt, with the aim to acquire a more complete dataset. The interviewees are kept anonymous to provide more figurative space for answers and respect privacy. Interviewing is in this case preferred over surveys to ensure that not only 'willing residents' would respond, in order to enhance the representativeness or exemplary value of the results. The interviews are semi-structured which provided the respondents with flexibility in their answers, focusing more on the point of view of the respondent than on the questions from the point of view of the researcher while remaining within the topic of participation and responsibility in local rainwater adaptation. In addition, there has been made use of neighbourhood observation. This observation helped to understand the issue in the local context and to develop affinity with the neighbourhood, which contributed to the quality of the interviews, but also in finding relevant data. Some of the data provided a different or additional perspective, which then could be processed in the formulation and conduct of the following interviews. A potential tool to analyse the interviews could have been coding the transcripts, linking messages of text to sections in the transcription to highlight themes of interest, which facilitates for thematic analysis (Bryman, 2016). This could be applied to the themes 'degree of participation' by residents as well as by local government and 'degree of awareness' among residents. However, I have chosen to do the categorisation manually and then refer to the conceptual themes and to use quotes

directly, because a thematic analysis is unnecessary for this research. Additionally, the analysis of the gathered documents, the observations in the neighbourhood and relevant notes from the meetings with Rainproof and other stakeholders contributed to the analysis as a whole.

This research is making use of *grounded theory* as a framework, determining the process of collecting and analyzing the data. Grounded theory is the most frequently used framework in qualitative data analysis (Bryman, 2016). The data is collected systematically and analysed throughout the process, developing towards a theoretical claim. Before starting this research, I had little knowledge about rainwater adaptation and the local governing structures and context of the Rivierenbuurt, which made the choice logical to use a grounded theory approach. This provided the opportunity to conduct this research inductively, starting with an open perspective and little subjective views. Backman and Kyngäs (1999) describe the grounded theory approach as a inductive process that is undertaken by the researcher in which is being referred back and forth between the collection and analysis of data, working towards a general theoretical claim. During the first phase of the research I started with the gathering of theories and background information on this topic and the main concepts. In the second phase my contact with Amsterdam Rainproof started and I began gathering information about the case. At the same time I made observations in the neighbourhood to learn the context. During these phases there was a continuous process of referring back and forth between the gathered theoretical information and the gathering of data on the case, sometimes confusing how to use the information. Backman and Kyngäs (1999) explain several difficulties in grounded theory that need to be taken in consideration. One of the difficulties that I experienced during this research with the grounded theory approach is that there was no chronological order in collecting data, analyzing data and formulating conclusions. These research steps were taking place simultaneously, causing the organisation of the processes to be less clear and straightforward. This sometimes caused the process to be chaotic, losing focus on which steps to take. Another difficulty that they mention is the possibility of having preconceived knowledge on the topic which can cause the researcher to be biased in collecting and interpreting the data (Backman & Kyngäs, 1999). What is also difficult about the grounded theory approach is that there was little knowledge yet about the topic while conducting the interviews, as these are a large part of the data in this research, which made it difficult to formulate the right interview questions. The interviews were therefore conducted with little structure to provide the respondents with the space to elaborate and come up with new information of which I had no awareness. Backman and Kyngäs (1999, p.151) state that "*the goal of grounded theory is to generate a theory that accounts for a pattern of behaviour which is relevant for those involved."* This mainly reflects on the balance and dialogue between residents and local government in this particular case, and the relevant role division of all actors involved within the topic of rainwater adaptation.

In the data analysis section the discussion is taking place between the gathered data and observations, the theory and the views of the researcher, working towards a more general theoretical claim. This ongoing comparative aspect of reflecting back and forth is a significant character of grounded theory, according to Heath and Cowley (2004). Despite the fact that the grounded theory approach emphasizes the lack of knowledge

on the subject, possession of any previous knowledge does prove to be helpful in giving the analysis structure (Backman & Kyngäs, 1999).

3.3 Positionality

Beside my role as researcher I have been involved in the project of Rainproof, attending their meetings with different actors and contributing my thoughts. These meetings and conversations have been informative in my process of understanding the local context for participation, therefore, my involvement with Rainproof functioned as a source of this study as well. My position during this study functioned as that of a participant-observer; while conducting the research I have been participating in the process, which in its turn served as a source of data. A participant-observer role as a researcher is very common in social and qualitative research (Brueggeman, 1996). Participant-observer is a qualitative research method that is more common in cultural anthropology but is increasingly used in social science (Mees et al., 2019). With this method the researcher becomes affiliated in the process and becomes familiarized with the people that are being observed, enabling the researcher to collect more data in the natural setting (Mees et al., 2019). In this role it is important to maintain a non-judgemental orientation towards the actors (Brueggeman, 1996). As such, I became affiliated with the people from Rainproof and the municipality, being involved in the process of their ‘network approach’ project. This involvement offered much inside information and many other sources were suggested or came forward through a snowball effect. My participating role also affected the lens that I have had during the research. At the same time, my contribution to the conversations between Rainproof and other actors, that also functioned informatively for my research, will have been affected by my role as observer. Again, as a regularity in a grounded theory approach, this comparative reflection back and forth between the theory, the observations and my perception of the case as a participant gradually shaped the process of this research. Due to this ethnographic approach the line between theory and the observed reality becomes less clear.

3.4 Validity and reliability

In order to increase the quality of this research it was crucial to ensure the validity and reliability. To guarantee the validity in this study there were three main types of importance; *internal, external* and *ecological* validity (Bryman, 2016). Lincoln and Guba (1985) provide similar criterions for what they call the ‘trustworthiness’ of research, specifically for qualitative research; *credibility, transferability* and *confirmability*.
The internal validity or credibility of the study is concerned with the causality between the degree of participation within the community and the enhancement of rainwater adaptation in the neighbourhood. In order to ensure the causality, the potential contribution of participating residents or organisations to rainwater adaptation has been described thoroughly. In order to guarantee the external validity or transferability in this study it was pivotal to collect the data from a wide enough range and variety of respondents from the neighbourhood to be somewhat representative, but mostly illustrative or exemplary, for the community. By carefully describing the characteristics the results of the research can be generalized to other neighbourhoods with similar characteristics. The third type, ecological validity or confirmability, regards the applicability of the findings in this study to the natural social and everyday settings of the

community in the Rivierenbuurt (Bryman, 2016). To guarantee this type of validity it was crucial to reflect the daily life conditions, values, attitudes and knowledge base of the community in the research truly as they are in their everyday life. In order to do so, there has been as little as possible to no intervention in the daily life settings during the data collection (Bryman, 2016). In the interviews, for example, there was flexibility in the questions for the respondents to have space to provide information that I as an outsider could not have anticipated. The fourth type '*measurement validity'* is slightly less relevant for this research as it is mostly concerned with quantitative research. It emphasizes the importance of the reliability of the measurement of a concept, in this case participation. When measuring the degree of participation for both local residents and local government, the measurements needed to be stable and consistent to reflect on the concept of participation properly (Bryman, 2016).

The reliability, or what Lincoln and Guba (1985) call the *dependability* for qualitative research, is concerned with the repeatability of this study and the likeliness of the findings to apply at other times. To guarantee the dependability and thus the trustworthiness, Lincoln and Guba (1985) argue that the research process must be kept in records for others to be able to check the carried out procedures. In the case of this research the process of data collection has been described carefully in a logbook and the interview questions are added in the annex along with the transcription of the interviews.

The coming chapter will give a detailed and comprehensive description of the case, its features and its actors as well as it will put it in the institutional context, followed by an analysis of the empirical results and a comparative perspective (inter)nationally.

Chapter 4: Analysis

4.1 Issue description

Heavy rainfall can be interpreted in different ways. The KNMI (2021) explains that three main characteristics define extreme precipitation; size, intensity and duration. In the Netherlands rainfall is indicated as ´heavy precipitation´ from 50 millimetres or more in one day. The chance of repetition determines whether the precipitation is indicated as extreme or not. A chance of 1% per year is similar to once every 100 years, in other words a rare occurrence to which we are not prepared, making it an 'extreme event'. A precipitation event that is considered extreme in the Netherlands can be considered less extreme elsewhere where these events are experienced in higher frequencies, such as in the tropics (KNMI, 2021). However, these events are bound to location. Local chances of 1% per year occur almost every year throughout the Netherlands. This is due to the fact that these events have a certain size, and thus occur locally, having a larger chance to occur nationally but a small chance to occur on a lower scale (KNMI, 2021).

The image below is a map of Amsterdam created by Rainproof (2021) which displays neighbourhoods that are considered as 'bottlenecks' with regard to pluvial flooding. In other words, neighbourhoods that encounter issues of flooding at times of extreme

rainfall. The severity of the bottleneck is indicated by way of a lighter or darker colour orange. The darker the colour, the more severe the issue is considered to be in that neighbourhood by Rainproof. The Rivierenbuurt is the largest red indicated area.

