

The influence of shock events in Flood Risk Management



Lessons learned by qualitative research of shock event **Floods in Limburg, July 2021** and case study **Planned housing developments in Park de Valkenier** in the Municipality of Valkenburg aan de Geul, to improve the Flood Risk Management decision-making process regarding planned housing developments in flood prone areas of the Netherlands

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COLOFON

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Utrecht, November 2022

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Flooding damage in amusement park Park de Valkenier in the Municipality of Valkenburg aan de Geul, July 2021 (Copyright: 1Limburg, via <https://www.1limburg.nl/nieuws/1462509/pretpark-de-valkenier-rest-van-jaar-dicht-na-overstroming>)

PREFACE

Utrecht, November 2022


The choice for the floods in Limburg as the research topic for this Master's thesis is influenced by my personal experience. About year ago, I completed my Bachelor's thesis regarding how to deal with rain water floods in a sloped neighbourhood of Nijmegen, whilst mainly focusing on technical measures as disconnecting the rain water sewerage from the wastewater sewerage system. After finishing that research in the summer of 2021, I went on a camping trip with my boyfriend where we visited the city of Liège (*Luik*) in Belgium. We arrived there on the 19th of July, only a couple of days after an enormous flood event occurred. The sight of the damage was impressive and it had a major impact on me. I will never forget the look on people's faces whilst they were sitting on the sidewalk next to all their soaked, muddled and destroyed belongings, piled up next to their houses, waiting for yet another garbage truck come to pick everything up.

This inspired me to finish my degree in Spatial Planning with a focus on water management and flood risk caused by climate change, resulting in the choice for the Master's specialisation in the track Cities Water and Climate Change. Whilst designing a rough draft for this research, my main goal was to contribute to (a part of) the solution to this pluvial flooding problem. Even though the effects of climate change may be inevitable, I still felt the drive to help reduce some of the consequences of it. Luckily, both the Radboud University and Witteveen+Bos gave me the opportunity to do so.

This resulted in writing my Master's thesis at the office of Witteveen+Bos, in between numerous of passionate engineering consultants. I want to thank mr. Ypma for guiding me through my internship and for answering all my questions as a newbie in the world of consultancy. His connections at the Water Authority of Limburg and the Province of Limburg were really helpful to get in touch with relevant interviewees. I want to thank my supervisor mr. Meijerink as well, not only for organising convenient thesis group meetings on campus, but also for his critical yet constructive individual feedback. Even whilst I sometimes got lost in infinite numbers of theories... and methods... and strategies..., he kept providing me the structure and guidelines I needed to graduate. I also want to thank all the interviewees for their contribution to my research and for their passionate stories, which inspired me to apply for a job at a Water Authority myself. Last but not least, I want to thank my friends, roommates, boyfriend, and family for supporting me through the last phase of my academic career.

The results of this research have to find their way into the spatial planning field of the Netherlands. To reach that goal, I will take my responsibility and introduce my findings into the working environment during my first job as Plan Advisor at the Water Authority of Rijnland, in Leiden.

Enjoy reading,



Denise van Haastrecht
MSc Spatial Planning

SUMMARY

Climate change causes heavier rainfall events in shorter periods of time. The consequences of climate change, such as flood events, are especially visible in urban areas. Due to population growth, there are one million new houses needed in the Netherlands by the year 2030. Over 820.000 of these planned housing developments happen to be planned in flood prone areas. The floods in the Dutch province of Limburg in July 2021 figure as a shock event which created national awareness regarding the questions *where* and *how* to construct new residential areas.

The goal of this research is determine how Flood Risk Management could be improved. To study this, the concept of Multi-Layer Safety (*meerlaagsveiligheid*) will be used. MLS is the combination of three strategies to reduce flood risk: 1) flood prevention, 2) sustainable spatial planning, and 3) disaster management. Flood Risk Management in the Netherlands is known for its technocritical measures to reduce the probability of floods (Layer 1 of MLS). As climate change increases the risk of flooding, the implementation of Flood Risk Management must also be focusing on other measures than the technocratic approach, such as sustainable spatial planning. An example of this are exposure reduction measures: prohibited or adapted building near river beds and other flood prone areas (Layer 2 of MLS). To change or shift the leading policy approach in the Dutch governance system from technocratic to spatial measures, coordination across multiple levels of actors is required – from local and regional to national.

The main research question focuses on the planned housing developments in the (in July 2021 flooded) former amusement park Pretpark de Valkenier in the Municipality aan de Geul, in a way to improve the (policy) decision-making process regarding planned housing developments in flood prone areas of the Netherlands. To study this question, the method of a longitudinal single case has been used.

The theoretical foundation used in this research is the CIAD Framework: a slightly adjusted, more critical and politicised framework than the original Institutional Analysis and Development Framework by Elinor Ostrom. This framework is used to explain the so-called interactions in the arena regarding Flood Risk Management – not only in the Municipality of Valkenburg aan de Geul, but also in the Province of Limburg and in the National Government, since interactions and policy developments are taking place on multiple scale levels at the same time.

