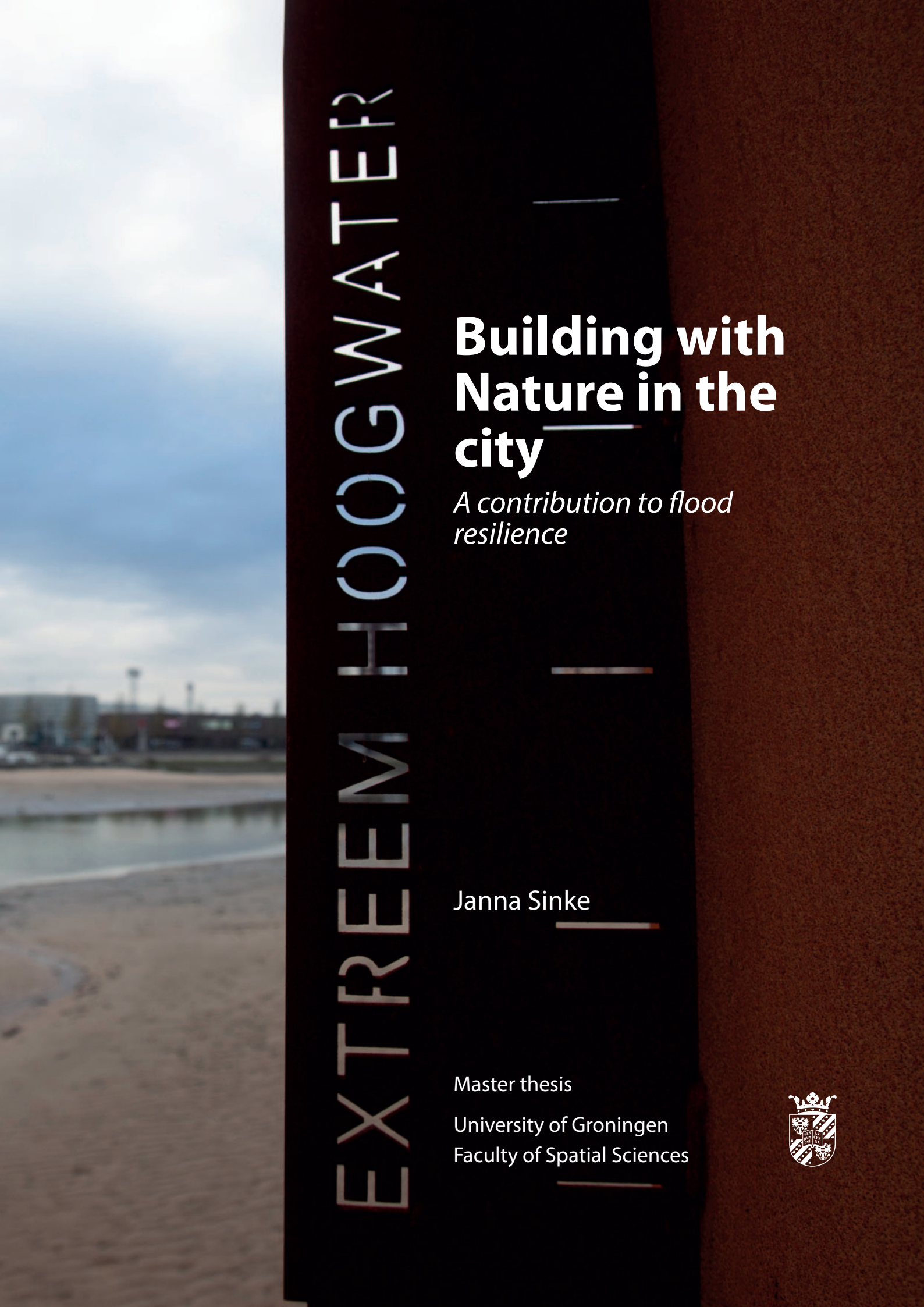

Building with Nature in the city

A contribution to flood resilience

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Master thesis

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Abstract

Trends as urbanization and climate change present challenges to our society and cities are especially vulnerable. To deal with the effects of these trends new approaches, such as resilience, and green concepts, such as Building with Nature, have emerged. Resilience consists of three key components: robustness, adaptability, and transition. This thesis researches the contribution of three Building with Nature cases in Rotterdam and Dordrecht to urban flood resilience and the interaction with climate adaptation policy. Data was collected by conducting policy analysis and semi-structured interviews with employees from governmental organisations, NGO's, and experts. The results indicate that local urban policies acknowledge the importance of nature and biodiversity in climate adaptation, however, Building with Nature is never specifically mentioned. Furthermore, the cases show that there is contribution to flood resilience but this is still limited. Opportunities in flood protection and collaboration are often not taken and although there is more support and awareness, the transformation towards a system of 'living with the water' is still well on its way.

Key words: resilience, Building with Nature, Nature-based Solutions, cities, climate adaptation, adaptability, transition, societal change

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1 Introduction

1.1 Background

The United Nations projects that by 2050 68 per cent of the world's population will live in urban areas (United Nations, 2018). Urban growth comes with expansion of paved areas and a decrease of nature areas which leads to higher peak discharges and more pluvial and fluvial floods (Raadgever & Hegger, 2018). At the same time, climate change presents serious challenges to our society, in particular to cities (Kabisch et al, 2017). More extreme weather, rising sea levels, and rising temperature are among the greatest risks of climate change. These risks can cause an increase in extreme weather events, such as floods (Milly et al, 2002; Bouwer et al, 2010; KNMI, 2020). Cities are particular vulnerable for the effects of climate change. They hold a high population density, have a complex infrastructural system, and concentrated economic activity (Rosenzweig et al, 2010). And most important, they are often built in delta areas or along a river. Furthermore, cities have to deal with other effects of climate change as well, such as the urban heat island effect which can cause a range of negative health effects, such as respiratory difficulties and heat exhaustion. The impact that climate change has on the functioning of ecosystems therefore also has a negative effect on the well-being of humans (Kabisch et al, 2017).

To deal with the effects of climate change several approaches can be identified. A relatively new approach in water management and spatial planning is resilience. Resilience includes the idea that (eco)systems or groups can resist or adapt to stress without a change in their functionality (Restemeyer et al, 2015) or can bounce back from a shock event to the original situation (Davoudi et al, 2013). The concept of resilience will be further explained in the theoretical framework chapter. Since the concept of resilience is relatively new in social sciences, the amount of literature is limited but growing. More knowledge and experience are available about the concept of flood risk management which is the current approach in water management.

Over the years, approaches in flood risk management changed. Before, roughly around the 1990s, flood risk management used an approach also known as command-and-control with an emphasis on reducing uncertainties. It existed mainly of hard engineering infrastructures and keeping the water out as much as possible. This approach is considered anthropocentric where nature is considered a resources to be used by humans (Baker, 2007). The command-and-control approach has several negative consequences. First, it disrupts the natural flow of water and degrades ecosystems. Human-induced changes have a significant effect on ecosystems that protect land from flooding, such as marsh- and wetlands or sediment transportation (Van Slobbe et al, 2013). The disappearance of these ecosystems puts a city at more risk of flooding. Second, keeping the water out has created a 'safety paradox'. Higher dikes give people a sense of safety which increases population and economic activity. However, the potential damages in case of a flood increases with it which leads to a cycle of higher risk and more risk reducing measures (Burby, 2006). In

order to get out of this cycle, a change in approach is needed. This change can be called 'the spatial turn in water management' (Van Ruiten & Hartmann, 2016). This spatial turn refers to the demand for land in water management, especially in flood risk management. Using an approach that includes 'living with the water' means a need for more space. However, especially in cities space can be scarce. Multifunctionality to use space efficiently is an important part of this approach. Spatial planning and water management have to integrate their efforts and knowledge more than they did before, and moreover have to work with other disciplines as well. An example of one of the first major projects that include this spatial turn is the Room for the River programme in the Netherlands which included spatial quality as well as water safety. After the effects of the command-and-control approach became clearer, and in combination with the spatial turn, green alternative approaches to flood risk management emerged. These approaches are generally more holistic and include more non-state actors (Forrest et al, 2020). This paper specifically looks at Building with Nature which uses natural processes to build and strengthen hydraulic infrastructure. Building with Nature is currently mainly in use in coastal and river areas. The amount of research on Building with Nature is slowly increasing and there is more and more appreciation for the concept. However, there is still uncertainty about the impact (does it actually work?) and long-term costs. Building with Nature is not yet used on a large scale and it is not yet an established method. This thesis uses three case studies in Rotterdam and Dordrecht. These are the Nassauhaven and the Brienenoord island in Rotterdam and the Wervenpark in Dordrecht. These cases are all build according to the Building with Nature philosophy and are followed closely and supported by the programme Building with Nature, executed by Ecoshape.

1.2 Research goals and research question

The aim of this study is to explore how Building with Nature can contribute to the prevention of urban floods and make cities more resilient. This will be done by using case studies in Rotterdam and Dordrecht. Several research goals have been set:

- Gaining insight in how Building with Nature can be used in urban areas.
- Gaining insight in the relation between the different components of resilience (robustness, adaptability, and transition).
- Providing recommendations how to increase the Building with Nature projects in flood policy in the Netherlands and thereby contributing to flood resilience.

The main research question is:
How can Building with Nature projects contribute to flood resilience in Dutch urban areas?

This main question is divided in three sub-questions.

1 How is Building with Nature included in current urban policies?
2 Till what extend do the Building with Nature cases of Rotterdam and Dordrecht contribute to resilience?
3 What are lessons learned for use in other urban areas?

1.3 Scientific relevance

That Building with Nature contributes to flood protection and nature/biodiversity has been proved by several projects in the Netherlands (De Vriend et al, 2015). However, the literature about Building with Nature mainly focuses on river and coastal areas and not on urban areas (De Vriend et al, 2015; Mulder & Van Dalfsen, 2011). This suggests that there is a need for more research on how to implement the Building with Nature concept in urban systems. This research will connect the Building with Nature designs to flood resilience to

review how they contribute or complement each other. Flood resilience is more than flood protection, it includes other aspects as well, as will be explained in the theoretical framework. The combination of Building with Nature and flood resilience has not been made yet in current literature. The connection can show how Building with Nature can contribute more to the fields of water management and spatial planning. Furthermore, the amount of academic literature on Building with Nature is still limited, especially with international cases or authors. This thesis will therefore contribute to the general Building with Nature debate.

1.4 Societal relevance

The Building with Nature philosophy has several goals in creating their designs. Not just maintaining or increasing nature and biodiversity but also contributing to flood protection, while increasing collaboration between disciplines, sectors and societal actors. Collaboration and participation of societal actors (citizens, NGO's, civic initiatives) are becoming much more important over the last few decades. An approach that includes this process from the start will help make it more common practice and increase involvement from society in water management and spatial planning.

1.5 Structure

After the introduction, section two will show the theoretical framework explaining the key concepts in this thesis. The section is concluded with the conceptual model showing the relationships between the concepts. Section three contains the methodology. Section four aims to show the results and analysis of the data. Sections five, six and seven include the conclusion, discussion, reflection, and recommendations.

2 Theoretical Framework

2.1 Impacts Climate Change for cities

Due to global warming, the climate is changing. Sea levels are rising and weather patterns are changing. The general changes are a rising temperature, rising sea level, and more extreme weather in both winter and summer with more (intense) precipitation in winter and more heat waves as well as hail storms in summer (KNMI, 2015). Extreme weather is already noticeable and it seems that climate change to a certain degree is unavoidable (Albers et al, 2015). In the Netherlands, heat waves have occurred for the last three years while also local floods have happened because of extreme rain and thunderstorms (KNMI, 2021). Unfortunately, the impact and consequences of climate change on a local level are still uncertain and hard to predict. This makes planning practice extremely difficult.

Cities are crucial to mitigation and adaptation efforts as well as any form of a sustainable society (Rosenzweig et al, 2010). They are key in producing, and therefore producing less, greenhouse gasses and waste (Bicknell, Dodman & Sattherthwaite, 2009). On the other hand, cities and their inhabitants are extremely vulnerable to the effects of climate change. Many large cities are located in low-lying areas in river deltas. Rising sea level and more extreme weather leads to higher chances of floods which threaten not only lives but also economic centers, cultural heritage and sectors that a local economy could depend on such as tourism. Further impacts can be energy shortages, damaged infrastructure, and scarcity of food and water. These impacts are interrelated and can lead to more social issues such as poverty, mental health issues, and migration (Gasper, Blohm & Ruth, 2011). Urban poor are especially vulnerable because of their low-income, they often reside in more exposed areas, live in low-quality housing, and lack resources to mitigate damages (Gasper, Blohm & Ruth, 2011).

2.2 Types of flooding

To be able to talk about flood resilience, we need to include the types of floods that can happen, also focusing on the location of the cases. This research focuses on the Dutch situation with cases in the western part of the Netherlands, located along rivers that are in direct connection to the North Sea. This means that coastal floods, fluvial floods, and pluvial floods are of interest here. Coastal floods occur in coastal areas and are typically caused by a severe storm and/or high tide. It is often pushed on the shore by strong winds or breaks through flood defences and thereby floods low-lying land. Fluvial, or river floods, occur when a river exceeds its capacity and breaks or overflows the flood defences. It can be caused by heavy snow melt or excessive rainfall. Pluvial, or surface, flooding is caused by heavy rainfall. It can cause an independent flood event or overflow a water body. Pluvial flooding can happen in any urban area, even in higher elevated areas. In cities, pluvial flooding mostly occurs when the amount of precipitation exceeds the capacity of the

drainage or sewage system (Rosenzweig et al, 2018). An increase in population or infrastructure in coastal, riverine or urban areas also increases the risk of flooding (Lumbroso, 2017). Considering the location of the cases (along the rivers) they have potentially the most impact on coastal and fluvial floods.

2.3 Dutch traditions in flood management

The Netherlands has a long history in flood risk management. Originally, land owners and local communities were responsible for water management, however, this changed when around 800 CE swamps were drained which led to soil subsidence and more flood protection was necessary (Mostert, 2006). In 1255 the first regional water board was established in Leiden (Unie van Waterschappen, 2021). Nowadays, 21 regional water boards are left who are responsible for most surface water and waste water treatment. Flooding in the Netherlands has been fairly common through the centuries with the 1st en 2nd St. Elizabethsvloed in 1404 and 1421, the Allerheiligenvloed in 1570, and the Zuiderzeevloed in 1906 which was the motivation for the construction of the Afsluitdijk (Watersnoodmuseum, 2020). The most recent large flood was in 1953 (in the Netherlands known as the Watersnoodramp) when a northwestern storm and spring tide led to flooding in Zeeland, Zuid-Holland, and Brabant. The Dutch government reacted with a huge programme to increase flood protection. The Delta works exist of 14 dams and storm barriers to protect the south-west of the Netherlands. Since then the focus in flood risk management has been on prevention with technical solutions. However, this slowly started to change since the 1970s when there became more environmental awareness for the effects of technical solutions and the command-and-control approach. Since the near flood events in 1993 and 1995 more priority was given to land-use planning and ecology which resulted in the Room for the River programme (Van Buuren, Ellen & Warner, 2016). This more integral form of water management became standard with the introduction of multilayer safety which combines measures in the three layers of flood risk: flood defence, spatial planning, and crisis management (Van Buuren, Ellen & Warner, 2016). Thus, there are signs that Dutch flood risk management is changing, despite the path dependency on the technical flood management approach, although there is still a great emphasis on 'better safe than sorry'.