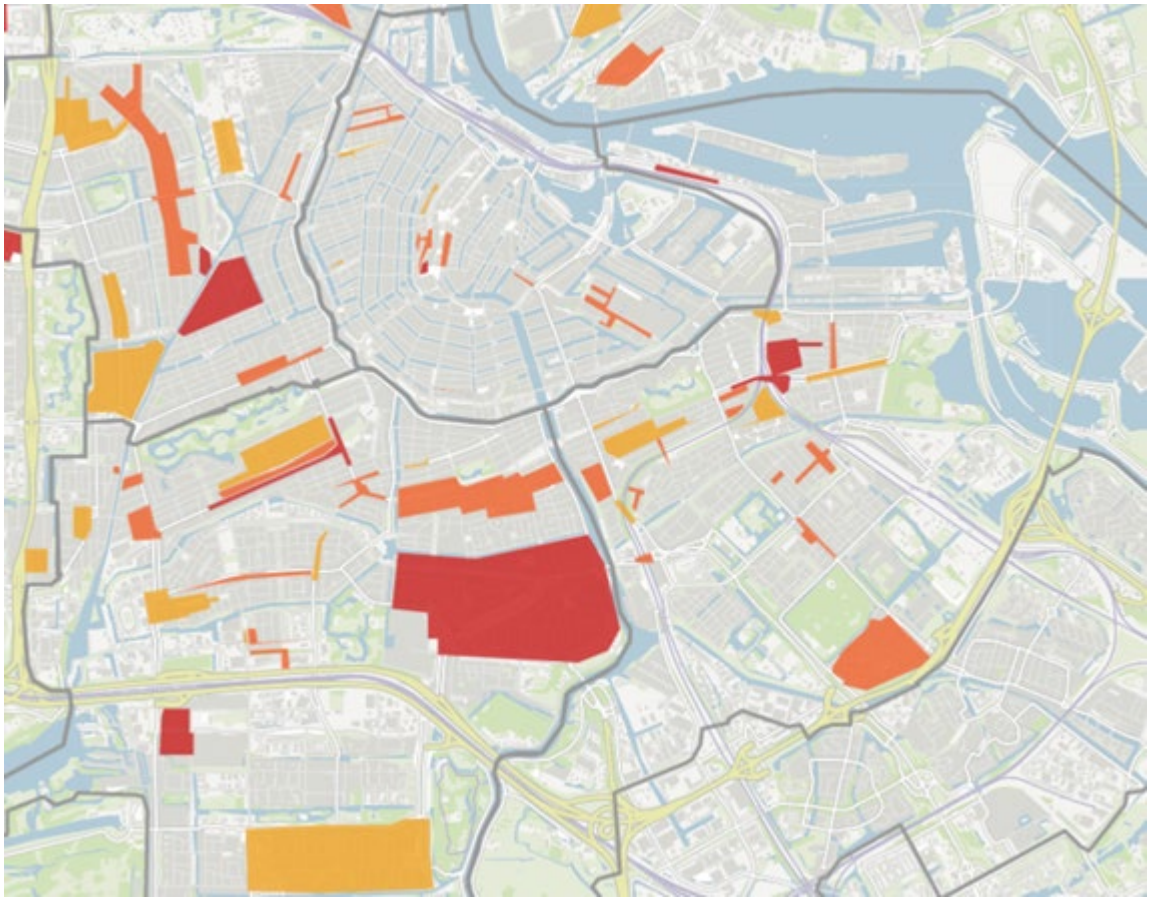

Figure 4: ‘Bottleneck’ areas for pluvial flooding in Amsterdam (Rainproof, 2021)

The chance of high intensity rainfall events, occurring mostly during summer, will double towards 2050 according to KNMI (2021). The Rivierenbuurt in particular has a higher vulnerability due to its low-lying characteristics in combination with high amounts of grey infrastructure in the neighbourhood. Because of the hard surfaces the rainwater in the area is sinking into the ground more difficult and creates more rapid flows of rainwater, which streams to the low-lying parts of the area and into the sewers. The capacity of the drainage system is not designed for such high amounts of water and thus experiences difficulties with processing the water in periods of heavy rainfall, resulting in flooded streets, squares or gardens. The pluvial floods in the streets can cause different forms of damage or nuisance. For example, when plants or trees are flooded for a longer period they are likely to rot, with chances to die (Gemeente Amsterdam, 2020). Similarly, grey infrastructure can suffer damages as a result of the flooding, as well as houses, basements, shops or schools. Accessibility and mobility can suffer complications causing emergency services to be hindered and energy malfunctions can occur, which could cause complications in hospitals and other crucial services (Gemeente Amsterdam, 2020). To form my own understanding of the spatial context in the Rivierenbuurt I decided to walk through the neighbourhood, taking pictures and comparing different parts. The biggest differences were seen between the larger (shopping) streets and the

tiny parks between the building blocks. Some parts of the neighbourhood were clearly older and some were recently rebuilt in a more rain adaptive manner.

Climate issues such as heavy rainfall require an integral approach in which there is not only top down input in adaptive practices. Involvement of other actors and a well-organized cooperation between all actors is highly essential to be able to sustain adaptation that is efficient. Transparancy International (2011) states in their report *"Guaranteeing Public Participation in Climate Governance"* that public participation is a crucial factor of good governance. It enables trust building between different actors and bundles knowledge and resources, which increases the efficiency in processes of governance. They mention that accessible information, direct engagement and oversight are crucial elements of public participation. These elements allow all actors for the development of an informed opinion, to have an influence on policies and to assess implemented policies (TI, 2011). Increasing these elements helps to reduce the mismanagement of resources, which occurs often due to the fragmented character of local actors. So, it is pivotal to create a cooperative context of participation in which improving the issue of pluvial flooding is central.

The pluvial issue in the case of the Rivierenbuurt is one that is experiencing difficulty in two different elements. On the one hand, how to realize adaptive change to deal best with the excessive rainwater, and on the other hand, how to create the desirable setting for cooperation to take place in which participation by all actors is possible and stimulated. In the following chapter the institutional context, as is visualized in figure 5, will be discussed, describing the different roles and responsibility of the different types of actors.

4.2 Institutional context

Mees et al. (2019) explain that in the Netherlands adaptation to pluvial flooding is the responsibility of both the local government and the residents. It is a governmental responsibility to efficiently collect and process the excessive rainwater in public space. This responsibility of collecting and discharging drainage water of local governments is stated in the 'Environmental Management Act' (or *Wet milieubeheer*) (Trell & van Geet, 2019). So far, governmental measures mostly consist of improvement of the sewer system or increasing its capacity. Residents have the similar responsibility of adaptation for their own property, for example, by collecting or processing the water on their roofs, balconies or in their gardens (Mees et al., 2019). However, in some cases the responsibility is difficult to determine. Bergsma, Gupta and Jong (2012) give the example of a damaged basement as a result of moisture. The moisture can have several causes: lacking private drainage, a lacking public drainage capacity, reduced natural drainage capacity (as a result of high amounts of paved surface), extreme precipitation or all of the above combined, complicating the responsibility division. Trell and van Geet (2019) agree, arguing for the involvement of multiple private actors as well as public actors, in order to enhance the local adaptive capacity. The capacity increases as the different actors join their ambitions, knowledge and resources, creating a multi-actor context in which the actors are interdependent and share responsibilities (Trell & van Geet, 2019). The capacity to cooperate and act collectively is pivotal to the adaptive capacity. However, this is also dependent on the formulation and communication of roles and

responsibility and the way these are perceived. Trell and van Geet (2019) explain that the institutional structure, varying between more top down hierarchical governance and more synergetic collaborative governance, has a strong influence on the effectiveness of adaptive goals, needing a leading figure regardless.

Bergsma, Gupta and Jong (2012) argue that (individual) sense of responsibility is an important factor that affects the adaptive capacity. The conventional idea that the government is wholly responsible for events that lack a direct culprit is changing. All parties can and should participate and contribute by taking their responsibility in preventing and adapting to weather events such as extreme precipitation (Bergsma, Gupta & Jong, 2012). However, the way responsibilities are divided between formal and informal institutions remains vague. This, in combination with a fragmented local governmental context, causes a responsibility gap and a lack of efficiency (Bergsma, Gupta & Jong, 2012). According to Trell and van Geet (2019, p.380) the informal context on the one hand, mainly being the local residents (and businesses and community initiatives), is impacted by two main features determining their involvement to the local adaptation: their perception "*on the (distribution of) roles and responsibilities*" and "*their attitude/willingness toward taking action*". Together, these features determine the general attitude of the residents towards rainwater adaptation. On the other hand, in the context of formal institutions in the Netherlands there has been the 2009 'Dutch Water Act', that prescribes that owners, such as individual homeowners or housing associations, have the responsibility to process rainwater and to protect their property against any form of damage caused by precipitation, making it rainproof when needed (Trell & van Geet, 2019). This responsibility protects the tenants. However, Trell and van Geet (2019) explain that there is an unequal risk division of rainwater runoff due to the obligation of low-lying properties to receive runoff water, exempting homeowners of higher-lying properties from the responsibility for damage caused by rainwater run-off and thus from the collection of the rainwater. Furthermore, the municipality is also bound to the ´duty of care´, which allocates the responsibility to the local government when the individual lacks the capacity to take responsibility, regarding the public domain. This duty obliges the municipality to make an effort but it is not results-oriented. The costs made by the municipality, however, are processed in the sewage taxes of property owners. How the duty is executed differs per municipality, depending on the local 'Municipal Sewage Plan' (Trell & van Geet, 2019). Legally speaking, homeowners would find a more logical placing in the model under 'market' (figure 5), in case of rental. Socially speaking and on a neighbourhood level, they remain to be considered as (civil) society, as in most cases the homeowner lives in the house.

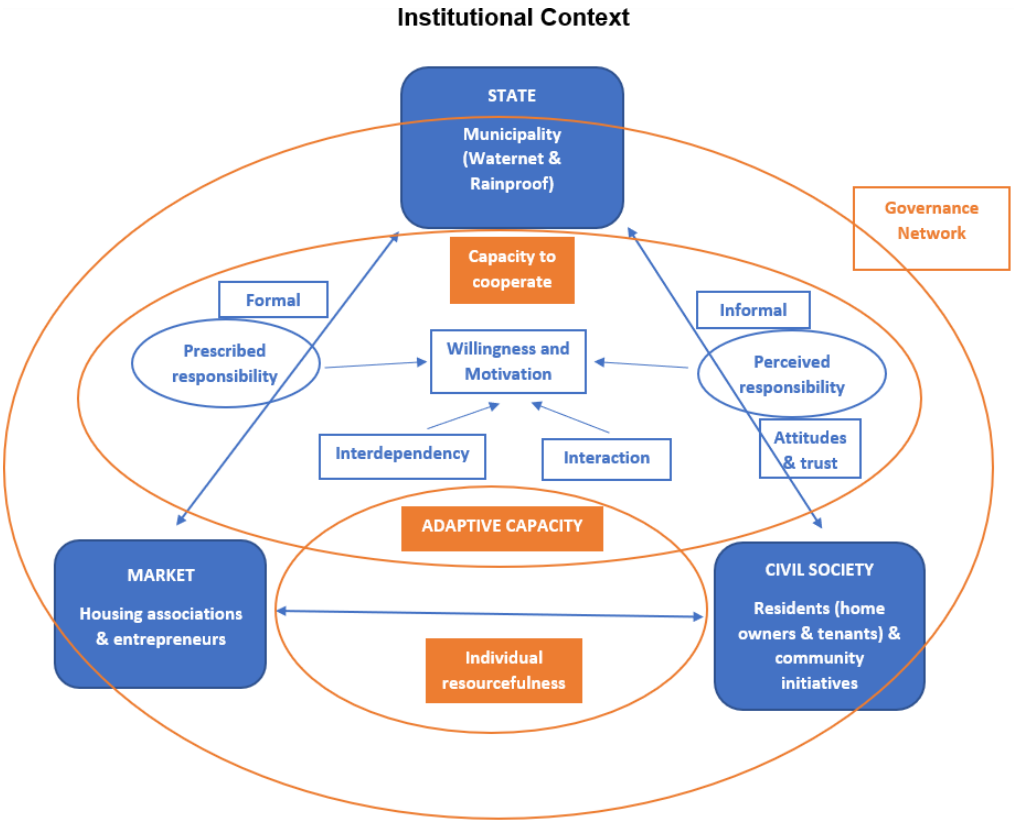

Figure 5: Institutional context of the local adaptive capacity, adapted from Trell and van Geet (2019)

As displayed in figure 5, the institutional context exists of three groups; ‘state’, ‘market’ and ‘civil society’. This model helps to visualize the context of and the relationships between actors for this research. ‘State’ in this case consists of the municipality of Amsterdam (which from now on will be indicated in this case as the municipality or local government) and the two different sub organisations Waternet and Rainproof. ‘Civil society’, as interpreted in this case, consists of the local residents, both homeowners and tenants, community initiatives and other nonprofit organisations. ‘Market’ consists of housing associations and local entrepreneurs.

As these three groups have different relationships there is a need for a common understanding of the issue with a common goal, to create a participative setting in which the issue can be addressed. In most cases there is a top down hierarchy between the different institutional groups. To find out how these groups relate to each other and understand this structure better, I sought to speak with actors from each institutional group; residents, governmental officials, community based organisations and entrepreneurs. The process of learning which actors are relevant in this context was done inductively, without any preconceived knowledge about the context, finding out by speaking to different actors. These actors will be described more comprehensively in the next subchapter.

4.3 Actor description

In the Rivierenbuurt there are a few different groups of actors, or ‘parties involved’ with regard to the topic of rainwater. On the one hand there are the state actors such as the local government and, subservingly, Waternet and Rainproof. The municipality holds the largest share of control, of which Waternet is a part that is responsible for the water management in the region. Rainproof is a programme, originating from Waternet, that serves the purpose of adapting Amsterdam into a rainproof city, largely by mediating or creating partnerships between all parties involved (such as the government and residents) with the focus on rainwater issues. The interviewee who works for both the municipality and Rainproof describes Rainproof as a crucial party for a network approach who brings all involved together that are needed to make the city rainproof. The municipality cannot do this on their own, as they have many different faces, consisting of different departments for different topics with different interests and Rainproof brings the necessary actors together, while being one familiar ‘face’ for all the parties involved. The municipality is more of a steering party that tells other actors how to do things. Besides the steering role, the municipality has a facilitating role, offering services and subsidies. Furthermore, they also have the role of informing residents and other relevant actors. Rainproof is a crucial extension of the municipality in this field, making people aware and informing them of the different possibilities.

On the other hand there is the Civil Society, among who are the residents, who are the largest share in the area and thus affect a large part of the space and whose daily lives are most directly impacted. But also community initiatives, one of which is the NMT-Zuid, who are financially supported by the state. Considering that there are three hands in this context (figure 5), on the third hand there is the Market, among whom the entrepreneurs or businesses in the neighbourhood are considered, who can have impact through their enterprises. The market also consists of the housing associations in the area who own shares of the housing in the neighbourhood providing them with influence on the residential context. Considering that 50 percent of the area consists of public space (as stated by Rainproof), which is mostly top down owned, and the other half consists of private space, privately or bottom up owned, the issue needs to be addressed by both bottom up and top down parties combined as a whole with participation from all different parties involved.

In order to explore the attitude among all parties I have conducted 55 short interviews with residents of the Rivierenbuurt and three online interviews with other actors in this context, among who the chairman of the business association in the Rijnstraat, someone from the NMT-Zuid, which stands for Nature & Environment Team South (Natuur & Milieu Team Zuid), an impartial social-environmental consultancy organisation that accompanies local initiatives or residential and community issues in the South of Amsterdam, and an official from the municipality, who is also working for Rainproof. These interviewees are all respondents who were suggested through my contact with Rainproof. A disadvantage of the online nature of these interviews is that the acquaintance with the interviewees was less personal, making it more difficult to interpret their statements. To use this case illustratively the actors can be used in comparison. However, most of these actors are case bound. To understand these actors better and

the contribution of the interviewees, an explanation of their roles and their relationship to or view on the other actors are provided.

The last named interviewee, who is mentioned before, is a municipal official working for the central department of ´Space and Sustainability´ (‘Ruimte en Duurzaamheid), with the role of Rainproof policy advisor. This department is split up in teams that work per city district. She explains that the programme ‘Climate Adaptation’ did not exist yet in 2014, the year Rainproof was founded as a programme. Climate Adaptation as a programme was initiated only two years ago and resulted from ´Spatial Adaptation Nationally´, from the national ´Delta Plan´, which orders every municipality to come up with a plan about how to deal with the changing climate. Of the four main topics, rainwater nuisance is one. Her personal role in this field of work lies more with the policy making process.

In my interview with the senior advisor from NMT-Zuid she explained how they came to exist and what is the role of the organisation, which is a non-governmental and subsidized organisation. Being part of foundation ‘Wijkcentrum de Pijp’, the NMT was founded by residents to increase the green in the neighbourhood, as it was mainly concrete and stone. By the end of the 1990s they were granted a subsidy by the city district to hire a few people to guide these processes. As such, the NMT was developed into a professional team to help with greening the neighbourhood and enhance sustainability, in which the topic of rainwater issues is included. The NMT workers are process supervisors, as she describes. Mainly, residents come to them, asking for advice or support on local change and the NMT then help with getting all the conditions right for them to start a local project. And sometimes, she returns to check on the project. Besides this, there are neighbourhood get-togethers, as part of the stimulation for local green initiatives, which work well for the residents to get to know each other, increasing the social cohesion. However, as she mentions, in all this the NMT are only the facilitators, guides of the process and advisors. They share their expertise and knowledge about, for example, the types of plants or soil that is needed, but they also give more technical advice on necessary depths, the ideal location or about size of specific constructions.

With regard to the municipality, she speaks of them as their cooperative partners. They are financially crucial to start projects. And in return, the NMT can be considered as the helping troops of the local government. She explains that in the municipality, since the decentralization, the local city districts have different roles now. The districts now need to go ‘shopping’ for a budget at the central city to be able to realize their plans, which changes the ‘partnership’. The NMT have contact persons within the municipality with whom they work together on the realization of their plans and these officials work internally on how to receive permission on particular things or financial support or to get the support of a particular municipal service on getting something constructed. The contact persons are basically internally lobbying. She continues that local organisations such as the NMT and ‘Groene Buurten’ (translated as ‘Green Neighbourhoods’) are missing in the rest of the city districts, missing a middleman between the municipality and the residents who can connect their different interests and translate the different languages they speak (as a figure of speech). It is important to have such an impartial actor who understands the interests of both sides that helps work towards a consensus

that pleases each side. When it comes to Rainproof, she describes them as a marketing actor, in the field of urban rainwater issues, a project based organisation who provides information to people about how to improve things and work smarter. As well as the NMT, Rainproof is but one club that cannot reach everyone in Amsterdam, but trying as much as they can through cooperation with other actors, such as residents and organisations that are already active in the neighbourhood.

In my interview with the head of the Rijnstraat association of businesses, the interviewee expressed his regret that Rainproof is lacking the decisive power in Amsterdam to act independently as there are many areas in Amsterdam that are in need of attention. He noted that the government has green services, that information is being shared and that there are specialized people per topic within the government. However, there is a need for more combined action, where the measures are addressing different issues at the same time. The internal fragmentation at the municipality is an issue which makes it harder to achieve goals, due to the low efficiency. Despite all parties being very keen in achieving their aims, they are all focusing on their own goal, lacking budget and needing more maintenance, while combining their aims and activities in collective measures could help increase the efficiency in achieving those goals, as he claimed. He then described that the business association in the Rijnstraat is looking for co-operative participation in every way. The most obvious actor they connected with is the municipality. They have also been in touch with the ‘buurtmakelaar’ (translated to neighbourhood broker) in Amsterdam-Zuid and with several technicians within the local government to inventory what is needed and what is possible within limits. He also emphasized his openness towards a cooperation with Rainproof and invited them to together participate in terms of greenery in the area.

During the meetings that I attended with Rainproof and different officials from the local government I came to learn which different parties from different areas within the municipality are involved in the Rainproof project in the Rivierenbuurt. This first meeting served the purpose of brainstorming about which approach to use during this project and was attended by Rainproof, several municipal officials from the district South, different officials from the central department of the city, of which someone from ´the Green Vision programme´ and someone from the ´Climate Adaptation team´, and an official from Waternet. My attendance to this meeting mainly served the purpose of observing and learning the internal organisational landscape of this project. Additionally, I explained my own contribution to the project, namely this research, but largely the data resulting from my interviews with the residents and other parties about issue awareness and the sense of responsibility.

A later meeting consisted of more non-governmental actors, besides Rainproof and the officials from the municipality. Among those were people from three large housing corporations ‘Ymere’, ‘Rochdale’ and ‘Stadsgenoot’, someone from the NMT-Zuid, the street manager of the Rijnstraat and someone from ‘het huis van de wijk’ (translated as ‘house of the neighbourhood’). ´Het huis van de wijk´ is a neighbourhood initiative that engages in initiatives to help local residents solve neighbourhood issues. The goal of this meeting was to link the different actors locally in order to initiate cooperation, also without the need for any government (or Rainproof) interference.

The actors mentioned in this subchapter are those actors who I got in contact with, all different from each other and from different institutional groups, as shown in figure 5. For this case they represent other similar actors who are affected by the issue. The subchapter below provides a description of my observations as an observing participant in the neighbourhood as well as in the meetings with some relevant actors of this case.