2.4 What is flood resilience?

With the effects of climate changes and causes of floods explained, the next step is to see what cities can do to deal with these impacts. As explained earlier, the command-and-control approach has several negative consequences and therefore only resisting measures are not enough. Climate adaptation is the next step but only being adaptive is not good enough with the high uncertainty that comes with the changing climate. Cities need to be resilient. Since the change towards more spatial and ecological focused flood risk management, several alternative approaches have come up that are more focused on the interaction with social systems and nature and seek a balance between society, nature and quality of life (Baker, 2007). One of these eco-centric approaches is resilience theory.

Flood resilience is one of the main concepts in this thesis. The choice for flood resilience was due to the broader nature of this concept, not only a focus on water safety but also on adaptation. Flood resilience is getting more global recognition, however, the concept is complex and multi-faceted, and therefore difficult to make concrete and implement it in practice (Forrest et al, 2020).

Resilience finds it basis in applied sciences, where it is used to describe the stability of materials and their resistance to external events (Spaans & Waterhout, 2017). There are

several definitions of resilience: it mostly comes down to its ability to persist and adapt (Holling, 1973; Spaans & Waterhout, 2017; Restemeyer et al, 2015). Key in this definition is the existence of an equilibrium in a system (Spaans & Waterhout, 2017). This can be an existing one that the system bounces back to or a new one to which it moves towards. Resilience can be seen as a useful addition to sustainability and reducing vulnerability (Klein et al, 2003). Resilience is not a new concept within ecology and engineering, however it has not been used often in flood risk management (Liao, 2012). Even though much has been written about resilience, it still remains somewhat of a fuzzy concept (Davoudi et al, 2013). Therefore, it is of interest to explain more about resilience.

Starting in the 1960s resilience began to be used in ecology with the work of Holling (1973). He made the distinction between stability and resilience where he referred to stability '*the ability of a system to return to an equilibrium state after a temporary disturbance*' (Holling, 1973, p.17)) as engineering resilience. Engineering resilience includes both resistance and recovery, although it is mostly focused on recovery. The faster a system bounces back to its original function, the greater the resilience (Liao, 2012). The disturbance was mostly seen as a threat from outside the system that can change the stability of the system. Holling defined resilience not only that a system can resist and return but also that it can *'absorb change and disturbance and still maintain the same relationships between populations or state variables'* (Holling, 1973, p.14). This was later called ecological resilience. The key difference here is that engineering resilience solely focuses on bouncing back while ecological resilience considers the possibility that a system can change to a new equilibrium (Liao, 2012; Davoudi et al, 2013). Furthermore, it acknowledges that ecosystems are more complex, existing of several structures and processes. Therefore, it is extremely difficult or impossible to return to the original situation (Liao, 2012). Ecological resilience is measured by how much disturbance the system can handle before it shifts to a different equilibrium (Liao, 2012).

Criticism engineering and ecological resilience

What these first two types of resilience still have in common is that they use the idea of equilibria, of bouncing back to 'normal circumstances'. This definition stuck with the concept when it started to be used in social sciences (e.g. psychology, economics, planning). In this sense, resilience is used to *'preserve what we have and recover to where we were'* (Davoudi, 2012, p.302). Kaika (2017) is particularly critical on resilience arguing that resilience works as immunology; '*it vaccinates citizens and environments so that they can take more suffering, deprivation or environmental degradation in the future*' (Kaika, 2017, p.95). She further states that resilience needs to incorporate social processes, for instance the role of communities, social learning etc. The critics on engineering and ecological resilience led to a third type of resilience: evolutionary resilience (Davoudi, 2012). Evolutionary resilience takes complexity, uncertainty and unpredictability into account. Engineering and ecological resilience are too simplistic for our current complex society. In both engineering and ecological resilience, there is always the notion of an equilibrium. Whether this is about bouncing back to or bouncing towards a new one. This implies that there is an optimal state however, in our complex social-ecological system an optimal state does not exist (Liao, 2012). Evolutionary resilience (or social-ecological resilience) includes the idea of change, adaptation or transformation (Davoudi et al, 2013). It challenges the idea of equilibrium by stating that systems change over time, with or without disturbances (Davoudi, 2012). Change can also happen because of amplified small-scale events (connecting it to Lorenz's 'butterfly effect'). Evolutionary resilience shows the shift in how scientists think about the world and corresponds to the shift from technical rationality towards communicative rationality. From an orderly and predictable world to a complex and uncertain one (Davoudi, 2012).

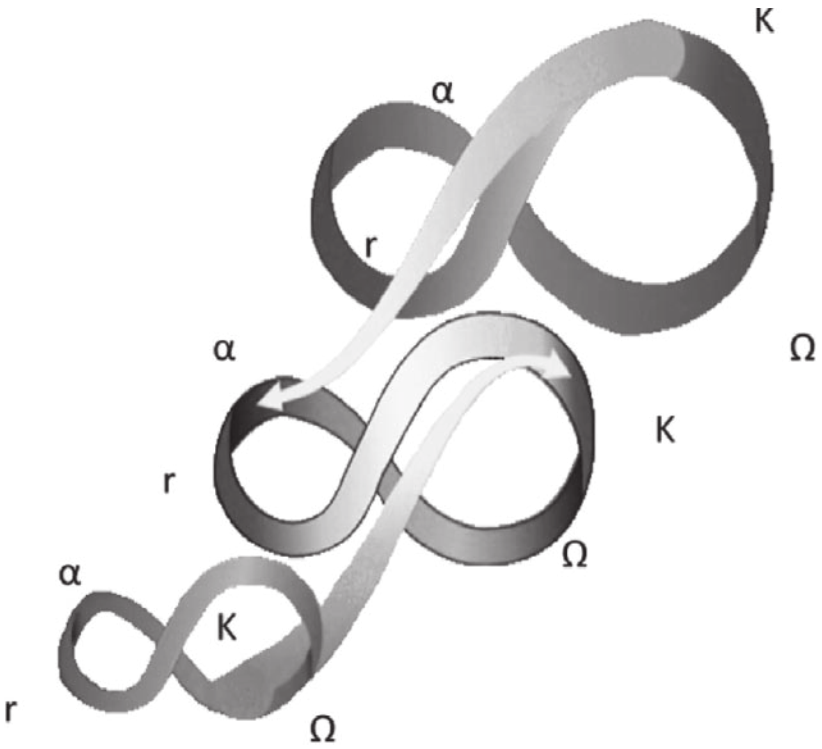

Figure 1: visualisation evolutionary resilience (Davoudi et al, 2013)

Evolutionary resilience can be visualized using the adaptive cycle by Holling (adapted by Davoudi et al, 2013). It exists of four phases: growth(r), conservation(K), creative destruction(Ω), and reorganization(a) as can be seen in figure 2. The growth phase can be identified by rapid growth of resources, more competition and opportunities and a high but decreasing level of resilience. In the conservation phase, the growth slows down. This phase is stable, high level of certainty and low resilience. The creative destruction phase is characterized by chaos and release of resources and capital. During this phase there is high uncertainty and low but increasing resilience. In the reorganization phase is more room for innovation, there is much uncertainty and high resilience (Davoudi et al, 2013). The phases are not necessarily sequential. They move in cycles of different speeds and scales. This means that complex systems constantly interact with each other and thereby maintain resilience. However, there is always a threat that a system gets 'locked in' in the conservation phase. When that happens, the system is more vulnerable for new shock events (Davoudi et al, 2013).

2.5 Building resilience

Now that the concept of resilience has been explained, it is time to translate it to how to build resilience. The adaptive cycle cannot be used as a framework, it only visualises how evolutionary resilience works. Evolutionary resilience is used because cities can be considered complex adaptive systems (Davoudi et al, 2013). Academics see robustness, adaptability, and transformability as key components for building resilience (Davoudi et al, 2013; Restemeyer et al, 2015). These components form the basis for a flood resilience framework.

Robustness

Robustness in daily life is associated with strength and durability and is therefore seen as a desirable characteristic (Mens et al, 2011). In flood resilience, robustness or resistance is the power to resist a shock event, in the case of this research a flood event. A resistance strategy has the goal to reduce the probability of a flood event, to keep water away

(Restemeyer et al, 2015). On its own, it corresponds with engineering resilience. Robustness is about withstanding a flood, for example by building and maintaining dikes, dams and other technical flood defences. In academic literature there is a discussion about resistance vs resilience strategies. Resistance strategies reduce the probability of flooding whereas resilience strategies include the possibility of flooding and minimizing the consequences (Restemeyer et al, 2015). Resistance in itself is part of resilience however, when focusing mainly or only on resistance it can actually reduce overall resilience. Citizens in cities with a flood-control strategy are generally less aware of flood risks and measures can create a false sense of security; therefore citizens are less prepared and might have difficulties to adapt to a new situation (Liao, 2012). Because there is no balance between the three elements of flood resilience, a flood will have a greater impact in this situation. Flood policy in the Netherlands has been focused on robustness and flood protection for centuries. This has led to places that are very well protected by physical infrastructure. However, when a flood occurs, the impact is extremely high.

Adaptability

Adaptability is central in ecological resilience (Davoudi et al, 2013). The focus is, besides resistance, on the ability to adapt. It aims at adjusting cities and surroundings to minimize the consequences and leave less damage (Restemeyer et al, 2015). For example, elevating houses or water-resistant windows. To achieve this, changes in both the physical sphere and the social sphere are required (Restemeyer et al, 2015). Adaptability is also associated with the ability to learn. Every flood (or almost flood) should be seen as an opportunity to learn and make adjustments to better prepare for the next flood (Liao, 2012).

Davoudi et al (2013) argue that adaptability is made up of flexibility and resourcefulness. Flexibility indicates the existence of open and flexible social networks and collaboration between people as part of resilience (Davoudi et al, 2013; Gunderson et al, 2006). The networks can facilitate flows of ideas and form connections between people and thereby help in post-disaster recovery (Davoudi et al, 2013). Academics agree that participation of both public and private stakeholders is necessary to tackle issues like climate adaptation (Hegger et al, 2017). Also in flood risk management and resilience it is acknowledged that collaboration between stakeholders is necessary and a societal task (Restemeyer et al, 2015; De Vriend et al, 2015). This leads to the need for a balance of state, market en civil society in which stakeholder involvement is a main characteristic (Driessen et al, 2012). Stakeholders can include governmental organisations, NGO's and civic organisations. According to Arnstein (2019) citizen participation is the redistribution of power to include the people who do not have political or economical power through which they can have influence on the decision-making process. Public participation is especially relevant in environmental issues because this requires knowledge, commitment, and action over different government levels and general public over a long time period (Beierle, 1999). Also, it brings different perspectives to the table. Last, public participation can keep projects going and it is an effective method against the 'not in my backyard' syndrome (Beierle, 1999). Nowadays, public participation is seen as the cornerstone of democracy and as an inclusive approach to include different views. As the amount of public participation increased so did the criticism. There arose recognition that participatory processes are difficult and problematic. Bloomfield et al (2001) and Few et al (2007) lists some of the more common problems of public apathy, time costs in public participation, and the long-term and uncertain nature of climate change adaptation. One of the most challenging problems is embedded in relations and redistribution of power. These problems combined can lead to tensions between the principles of participation and the obligation for climate adaptation (Few et al, 2007). Few et al (2007) argues how some of

this is in how participation processes are promoted. If real public involvement (co-creation) is not possible than it is important not to promote it as such. Furthermore, Few et al (2007) pleads for a tailored approach where in some situation an expert-led discussion with the public acting as a democratic check might be more appropriate. However, if there is chosen for an inclusive process than (governmental) agencies need to place trust in the stakeholders they work with. They need to find the right stakeholders and be sensitive to social inequalities. Time and effort needs to be invested in meeting with stakeholder groups to build trust and enthusiasm (Few et al, 2007)

Resourcefulness refers to ''efficiency, rapidity and diversity'' (Davoudi et al, 2013, p.317). In several disciplines, from economy to climate adaptation, academics agree that diversity and mixed-uses increase resilience. A lack of diversity can erode resilience by becoming dependent on a certain service or area. In concreting this concept the focus will be on mixed land uses and combining of functions. This contributes to the diversity of the area. It also fits to the type of cases and is deemed important information by the researcher.

Transformability/Transition

The third component in the framework from Davoudi et al (2013) and Restemeyer et al (2015) is transformability, and this is the main difference between engineering and ecological resilience on one hand and evolutionary resilience on the other. Transformability is the ability to make a shift from an old situation to a new one. In the case of flood resilience, the shift from 'fighting the water' to 'living with the water' is often used (Restemeyer et al, 2015). Transformability is what Davoudi et al (2013) describe as a system shift: in the adaptive cycle part of the creative destruction phase. It refers to a time of chaos and uncertainty when a system shifts towards something new. However, there is discussion considering the definitions of transformability and transition, two concepts that are sometimes used exchangeable. Pelling (2011) makes a separation between transition and transformation arguing that transition involve incremental changes while the overarching norms and systems are still in place. Transformation is a system change where underlying values are questioned and which requires radical changes (Pelling, 2011). So which concept is relevant in this thesis? Theoretically and practically, transition is more relevant considering the gradual steps that are taken. At the moment, radical changes are not happening nor are they planned. The current global plans for resilience or climate adaptation still include the use of incremental steps. This means that there could be a discussion about the use and definition of transition vs transformability in this thesis. If the reasoning from Pelling (2011) on the difference between transition and transformability is followed, the framework from Davoudi et al (2013) and Restemeyer et al (2015) could be adapted. For the purpose of conceptual clarity, this thesis follows the argumentation of Pelling and adapts the resilience framework. The framework therefore replaces transformability with transition to illustrate that it asks for a change in mind-sets over a period of time and it thereby acknowledges that people, their behaviour, and values generally do not change radically. However, the framework from Davoudi et al and Restemeyer et al is still relevant and appropriate because these authors do not use transformability in a radical way. This is mere a choice of words and definitions, not a difference in content. The meaning of transformability, as described by Davoudi et al and Restemeyer et al, will be used in this thesis. The advantage of changing the word is to create more clarity on what transition and transformability is, and the difference in change in both concepts.

Restemeyer et al (2015) argue that only if the physical environment as well as people's mindsets change transition can happen. This matches Davoudi et al (2013) opinion that

adapting to climate change is also a 'social, political and normative challenge' (Davoudi et al, 2013, p.318). Therefore, in transition we will look at changes in the physical, social, and political environment. It particularly asks for a change in people's mind-sets and behaviour (Restemeyer et al, 2015). Hence, the social and political part will focus on mind-sets. How are people and politicians/policy makers looking at Building with Nature projects? Is there a difference between 5 or 10 years ago and nowadays? In other words, is there a change in mind-sets?

2.6 Transition management

The last component of resilience, transition, is the component that sets resilience apart from for example climate adaptation. Transition is about change, about transforming into a new state or situation. In academic literature this is often researched as transition management. Transition literature is included here to give an overview of the transition from 'keeping the water out' to 'living with the water' of which Building with Nature and Nature-based Solutions are a part of. The literature explains how transitions work, the different steps they take, and how it is an ongoing cycle. The results will indicate how far along we are in the transition and what next steps could be.