4.4 Participant observations

A few things stood out, while walking through the Rivierenbuurt. Some parts of the neighbourhood and some of the large streets are very green, with some streets having several facade gardens and some areas having renewed structures. Other parts still consist largely of grey infrastructure, having almost no facade gardens and still have old street structures. Signs of a transition in this neighbourhood. However, these were only the visible aspects in the public space, of which most came from a governmental hand. The private initiatives in the neighbourhood, except for the facade gardens, and the status quo in the private sphere were more difficult to observe. To get a more comprehensive idea about the context I made use of different methods to triangulate. Besides observing the neighbourhood I used websites and municipal documents to learn about the Rivierenbuurt as well as by speaking in the streets with local residents and online to different people from the area. However, all these conversations were with little preconceived knowledge, making it difficult to pose the right questions. With this grounded theory approach I used the conversations and observations to learn the context.

There was a meeting between Rainproof and other sub categorical actors within the municipality, to brainstorm about the approach and the potential measures to increase local rainwater adaptation and participation from other actors. A follow up meeting was organized to update each other and discuss the process. Another meeting, also with the non-governmental actors, served the purpose of connecting those actors, to discuss the points of relevance regarding rainwater issues and to suggest potential solutions. Attending those meetings brought the following things to the light.

As said, the first two meetings that I attended consisted of dividing roles between the different government officials and Rainproof and brainstorming about how to approach the issue and potential initiatives that could help both socially and with climate adaptation, and how to mainstream the topic by creating awareness. But during the meeting it was also discussed which actors to involve in the process, what budgets are available and what to do with them. During the third meeting, in which we also got together with different types of (non-governmental) actors, there was a more practical discussion. A few topics were pre-decided to be discussed and the attendees could bring up their own experiences with the issue or ideas for improvement. The actors would then be linked to the other as directly as possible in terms of who can help with that specific issue, with the aim to avoid intermediaries where possible. These meetings show the intentions of the municipality to initiate a network with direct contact between all actors, with a clear role of the municipality as network creator and steerer (as described in figure 3, rung 4). Subjects of discussion were the maintenance of gardens, moisture and fungus in the houses, creating more awareness among residents and improving local social conditions by greening. One of the difficulties with greening people’s gardens or

community gardens is the maintenance, in terms of responsibility, but even more so that people are not capable of maintaining the gardens due to a lack of knowledge or due to physical limitations such as old age or handicaps. Maintenance by a third party is financially undesirable. So, information needs to be provided in a simple way, by improving the online links and by making people familiar with local organisations such as the NMT Zuid, who can advise them and share their expertise. But, to overcome the physical difficulties there were suggestions about garden adoption, in which case other people from the same block or neighbourhood help with the garden maintenance voluntarily or alternatively for a small fee. Other things that were mentioned were that in most parts of the Rivierbuurt there is a hard ceramic layer underneath the gardens, complicating the water to sink into the ground. Also, the question was posed whether or not it is possible to regulate tiling gardens in the Rivierenbuurt, by implementing a maximum percentage of hard surface for gardens in the destination plans. This could help corporations with greening their properties by giving them legal back up, which they can refer to. Here, the desire was clearly expressed for more regulation by the government. As regards figure two, the participation ladder by Mees et al. (2019), the government seems to shift between the rungs, practicing different rungs at different occasions or situations.

The meeting was facilitated by the municipality and managed to get different actors to become familiar with the other, building the first few connections. As, did it give space for the non-governmental actors to share their concerns, ideas and goals. It helps to build trust between the actors for the benefit of participation in a cooperative setting. This type of initiative by the government corresponds with the fourth rung of the Mees et al. (2019) ladder of government participation, network steering, as they "*initiated and created a network of public and private stakeholders"*. It corresponds highly with the role description of the rung of network steering as well with the following roles: "*Process coordination, fostering of dialogue and negotiation among stakeholders, mediation of interests, arbitrage of conflicts, trust building, creation of a level playing field through rules of the game"* (Mees et al., 2019, p.200). This rung also describes that decisions are co-decided. In this initiation of a network and the fostering of dialogue there has not been much decision making. In the case of decision making, it will be in the form of co-deciding, but the local government will always have the last say. However, for the participative network and cooperation between these actors and the municipality to work well it is important to have a co-decisive decision making process as well.

Confirming the need for a cooperative setting in which all actors participate, the municipal official who I interviewed also emphasized that the largest challenge to achieve the goals of rainwater adaptation is to cooperate both between parties and internally in the municipality between the different departments and programmes. This is a challenge of co-governance, looking at Chaskin and Garg's (1997, p.632) definition of governance, where a cooperative structure must be formed in which the different parties work together on the implementation and the carrying out of adaptive measures and identify and organize the accountability and responsibility clearly between all parties, regarding the necessary action. The interviewee also emphasized on combining the work, as the necessary activities are too expensive if they would be carried out only for rainproof purposes, and connecting the existing projects would enhance the efficiency of achieving the different goals. Nationally, there is a partnership called 'Samen Klimaat

Bestendig' (translated as 'Together Climate Proof') in which Amsterdam and Rotterdam, with their programme 'Weerwoord' are the leading cities. Internationally, there are partnerships as well. Waternet, for example, is closely involved with the yearly organised 'International Water Week', with the purpose of sharing knowledge.

Being part of the interactions and discussions provided me with insight on how the roles are divided, how the different actors view the issue and the willingness of these actors to participate and cooperatively work on adaptation. To have these different actors from all three institutional groups (figure 5) together in a meeting, that gave the first impression that there are a lot of possibilities to cooperate between these actors, is a good start for creating a participative network for local rainwater adaptation. A direct representation of residents was missing. The residents were indirectly represented through the NMT-Zuid and 'het huis van de wijk', who are considered as the same institutional group, as shown in figure 5.

4.5 Initiatives and regulations

There have been started several initiatives, mostly by the government, and there are some planned initiatives that aim to increase the adaptive capacity of the Rivierenbuurt with regard to rainwater issues, that are worth mentioning. In this subchapter different regulations and initiatives will be discussed. Besides the local initiatives, there are national initiatives and regulations that affect the case.

One of the initiatives that is already in place is the 'tileservice', a cost free service facilitated by the government that comes to pick up tiles that are removed either from peoples gardens or from the footway in front of their houses. This makes it easier for people to remove their tiles in order to green their garden. This service is connected to the 'NK tegelwippen' (translated as 'national championship tile lifting'), which is a national contest between cities of which city can lift or remove the most tiles. The contest has the goal of motivating cities to stimulate their citizens to remove as many tiles as possible. The tileservice is a clear example of the municipality stimulating other actors, in this case the residents, where they provide support in the form of the service, which enables the residents to take initiative in removing tiles from their gardens. This initiative by the government corresponds with the third rung in figure 3, the role of stimulating, as they provide structural support to local community or individual initiatives. The current governmental initiatives in the public space consist mostly of completely top down controlled activities such as restructuring and renewing of the streets, parks or squares and tram rails designed with waterstrips as fundament, increasing green and constructing wadi's (a wadi is a sand filled ditch that is planted with the aim to absorb as much water as possible, the word is inspired by the Arabic word that means a ´dry river valley´, but has the Dutch acronym of Water Afvoer Drainage Infiltratie, which translates as much as Water Disposal Drainage Infiltration (Rainproof, 2021)) and increasing the sewer capacity. These activities would fit into the fifth rung of hierarchical governing, as explained in figure 3.

Besides these actions, in order to make more local participation possible the municipality is trying to create more awareness among the residents through newsletters and stimulate initiatives such as creating little facade gardens and blue and green roofs

(blue-green roofs have an extra ‘blue’ layer functioning as water storage underneath the ‘green’ planted layer, that can store more abundant rainwater in periods of heavy rainfall which in turn can be used in periods of drought to water the plants of the green layer (Rainproof, 2021)). In order to improve and thus reduce the responsibility gap, such communicative intentions from the local government are very important in stimulating the perceived responsibility among the residents. As figure 5 shows, the perceived responsibility in the society is important for the willingness and motivation of individuals to participate. For the practical initiatives it is possible to receive support financially or with construction. Up until half of the costs can be subsidized by the municipality depending on a few conditions, a few of which are that the roof has to date back more than five years ago, the new roof needs to be maintained at least five years and the minimum of the roof surface needs to be 30 square meters (Rainproof, 2021). These different types of government initiatives show how the municipality shifts between rungs of the participation ladder, as it showed more regulating initiatives as mentioned before and in this case they are mostly stimulating, also by informing, and facilitating.

I had little knowledge of these initiatives beforehand and learned about it inductively through my contact with Rainproof. The NK tegelwippen was one of the first examples that was mentioned in our meetings, followed by the initiatives such as the newsletters and local signs in the streets.

The interviewee, who is active for both the municipality and Rainproof, explained the approach they are working on. The approach, which was initiated by Rainproof, is to see which working processes within the municipality are already experiencing trouble with the changing climate, to make sure these are being adapted to the issue. She gave the example of searching for where in the public domain it would be possible to construct wadi’s. But before this, they are first looking at where the cause of the issue is to be found and then they take stress tests to decide which locations are most vulnerable and thus most urgent. Furthermore, she explains, they are now focusing on turning the topic of rainwater into a leading process in the design of space, aiming to develop the approach on how to use the excessive rainwater better and to use it locally as much as possible to also tackle other issues like drought. With the stored rainwater the groundwater level could be replenished directly and trees and plants could be watered. But, as she underlines, it is important to renew the design or structure of the city as the old structures were designed to process rainwater as quickly as possible, out of the squares and streets and into the sewer. This system, besides not utilizing the opportunity to use the water, has also reached its limits of capacity as rainfall has an increasing intensity due to climate change. During this research, through the examples of Gothenburg and the ones provided by this interviewee I got aware of the perspective of using excessive rainwater rather than disposing it. This is also a characteristic of the grounded theory approach.

At the moment the sewage system is capable of processing an amount of 20mm of (rain)water per hour. However, the municipality implemented a 60mm norm, a policy they imposed on themselves, stating that the city must be able to process 60mm of rain per hour without properties getting damaged or flooded streets creating nuisance. This means that in the case of 60mm rainfall per hour, the remaining 40mm need to be processed outside of the sewer. Therefore, temporary ground level solutions are needed

for water storage. It is a set policy that is supposed to be included in all activities carried out in the public domain. However, it is not always the case in practice. These norms have most effect with projects where something is renewed or newly built. Such as the redesign of an area where all the water flows towards a few smaller streets that are less crucial in traffic, where it can stay between the curbs and sink slowly into the ground in about an hour. But also, when a road is opened up a more porous material could be used when the road is being rebuilt, so the rainwater could sink in more easily. Other solutions, as mentioned before, are more strips of greenery, green roofs and wadi's. However, such changes in the urban design most of the time demand an urban designer, making the processes slower, more difficult and more expensive. Nonetheless, the sustainable norms and considerations are then also better assured.

This 60mm norm is more of a 'modelling' way and a systemic way of looking at the city and its issues, she continues. But the norm is also stated in the 'gemeentelijk rioleringsplan' (translated as 'municipal sewage plan'), which was operative until this year. So now a new plan is being developed by Waternet for the coming four years, with an even stronger focus on how to handle the excessive rainwater. This year the 'hemelwater verordening' (translated as 'rainwater regulation') was also put in place, a hard demand which obliges all new buildings and existing building that are renovated to comply with an amount of water storage that is calculated with the '60mm norm', so regulating the private sphere. Here, the municipality is still working on the permits, to make sure that license holders are also aware of the regulation when they request a new permit. She provides the example of IJburg, where they have practiced this regulation on Centrumeiland (the centre island of IJburg). As the island was added in the IJsselmeer, it was then decided that the island cannot have any influence on the surface water of the IJsselmeer. So basically, all rainwater that falls on the island must be processed or used on the island, by watering greenery or flushing toilets for example. This way the design of the island is water neutral. The obligation of having any form of water storage was also made clear to all the lot owners. A calculation tool was then developed to control whether the projects of the housing developers would meet the water neutrality norm of the island. This same tool is now also used as a base for the new rainwater regulation, she explains, and is made available for the whole city and license issuers to check whether the suggested water storage meets the norm.

The regulations like these are, however, only possible when it is properly aligned with all the parties involved. The 'Amsterdamse federatie voor woningbouwcorporaties' (translated as 'the Amsterdam federation for housing associations'), the umbrella organisation for the housing associations in Amsterdam, reads along with regulations such as the 'hemelwater verordening' and checks in what way the regulation would affect them as well as its feasibility. She underlines that this contact is crucial for the feasibility of the plans, as well as for a network approach, as it is easier to have conversations and keep having the conversation with the parties during the implementation of the measures because of the already existing contact with the housing associations.

Another example she gives is in Amsterdam West, where there were two zoning plans ('bestemmingsplannen') that suggested a maximum degree of hardening ('verhardingsgraad') in peoples gardens. However, this is a measure that should be implemented for the whole city. From next year on, with the new environmental code

(‘omgevingswet’) all the existing zoning plans will be combined into one main plan which will have specifications per location. Such measures for rainwater adaptation show a clear regulating role of the local government. This issue of tiled gardens is also something which the housing associations are trying to figure out as their property is being damaged by rainwater nuisance. And, she states, they are responsible for the wellbeing of their tenant as well. She continues that in some cases when tenants are leaving a house, they have to leave the garden in a 100% tiled state for the new tenant. This shows that there is a lot of space for improvement with regard to the rainwater issue for some housing associations. Such dated internal policies of housing associations need to be adjusted. Another part of the issue is that due to the high housing prices people use their gardens to construct annexes or to build basements, both disturbing the flow of the groundwater. This has happened a lot in both city districts South and West Amsterdam. As a result of the initiative ‘stop de bouwwoede’ (translated as ‘stop the construction madness’) by the residents, the zoning plans were adapted in Amsterdam West. The maximum degree of hardening is preventing both extra constructions and the tiling of the gardens. However, she notes, it is largely dependent on the supervision of the regulation whether it works or not. So, in order to achieve lower degrees of tiling in gardens the input of the municipality might have more effect through a more facilitating or stimulating role (rung 2 and 3 in figure 3). In practice, every small bit contributes, so together with facade gardens and such other things it will help to tackle the issue. She really emphasizes that there is a need for a combination of solutions, as there is not an all-embracing solution.

In an online interview with the head of the ‘Rijnstraat ondernemersvereniging’, the association of businesses in the Rijnstraat (one of the main streets in the Rivierenbuurt) he explained his thought on that the large quantity of asphalt in the Rijnstraat, being a broad street, has a large impact in creating rainwater nuisance. Our meeting consisted mainly of descriptions and ambitions by the interviewee regarding the adaptation of the Rijnstraat area. This way he provided me with the opportunity to learn a lot about the perspective of businesses in the Rivierenbuurt on rainwater adaptation because of my little preconceived knowledge about their perspective. He explained that their association of local businesses has the plan to turn the street into a green recreational street with a higher adaptive capacity. Together the entrepreneurs of the Rijnstraat had joined a local contest of initiatives to make Amsterdam more green, of which most initiatives emphasized sustainability as well. Their plan was one of the chosen initiatives, winning a prize of 19.500 euros to realize the plan. The plan that they created to make the Rijnstraat greener, called Rijnstraat 'Verblijfsstraat’ (translates to ‘residential street’), is however not complete yet. They were also still working on the website, for which they use software from the municipality, that has the aim to stimulate participation in the neighbourhood in making the street more green. More specifically, the plan aims to increase the amount of plants in the street, create more open structures (like parking spots with porous stones) on the ground and to create little parks and hedges that can help increase water drainage, the quality of space, biodiversity and the reduction of emissions and noise. But also by constructing ‘verhoogde plantsoenen’ (translated as raised beds) more height differences are created. People can then also use it to take a seat. Such constructions provide the area with more colour, and can help increase social interaction, which both contribute to the local liveability. Another one of their ideas is to construct water basins. The stored water can be used in periods of droughts to water the

plants or could be used with firefighting. More open water structures in the neighbourhood could be helpful with rainwater adaptation as well, relieving the drainage system from more pressure. Besides the public space they also look in their plan at facade gardens in front of the stores in the street and at green roofs. However, the stores are on ground level so shopkeepers have little influence on what is happening on the roofs. With regard to the gardens of shops, most of the time these are completely constructed, as most stores want to use as much space as possible. Some shops do not have this, in which case they often make sure to construct the gardens with wood for example, so the water can sink in more easily. Other initiatives were to create flower beds around trash containers, make green roofs on garden sheds and to create tree drip lines (tileless open soil around a tree).

One of the problems, as he continued, is that the maintenance of streets and public space per area are planned per 40 years (for large maintenance) and per 20 years (for smaller maintenance). During that time they have to wait for big initiatives in an area as the municipal budget is lacking for more reconstruction activities. However, by waiting the issues can increase. This shows hierarchical thinking from the local government, rather than involving other actors more and having a co-governing setting to achieve goals more efficiently. He mentions a construction that is planned in two years for an area close to the Rijnstraat, in which different activities could be combined, tackling several issues at the same time. Combining these different goals in the same construction work would increase efficiency a lot more in terms of costs and labour, and more knowledge and expertise would be shared. It is then also more easy to handle the issues at a larger scale as the higher efficiency would leave more budget to do so. Especially when these measures are taken in a participative structure, cooperating between entrepreneurs, residents and municipality, as well as with rainproof or other organisations.

In the online interview with the respondent from the NMT more emphasis was put on people's awareness of the issue and their perspective on rainwater abundance. She explained how she is working on a mini campaign to put the focus on the reuse of water as a topic, instead of negatively considering it as a water nuisance, to change the way people think. There need to be more initiatives that use the rainwater abundance as an advantage rather than a disadvantage, using the water in dry periods. One initiative she mentions is a sale action of rainwater barrels in 2017, that had the aim of motivating people to buy a barrel for at their house that collects rainwater for reuse. With other initiatives they try to include the topic of rainwater more in the restructuring or redesigning of the neighbourhood. Examples of some are, connecting peoples rain pipes directly to their plants, putting rain barrels at the facades of houses and creating underground containers for collecting water that could be pumped up electrically to water plants or trees. The aim with these initiatives is to increase the circularity of water. Another project that they had in 2018 was a demo day with Rainproof where they applied different ways of placing water barrels, to show the possibilities, they showed water permeable tiles and they placed green roofs, all to make people more familiar with the opportunities they have in hand. In 2020 another organisation in the South district, ‘Buurt Budget Zuid’ (translated as ‘neighbourhood budget south’), initiated the project ‘Groene Schuurtjes’ (translated as ‘green sheds’) with which the NMT helped, motivating as many people as possible to make their sheds green (of plants) for more water collection and

cooling. There were two rounds, one of which was in the Rivierenbuurt, with a total request for 3600 square meters of green, showing that there was much spirit from the residents. Possibly a third round will follow.

It is evident that most initiatives are municipal. However, the input from both the market (Rijnstraat association) and civil society (NMT-Zuid), as figure 5 displays, show more shared responsibility. This broader sense of responsibility for adaptive action throughout the three institutional groups helps to mainstream the topic of rainwater adaptation among residents. Stimulating awareness and involvement of local people in this topic is very important for local adaptive change to take place integrally. By involving people in initiatives awareness can slowly grow, which is crucial for developing a sense of responsibility. The next subchapter discusses the interviews with local residents and their degree of awareness and sense of responsibility, but also from the perspective of the other interviewed local actors.

4.6 Local awareness and sense of responsibility

The perception that citizens have of the probability of damaging weather events to affect them, such as flooded streets or squares, decreases as their trust in the government to take responsibility is higher. This reduces their mitigative and adaptive intentions to act on an individual or community level (Bergsma, Gupta & Jong, 2012). Bergsma, Gupta and Jong (2012) elaborate on this stating that the trust as well as the related sense of responsibility and the willingness and motivation to take action have a large impact on the capacity to cooperate as a collective.

To gain knowledge about the general attitude among the residents in the Rivierenbuurt regarding excessive rainfall and rainwater I visited different areas in the neighbourhood to have short conversations with the residents about this topic. Approaching people in the streets provided me the chance to speak to different residents from different areas, and thus find respondents through purposive sampling with the goal to have more representative, or rather illustrative, results. Most people approached were willing to take the time to have a conversation. Some respondents did not live in the Rivierenbuurt and only a few respondents refused a conversation. Despite explaining the reason for requesting a conversation, namely as a part of this research for my Masters, some respondents reacted suspiciously, asking for more background information or worrying that something would be expected from them. A few reacted doubtful to the question whether it would be okay to record the conversation, for me to be able to listen back to it and transcribe the results.