Transitions are transformation processes in which the structure or institutions of society changes (Rotmans et al, 2001; Jerneck & Olsson, 2008). Transition research seeks to *'integrate insights from areas such as complexity science, innovation studies, sociology, and environmental science to better understand large scale systemic change in societal systems'* (Loorbach, Frantzeskaki & Huffenreuter, 2015, p.49). Because of the interconnectedness of problems and their social functions water-related challenges become increasingly more complex. Transition theory is partly rooted in complex adaptive systems theory (CAS) which in turn is embedded in complexity theory. Complexity theory start from the assumption that change does not occur in a linear line and views equilibria as multiple, temporary, and moving parts (Duit & Galaz, 2008). Phenomena that are in line with complex systems behaviour are e.g. chaotic change, emergence, and hysteresis. These are the same characteristics that can be found in the phases of evolutionary resilience, especially the creative destruction phase. When we look at transitions from a CAS point of view, transitions are system transformations between two equilibria. In between the two equilibria there is a period of irreversible change (Rotmans, 1994). This change can be rapid and sharp, however, the transition can also be slow and steady (Duit & Galaz, 2008). The description of CAS and transitions are very similar to evolutionary resilience. Figure 2 shows transitions therefore has many similarities to the adaptive cycle used to describe evolutionary resilience. Just as the adaptive cycle, transitions exists of four phases: predevelopment phase (the status quo does not change visibly), take-off phase (start of the process of change), acceleration phase (there is visible socio-cultural, ecological, economic, and institutional change with collective learning), and the stabilization phase (decrease in speed of change) (Rotmans et al, 2001). From stabilization, the process can start over again.

In order to illustrate the phases in transitions we link it to the transition used in this thesis: towards 'living with the water' using Nature-based Solutions. At the moment, we are leaving the take-off phase and entering the acceleration phase. The importance of climate change (mitigation and adaptation), loss of biodiversity, effects of urbanization, and scarcity of fresh water is becoming more known to the broader public. More and more projects mitigating those effects and projects adapting to them are being constructed. However, if we want this transition to succeed, we need to get through the acceleration phase which means that we need to change parts of our current system that is still much focused on engineering measures.

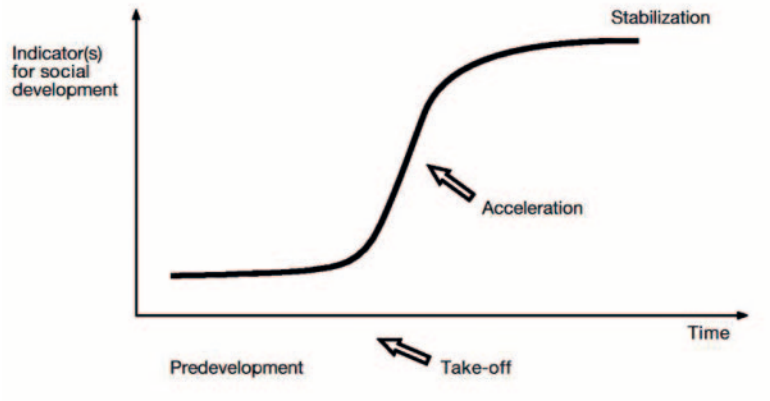

Figure 2: phases of transitions (Rotmans et al,2001)

A characteristic of evolutionary resilience is that it is constantly moving. There is no equilibrium or goal to reach but it is an ongoing process. Although the figure that represents transitions does give the assumption of an equilibrium, you could argue that a complete and perfect stable situation does not exists as we and the world around us is constantly changing. Rotmans et al (2001) describe that the new equilibrium is a dynamic equilibrium. There is no status quo, new rules and norms are developed as we go along. There is discussion to the existence of such a social equilibrium, however, since this is beyond the scope of this research, it will not be discussed further.

2.7 Measuring resilience

This thesis aims to measure the contribution of Building with Nature projects to local flood resilience. However, direct measurement of resilience is hard because it requires measuring the boundaries between an old and new situation in a complex system (Carpenter et al, 2005). In natural science, this is often done by manipulating the system or comparing before/after studies after a disturbance. However, considering we are measuring in a social system this could be impossible or unethical (Walker et al, 2006). Furthermore, for resilience we are often more interested in future resilience which makes it even harder to measure. There are no set indicators to include when measuring resilience. This is because resilience is a changing concept and the relationship between resilience and its indicators is dynamic, complex, and can change over time (Carpenter et al, 2005).

Even though measuring resilience is difficult, there have been attempts to design indicators for resilience. A report from the United Nations Development Programme (UNDP) (Winderl, 2014) reviews the ongoing efforts focusing on disaster resilience. In attempting to measure resilience Winderl (2014) first makes a distinction between inductive and deductive approach. The inductive approach uses a set of characteristics that is considered to be relevant in a specific empirical context and tries to measure these. An inductive approach is easily adaptable to different cases, however, this also makes it more difficult to generalise it. A deductive approach, on the other hand, does not use a set of characteristics that is derived from a certain case and includes more independent indicators. This thesis uses more of an inductive approach, although it does not correspond with all of the characteristics of this approach. The resilience framework used is derived from general resilience theory, which is a characteristic of the inductive approach. However, it is not context-specific and therefore can be used on many cases. It is, on the other hand, discipline specific namely to flood resilience.

Indicators

Measuring resilience in a broad way involves several elements. According to Winderl (2014) these are well-being before and after a disaster, vulnerability, resilience capacities, disaster-related losses and stress, reaction to recovery, and measuring programme results. Since this is to broad for this research, focus will be on vulnerability and resilience capacities. Furthermore, these concepts are the most relevant to this research. This thesis is not about resilience but about flood resilience. The combination with Building with Nature makes that the relevant concepts are on the prevention side, not on recovery after a flood. Vulnerability focusses on how exposed people are and how likely it is that they get harmed. This also depends on social groups and location. Vulnerability can be linked to probability, for example the probability of the occurrence of a flood. For the Netherlands, this is calculated by Rijkswaterstaat. The Climate Effect Atlas gives information on the chances of flooding for the entire Netherlands (Klimaateffectatlas, 2021). This ranges from once every 30,000 years to every 30 years.

Resilience capacity is at the core of resilience itself and also at measuring resilience. The advantage is that it is not disaster-dependent and therefore can be measured at any time. Winderl (2014) uses the same distinction in resilience elements as the resilience framework explained earlier, only with slightly different words. The three capacities are absorptive coping capacity, adaptive capacity, and transformative capacity which correspond to our framework of robustness, adaptability and transition. Absorptive coping capacity correlates with robustness: stability and persistence to a shock. Adaptive capacity corresponds with adaptability: flexibility and adapting. Last transformative capacity is compatible with transition: the ability to change. Considering these similarities, we use the framework explained in paragraph 2.6 and the indicators that we have derived from it for the qualitative measurement of resilience. The dimensions used in the framework are of physical and social nature, they look for changes in the physical environment as well as changes in society. The research question on urban policy adds an institutional dimension which gives for a broader view of resilience.

2.8 Nature-based Solutions and aligned concepts

In the fields of environmental management or water management new concepts come up on a regular basis, starting with sustainable development in the 1980s to biodiversity and ecosystem services. Many of theses concepts are then adopted in policy, for example in the UN Millennium Ecosystem Assessment or EU programmes. A newer addition is Nature-based Solutions, which specifically uses nature as a means for solutions for climate mitigation and adaptation (Nesshöver et al, 2017). Building with Nature can be seen as a way to achieve Nature-based Solutions (NbS). Although NbS is relatively new, there is already a diversity in definitions. IUCN (International Union for Conservation of Nature and Natural Resources) defines NbS as *'actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits'* (IUCN, 2016, p.2). The European Commission understands NbS as *'solutions that aim to help societies address a variety of environmental, social and economic challenges in sustainable ways. They are actions inspired by, supported by or copied from nature'* (European Commission, 2015, p.24). As can be seen, these two definitions already slightly differ in their focus with the IUCN giving more attention to the nature component while the EC puts more emphasis on the societal and economic challenges and benefits. NbS specifically links societal challenges with nature as something helpful. It therefore overlaps with several other concepts such as Blue-Green Infrastructure, Ecosystem Approach, or Ecosystem-based Adaptation

(Nesshöver et al, 2017). These are only three of more concepts that are alike. These three are chosen to compare to show similarities and differences in the many concepts that are out there. What these concepts all have in common in that none of them have a single set definition, however, they are all commonly used in science and policy. Below is a description of each concept with references to literature. Table 1 summarizes this and gives the relation to NbS.

Blue/Green infrastructure can be used separately and combined. Blue infrastructure refers to water elements, like rivers, ponds, wetlands, and canals. Green infrastructure refers to trees, hedgerows, parks, and fields. *'Connectivity is a key concept for BGI, since many of the benefits of BGI can only be truly realized by an interconnected network of its constituting components.'* (Ghofrani et al, 2017, p.18). Blue/Green infrastructure creates corridors that connect individual blue or green parts and thereby stimulates among others biodiversity. Furthermore, it can be used as a flood safety approach. *'BGI is an important means of dealing with flooding/extreme weather since it can consist of a network of interconnected water reservoirs, wetlands, and their associated (natural) open spaces developed along rivers, which serve several interrelated purposes'* (Ghofrani et al, 2017, p.18). The Ecosystem Approach *'is a strategy for the integrated management of land, water and living resources that promote conservation and sustainable use in an equitable way.'* (Shepherd, 2004, p.1). It aims for decentralised, participatory management and is implemented through the use of 12 principles and 5 steps focusing on stakeholders, functioning and impact of the ecosystem, economic issues, and long-term goals. Ecosystem-based Adaptation (EbA) *'includes the sustainable management, conservation and restoration of ecosystems to provide services that help people adapt to both current climate variability, and climate change.'* (Colls et al, 2009, p.1). The measures involve the management of ecosystems and using their services to reduce vulnerability. EbA includes multi-sectoral and multi-scale approaches and participatory and inclusive processes of

Table 1: aligned concepts with NbS

Concept	Blue/Green Infrastructure	Ecosystem Approach	Ecosystem-based Adaptation	Building with Nature
Definition	• Creating of green or blue corridors that connect water and green elements to each other • Aim to improve environmental issues such as biodiversity, water quality, and flooding • Aim to improve quality of life and place (Mell, 2010)	• Protect and manage the environment using scientific methods • Includes human, economy, and ecology • Decentralization and participation as important parts	• Management of ecosystems to help people adapt to climate change and increasing resilience • Multi-sectoral and multi-scale approaches • Using wide range of stakeholders	• Upscaling NbS for water-related infrastructure • Often combined with flood safety/engineering • Redefining what do and how to do it • Combining multiple functions • Including wide range of stakeholders
Relation to NbS	Similar in some ways, however, BGI is focused more on infrastructure and connections/ network.	Ecosystem Services can help during NbS designs but connection between services and not focus on one or few ES is important (Nesshöver et al, 2017).	EbA can be part of NbS to ensure solutions are climate adaptive (Nesshöver et al, 2017).	Part of achieving NbS, focused on water-related projects and infrastructure.

governmental, private and civic organisations (Vignola et al, 2009). Building with Nature is the last approach explained in this comparison and the main topic of this thesis. Building with Nature is 'a conceptual approach to creating, implementing, and upscaling Nature-based Solutions for water-related infrastructure' (Ecoshape, One Architecture & Urbanism, 2020, p.14). It requires a different way of thinking, acting, and interacting.

Concepts like Blue-Green Infrastructure are aimed at solving specific problems and aim to implement a natural component to, in essence, technical infrastructure (Nesshöver et al, 2017). On the other hand, Ecosystem Approach (EA) and Ecosystem-based Adaptation (EbA) are most alike NbS. More than, for example BGI, they seek a balance between society and nature and they focus more on complexity, transforming systems, and resilience. They also put a focus on participation of (civic) stakeholders and NGOs. This is not always shared by other concepts but it is a common factor with NbS and Building with Nature. Building with Nature starts with understanding the natural and societal system and therefore it has a clear societal/stakeholder component. However, the engineering component is never far away. Building with Nature always searches for the optimal balance between green and gray (Ecoshape, One Architecture & Urbanism, 2020).

2.9 Building with Nature

Building with Nature is a way of challenging the traditional 'hard' engineering approach. It is an innovative approach to the engineering of flood defences. It uses the natural system, processes and materials to create hydraulic infrastructure that is sustainable and adaptable (Ecoshape, 2020a). Generally, within this 'hard' engineering approach nature and humans are seen as two separate entities, there is a need to control nature. However, a view where humans are a part of nature has become more important (Walker et al, 2004). This interconnectedness is integrated in the Building with Nature philosophy, made visible in a triangle, see figure 3. This shows the relationship between the different subsystems. The engineering system represents all human interventions that have influence on the natural systems, such as dikes and dams. The societal system includes the institutional side (formal and informal laws and rules). The natural system includes hydro-morphological and ecological processes (Van Slobbe et al, 2013).

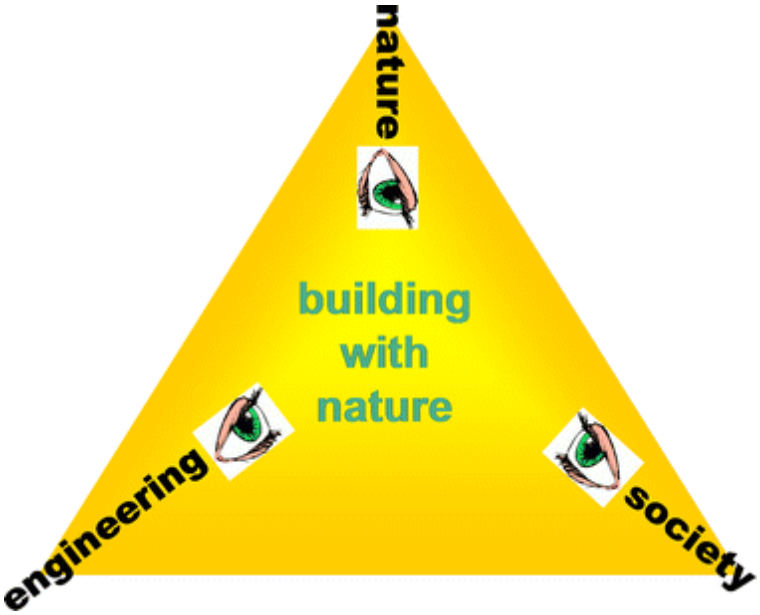

Figure 3: subsystems of Building with Nature (Van Slobbe et al, 2013)

Building with Nature is a different way of thinking, acting, and interacting. The thinking starts with the natural system instead of a certain design concept or function. What are the dynamics of the system, what are the different interest of the stakeholders? The acting is more collaborative and monitoring is a big part of the process. The natural elements take time to develop and monitoring is needed to make sure the project functions as expected. In Building with Nature different disciplines and stakeholders work together. This kind of interaction requires a different, more collaborative attitude (De Vriend et al, 2015). Because of the innovative nature of this philosophy, the focus on collaboration, and the focus on recovering and expanding ecosystems, it is an approach that can, and perhaps should be, applied more in the future. However, this is not the case yet. Therefore, it is one of the main concepts in this thesis.

The public-private Building with Nature programme in the Netherlands is managed by Ecoshape, a foundation that develops pilot projects and shares knowledge. Within this programme, the following design steps were developed and tested (De Vriend et al, 2015; Ecoshape, 2020b). Fundamental for these steps is to know how the natural system functions and how to interpret its behaviour. This can indicate how to integrate the infrastructure in it and how it develops.

Step 1: Understand the physical, socio-economical, and governance context of the system
Step 2: Identify realistic alternatives for providing ecosystem services that use the system's potential while strengthen the sustainability component. This includes involvement of a variety of stakeholders with a scientific background as well as field practitioners, decision makers, citizens etc.
Step 3: Evaluate the qualities of alternatives and pre-select an integral solution. This includes assessing the values and qualities of the alternatives and compare them. Cost-Benefit analyses, including natural benefits, can be useful.
Step 4: Adjust selected solution. Review the conditions and restrictions of the project.
Step 5: Prepare the solution for implementation. This can include proposals, design, maintenance, and monitoring. Also finding the required funds and risk analyses can be part of this.

These design steps should be used in the studied cases since they are built according to the Building with Nature philosophy. Furthermore, several steps correspond with parts of flood resilience such as collaboration between stakeholders.

Building with Nature in cities

Waterways were once the origin for many cities and are considered fundamental to their urban development (Phong, 2015). Nowadays, there is mostly a hard divide between the city and river and there exists little interaction between the two. River banks mostly exists of gray infrastructure, such flood barriers, and are straightened and hardened which leaves little space for any nature to develop. The events in light of climate change are reason to re-design the water-urban connection for which Building with Nature is suitable. Flood protection is here an important reason. Urban wetlands and vegetated foreshores can be used as water storage areas and attenuate waves which protects the city behind it with its cultural heritage, tourism sector and business centers, which are of critical economic value to cities. Just as in NbS, Building with Nature aims to produce multiple benefits. Preventing flooding as a result of climate change is one part. Other benefits are making connection with urban green and thereby providing new recreational opportunities, reducing the urban heat island effect, and increasing biodiversity. Waterways have the greatest ecological benefits when they are part of a larger network with blue corridors linked to upland urban green, such as parks. Figure 4 shows these connections where the river is

connected to green or blue parts further inland. This connects the ecology from the river with the variety of species living elsewhere. This is again where a concept as Building with Nature overlaps with a concept as Blue-Green Infrastructure. Furthermore, Building with Nature projects, such as tidal parks or wetlands, can also improve spatial quality and thereby increase property value (Ecoshape, One Architecture & Urbanism, 2020). This can be seen in figure 5 where green measures and corridors strengthens financial capacity and increase sectors like tourism that contribute to the local economy.

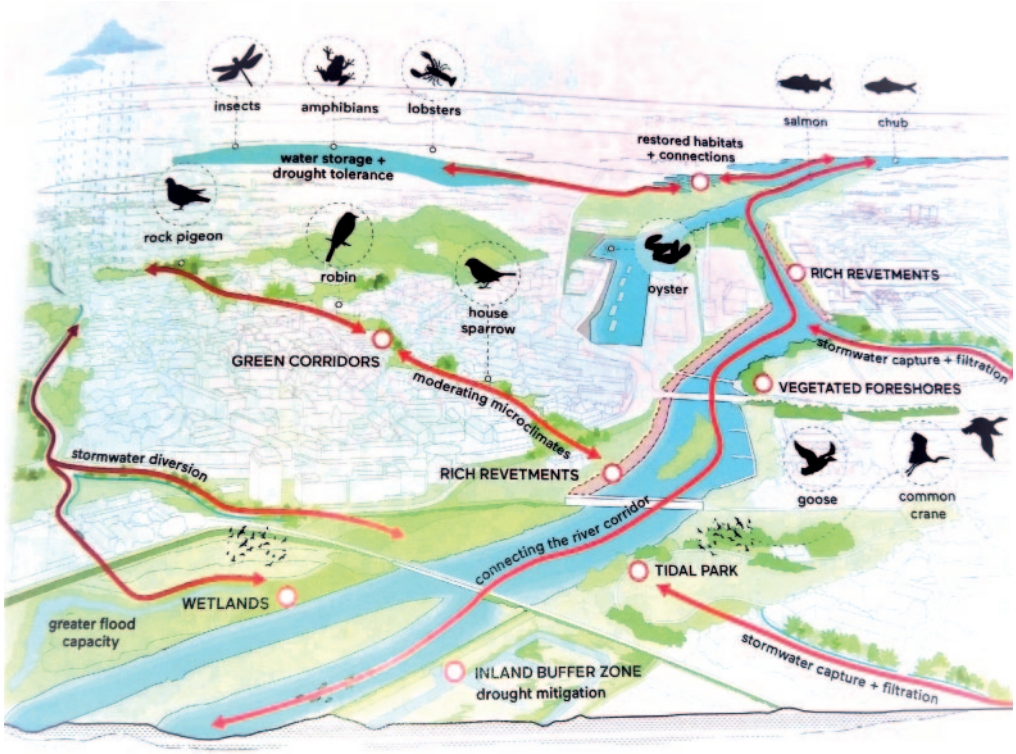

Figure 4: blue-green corridors (Ecoshape, One Architecture & Urbanism, 2020)

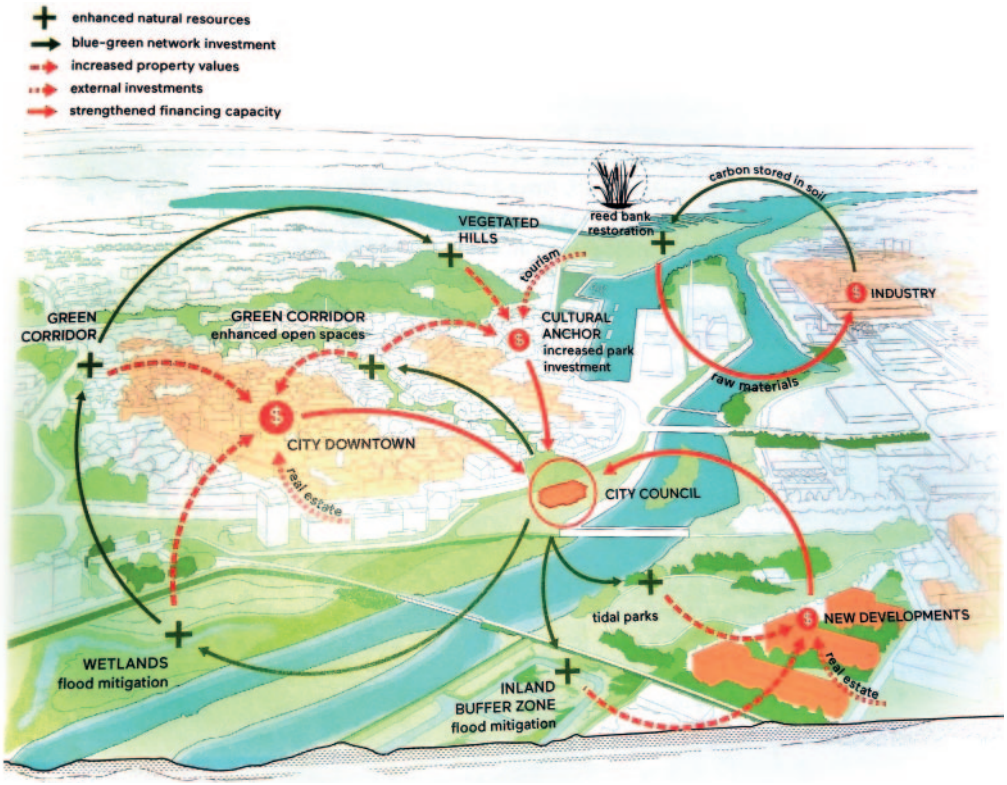

Figure 5: strengthening of financial capacity by green measures (Ecoshape, One Architecture & Urbanism, 2020)

2.10 Conceptual Model

The theoretical concepts described above can be visualised in a conceptual model, see figure 6. This model shows the relations between the concepts. However, it should be noted that a conceptual model is a simplified visualization of reality and therefore it might not include all cause-effect relationships.

This thesis studies the contribution of the concept of Building with Nature, effectuated in Nature-based Solutions, to flood resilience in urban areas which explains the first step in this model. Flood resilience is then divided in robustness, adaptability, and transition according to the revised resilience framework by Davoudi et al (2013) and Restemeyer et al (2015). Based on the literature review in this chapter, several elements were defined as part of robustness, adaptability, and transition. The connection from robustness to flood protection includes all the engineering structures that protect land from flooding. Adaptability is divided in flexibility, operationalized as collaboration between stakeholders, and resourcefulness, which is operationalized here as the spatial combination of functions. Collaboration with citizens is seen as public participation. How and till what extent are citizens involved in the different phases of the project? Combining of functions is about the land-use of the area, for instance nature, recreation, or education. Last, transition is all about changes. Change in physical environment but most importantly change in people's mind-set. Mind-set can be defined as 'a person's attitudes or opinions resulting from earlier experiences' (Cambridge Dictionary, 2021). In this case, there will be asked about opinions on climate adaptation projects, specifically those that combine climate adaptation with urban green.

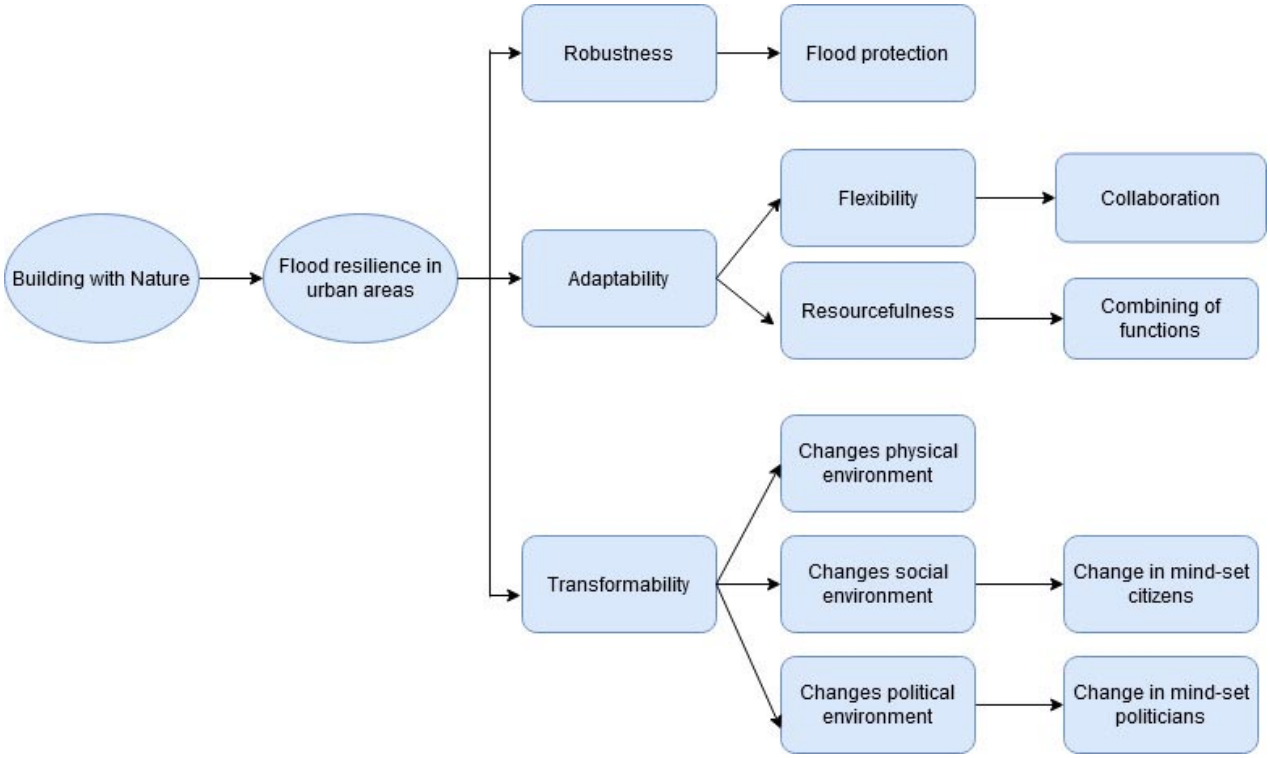

Figure 6: conceptual model

3 Research methodology

This chapter contains the research methodology and will explain the research approach, research methods, and data collection techniques used. The research is both explorative and qualitative.

3.1 Research strategy

This research consists of three parts/questions. The first part is about Building with Nature in existing urban policy, the second part is about the contribution of the selected cases to flood resilience in their cities. The third part is about what can be learned from these cases and how to implement these kinds of projects in urban areas. The third part is how to increase its presence in flood policy. In order to gain sufficient insight in the connection between Building with Nature projects and flood resilience a case study was conducted. According to Yin in Crowe et al (2011) a case study is '*an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident*' (2011, p.4). A case study allows the opportunity to explore complex issues in in-depth, from multiple perspectives and in their real-life context (Crowe et al, 2011; Thomas, 2011). They can be used to explain, describe or explore events. Considering flood resilience is a complex concept which has a clear societal component, a case study is an appropriate research approach to study the contribution of Building with nature to flood resilience. Other methods that could have been used are a qualitative approach with focus groups or a quantitative approach using statistics. Especially for statistics, a high number of cases/questionnaires is preferred which at the start was considered not feasible. The number of Building with Nature cases in the Netherlands is still relatively low and at the start of the research it was not known how many people would be able to cooperate for an interview or a questionnaire, in other words, the population was unknown. Because of this uncertainty there was chosen to dive deeper into the cases and focus on the complexity and societal component of the topic and therefore using a case study and interview method.

Case selection

Three cases have been selected in Rotterdam and Dordrecht, namely the Brienenoord Island, the Nassauhaven, and Wervenpark. Rotterdam and Dordrecht are very suitable to construct Building with Nature projects as they are prone to flood risk due to their location along the river and low lying areas. Furthermore, the city of Rotterdam has a resilience policy in place and both cities have climate adaptation policies and are actively working to achieve their adaptation goals. Both cities do not only want to be protected against floods but also include adaptation and resilience in their cities. The resilience strategy from Rotterdam explains this by setting up a wide range of goals from sustainable energy and climate adaptation to cyber resilience and improving the self-organising capacity of the city. Dordrecht does not have a specific resilience strategy but includes their ambitions in other policy documents such as the Structuurvisie 2040 where it also puts a focus on green-blue corridors and building 'flood proof'. Furthermore, both cities are also part of

City Deal Klimaatadaptatie which is a cooperation where public and private parties work on decentralised adaptation projects and sharing of knowledge. Another reason for choosing these cities and projects is that these are the only cities in the Netherlands where Building with Nature projects are currently being constructed.

The two cases in Rotterdam are part of a bigger programme called 'River as Tidal Park'. This programme constructs tidal parks along the rivers in Rotterdam and surrounding towns and uses the Building with Nature philosophy. Within this programme two projects have been chosen, Brienenoord Island and the Nassauhaven. These particular projects were chosen because of their location (in urban areas) and whether or not the projects finished construction. The Wervenpark in Dordrecht is a self-contained project, however, it is part of the city development of the neighbourhood Stadswerven, and also uses the Building with Nature philosophy. The programme in Rotterdam and the project in Dordrecht were chosen through the website of 'building with nature in de stad' from Ecoshape, Deltares, and Wittenveen + Bos. The three projects were deemed suitable by their location (in urban areas, along a river where they can be of influence for flood safety) and by their timetable in construction. The case selection included the different phases (design – under construction – finished) projects were in to ensure a variety. The Wervenpark is in the design phase, the Brienenoord Island is under construction, and the Nassauhaven is finished.

3.2 Research method and data collection techniques

During this research a multi-method research approach is used. This makes that the cases can be studied in a holistic way and from multiple methodological sides (Roller, 2020). Furthermore, a research that combines multiple data sources can produce more valid and reliable findings (Vogel & Henstra, 2015). A multi-method approach is particularly relevant in case-centred research such as case studies. This research combines techniques as literature study, policy analysis and in-depth interviews. The policy analysis provides the necessary policy context in which the cases are executed. The in-depth interviews provide detailed information about the cases and the process.

Table 2: researched methods

	Sub question	Research method
1	How is Building with Nature included in current urban policies?	Policy analysis
2	Till what extend do the Building with Nature cases of Rotterdam and Dordrecht contribute to resilience?	In-depth interviews Literature study
3	What are conditions for use in other urban areas?	In-depth interviews Literature study

Literature study

The first method was a literature study and the starting point of the research. The majority of this can be found in the theoretical framework. It defined the key concepts of this research and made them more concrete in order to use the concepts during interviews. Because of the amount of information on the web, the search was limited to online literature portals as Google Scholar. Any articles that were not freely accessible were found on SmartCat, the online literature portal of the University of Groningen. The literature search was focused around the key words 'resilience', 'flood resilience', 'robustness', 'transformability', 'transition', 'Building with Nature', 'climate adaptability', 'Nature-based Solutions', 'blue-green infrastructure, 'ecosystem-based adaptation', 'transition management', 'measuring resilience' in order to keep the focus in the right direction.