The goal of the conversation with local residents was to explore their awareness of the issue of pluvial flooding in the Rivierenbuurt and the degree to which they experience this as an issue, and their sense of responsibility towards the issue. The reactions of the local residents, however, were quite diverse as shown in figure 6 below.

Sex	%	Age	%	Household	%	Years of residency	%	Awareness	%	Issue experience	%
Man	43.6	<30	29.0	Alone	23.6	<5	32.6	Yes	63.6	Yes	32.7
Woman	56.4	30-45	32.7	Couple	30.9	5 -- 15	29.1	No	36.4	No	67.3
		45-65	16.5	Family	27.3	15 -- 40	25.5				
		65>	21.8	Roommate(s)	18.2	40>	12.8				

Cause	% (amount)	Solutions	% (amount)	Neighbourhood initiatives	% (amount)	Responsibility	% (amount)
Drainage blockage	16.4	Cleaning	7.2 (4)	No	63.6 (34)	Government	74.5 (41)
Lacking drainage	60.0 (33)	Water storage	25.5 (14)	Government	5.5 (3)	Waternet	9.1 (5)
Grey infrastructure	12.7 (7)	Green infrastructure	25.5 (14)	Construction work	18.2 (10)	City district	7.2 (4)
Low-lying neighbourhood	5.5 (3)	Restructuring infrastructure	14.5 (8)	Green infrastructure	9.1 (5)	Regional water authorities	5.5 (3)
Groundwater level	3.6 (2)	Renew drainage	43.6 (24)	Rainproof sign	1.8 (1)	Residents	0.0
Infrastructure design	5.5 (3)	Green roofs	3.6 (2)	Flyers	5.5 (3)	Combination	18.2 (10)
No idea	10.9 (6)	More drains	3.6 (2)	Social media	1.8 (1)		
Other	7.2 (4)	Porous infrastructure	3.6 (2)	Facade gardens	1.8 (1)		
		No idea	14.5 (8)				
		Other	3.6 (2)				
Other = Dated infrastructure, Hard structures underground, Lacking drainage in gardens & Sinking city							
		Other = Climate change mitigation & Prohibition underground basement boxes					

Individual contribution	% (amount)	Willing to contribute	%
Clean	5.5 (3)	Yes	54.5 (30)
Green	18.2 (10)	Probably	10.9 (6)
No	72.7 (40)	Maybe	10.9 (6)
Other	7.2 (4)	No	9.1 (5)
		N.d.	12.7 (7)
Green = (Facade) Garden & Green roof			
Other = Low water use, Connected drainage, Drainage unblocking, Good garden drainage			

Figure 6: Categorized results of resident interviews

As the figure above displays, the respondents of the resident interviews were quite divided in terms of demographic characteristics as well as in their answers. The slight majority of the respondents were female. The highest percentage respondents in the age category were in the subcategory of 30 to 45 years old, despite that being the smallest subcategory in terms of the amount of different ages. This already indicates that the neighbourhood predominantly consists of young working people or starters and families. Over a third of the respondents were older than 45 years old and almost a third of the respondents were younger than 30 years old. The next category of the different types of household somewhat confirms this indication; almost a third of the respondents were living together with their partner and with the respondents who were living in a family household they formed together more than half of all respondents. The smallest share in this subcategory were people who lived in a household composition with one or more roommates, indicating that there are less students or young graduates living in this neighbourhood. Most of the respondents only lived in the Rivierenbuurt for less than five years, a large share has been living there for 5 to 15 years and over a third (combining the other two relatively large subcategories, in terms of amount of years) has been living in the neighbourhood for longer than 15 years.

When I asked the residents about the issue of abundant rainwater and its consequences in the neighbourhood, over a third of all people had never heard of this issue and about 64 percent were aware of the issue. However, of all the residents who were aware or not, only a third experienced the issue as such. So, only half of all the people who did know of the issue did not experience it as such in their neighbourhood. This makes it more difficult to stimulate participation among those people, as people will be less willing to participate in improving a situation for which they do not see a need for improvement. Almost three quarters of all respondents were currently not contributing to any form of

rainwater adaptation, like removing tiles from their gardens or having a green roof or facade garden. Only about 18 percent of the respondents contributed with green individual initiatives. When asked about their willingness to contribute, more than half was willing, about 11 percent would probably be willing, another rough 11 percent was doubting and 9 percent was not prepared to contribute to adaptive initiatives that focus on rainwater issues.

The things that the residents thought could be the cause of the rainwater issue in the Rivierenbuurt are varying. Some believed that the drainages are sometimes blocked by trash or leaves. Close to two thirds of the respondents thought that the drainage system in the Rivierenbuurt is lacking, either due to its limited capacity or simply because it is dated and not working properly anymore. A few people mentioned that it is a low-lying neighbourhood, another few blamed a high groundwater level and some stated that the infrastructural design is incorrect. Other ideas were that the infrastructure is outdated, that there are too many hard structures underground, that the drainage in peoples gardens is lacking and that the city underground is sinking in. Seven out of the 55 respondents understood the issue and explained that it is largely due to the high amounts of grey infrastructure in the neighbourhood and about 11 percent had no idea about what could be the cause of the issue, or mainly is causing the floods.

The solutions that people mentioned about what would be needed to help tackle the issue largely reflected their ideas about the potential causes. Most people answered with the renewal of the drainage system as the necessary measure. About a quarter of the people mentioned that more green infrastructure is needed and also water storage was specifically mentioned as a solution by about a quarter of the respondents. Some talked about more cleaning and others named the restructuring of the infrastructure as measure for improvement. A few other, more specific, ideas about solving the issue were green roofs, more drains in the streets and constructing a more porous infrastructure. But also climate change mitigation and a prohibition for underground basement boxes were mentioned as ideas. Some had no idea of what could help.

To learn more about the awareness of the residents I asked them about the initiatives that they had experienced, regarding rainwater adaptation in the Rivierenbuurt. From what people had noticed, construction work at the larger streets in the neighbourhood was most mentioned. A few people also mentioned the new green infrastructures, like the green strips and the wadi´s. Some respondents mentioned other initiatives by the government. Others mentioned more informing types of initiatives such as flyers or newsletters, a rainproof sign that they had noticed in the area and social media. Besides the mentioning of facade gardens, as initiatives from residents, by one respondent, no one had noticed non-governmental initiatives by residents or other local actors. This low level of non-governmental contribution and participation was clearly expressed in their answers regarding the responsibility of taking adaptive action against the issue of rainwater. None of the respondents mentioned residents as responsible actors for rainwater adaptation, except for ten respondents who stated that residents as part of society should take some responsibility or share it with other actors and the government. But never as the main responsible. The rest of the answers made it quite clear that the people expect top-down adaptive action and responsibility, as roughly three quarters of the respondents pointed directly to the government and the rest of the respondents

indirectly by naming either Waternet, the local city district or the regional water authorities (or ‘waterschappen’) as main responsible. It became clear when asking these questions that the sense of personal responsibility among the residents towards the issue was very low, pointing at the governmental organisations to either tackle the issue top-down or through the combination of governmental initiatives of adaptation and by implementing more regulative measures to steer residents and businesses. Only a fifth of the respondents believed that residents need to contribute in the adaptation as it is an issue that is largely caused by and affecting them as well. This shows the large responsibility gap between the governmental and non-governmental actors. However, the numbers in figure 6, which show that the issue is being experienced as such by only a third of the respondents, explain the low sense of responsibility for a large part. The other part, of the expectation of the government to take care, could be explained by the societal structure in which we live, with a relatively high degree of state interference. When placing these results in the participation ladder of Arnstein (1969), figure 2, they would match mostly with the third rank, of informing, in which citizen participation is still very low, in relation to the lower two ranks, but slightly being stimulated by creating awareness. In the ladder of government participation by Mees et al. (2019), figure 3, when looking at these attitudes by the residents their expectations of the local government strongly correspond with the 5th rung; regulation. The government, however, besides the measures they are already taking, are also practicing the role of stimulating, rung 4. They are trying to stimulate local community initiatives as well as individual contribution by creating more awareness through the returning newsletter, rainproof signs and social media.

The interviewee from the municipality also explains that conventionally the municipality and Waternet were completely responsible. And she thinks that we are in a transition, but that people are still thinking in a traditional fashion regarding the role of the municipality. But in the present situation it is more about designing areas as buffers to enlarge the sponge effect in the city. And to do so, you need all sorts of different parties in the city; housing associations, private organisations, businesses and residents. Basically, everyone who possesses a piece of space in the city, in which water could be collected or stored in whatever way, needs to be involved. So, when looking at figure 3, the role of the municipality changes from regulating to more network steering as well. Rainproof in this whole is considered as a ‘boundary object’, a small organisation that operates on the boundaries of what is happening in the city and what is the government doing and make sure the conversation is running properly, to make the right connections between parties. She continues that on a policy level house owners are responsible for processing rainwater that falls on their lot. The municipality has the municipal sewage plan, the 60mm norm, which states that as municipality they should ensure that the city can process precipitation of 60mm per hour without any nuisance, such as flooded streets, or property damages to occur. This is what the municipality has imposed on themselves as responsibility, on a policy level. So everything that is done in the public domain should be able to process such an amount of rainfall. She states that 60mm per hour precipitation is extreme and is only happening once every 100 years (per location), but that its frequencies most likely will increase.

When I spoke to the head of the ‘Rijnstraat ondernemersvereniging’, it became clear that rainwater issues are a topic of discussion among entrepreneurs in the Rivierenbuurt as

he expressed that rainwater adaptation is an important topic to him and his colleagues. The entrepreneurs are very much aware of the Rainproof map of Amsterdam which shows the vulnerable neighbourhoods to rainwater issues, the Rivierenbuurt being the largest bottleneck area (figure 4). He also strongly shared their enthusiasm about taking action in rainwater adaptation. Furthermore, he added that almost all shopkeepers who have basements experience issues with either rainwater floods or moisture. The businesses also experience an economically negative impact with the rainwater nuisance, as the street is less accessible to people to walk around and go shopping. According to him there is a shared responsibility as all actors have interest in tackling the issue, with the government as warranter, having the most tools, tax incomes and thus the final responsibility. But, as he explained, the local people such as local organisations as well as the residents, need to take action themselves too as they live in the municipality and are thus being part of it. He also mentioned that they see the needed adaptive action, which is mainly the restructuring of the area and increasing green, being beneficial in more ways in its solutions, as it is enhancing the liveability and biodiversity of the area and it helps reduce carbon dioxide, particulate matter and noise disturbance. He, therefore, emphasizes on the need for an inclusive approach that combines different issues when taking measures. According to him, the role of the government should be to create a network between the actors and have a steering role in the process.