Policy analysis

The first sub-question was researched using policy analysis. Climate adaptation and resilience policy from Rotterdam and Dordrecht were analysed in order to see if Building with Nature projects were already involved in the policies and/or if there are more such projects to come. These policies are chosen because they are currently valid and give an overview of the climate adaptation, spatial planning, and flood policy in the relevant city. Rotterdam has more policy documents concerning climate adaptation and resilience than Dordrecht which can also derive from the participation of Rotterdam in the 100Resilient Cities programme which helps cities to build more resilience. In Dordrecht most of this policy is summarized in the Structuurvisie where it seeks the combination with spatial planning, sustainability, and liveability. Besides the urban policy, the national Environmental & Planning Act and the European Water Framework Directive for water quality were named during interviews as reasons to construct the projects and are therefore included in this table.

Table 3: analysed policy documents

City	Policy document	Year
Rotterdam	Rotterdam Adaptation Strategy	2013
	Rotterdams Weerwoord	2019
	Rotterdam Resilience Strategy	2016
Dordrecht	Structuurvisie 2040	2013
National	Environmental & Planning Act	2022
European	Water Framework Directive	2000

In-depth interviews

In-depth, semi-structured interviews were conducted as well. Semi-structured interviews were chosen as a way to keep the focus on the topic but still have the freedom by asking more about a specific answer. For each of the interviews interview guides were set up to guide the conversation. The interviews had the goal to see how robustness, adaptability and transition were present in the cases, how the main ideas of the cases could be expanded and how it could be included more in flood policies. Therefore, they followed the same structure as the conceptual model. Questions were about how Building with Nature was integrated in the different elements of resilience, if they saw any change in mind-sets and how they saw the future of Building with Nature (see appendix 1 and 2). To achieve answers to these questions, interviews were done with project members from the cases, from either governmental organisations or NGO's, and an expert interview with Ecoshape via email. The interview with Ecoshape had separate questions because of the expertise from the interviewee and the more general view that was needed. Furthermore, several surprising answers from earlier interviews were checked with the expert to see why these answers would be given. The interview was via email because of the busy schedule from the interviewee and was done in the form of a questionnaire with open questions.

The sampling method used was snowball sampling or chain-referral sampling. This non-probability sampling technique was chosen because the size of the population was unknown. Project members from the specific cases were needed in order to acquire the right primary data. A personal contact at the municipality of Rotterdam was used to obtain contact information for several interviewees. Interviewees were then asked for contact information from other project members.

Table 4: details interviews

Respon-dent	Organization	Role	Case	Date	Location
A	Municipality of Rotterdam	Projectmanager	Brienenoord Island	October 1, 2020	Microsoft Teams
B	ARK Natuuront-wikkeling	Projectmanager	Brienenoord Island	October 2, 2020	Microsoft Teams
C	Rijkswaterstaat	Consultant Environment	Brienenoord Island	October 15, 2020	Microsoft Teams
D	Municipality of Dordrecht	Landscape architect	Wervenpark	October 8, 2020	Microsoft Teams
E	Municipality of Dordrecht	Ecologist	Wervenpark	October 22, 2020	Microsoft Teams
F	Municipality of Dordrecht	Projectmanager	Wervenpark	October 29, 2020	Microsoft Teams
G	Municipality of Rotterdam	Projectmanager	Nassauhaven	October 12, 2020	Microsoft Teams
H	Municipality of Rotterdam	Landscape architect	Nassauhaven	November 12, 2020	Microsoft Teams
I	Ecoshape	Expert interview Ecoshape	General	December 2, 2020	Email

3.3 Data analysis

The data was analysed by coding the transcripts from the interviews, using the Atlas.ti program. There are two coding schemes used for policy and interviews. The coding scheme for the policy analysis focused on the elements about nature and green. The coding scheme for the interviews was primarily led by the resilience components of robustness, adaptability and transformability. The interviews were completely written out, except for the 'eh' and 'uh' expressions. Interviews were conducted over Microsoft Teams or via email. When permissions were given, the interviews were recorded.

Table 5: codes policy analysis

Codes
Nature, green, Building with Nature, ecology, water management, flood risk management

Table 6: codes interview analysis

Code group	Codes
Robustness	Flood protection
Adaptability	Reduce consequences, combining functions, collaboration citizens, collaboration stakeholders
Transformability	Societal change, awareness, attitude citizens, attitude politicians,
Building with Nature	Collaboration citizens, collaboration stakeholders, physical changes project, definition BwN, future BwN, goals of project, reason to apply BwN

The complete data collection and analysis process is shown in figure 7.

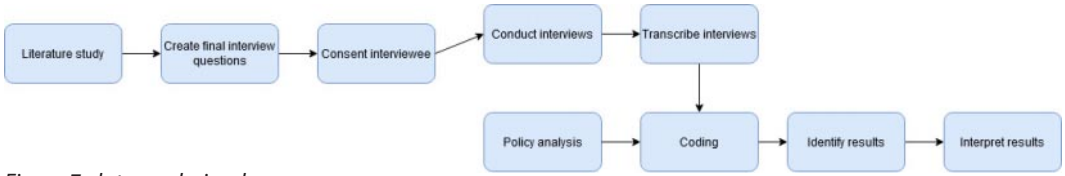

Figure 7: data analysis scheme

3.4 Case studies

This research was done with three case studies in two cities, Rotterdam and Dordrecht. Two case studies are located in Rotterdam, the Nassauhaven and the Brienenoord Island. Figure 8 and 9 show the locations of the cases.

Figure 8: locations cases Rotterdam

Figure 9: location case Dordrecht

The Nassauhaven

The Nassauhaven is an old harbour basin on the south bank of the Meuse. It is no longer in use as a port area since all port activity has moved to the west. It is now a residential area in the neighbourhood Feijenoord. Until recently, the banks of the Nassauhaven were steep and hard with no space for flora and fauna to grow. This is changed to a nature friendly bank. The construction of a tidal park is possible because of the open connection between the Meuse and the North sea. This creates more space for brackish nature. The tidal park is connected to the existing Nassauhavenpark, which is a small city park. The construction was finished in 2019 and the tidal park is visible in the landscape. There are steps leading down to the park that can be used for recreation and connects the harbour basin and park with the surrounding area. Because of the presence of sludge a technical construction was built on which the park was constructed. The Nassauhaven combines the tidal park with sustainable floating houses. The cases in Rotterdam are part of an ongoing trend in the city

Figure 10: Nassauhaven

Figure 11: Nassauhaven

of de-stoning the river banks, changing the hard quay walls to softer and greener banks that can facilitate nature, which is the main reason why Building with Nature is used in these cases.

The Brienenoord Island

The Brienenoord Island is a small island in the Meuse below the Van Brienenoord bridge. It originates from the 19th century and has had several functions over the years, such as (oil)industry, salmon fishery, and scouting. The last years, it has been a nature area and the redevelopment of the island gave opportunities to increase the amount of nature. On the west and south side of the island is space for tidal nature. The island is free for visitors and has allotment gardens and a nature playground for children. The project for the tidal park is to create more space for brackish nature through the construction of nature friendly banks. Furthermore, the bridge will be replaced to improve accessibility and part of the

Figure 12: Brienenoord Island

Figure 13: Brienenoord Island

island will be car free. The island is part of the recreational route 'Rondje Stadionpark', a route of 5 km through the neighbourhood of Ijsselmonde. Within this route, the Brienenoord Island is considered by the municipality to be more 'wild' nature compared to the city parks in the neighbourhood. The island is currently under construction and should be finished by summer 2021.

Regional programme 'River as Tidal Park'

The two tidal parks in Rotterdam are part of a regional programme called 'River as Tidal Park'. The programme has sixteen partners including several municipalities, Rijkswaterstaat, Ecoshape, Port of Rotterdam, water boards, NGO's, and engineering companies (Municipality of Rotterdam, 2018). The idea of making tidal parks comes from the already existing natural parks along the river. Because they contribute to nature, water safety, water quality and so on, they are an important part of the delta. Goals of the programme are bringing city and nature together, increasing of nature area, education, and increase water

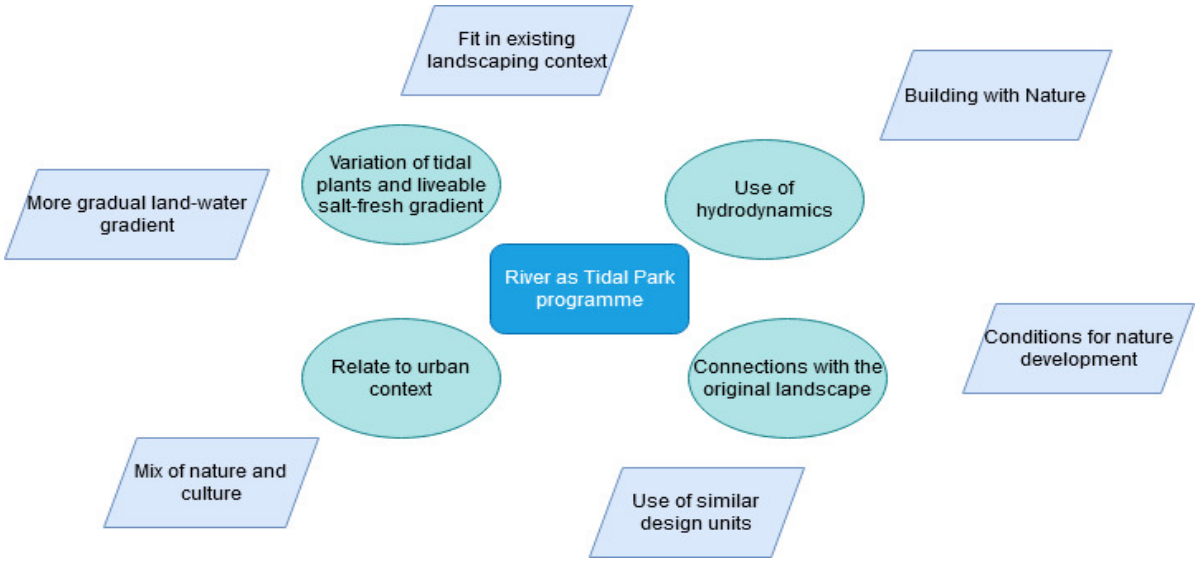

Figure 14: characteristics and design principles River as Tidal Park

safety. To streamline the process but to also create enough space for customization on a specific location, a framework was made to give inspiration and guidance to local projects. The framework is built with four characteristics and six design principles. Together, these characteristics from a target image to increase the size of the river banks, and make the river more accessible. The first design principle also includes a variety of which parks can be created in what location. For instance, in harbour basins or in the outer or inner bend of a river. With this, experiments in random places are avoided. The characteristics and design principles are shown in figure 14.

The Wervenpark

The last case is the Wervenpark in Dordrecht. This park is located in the former industrial area Stadswerven which is being redeveloped into a residential neighbourhood. The park lies along the river Beneden Merwede on the northeast side of Dordrecht. The space is divided between a part tidal nature and a city park. The area is a former shipyard and elements of this will be preserved in the park, for instance the slipway as part of the tidal park and the presence of an old crane. A subsidy was given by the province of South-Holland for the preservation of cultural-historical heritage in the park. Just as with the other tidal parks, the design includes the construction of a slowly rising slope from the river bed to the rest of the park. Vegetation is not planted but expected to develop spontaneously. The park can also be used to create more capacity for the river capacity. In case of extreme high water, the entire park can be flooded until the intersection with the Maasstraat. The neighbourhood itself is completely outer dike and therefore the ground level is raised to meet the flood safety standards. The tidal park will be Biesbosch-like nature and is part of the ecological zones connecting the Biesbosch with the city of Dordrecht. The preservation and expansion of Biesbosch nature is the main reason why Building with Nature was used in this case. The Biesbosch is fresh water tidal nature which is becoming rarer in the world. The Wervenpark can add some of this nature. Furthermore, there were ideas to do something different, to not just make another city park but include nature and biodiversity. The park is not constructed yet but is expected to be finished in the coming years.

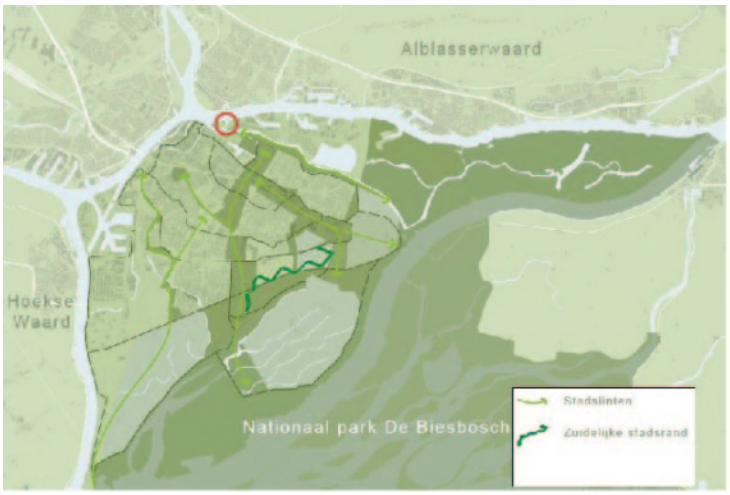

Figure 15: ecological zones Dordrecht


Figure 16: Wervenpark

4 Results

The results first zoom in on policies on the urban level and policies that were mentioned by interviewees as reasons for the start of the cases. Then, there will be zoomed in on the cases. Lastly, the two will be combined in how these Building with Nature projects can be expanded.

4.1 Building with Nature in local climate adaptation policy

Building with Nature or any nature-based measures are still relatively new in comparison to hard engineering solutions. However, they are mentioned more and more in urban policies in Dutch cities and in national policy.

Current policies

Relevant urban policies from Rotterdam and Dordrecht are the Rotterdam Adaptation Strategy (RAS), the Rotterdams Weerwoord, the Rotterdam Resilience Strategy, and the Structuurvisie 2040. Other policies that were mentioned by the interviewees are the national Environment & Planning Act and the European Water Framework Directive. These will also be discussed later. These policies together form the current policy context in which Building with Nature projects are started. Table 7 shows for each policy a short summary, focusing on green or blue-green measures.

Table 7: summary of policies

Policy document	Summary
Rotterdam Adaptation Strategy (2013)	Mentions the use of BwN briefly. Gives mostly examples that enhance the 'sponge function' of the city, such as green roofs, greening of public space. These kinds of measures can use the Building with Nature framework but do not necessarily need to. A key point in the Rotterdam Adaptation Strategy is the involvement of non-governmental stakeholders such as citizens, companies, educational institutions, and civil society organisations.
Rotterdams Weerwoord (2019)	The goal of the Rotterdams Weerwoord is a climate-proof Rotterdam in 2025 and practical measures that translate the needed up-scaling and speed of adaptation citywide. The strategy acknowledges the need for green as climate adaptive measure however, just as in the Rotterdam Adaptation Strategy, it is mainly focused on adaptive measures such as green roofs and planting of trees. The involvement of citizens and civic groups is again mentioned as necessary to succeed in implementing climate adaptation measures.
Rotterdam Resilience Strategy (2016)	The Resilience Strategy includes several qualities of resilience that partly overlap the framework of robustness, adaptability, and transformability used in this research. Although it is not specifically about flood resilience, this strategy does give some direction for it. The Resilience Strategy does not only include climate adaptation but also involves topics as circular economy, digitization, and democracy/public participation

Policy document	Summary
Dordrecht Structuurvisie 2040 (2013)	The use of green and construction of green-blue infrastructure is mentioned. Several green-blue zones connect The Biesbosch with the city of Dordrecht and its urban green. The ambition of the city is to enhance this and bring The Biesbosch nature into the city. The Structuurvisie explicitly states that Dordrecht wants to invest in innovative water safety projects, they also include Ecoshape in this. Furthermore, an environmental policy document (Omgevingsvisie) is currently being made which includes the preservation and stimulation of decrease of biodiversity. At the moment, Dordrecht is also making additional policy to make nature-inclusive building standard in all newly constructed buildings and neighbourhoods.
Environment & Planning Act (2022)	The Environment & Planning Act is a new law expected to come into effect in January 2022. It combines and modernises several environmental laws about construction, environment, water, spatial planning, and nature. A result of the Act is that climate adaptation, nature, and biodiversity are fully considered in new projects.
Water Framework Directive (2000)	For Rijkswaterstaat the main reason to participate in these tidal parks is that they have to full fill the requirements stipulated in the Water Framework Directive, the EU directive for water quality. This directive includes both chemical and ecological water quality. Tidal parks are a relative easy way to achieve better ecological quality. By collaborating with municipalities they can achieve multiple goals in one project.

Building with Nature in policies in Rotterdam and Dordrecht

In all the policies described above, nature and nature-based solutions are acknowledged as an important part of climate adaptation and spatial planning. The upcoming Environment & Planning Act confirms the trend in which preservation and stimulation of nature are considered just as important as other aspects. The general need for green, nature, climate adaptive measures, and nature-based solutions appear to have landed with politicians and policy makers. The policies in the cities of Rotterdam and Dordrecht seems more ambitious than on national level, however, this could also be explained because both Rotterdam and Dordrecht want to present themselves as frontrunners in climate adaptation and therefore are probably not representative for local urban policies in general. Nevertheless, green and blue-green infrastructure is becoming more and more important in planning and climate adaptation policies.

The specific concept of Building with Nature is not mentioned often, however, the idea is implemented in policies. This becomes visible in, for example, the Rotterdam Adaptation Strategy: '*We are moving more and more with the dynamics of the water and use more nature in measures to adapt the city to climate change'* (Municipality of Rotterdam, 2013). The Structuurvisie from Dordrecht explains: *'The ecological zones guide the Biesbosch into the city and form ecological and recreational connections to it outside area'* (Municipality of Dordrecht, 2013). For Dordrecht, this is one of the drivers for Building with Nature and this is a difference with Rotterdam. The latter does not have an existing nature area to build on and connect urban green with, it has to be created on its own. The main idea of Building with Nature, to use nature to achieve multiple goals concerning water safety, biodiversity etc., is implemented in policy. However, this is mainly a passive use of nature, e.g. green roofs, and not active use whereas Building with Nature generally uses the latter.

Building with Nature is especially unique when combined with flood risk management. Something that is scarcely mentioned in any of the analysed policy documents or the interviews. The Rotterdam Adaptation Strategy only mentions Building with Nature in the

caption of a photo saying *'Building with Nature combines attractive green with increasing of water safety'* (Municipality of Rotterdam, 2013). The effects of climate change are well written down in adaptation policies, for instance in the Rotterdams Weerwoord where the four main trends are explained: more precipitation, higher temperature, more droughts, and sea level rise. Although sea level rise is mentioned as a climate trend, the policy shows mostly adaptation measures in the city and less measures close to the river banks. The measures suggested in order to deal with sea level rise are dike reinforcement and adapting of outer dike areas to floods: *'In order to protect us against high water levels, dikes and flood defences must be periodically strengthened and raised. In addition, it must be determined for each area, both in and outside the dikes, which measures for prevention (dikes), spatial (for example building with a higher floor level), and crisis management is necessary to mitigate the consequences of a flood.'* (Municipality of Rotterdam, 2019). This shows a focus on robustness and adaptability but not on transition. The measures that are suggested are not completely new, even though adaptive measures are relatively new in the Dutch history of water management. However, they fit in the current system that focusses on prevention and add little to changing it.

The lack of Building with Nature in urban policies could have several reasons. First, the information about Building with Nature has not landed with everyone. Because it is a relatively new concept, there are still people that are not familiar with it. Ecoshape does try to spread the concept. They hope that the release of a book about Building with Nature in December 2020 will help spread the message. Second, the concept might be too specific to include in a city-wide policy. In the Netherlands, Building with Nature is often used in combination with flood risk management which might make it too specific to use in a more general climate adaptation policy. A third reason is there is no clear definition. It has become somewhat of an 'umbrella concept', a concept of which everyone has their own definition. Ecoshape explains that *'Building with Nature is a way to create nature-based solutions'* (Resp. I). The concept of nature-based solutions is broader and includes societal problems, human well-being, and biodiversity, while Building with Nature in practice is often more focused on biodiversity and water safety and thereby more specific. A term that was frequently used during the interviews was nature-inclusive building, which seems to be a term mostly used in the Netherlands. Nature-inclusive building and design is not only aimed at buildings but also at public space and spatial planning. The main difference with Building with Nature is that in the latter nature makes an active contribution to the creation of a solution. While with nature-inclusive building it is also possible that nature is offered facilities to grow, for instance with green facades where nature is not contributing to the existence of the building. With the multiple concepts and terms that are floating around, that are sometimes alike, sometimes overlapping, it is hard to explain why this concept is used, what it is to you, and what it can be used for. To include more Building with Nature in urban policies the concept needs to be on everyone's radar. It is necessary that policymakers as well as designers within the municipality are familiar with the concept and design guidelines.

Altogether, it is a positive trend to see how much adaptation and planning policy focuses on nature and greening of public spaces. However, the opportunity to use Building with Nature in combination with water safety and thereby achieving multiple goals is mostly not taken in local urban policies.

4.2 Contribution of Rotterdam and Dordrecht cases to resilience

During the in-depth analysis of the cases, the framework of robustness, adaptability, and transition is used to rate how the cases contribute to flood resilience and show their similarities and differences. In the interviews the interviewees were asked about these aspects (see appendix 1 and 2). Their responses helped to answer the question to what extend the cases contribute to flood resilience. Table 8 summarizes the results.

Table 8: summary cases

	Robustness	Adaptability	Transformability
Brienenoord Island – Rotterdam	Not a goal of the project. Park contributes a little to flood protection by creating a foreshore that breaks the waves, especially on the west side. However, north side (along the river) is still a hard bank.	No direct citizen power. After citizen protest, design was adjusted > citizens had influence on the design. Mixed-use of recreation, nature and education.	Project results in physical changes. According to interviewees, mind-set and support citizens and politicians is increasing
Nassauhaven – Rotterdam	Not a goal of the project. Small contribution to flood protection with the implementation of steps towards the tidal park which creates more space for high water.	No direct citizen power. Mixed-use of recreation, nature, and spatial quality.	Project is finished and gives a greener view of the bank = physical change. Increasing support from citizens and politicians, however, interviewee noticed that the low-income neighbourhood in which the project is located (Feijenoord) might contribute to less involvement from citizens.
Wervenpark – Dordrecht	Not a goal of the project. Park is located along the river and creates are foreshore which breaks the waves. However, sheet piles will be installed as well which is the main flood defence. The park does protect the hard banks from erosion and thereby does contribute to flood protection.	There are no houses in this area yet which means little involvement of citizens. Mixed-use of recreation and nature.	Project results in physical changes. Much support from politicians, order for project came from politics. Feeling from interviewee that people are more preservative about local green. Protest from NGO on removing of green to construct park.

Robustness

One factor in flood resilience is robustness, the power to resist a shock event. In this case the question is how much the project contributed to flood protection. Building with Nature is generally used in combination with flood risk management, with protection of coasts and river dikes. By creating multi-functional designs that produce a win-win situation. This win-win situation is also endorsed by the interviewees however, not on the topic of flood risk management. In none of the three cases flood protection was given as a goal of the project. Rijkswaterstaat argued: *'We do not make the tidal parks to prevent flooding. However,*

because we create more space, we create more capacity and more water storage area. It is not our goal but a nice bonus' (Resp. C). It was not something that was part of the design requirements and therefore we cannot discuss any design aspects concerning robustness. It was acknowledged that the tidal parks could potentially contribute to flood safety but considering the small scale of the projects, this is not researched and quantified enough. ARK Natuurontwikkeling explains: *'We are now on the eve of a new phase in the programme [River as Tidal Park programme] in which we look much more at the long term, how tidal parks can contribute to, for example, the possibility of lowering dikes. Only the areas that have now been developed are actually still very small and have not yet been quantified as to how it can contribute to the possibility of lowering dikes or other high water issues.'* (Resp. B). There is knowledge that the projects can contribute to flood safety and flood protection, however, it was not seen as goal. Also, the small scale of the researched projects can contribute to the lack of robustness. Engineering-like measures were still implemented, for example the installing of a sheet pile wall or raising of ground level. The Building with Nature projects were not used to reduce these hard engineering measures, for instance by not raising ground level because of the existence of a foreshore. However, considering all cases were located along the river, they could work as a buffer for any flood danger from the river as well as hold more precipitation than paved areas. Even though the areas are not designed with this function, they can still contribute to flood protection and water storage. That flood protection is not at all a goal in these projects is peculiar, especially since Building with Nature in the Netherlands has had a strong focus on the combination with flood risk management, for example with the Sand Engine. The national programme of Building with Nature was an initiative of the dredging sector and therefore the affiliation with water engineering is logical. However, in these cases it was different. According to Ecoshape, an explanation could be that a different definition of Building with Nature was used. One that does not include water engineering that much and focuses more on the nature part. In that sense it becomes more part of Nature-based Solutions (NbS), which is a broader term and also more internationally known. A second reason could be that they do not fully see their project as Building with Nature. Several interviewees did not have the feeling they worked on a Building with Nature project, saying: *'We did not really use that much Building with Nature. What I understand by that is that you let nature take its course. We did not do that. We detailed quite specifically how we wanted the nature in our city to be'* (Resp. A). This then comes back to the discussion about the definition of Building with Nature and whether or not it includes water engineering.

Adaptability

The second factor in flood resilience is adaptability, the ability of a city to adapt to a shock event and thereby minimising consequences and damage. This is made further concrete by identifying collaboration and combining of functions from the literature.

Combining of functions – Mixed-use makes an area more diverse and more capable to adapt to different functions. In all the cases functions were combined, mainly the functions of nature and recreation. The function of nature speaks for itself, considering they all are Building with Nature projects. The implementation of nature, however, is different in the projects. While in the Nassauhaven specific vegetation was planted on a technical construction because of the presence of sludge, in the Wervenpark they wanted vegetation to occur spontaneously, without interference from humans. They facilitate the optimal circumstances and hope that nature from the Biesbosch also settles in the Wervenpark. A respondent from the Wervenpark explained: *'The river just laid down seeds, we did not sow anything. And what emerged is exactly what we came up with'* (Resp. D). One of the nature reasons for construction the tidal parks is the possibility to stimulate tidal

nature in the delta. The parks in Rotterdam are brackish tidal nature, the park in Dordrecht is fresh water tidal nature. This tidal nature has largely disappeared in the Dutch Delta due to closing of open connections with the North Sea, urbanization, expansion of agricultural land, and canalizing of rivers (Province of Zuid-Holland, 2021). By reimplementing this tidal nature, the area becomes interesting for several species that are specific to the delta. *'You want to develop a habitat that really suits a delta system. For example, those shallow banks and slabs that dry up. And on those plates that dry up you get migratory birds, you get species that can forage well because there are many shellfish and worms there. […] And on the island itself, the harder, steep banks are replaced by shallow banks. And there you also get habitat that is particularly interesting for a number of species that really belong in a delta. Such as the marsh marigold, which is a fresh water tidal specie, and migratory fish that can look for resting areas in the transition from salt to fresh water and vice versa.'* (Resp. B). The design of shallow banks and a gradient zone with a long slope (a foreshore) is something that is typically Building with Nature and is often used to reduce pressure on the flood defences (TU Delft, 2019). In these cases, they are used to stimulate nature and not for flood protection reasons. However, the design aspects are the same. Nature in the inland parks is also stimulated with several measures. The ecologist from the municipality of Dordrecht explains: *'Sand Martins can already be found in the river area. They live in steep walls created by erosion of the river. […] They breed there and because we know they breed there, we want to offer them an artificial sand martin wall. […] Bees, that is another. Bees now also occur in the river landscape and they breed on dry steep walls. Sand bees are a large group that could potentially become involved. So what we want to do is make a few small steep walls in which we imitate those natural conditions.'* (Resp. E).

Multifunctionality is not a new topic in a city, the scarcity of space in cities makes that city planners try to combine functions as much as possible. The combination with the function of recreation is therefore an obvious one considering this is done often, especially in urban areas. All of the tidal parks are connected to a normal park. The Wervenpark and the Nassauhaven are more city parks with paths and (mowed) lawns. The Brienenoord Island is different in the sense that nature is a bit wilder than in the typical city park. For this project a recreation research was done by the municipality which revealed that the island mainly attracted people who *'do not want to walk over existing paths but want to stroll through the woods'* (Resp. A). The design is focused on these people. The Brienenoord Island has another function, namely that of education. Buitenplaats Brienenoord is a foundation that organises all kinds of activities for all ages, mainly in the creative sector.

Collaboration – Collaboration is divided in participation with citizens (citizen participation) and cooperation between sectors. To visually show the collaboration with citizens, the participation ladder from Arnstein (2019) is used which shows eight levels with each rung showing the extend of citizens' power. The collaboration with citizens in the cases was two-sided. On one hand the collaboration with citizens was

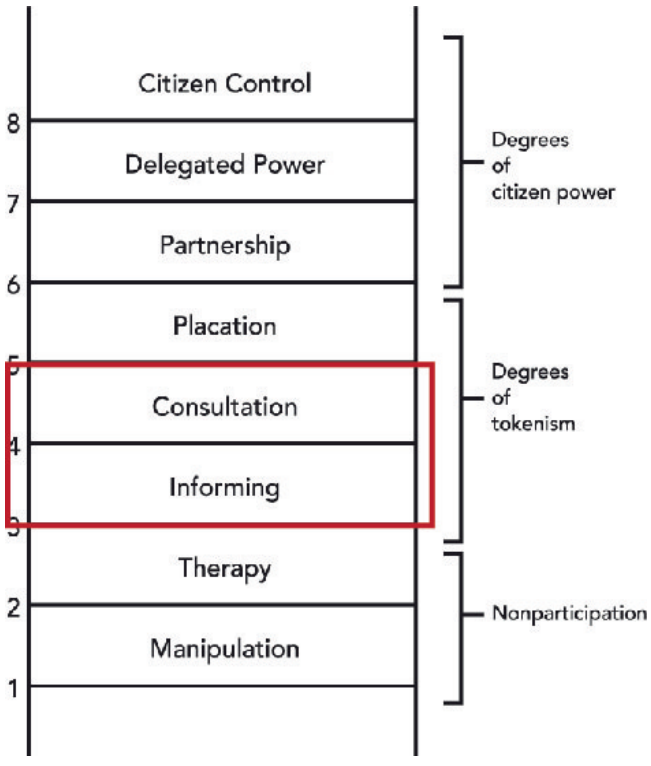

Figure 17: participation ladder (Arnstein, 2019)

mostly at an informing and consulting level on Arnstein's ladder (see figure 17). Designs were in all cases made by the governmental organisations involved and presented to the public in a participation process. However, questions and protests to the plans were taken seriously. In the case of the Brienenoord Island, the first design was to include a tidal creek across the island. After protest from citizens, who were used to walk over the entire island, the creek was removed from the design. The interviewee from Rijkswaterstaat explained: *'We followed the legal procedures for public participation which included information meetings. These resulted in a change in the design*' (Resp. C). This shows that as long as concerns are taken seriously, citizens can still have influence in the project through the use of information and feedback meetings. The fact that concerns and protests were taken seriously and can lead to a change in the design is a good step, however, the participation is still at a low level with no real power for citizens. Working together with citizens in a co-creation setting is still a long way from the amount of involvement showed in the cases.