In the other interview I asked the senior advisor of the NMT-Zuid about the division of responsibility. She argued that the municipality is the main responsible regarding public space. When residents have local initiatives there are agreements about the maintenance for example. But when it comes to whose responsibility it is or who is liable in the end, according to her, the municipality is always the ultimate responsible actor. However, she says, with regard to the private space the situation is different. Here the owners and landlords are mainly responsible. So, corporations and VVE’s, but there are also many private landlords. As they own the ground, in the situation of rainwater nuisance they are responsible to solve the issue. It is never the renter’s responsibility. But apart from the legal responsibility, in her opinion renters have a moral responsibility to contribute to rainwater adaptation and help solve the issue, in the common interest. When placing her arguments about the role of the government in the ladder of government participation in figure 3 there must be made a distinction between the public and private sphere. Legally the government is fully responsible for taking action in the public sphere, and thus must take the role of regulating, in rung 5. However, with regard to the private sphere, it is up to the landowners to take responsibility. Here, thus, the government can take a more facilitating or enabling role where they do stimulate change as it is in their interest, but their (financial) support is limited.

The interviewee mentioned the ´NK tegelwippen´. She explained that this project was initiated to increase awareness among citizens about water storage and to increase the water storage at the same time. A clear example of the government participating from a stimulating role. But, she explained, the topic remains quite abstract to the residents, needing explanation about the influence people can have with their garden as a part of the whole contributing to rainwater storage and reducing water nuisance. Often, the topic is not close enough to the people, only when their basement is flooded. Water as a topic needs to be included in other stories to increase awareness among people. She continues that the re-use of water needs to be promoted more, changing the perspective

of people on the abundant water as well into a positive factor, of how it can be used rather than disposed of. For example, for people to water their plants with. It is easier to stimulate people with a positive message of how it benefits them. By bringing the topic in such a way that it touches the personal interest of people helps to get them more active as it stimulates their personal awareness. An example could be that they should not let the rainwater runoff to the sewers directly as the groundwater level in the city is low. Due to the low level, the poles on which the houses in Amsterdam are built can rot. This could be a personal motivation for people to remove tiles from their gardens, for example, to increase the groundwater level around their houses. Making the issue personal helps to increase people's awareness, stimulating them to become more active. She adds that it is also important to involve residents in the initiatives and make them have the feeling that it is their project, rather than only asking them for maintenance, making them feel like a sort of free labour for the government. This corresponds with Hosseini et al. (2017), who emphasize in their definition of participation, as mentioned in chapter 2.3, on the importance of mental and emotional involvement of individuals for a cooperative setting to be possible in which responsibility is shared.

As it has turned out, over a third of the resident respondents are not familiar with the issue and most of them do not feel any responsibility with regard to tackling this issue, it seems that this is a big challenge in achieving a participative local network but also something where a lot of progress can be made. Figure 6 also shows that over half of the respondents, taking into consideration the 'probably' and 'maybe' responses, up to 75 per cent are willing to contribute in adaptive change. It is essential that the topic or issue is brought to residents as something that affects them but also something that can benefit them, while making it easier for them to contribute and, where needed, impose measures through regulation.

Chapter 5: Conclusion

Rainwater adaptation in the Rivierenbuurt still remains a relatively new topic, but one that is growing among the local community. In the local government it is a topic that has been established since the last ten years mostly. Over the years the municipality of Amsterdam has been increasingly taking measures to improve the spatial design of the public space in the Rivierenbuurt, as well as to inform its local residents. Besides the municipal measures there have been a few initiatives from market and (civil) society (figure 5), such as Rijnstraat Verblijfstraat, the rain barrel sales action by NMT-Zuid and individual greening by residents. However, the initiative by Rainproof has the aim to improve the adaptive capacity of the Rivierenbuurt by stimulating participation among the residents and by stimulating cooperation between the local actors by organizing online meetings together with the municipality, in which the actors get the chance to share their perspective and directly make contact with other actors. The municipality took the role of network steering in this process, corresponding with Rung 4 in figure 3.

The focus of this research was on the degree of local participation and the local attitude towards rainwater adaptation. Through the use of inductive research methods, corresponding with a grounded theory approach, the local attitude in the Rivierenbuurt is

tested by studying the awareness and sense of responsibility of the residents and the willingness of local actors. This study for a large part consisted of short interviews with residents in public space in different areas of the neighbourhood, spreading the chance of speaking to different types of residents, to learn about their attitude towards rainwater adaptation and the corresponding governance structures. Furthermore, I conducted in depth interviews with different active actors, from the local government, from a non-governmental societal organisation and with an entrepreneur, conversing with different institutional groups (figure 5) to be able to form a comprehensive case. The non-governmental respondents shared their expectations of the local government, pointing out their responsibility, but also shared their enthusiasm to contribute, emphasizing a shared responsibility. To find out how the local participation can be increased, this research made use of the ladder of government participation by Mees et al. (2019), figure 3, to look at the role of the local government as well as their desirable role in relation to the involvement of other actors. The results from the interviews with the residents indicated some awareness about the pluvial issues but fewer who experienced an issue as well as a low degree of participation in the adaptation of it. Regarding the responsibility of adaptive action, in the response the most fingers were pointed at the government as the main responsible actor, leaving a responsibility gap between actors. The low degree of participation and low sense of personal responsibility are logically deducible from the low degree of issue experience on this topic.

During this research it became essential to look at the role of the government to answer the main research question *“How can local participation be increased in the Rivierenbuurt in Amsterdam in order to create a rainproof neighbourhood that is largely self-governed?”* The ladder in figure 3, by Mees et al. (2019), displays the degree of government interference or participation over 5 rungs from complete government regulation to the government completely letting go. When looking at de ladder by Mees et al. (2019) in figure 3, the municipality of Amsterdam can be placed in Rung 5, the most top down controlled role of government participation, as a large part of their measures still consist of regulation. However, more important in this context is the traditional perception of the municipality´s role by its citizens, being that of top down hierarchical control and the inherent responsibility. Due to this perception, the sense of their own individual responsibility is lower among the residents. Nonetheless, the municipality is also slightly shifting between the rungs on the participation ladder, using different types of roles to enhance the local adaptive capacity. To increase the involvement of the other local actors, the municipality is using measures, such as the distribution of information letters, placing signs in the neighbourhood and posting educational newsletters on social media. Furthermore, incentives such as free services or subsidies are being used to stimulate participation. But they are also trying to increase the local involvement and enhance efficiency by bringing different actors together in network meetings, to kickstart direct cooperation. The municipality is using these stimulating and facilitating methods as well as network steering, to get residents active and involved and to bring the different actors together to move towards a co-governing situation. These types of handling by the municipality can be placed in the Rungs 2, 3 and 4 (figure 3).

It can be concluded that the municipality can make the most progress in the network steering, informing, stimulating and facilitating types of governing to involve the local

actors and so increase rainwater adaptation in the private sphere. Important in this process is to change the perception of the issue into a way of positive thinking of how to use it to our benefit, rather than focusing on the negative effects, as is the core principle in the case of Gothenburg. By moving away from the predominantly top down way of governing there will be more shared responsibility as well, reducing the responsibility gap. Looking at the different modes of governance by Juhola (2019, p3.), the municipality should fulfill a combination of 5 of the 6 modes: "*governing by regulation, governing by participation and partnerships, governing by the provision of information, governing by providing services, and governing by incentives"*. The key, thus, to more local participation in the Rivierenbuurt and a self-governable rainproof neighbourhood is to increase local awareness and involvement and make all actors see and experience the topic as something that affects them and can benefit them individually, by changing the government's role and stimulating co-governance.

5.1 Limitations and recommendations

Because of the mismatching timing between this research and the network forming, as part of the Rainproof project, it was not possible to attend more network meetings, because the Rainproof network initiative was still in its early stages. Due to this, the research lacks the descriptions of a network forming process, missing the data to make statements on the network approach in this context. In addition, due to limited time it was not possible to conduct sufficient interviews with residents for the data to be representative. Because of the smaller sample size, the data resulting from the interviews are used illustratively rather than representatively, as to the local attitude towards rainwater adaptation and participation in this. Another limitation regarding the interviews is the translation of the interviews, making the results susceptible to my interpretation. Furthermore, the respondents from the depth interviews have all been suggested by Rainproof, which affects the results as no respondents from these groups of actors have been found independently from Rainproof. As much of the data is also derived from the depth interviews with these few different actors, more interviews could have been useful to confirm or dispute the data, which now is largely derived from single sources per different institutional group.

In addition to this research, recommended further research could study the outcomes of a shift in the government's role in order to affirm the results of this research. Furthermore, a follow-up study could be done about this case of the Rivierenbuurt to find out what effects a co-governing network approach and local participation have had on the local adaptive capacity with regard to rainwater. It can be recommended to the municipality, as the most influential actor, to improve the internal efficiency to be able to properly stimulate other actors, as many individuals who aim to participate have experienced difficulties in their communication with the municipality due to the many different departments. In regard to the network approach by Amsterdam Rainproof, to involve the residents and increase their participation in the local adaptation, the emphasis of stimulating awareness should shift towards triggering the individual sense of responsibility by addressing the way excessive rainwater can both positively and negatively affect them individually.

References

Aina, Y. A., Wafer, A., Ahmed, F., & Alshuwaikhat, H. M. (2019). Top-down sustainable urban development? Urban governance transformation in Saudi Arabia. *Cities*, *90*, 272-281.

Archer, D., Almansi, F., DiGregorio, M., Roberts, D., Sharma, D., & Syam, D. (2014). Moving towards inclusive urban adaptation: approaches to integrating community-based adaptation to climate change at city and national scale. *Climate and Development*, *6*(4), 345-356. à

Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of planners*, *35*(4), 216-224.