Collaboration between sectors and departments was considered good by the governmental organisations interviewed. For the Rotterdam cases a collaboration was sought with Rijkswaterstaat for the Water Framework Directive. They were also involved because of the high economic importance of the Meuse and surrounding waterways. The presence of a tidal park should not have negative influence on the shipping lane and thereby impacting the economy. Research was done to confirm that this was not the case. A side note to the collaboration between stakeholders is that there was not much collaboration with NGO's or civic organisations. One interviewee, who works for an NGO, had some criticism on the collaboration saying *'whoever pays, decides'* (Resp. B). Governmental organisations generally bring in more funds and therefore have more decision-making power, while NGOs put much time and effort in the project as well.

Transition

Transition is the ability to make a shift from an old situation to a new one, a system shift. Transition is divided in three components based on the theory: changes in physical environment, changes in mind-set of citizens, and changes in mind-set of politicians. Since transition refers especially to social and political change, more attention was paid to the last two components. All interviewees agreed that there is more awareness and support from both citizens and politicians for climate adaptation measures in general as well as green measures. This was the case in all cases and the general feeling of the interviewees based on their expertise.

Citizens' mind-set – People become more aware of the effects and dangers of climate change, the need for adaptation measures and the role for nature in this. *'I think support is growing. Why? I think people are starting to realize that nature is part of the balance we have in this situation and that climate change and urban development are putting pressure on it. So I think it is increasingly seen that including nature as a full component of the physical living environment is important. And even contributes to human health.'* (Resp. E). The heatwaves and extreme weather events of the last few years most likely added to the increased awareness. Furthermore, green has been an important topic for several years. Removing of green is more sensitive, even leading to court cases in Dordrecht, while the construction of green measures is welcomed. On the other hand, the kind of rugged nature that is present in some tidal parks makes some people worried about litter and mosquitoes. *'We always use bats as an exterminator of the mosquitoes, which means that we must also build nature-inclusive and give space to the bats. So we always try to make the ecosystem story clear that people will understand. And that works. So I do think that people have a better understanding of the role of the city for nature.'* (Resp. D).

Even though there was more support and awareness for the projects among citizens, this did not necessarily translate to more involvement of citizens in the design phase. When asked about the reaction from citizens after the tidal parks were implemented, one of the interviewees from the Nassauhavenpark in the neighbourhood Feijenoord explained: *'I think there is support, however it is difficult to measure because you get little response or contact with citizens. It seems that they don't care that much because they have other, more urgent problems. The neighbourhood exists of mostly social housing with citizens who are more worried about their income than a tidal park'* (Resp. G). This corresponds with studies that argue that people from low-income neighbourhoods are less likely to be politically and socially engaged (Verba, Scholzman & Brady, 1995; Solt, 2010). They have other, more urgent issues such as their income, paying rent and/or debts. Participating in any kind of climate adaptive measures are generally not high in their priority list.

Politicians' mind-set – All interviewees agreed that there is much support from politicians for the implementation of Building with Nature projects. For Rijkswaterstaat this is legislated in both EU law and national law, leading from the Water Framework Directive for water quality. Rijkswaterstaat explains: *'Politicians are very aware that this is also a task from Europe. So that we have to improve the water quality in the Nieuwe Maas is not just an idea, it is an assignment, a law. And if we fail to do so, there are also consequences.'* (Resp. C). Rijkswaterstaat is therefore involved in several tidal parks in and around Rotterdam, including the Brienenoord Island. Another incentive to include nature as an integral component in urban development is the upcoming Environmental & Planning Act which sees nature as an important part: *'The Environment & Planning Act assumes that nature is a full part of the physical environment. We have to accept that this is a value that is part of the environment and that we need to take into account'* (Resp. E). For municipalities there are several reasons to implement such projects, such as providing of green/nature, providing of recreation, increase spatial quality, and implement climate adaptation measures. For the municipality of Rotterdam, the main reason is to connect city, nature and river. Through the years, the river has become disconnected from the city and its residents. By implementing these parks citizens are able to come close to river again and see nature up close. Especially in urban neighbourhoods like Feijenoord (case Nassauhaven), people generally do not see much nature. Implementing more nature and green-blue infrastructure is in both cities part of urban and environmental policies. However, the struggle with other interests mainly housing construction was mentioned often. Currently, there is a housing shortage of 331,000 houses in the Netherlands (Rijksoverheid, 2020). Both Rotterdam and Dordrecht have to build thousands of houses in the next ten years on top of the densification policies in most Dutch cities which means building within the current city borders. This increases the pressure on 'vacant' spaces such as parks. Furthermore, Building with Nature requires long term thinking. The trend is, on the other hand, to do projects on short term with quick results. Therefore, a change in mind-set is necessary to convert towards long term thinking.

With the increase in awareness and support from both citizens and politicians it is likely that their mind-set is changing in a positive direction. A point raised by the project leader of the Brienenoord Island is that not everyone within the municipality is used to design with this much space for nature. *'It is complicated when people are used to design streets and squares. This is something completely different. So we had to really think 'how do I make this design'. And how do I let go control and let nature determine what the area will ultimately look like.'* (Resp. A). This links to the observation from Ecoshape that Building with Nature has not landed everywhere and with everyone. It seems that more education on using nature in urban designs might be necessary.

It is difficult to say how much these specific cases contribute to transition. These are only three cases in a transition that includes more than Building with Nature, which is just one concept that can lead to Nature-based Solutions. With the data collected from the interviews about the awareness and support from citizens and politicians we can see that this is increasing and thereby contributing to the bigger transition.

4.3 Lessons learnt and potential for implementation in urban areas

What are lessons learnt from these cases? This paragraph will define elements from the researched cases, the local urban policy, and the literature study in order to implement these Building with Nature projects in urban areas.

Policy

As mentioned before, Rotterdam and Dordrecht are among the frontrunners in the Netherlands when it comes to climate adaptation with ambitious policy. This also becomes visible in the fact that these are the only cities in the Netherlands with Building with Nature projects, including the ones in the towns around Rotterdam that are part of the regional programme. The first thing other cities can get inspiration from is therefore the adaptation policy from these cities. How did they include nature-based solutions in their policies? And how is this now visible in the physical environment? The programme 'River as Tidal Park' can also be used as inspiration. Several towns around Rotterdam, like Capelle a/d Ijssel and Ridderkerk, participate in this programme. The design guidelines in this programme are extremely useful in expanding these kind of tidal parks. They give direction, yet also give space for local circumstances. Since every location, stakeholders and amount of public participation are different, customization is key. Nevertheless, guidelines are very helpful in expending these kinds of projects, not just on a regional scale. Other regions or other countries can learn from this if they want to start a similar project. And every new project, every new experience adds to the already existing knowledge. However, only looking at other policy is not enough. There has to be ambition within the city to use Building with Nature, as will further be explained in the next paragraph. This is not only about employees of a municipality but also about politicians since they heavily influence policymaking. Second, there has be enough knowledge about the concept and nature-based solutions in general. Last, the city itself has to be suitable for the implementation of these projects. The cases researched in this thesis are all tidal parks which means that they are located in cities that have tidal differences. Furthermore, they are located along a river. A city that is not located along a river or does not have tidal differences might have to look for other ways to implement Building with Nature in their city. Furthermore, there is interaction between policy and the cases. The cases are started from policy, the policy context creates the circumstances that these projects can be started. However, the cases could also have a positive influence on future policy. It could be used as a showcase and inspiration to other cities and towns and thereby influence their policy.

Sense of urgency

A second lesson is that there needs to be a sense of urgency among the stakeholders. This is urgency for climate adaptation, for loss of biodiversity, and the impacts these issues have. Creating urgency for environmental problems is not easy, since it is not directly visible people often forget or are less interested. Education, especially by making it more personal, and collaboration is therefore key. As mentioned, these cases can work as a showcase and educate people on the importance of these kinds of projects and encourage them to participate.

The initiative for the 'River as Tidal Park' programme came from nature organisations WNF (WWF in English) and ARK Natuurontwikkeling and common ground was found with the municipality of Rotterdam, the port authority, and Rijkswaterstaat that all have slightly different stakes but the same goal. For the municipality the main goal is about the reconnecting of city and nature. The city and its spatial planning have turned away from the river and the creation of tidal parks gives residents the opportunity to come close to the water again. Furthermore, the creation of nature, water safety, and education are goals for the municipality. For Rijkswaterstaat, the main driver is the European Water Framework Directive, as discussed in the previous paragraph, to ensure good water quality. ARK Natuurontwikkeling has put the urgency for climate adaptation, water safety, and nature development in an alternative idea for the Nieuwe Waterweg, making the Nieuwe Waterweg shallower. This could recover the tidal nature, contribute to water safety, contribute to a sustainable fresh water supply, create more opportunities for sustainable spatial planning, and coexist with the sustainable development of port and shipping. The report is written following the success of the 'River as Tidal Park' programme and the report from Wageningen University (A nature-based future for the Netherlands in 2120) which pleads for a nature-inclusive society where nature takes the lead and is used as a starting point (Wageningen University, 2019). Reports like this can provide inspiration and urgency to cities and citizens.

This same sense of urgency can be found in Dordrecht where several people within the municipality had high ambitious to create as much nature as possible. For Dordrecht this was the case with making the quay walls more natural which, after research, turned out to be too difficult. The landscape architect from the Wervenpark explained: '*A projectmanager told me 'you have very high ambitions, if you achieve half of it you also have a great project'. The quay walls unfortunately were not achievable, however, we have a lot of measures that were included in the design which is already really good*' (Resp. D). Whether it is one person, several people or an entire organisation is not very important. But projects like these need people who set high ambitions and who feel the need and urgency for the project. A comment that touches upon this is from an interviewee from Rotterdam: '*I have to say that what I notice in Rotterdam is that people say to just try it. You can do a lot of research and discussions in advance about if a tidal park actually works. And before you know it you have eight years of scientific research. We just did it. And together with the floating houses it has an impact. People cycle by to have a look. Even if people don't like the design, it is inspiring to see what else is possible*' (Resp. G).

Citizen involvement

This inspiration for Building with Nature could, and perhaps should, be continued to the involvement of citizens. As described before, their involvement was limited although protests were taken seriously. The Building with Nature-philosophy strongly includes the involvement of a variety of stakeholders, including citizens. It would be very interesting to see the outcome of a project that involves citizens more, maybe even to the level of co-creation which would be 'partnership' on Arnstein's ladder. However, increasing public participation is not easy. Especially in neighbourhoods where residents have more urgent problems, as one of the interviewees from the Nassauhaven explained earlier. When you research 'increasing public participation', you get much advice on this topic. These might not all have come from academic articles but that does not mean that they are not helpful. Actually, many of these tips and tricks are similar to the ones mentioned in this thesis and ones already used. For instance, the creation or urgency, use of several ways of communication (e.g. newsletters, social media etc.), offer incentives, and empower citizens by redistribution of power.

Upscaling and pilot paradox

In the phases of transitions, the transition towards 'living with the water' using Nature-based Solutions, just entered the acceleration phase. More projects that use Nature-based Solutions are designed and constructed. However, in order to stay in this acceleration phase it is important to keep this direction going. Trying new methods for complex, societal problems, like the ones in this transition, are often done in pilots and living labs. This is also the case for Building with Nature as it is a relatively new concept. However, there is a risk of getting in a 'pilot paradox'; the conditions that are necessary for the success of a pilot are the same ones that prohibit the upscaling (Breman et al, 2017). In a pilot, a new and innovative method is used on a small scale to research the effects. Often, the pilot itself is considered a success but subsequently there is little effect in practice. Therefore, we need to look at internal (does it produce the desired result?) and external (does it result in structural lessons and changes in practice?) effects (Breman et al, 2017). In order for a pilot to really be successful there need to be structural changes to the methods or institutional system used for this particular topic. Thence, upscaling of pilots is more difficult than often expected. To deal with the pilot paradox it is first of all important to manage expectations: what is the goal of the pilot? Is it to test a new theory, to give impulse to research, or to search for possible changes in policy? Building with Nature creates Nature-based Solutions, which is of importance to climate adaptation and other effects of climate change. Most pilots on this topic will, or should, therefore look for possible changes in methods or policy. A change in how they approach similar projects and how they can include more nature in this. Creating of parallel processes can help with this. Parallel to the small process of the specific pilot, a larger process can be organised which includes more stakeholders, people from different departments and critics. This larger process can discuss the application in practice on a larger scale. What are advantages/disadvantages and what kind of problems could arise? Lastly, from the start of the pilot there has to be willingness from politicians and policymakers to accept and work with the outcomes of the pilot. In that sense, a pilot is not without obligation (Breman et al, 2017). Rotterdam has managed to slightly upscale the tidal parks by creating a programme. The programme involves more than 15 partners: governmental organisations (Rijkswaterstaat, water boards, municipalities, province), NGO's (WNF, ARK Natuurontwikkeling), and knowledge institutions (Tauw, Deltares). Not all organisations will be involved in every project, however, by having created this programme as a parallel process they can research the upscaling and implementation of these pilots citywide and even beyond the Rotterdam city borders. The programme has led to multiple tidal parks in and around Rotterdam and more are planned including one in the Maashaven. The upscaling in Rotterdam is moving in the right direction, however, soon all the low hanging fruit will be picked and they will need to start looking to larger projects and make more drastic decisions. *'I do think that everyone is really scratching their heads about: what is the next phase? There are many opportunities for new parks. But at some point you have to make more drastic choices. For example, the Waalhaven. In our vision [Ark Natuurontwikkeling], we do not want to have industry in the Waalhaven any longer and instead create a tidal park. These are of course big choices that are long-term and require a lot of lobbying power. The idea of making the river more shallow is that ports of the future will need less space because less fossil fuels are used. And that they would go to offshore islands.'* (Resp. B). The Waalhaven is currently still in use as an industrial harbour basin, however, the change to a tidal park could be a huge step and add to goals as water quality, greening of the area, and water safety on a larger scale than we have seen so far. A decision like this would mean that the acceleration phase has really taken off.

5 Conclusion

5.1 Answering research question

The first sub-question: *'How is Building with Nature included in current urban policies?'* is answered in the policy analysis in the results chapter. The importance of using nature, creating urban green, and combining it with other functions is acknowledged in the policies and deemed important in spatial planning and climate adaptation. However, the terms of Building with Nature and/or Nature-based Solutions are not used in the policies. This could be because of a lack of familiarity, the specificity of the concept, or the differences in definitions. More education on the concepts and their benefits could help.