Backman, K., & Kyngäs, H. A. (1999). Challenges of the grounded theory approach to a novice researcher. *Nursing & health sciences*, *1*(3), 147-153.

Baker, I., Peterson, A., Brown, G., & McAlpine, C. (2012). Local government response to the impacts of climate change: An evaluation of local climate adaptation plans. *Landscape and urban planning*, *107*(2), 127-136.

Bergsma, E., Gupta, J., & Jong, P. (2012). Does individual responsibility increase the adaptive capacity of society? The case of local water management in the Netherlands. Resources, conservation and recycling, 64, 13-22.Bergsma, E., Gupta, J., & Jong, P. (2012). Does individual responsibility increase the adaptive capacity of society? The case of local water management in the Netherlands. *Resources, conservation and recycling*, *64*, 13-22.

Birnbaum, S. (2016). Environmental co-governance, legitimacy, and the quest for compliance: when and why is stakeholder participation desirable?. *Journal of Environmental Policy & Planning*, *18*(3), 306-323.

Blakeley, G. (2010). Governing ourselves: citizen participation and governance in Barcelona and Manchester. *International Journal of Urban and Regional Research*, *34*(1), 130-145.

Brink, E., & Wamsler, C. (2018). Collaborative governance for climate change adaptation: mapping citizen–municipality interactions. *Environmental Policy and Governance*, *28*(2), 82-97.

Brueggemann, B. J. (1996). Participant-Observer Role. Ethics and representation in qualitative studies of literacy, 17.

Bryman, A. (2016). *Social research methods*. Oxford university press.

Chaskin, R. J., & Garg, S. (1997). The issue of governance in neighborhood-based initiatives. *Urban Affairs Review*, *32*(5), 631-661.

Collins, K., & Ison, R. (2009). Jumping off Arnstein's ladder: social learning as a new policy paradigm for climate change adaptation. Environmental Policy and Governance, 19(6), 358-373.

Dai, L., Wörner, R., & van Rijswick, H. F. (2018). Rainproof cities in the Netherlands: Approaches in Dutch water governance to climate-adaptive urban planning. *International Journal of Water Resources Development*, *34*(4), 652-674.

Dirix, J., Peeters, W., Eyckmans, J., Jones, P. T., & Sterckx, S. (2013). Strengthening bottom-up and top-down climate governance. *Climate Policy*, *13*(3), 363-383.

Dong, X., Guo, H., & Zeng, S. (2017). Enhancing future resilience in urban drainage system: Green versus grey infrastructure. *Water Research*, *124*, 280-289.

Gemeente Amsterdam (2020). Strategie Klimaatadaptatie Amsterdam

Heath, H., & Cowley, S. (2004). Developing a grounded theory approach: a comparison of Glaser and Strauss. *International journal of nursing studies*, *41*(2), 141-150.

Hosseini, A., Pourahmad, A., Taeeb, A., Amini, M., & Behvandi, S. (2017). Renewal strategies and neighborhood participation on urban blight. *International Journal of Sustainable Built Environment*, *6*(1), 113-121.

Juhola, S. K. (2019). Responsibility for climate change adaptation. *Wiley Interdisciplinary Reviews: Climate Change*, *10*(5), e608.

KNMI (2021). Extreme Neerslag. Retrieved May 17th, 2021, from: https://www.knmi.nl/kennis-en-datacentrum/uitleg/extreme-neerslag

Lincoln, Y. S., and Guba, E. (1985). Naturalistic Inquiry. Beverly Hills, CA: Sage.

Mees, H. L., Uittenbroek, C. J., Hegger, D. L., & Driessen, P. P. (2019). From citizen participation to government participation: An exploration of the roles of local governments in community initiatives for climate change adaptation in the Netherlands. *Environmental Policy and Governance*, *29*(3), 198-208.

Moser, S. C. (2014). Communicating adaptation to climate change: the art and science of public engagement when climate change comes home. *Wiley Interdisciplinary Reviews: Climate Change*, *5*(3), 337-358

Nalau, J., Preston, B. L., & Maloney, M. C. (2015). Is adaptation a local responsibility?. *Environmental Science & Policy*, *48*, 89-98.

Niyogi, D., Lei, M., Kishtawal, C., Schmid, P., & Shepherd, M. (2017). Urbanization impacts on the summer heavy rainfall climatology over the eastern United States. *Earth Interactions*, *21*(5), 1-17.

Orange R., (2021). Wetter the better: Gothenburg's bold plan to be the world's best rainy city. The Guardian. Retrieved June 8th, 2021, from: https://www.theguardian.com/world/2021/may/06/wetter-the-better-gothenburgs-bold-plan-to-be-worlds-best-rainy-city .

PBL Netherlands Environmental Assessment Agency (2010) The Netherlands in the future: Second sustainability outlook: the physical living environment in the Netherlands. Bilthoven, the Netherlands: PBL Netherlands Environmental Assessment Agency.

Phadke, R., Manning, C., & Burlager, S. (2015). Making it personal: Diversity and deliberation in climate adaptation planning. *Climate Risk Management*, *9*, 62-76.

Rainproof (2021). Retrieved May 7th, 2021, from: https://maps.amsterdam.nl/rainproof/

Rainproof (2021). Retrieved September 10th, 2021, from: https://www.rainproof.nl/toolbox/maatregelen/wadis

Rainproof (2021). Retrieved September 10th, 2021, from: https://www.rainproof.nl/subsidies

Serrao-Neumann, S., Harman, B., Leitch, A., & Low Choy, D. (2015). Public engagement and climate adaptation: insights from three local governments in Australia. *Journal of environmental planning and management*, *58*(7), 1196-1216.

Stoker, G. (2011). Was local governance such a good idea? A global comparative perspective. *Public administration*, *89*(1), 15-31.

Strengers, Y., & Maller, C. (Eds.). (2014). *Social practices, intervention and sustainability: Beyond behaviour change*. Routledge.

Tokarczyk-Dorociak, K., Walter, E., Kobierska, K., & Kołodyński, R. (2017). Rainwater management in the urban landscape of Wroclaw in terms of adaptation to climate changes. *Journal of Ecological Engineering*, *18*(6).

Transparancy International (2011). Policy Position: *Guaranteeing Public Participation in Climate Governance,* 1998-6432

Trell, E. M., & van Geet, M. T. (2019). The governance of local urban climate adaptation: Towards participation, collaboration and shared responsibilities. *Planning Theory & Practice*, *20*(3), 376-394.

Waternet (2021). Retrieved March 3rd, 2021, from: https://www.waternet.nl/over-ons/

Westra, S., Fowler, H. J., Evans, J. P., Alexander, L. V., Berg, P., Johnson, F., ... & Roberts, N. M. (2014). Future changes to the intensity and frequency of short-duration extreme rainfall. *Reviews of geophysics*, *52*(3), 522-555.

Annex

Interview questions residents

Do you live in the Rivierenbuurt?

Personal questions:

- *Age?*
- *Sex?*
- *Type of household?*
- *How long have you lived in this neighbourhood?*

Do/have you experience(d) a problem with rainwater in your neighbourhood?

- *Yes? What is the problem?*
- *No? Explain the problem*

What do you think is the cause of this problem?

How do you think this problem can be solved or reduced?

- *Can you name (other/more) potential measures that can contribute to reducing the issue?*

Do you experience initiatives taken regarding this issue in your neighbourhood?

Who do you think is or should be responsible for taking action?

- *Government? What do you expect from them?*
- *Residents? What can be expected from them?*
- *Other? What is their role in this?*

Do you do anything yourself to help reduce this issue?

- *Yes? What?*
- *No? Would you be prepared to do anything/make a contribution to reduce this issue?*

-No? Why not?

Interview questions NMT-Zuid

Can you explain who you are and what it is that you do?

What is your role in this?

For how long have you been active in the Rivierenbuurt?

What is your perspective regarding rainwater issues?

- *What are the main causes?*
- *How does this issue relate to the other activities that you are involved in?*

What do you consider as the biggest challenge, with regard to local rainwater adaptation?

What are the activities of the NMT in the Rivierenbuurt that cover the issue of rainwater nuisance? (Or which activities are you involved in?)

- *Presently and planned?*
- *Do you see other opportunities?*

How do you experience the attitude of the residents in the Rivierenbuurt?

- *Why is this the case?*

How is your (NMT) cooperation with the local residents?

- *and with the local government?*

What would be your (ideal) distribution of responsibility with regard to this issue in the neighbourhood?

What would be the ideal situation with regard to rainwater adaptation and its measures in your opinion?

Interview questions Chairman of business association Rijnstraat

Could you introduce yourself and explain what it is you do?

For how long have you been involved in this neighbourhood?

Are you aware of the topic 'Rainproof'?

How much of the rainwater issues have you experienced in the Rivierenbuurt and in which way?

What is(/are) in your opinion the best way(s) to tackle this issue?

Who are in your opinion responsible to take action regarding this issue?

- *How do you feel about a more divided/shared responsibility/cooperation?*

How large do you think your influence is regarding this topic?

- *Is there something you are doing to reduce the issue at the moment?*
- *Or, what do you think you could do to (help) reduce the issue?*
- *Are you willing to contribute to the reduction of this issue?*

Have you experienced initiatives from other entrepreneurs in this area/neighbourhood?

Interview questions employee of the municipality of Amsterdam/Rainproof

Can you explain what it is you do and what your role is within the municipality/rainproof?

Why is pluvial flooding such a problem?

What is the role of the municipality in this issue?

What is the municipality doing at the moment to reduce the rainwater issues?

What is the city's policy regarding rainwater adaptation?

What is/are the goal(s) of the municipality?

What do you believe to be the biggest challenge to achieve the goal(s)?

What is needed to solve the issue as a whole?

- *And with what division of roles?*

Have you heard about the Rainproof plan of Gothenborg?

- *No? Explain the idea of using rain in your advantage*
- *Yes? What do you think of the idea?*

Is this an approach that could be used in Amsterdam?

- *Or is this already being applied?*

Are you working together with other cities, (inter)nationally, to improve your methods and share knowledge?

Why is the Rivierenbuurt a case of significance in which to address this issue?