The second sub-question: *'Till what extent do the Building with Nature cases of Rotterdam and Dordrecht contribute to resilience?'* is answered by literature study and interviews. The foundation for this question can be found in the theoretical framework. The drafting of the interview questions and the analysis of the interviews was done according to the flood resilience framework of Davoudi (2012), Davoudi et al (2013), Restemeyer et al (2015), and Pelling (2011) which include robustness, adaptability, and transition. The results indicate that the contribution to robustness was limited. There is contribution but this could have been more if robustness was a goal of the projects. Furthermore, the small scale of the projects could also be an indication of why robustness was limited. This was not expected considering the literature on Building with Nature in the theoretical framework. It could be that there is more contribution if the tidal parks are constructed on a larger scale. On the adaptability component, the cases scored relatively good. Multifunctionality is stimulated by combining functions of nature and recreation. There is a strong focus on preserving and reviving nature with many aquatic and non-aquatic measures. However, it is acknowledged that the area is still urban green and therefore has to be planned in a way that people can use and enjoy it. Adaptability can be increased by collaborating with different stakeholders and different sectors/disciplines/departments. The results show that collaboration was mostly informing and consulting, but protests were taken seriously. However, there was no real decision-making power for citizens. A note here is that in two cases there were not many citizens living in close proximity which could influence the amount of public participation. All interviewees agreed that there seems to be more awareness and support for climate adaptation projects in general by both the public and politicians. Furthermore, the changes in the physical environment combined with information boards at the specific sites show why the tidal parks are being constructed which in turn can create more awareness. In short, there is a change in mind-sets visible but this does not mean that the transition to a new water culture is even remotely finished, however, this can be seen as a positive first step.

In the third sub-question *'What are lessons learned for use in other urban areas?'*, a generalization is made to show what elements are necessary for use in other urban areas and for upscaling the concept. Several striking parts from the interviews and literature about upscaling pilots indicated various points that should be taken into account. These

include a sense of urgency by public, politicians, and policymakers, collaboration with citizens and between disciplines, and including application of pilots in larger policies to avoid the pilot paradox. Furthermore, by implementing a tidal park inspiration can be found in the already existing ones. This research does not create a blueprint for tidal parks that can be copied one on one. An important part of Building with Nature is to understand the natural system of the specific site and to build on this. This means that every tidal park will be different and needs a tailored approach.

By answering the sub-questions, the main research question can be answered: *'How can Building with Nature projects contribute to flood resilience in Dutch urban areas?'*. Building with Nature can contribute to all aspects of flood resilience, namely robustness, adaptability, and transition. In order for a city to be flood resilient it has to pay attention to all the aspects equally. The contribution to robustness is clear from the literature, however, the cases show that priority, and scale and size of the project also matter. The results and literature also show that awareness and a sense of urgency is a particularly important for a transition to happen. The transition element needs more attention if a change to a new water culture ('living with the water') will happen. Considering the effects of the command-and-control approach and the impacts of climate change, such a transition is needed to deal with any type of flood (Restemeyer et al, 2015). Thus, the more cities foster change in institutional, social, and political dimensions, the more resilient a city becomes.

5.2 Contribution to planning theory and practice

During the research, several insights were gained which contribute to both planning theory and planning practice. This contribution has partly been explained in the paragraph 1.3 and 1.4, the scientific and societal relevance. Due to the uncertainties about climate change developments and the complexity of socio-ecological systems like cities, there is need for an improved understanding of resilience theory. Hence, this research contributes to flood resilience theory. Furthermore, it contributes to the relation of the elements of resilience (robustness, adaptability, transition) and their interaction with current and future policy.

This research also adds to the growing body of literature on Building with Nature and Nature-based Solutions. The link with robustness has been clear from existing literature, but Building with Nature can also contribute to the other components of flood resilience and thereby can overall contribute more to multiple disciplines. Furthermore, Building with Nature requires a different attitude towards uncertainty than the standard command-and-control approach (Van Den Hoek et al, 2012). Including this uncertainty in policy as well as in the project is part of the transition and the system shift towards a new water culture. This research adds to planning practice in the Dutch context which is currently in transition. It provides insights in how Building with Nature can work in a new system and what is necessary for upscaling. Lastly, this thesis provides insight how societal changes are necessary in order to deal with water-related consequences of climate change. Becoming and staying resilient can only be achieved if everyone participates. Participation can occur in different forms and it is necessary to tailor this to the specific project. However, people's mind-sets and attitudes towards climate adaptation, Nature-based Solutions, and Building with Nature needs to change further, because residents of a city should and can contribute to flood resilience.

6 Discussion

This thesis studied the contribution of Building with Nature to flood resilience in urban areas. A framework on the basis of robustness, adaptability, and transition was used to analyse the cases in Rotterdam and Dordrecht. Together with a policy analysis, this has led to an analysis focused on political, social, and institutional dimensions. Design aspects that contributed to one or more of the elements of flood resilience were included, however, there was not a specific focus on the designs of the parks.

6.1 Policy, robustness, adaptability, and transition

The policy analysis showed that the ideas of Nature-based Solutions are implemented in urban policies, although it is not named as such. The importance of (urban) green and combining nature with other functions in the city has been acknowledged in the analysed policies. However, these particular cities have high ambitions and are therefore perhaps not representative for the entire country or for national policy. These ambitious policies can be used as inspiration or an example. Policies are an important part of a transition; they can stimulate it or hold it back. In transitions, we distinguish different levels: macro (social values, global worldviews), meso (dominant practices, guides policy), and micro level (individual actors, local practices). Local practices on the micro level can work as a catalyser for transitions on the meso level (Rotmans et al, 2001). If Building with Nature can be established in local policies, it could have influence on national policies from there.

Robustness was in none of the researched cases a goal of the project. Considering the literature on Building with Nature is mostly focused on flood safety (Van Slobbe et al, 2013; Ecoshape, 2020a,b) and several other Building with Nature projects in the Netherlands (e.g. the Sand Engine) have this goal as well, this was not expected beforehand. An answer to why this is was not found in literature. It could be that this observation has not been made before as a result of academic research. A possible explanation could be that there is discussion about the definition of Building with Nature and a choice was made in the cases to focus more on the nature aspect. Even though it was not a goal, a tidal park can still contribute to flood protection, however, the effect will most likely be less. Another point is that the current tidal parks are still made on a small scale and therefore have less impact on flood protection of a larger area. If or when larger tidal parks are constructed, the effects they have on flood protection can also be researched more in-depth.

In the element adaptability combining of functions is considered quite high. All projects combined functions of nature and recreation. There was much attention for nature, both aquatic and dry nature. Urban green is receiving more attention as it is seen as important to the quality of urban life (Feltynowski & Kronenberg, 2020). This also became visible in the researched cases where there was much effort in increasing biodiversity. As mentioned in the literature review, Nature-based Solutions is the latest addition to a long list of environmentally friendly concepts to deal with the effects of climate change (Nesshöver et al, 2017). The focus on nature in the cases shows that there is an ongoing trend of using

these concepts in practice. However, it must also be noted that these (tidal) parks are also considered urban green and are meant to be used and enjoyed by people. Collaboration was the second part of adaptability.

Collaboration with citizens mostly stayed at the level of informing and consulting which was expected, however, beforehand there was hope for more involvement. Protests were taken seriously, however, there was no real power for citizens. The question is whether this is possible or wanted in this situation. For the creating of tidal parks specific knowledge is necessary; on how to construct it, what kind of flora and fauna is planted or desired, and what effects could be on the rest of the river (e.g. erosion/sedimentation). This means that there is a high amount of expertise involved. In the literature review, Few et al (2007) questioned whether a high level of citizen involvement (co-creation) is possible in every situation. Involvement of citizens at the consulting level with a democratic check could also be a possibility instead of a 'failed' co-creation project. As long as citizens are listened to and taken seriously, an expert-led discussion with citizen involvement at the consultation level perhaps might be the highest achievable option. However, this should be tailored to every project specifically. Another point to make for these specific cases is that for two cases (Brienenoord Island and Wervenpark) there are no citizens living closely to the parks. The Brienenoord Island is not inhabited and houses in the neighbourhood Stadswerven are yet to be constructed. Citizens who live farther away and have less of a stake in the project, would be less inclined to participate in a participation process.

The last element of flood resilience is transition where the results show that there is a change in mind-sets of citizens and politicians. Interviewees felt that there is more awareness and support for climate adaptation and urban green measures. These results indicate that there is a start towards thinking differently about water management and climate change. The results also imply that a transition to a new system is still very much a work in progress and also the most radical component (Folke et al, 2010). Changing people's mind-sets is not easy and transformation in climate adaptation goes hand in hand with embracing the broader challenges of sustainable development (Tàbara et al, 2019). Roggema (2012) argues that transformational change should start at a time when the existing system is still full operational. The existing system of flood risk management with a command-and-control approach is still very much operational, however, the results show that transition towards living with the water has started, both in mind-sets as well as in policy. Nevertheless, it is important to be aware of the 'weak profile' of environmental policies. Environmental problems, including climate change, can be difficult for politicians, policy-makers, and the public to understand because of the scientific aspects and use of jargon (Zuidema, 2016). Furthermore, it is not always tangible. This makes it difficult to see the benefits of environmental policies versus the loss of benefits of, for example, economic growth. Additionally, environmental policies and projects have to compete with other social problems such as the housing shortage. Priority could be given to short-term benefits, such as more houses, over long-term benefits as climate adaptation. Counteracting this weak profile could be done by enforcing policies from the central government, financial incentives, and informing, persuading and creating awareness (Zuidema, 2016). If we want environmental policies to go through, to be implemented and thereby move forward in the acceleration phase in the transition, we will need all of these arguments.

6.2 Reflection

The cases used during this research are at a local level. This is because Building with Nature still often uses pilots and projects on a small scale to test the method. During the research it became difficult to set the exact boundaries for this research. This is because of the differences in stakeholders and events on multiple scales. The boundaries for the cases are clear, however, the transition element of the flood resilience framework works on a much larger scale. It is therefore difficult to say how much three small scale cases contribute to a national or international transition.

As mentioned before, the cases chosen are located in cities that are not considered a general Dutch city but rather frontrunners on climate adaptation. This was unavoidable due to the fact that there are only a small amount of cases of Building with Nature in urban areas. However, it makes a generalization more difficult and readers should keep this in mind while reading this thesis.

The usage of semi-structured interviews was a valuable source of information. Not all of them provided an equal amount of information, some more than others. A limitation on this part is the variety of organisations. Most of the interviewees are from governmental organisations and only one from an NGO. The different perspective from an NGO was very helpful and the research might have given slightly different results if there had been more variety between the interviewees. Most relevant stakeholders were interviewed, citizens or civic groups were not interviewed. There were no specific civic groups known that were involved beforehand and the interviews confirmed this. An addition to the research could have been to interview people in the neighbourhood about their view on the tidal parks. However, due to the Covid-19 pandemic and the distance between the researcher and the cases this was not possible.

The results partly met my expectation. I did not expect that robustness was not a goal of any in the cases, especially considering the other Building with Nature projects in the Netherlands and the existing academic literature. That collaboration was limited was not surprising although I had hoped for more. Transition was slightly new for me as I did not know as much about it as the other two components of resilience. That this component is the most important is, in hindsight, not very surprising.

7 Recommendations

This thesis focused on both urban level as well as case level which gave a broad view of the several aspects of flood resilience. In light of the lessons learnt and conclusions that were drawn from the data, the most important recommendation is to focus more on fostering societal change. Of course, this is a difficult process and will not happen overnight. However, it is instrumental to achieve climate adaptation and sustainability.

Involving a communication department or team early on in a project could help with increasing public participation and thereby also increase awareness and support. Becoming resilient is a shared task of government and citizens and by communicating from the start and being transparent citizens feel like they are more a part of the project.

I would recommend follow-up research on the role of citizens in specifically Building with Nature projects. The 'why' question has been answered, however, the 'how' question has not. Furthermore, I would recommend further research on how robustness can be more integrated in urban Building with Nature projects to increase the overall resilience.

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Appendix 1

Interview Guide Cases

General
- Could you state your position within the organisation and project?
- How did this project come about?

Building with Nature
- To what extent was Building with Nature used in this project?
- What do you see as Building with Nature?
- How was Building with Nature integrated in this project?
- Why was it decided to apply Building with Nature?
- Who was involved during the making of the design?
- Was Ecoshape, as expert, involved in the project?
  - Where the guidelines used?
- What were specific points that were taken into account during the design?

Robustness
- What were the goals of this project?
- Was flood protection a goal of this project?
- To what extent does the design work against floods?

Adaptability
- Which stakeholders are involved in the project?
- With whom did you work together (different disciplines, departments)?
- How did you experience the collaboration between the different stakeholders?
- Was there anyone you didn't work with but should have been involved?
- Is there something in the collaboration that you would do differently in a similar project?
- Which functions does the project area have?
- Was there chosen to combine functions?

Transformability
- Were civic groups or individual citizens involved in the project?
- To what extent were they involved in the different phases of the project (from initial idea till implementation)?
  - What was their influence on the project?
- To what extent was there support from citizens?
- To what extent was there support from politicians?
- Do you notice any changes in people's attitudes for this kind of nature development projects, between now en 5 years ago?
- To what extent is Building with Nature included in the climate adaptation- or resilience policy in your city?

Closing
- What did you learn from this Building with Nature project?
- How do you think Building with Nature is going to develop in the future?

Appendix 2

Interview Guide Ecoshape

Vanuit mijn opleiding Environmental & Infrastructure Planning aan de Rijksuniversiteit Groningen ben ik bezig met het schrijven van mijn master thesis over Building with Nature in de stad en hoe dit bijdraagt aan flood resilience. Hierbij heb ik flood resilience gedefinieerd met robustness, adaptability en transformability en dit uiteraard nog verder concreet gemaakt. Ik maak gebruik van drie casussen: het Brienenoordeiland en de Nassauhaven in Rotterdam en het Wervenpark in Dordrecht. Alle drie zijn dit getijdenparken in stedelijk gebied.

Na de interviews die ik heb afgenomen met medewerkers van de gemeente Rotterdam en Dordrecht, Rijkswaterstaat en ARK Natuurontwikkeling bleef ik met enkele vragen achter over dingen die mij opvielen tijdens de interviews.

- Ik heb interviews gedaan met medewerkers van de gemeenten, Rijkswaterstaat en ARK die aan de projecten hebben gewerkt. Zij gaven aan dat Ecoshape alleen in het begin betrokken was bij de projecten.
  - Wat is precies jullie rol geweest in deze tijd?
  - Wat hebben jullie aan expertise meegegeven?
  - In hoeverre zijn jullie door de design steps van Ecoshape gegaan met de projectleden?
- Vanuit de literatuur komt een beeld dat Building with Nature voornamelijk wordt gebruikt in combinatie met 'engineering' of 'flood protection' (bescherming tegen overstromingen). Voorbeelden die tijdens presentaties e.d. worden gebruikt versterken dat, bijvoorbeeld door de Zandmotor als voorbeeld te nemen. Echter werd tijdens de interviews duidelijk dat voor de gemeenten bescherming tegen overstromingen geen doel was en alleen Rijkswaterstaat gaf aan dat het mooi meegenomen was.
  - Is dit ook jullie ervaring?
  - En hoe zouden jullie dit verschil in doelen verklaren tussen de literatuur en praktijk?
  - Is dit verschil in doelen misschien iets specifieks voor stedelijk gebied?
- Tijdens de interviews merkte ik dat de meeste mensen niet doorhadden dat ze Building with Nature gebruikten of hadden ze een ander beeld er van. De term natuurinclusief bouwen werd vaker gebruikt.
  - In hoeverre zit daar volgens jullie een verschil in?
  - Merken jullie vaker dat de term Building with Nature verwarring brengt?
- Waarom zouden medewerkers niet specifiek Building with Nature kennen? Is dat omdat het concept te abstract is/te moeilijk/niet praktisch toepasbaar genoeg etc?
- Tot slot, twee vragen die ik bij alle interviews heb gesteld.
  - Merkt u verandering in hoe mensen/omwonenden reageren op Building with Nature/natuurontwikkelings-projecten tussen nu en 5 jaar geleden?
  - Hoe denkt u dat BwN zich gaat ontwikkelen in de toekomst?