Three findings from the longitudinal single case study of Park de Valkenier seemed to be the most outstanding, since the interviewees did not only mentioned the downsides and problems, but also how this could be improved. These three main elements are 1) the translation from more abstract, general policy documents into concrete rules on local scale in a correct way (*doorvertaling*); 2) responsibility issues and the role of the Water Authority; and 3) the finance system for the regional water system. The three main conclusions focus on these three elements and how to improve them. These findings can be used to improve future Flood Risk Management strategies and policy development, regarding housing developments in flood prone areas (Layer 2 of Multi-Layer Safety).

The most important recommendation for consultancy companies is to keep flood risk into account in spatial plans, even whilst the Water Assessment does not (yet) require to take run-off water in sloped landscapes or low-lying landscapes into account. Focusing on the complete water system is essential for developing climate proof and flood proof designs.

Keywords Institutional Analysis – Flood Risk Management – Spatial Planning – Multi-Layer Safety

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LIST OF ABBREVIATIONS

CIAD	Critical Institutional Analysis and Development
FRM	Flood Risk Management
IAD	Institutional Analysis and Development
KNMI	Royal Netherlands Meteorological Institute (<i>Koninklijk Nederlands Meteorologisch Instituut</i>)
MinBZK	Ministry of the Interior and Kingdom Relations (<i>Ministerie van Binnenlandse Zaken en Koninkrijksrelaties</i>)
MinIenW	Ministry of Infrastructure and Water Management (<i>Ministerie van Infrastructuur en Waterstaat</i>)
MLS	Multi-Layer Safety
MSF	Multiple Streams Framework
NWP	National Water Program (<i>Nationaal Waterprogramma</i>)
OFL	Physical Environment Consultative Council (<i>Overlegorgaan Fysieke Leefomgeving</i>)
PDA	Policy Document Analysis
RWS	Department of Waterways and Public Works (<i>Rijkswaterstaat</i>)

“We konden ons technisch veel permitteren bij investeringsbeslissingen en het democratisch toedelen van functies aan landgebruik. Het water is volgend en het Waterschap zorgt ervoor dat het water wordt gefikst. Die tijd hebben we wat mij betreft achter ons gelaten”

Deltacommissaris Peter Glas

Toelichting Deltaprogramma 2021 – 9 november 2020

“Er is een cultuuromslag nodig waarin we accepteren dat we land, water en bodem niet meer volledig naar onze hand kunnen zetten. Het dwingender maken van de Watertoets in het nieuwe Coalitieakkoord onderstreept de urgentie hiervan. Met deze passage in het Coalitieakkoord is de eerste stap in de goede richting gezet. Een logische vervolgstap is het aanscherpen van wet- en regelgeving door het Rijk, om te zorgen dat het niet alleen bij mooie woorden blijft”

Voorzitter van de Unie van Waterschappen Rogier van der Sande

Reactie op Coalitieakkoord 2021-2025 – 15 december 2021

1. INTRODUCTION

1.1. Increased flood risk due to climate change and spatial planning

Climate change

The slowly but steady rise in average temperature on Earth results in more water vapor in the air (Lenderink & Meijgaard, 2010). This does not only cause more rain to fall, but it also leads towards heavier rainfall events in shorter periods of time (KNMI, 2016). Therefore, climate change causes extreme weather events, such as extreme periods of drought followed by intense rainfall (IPCC, 2012). The most recent report from the IPCC also mentions the *domino effects* caused by climate change, such as heats, droughts and also rain water floods (IPCC, 2022). On a global level, the number of damaging flood events has increased in the last century (White, 2010). According to Rosenzweig et al. (2017), it is very likely that global climate change will result in more short and intense rainfall events worldwide. Prolonged periods of precipitation and an increase in the intensity of this rainfall results to an increase in flood risk. One of the most frequently cited causes of climate change in academic literature is the increase in floods (Lehner et al., 2006; Dankers et al., 2013; Arnell & Gosling, 2016). Pluvial flooding is one of the main challenges which have to be tackled in the near future (Dai et al., 2018). The consequences of climate change, such as flood events, are especially visible in urban areas (Albers et al., 2015), which stresses the importance of adaptation towards climate change in urban areas (Carter et al., 2015).

Risk based approach

From the 21st century onwards, there has been a shift from flood protection to Flood Risk Management (Merz et al., 2010). Flood Risk Management can be divided into three elements: flood probability (hazard reduction), enhancing the capability to deal with floods (vulnerability reduction), and by limiting the potential flood damage (exposure reduction) (De Moel et al., 2009). Flood risk can be defined as “the probability of negative consequences due to floods and [...] is interpreted as harm to flood-prone elements with a specific vulnerability (elements at risk) due to probable flood events with their features” (Schanze, 2006, p. 3). This means that flood risk can be measured by multiplying the probability of a flood event and the consequences of that flood (*risico = kans x gevolg*) (De Moel et al., 2009).

Spatial planning in flood prone areas

Therefore, the increase of probability of floods due to climate change is not the only factor influencing the risk of flooding. The consequences of floods are increasing as well. As if dealing with climate change and flood events wasn't complex enough already, Dutch newspaper NRC headlines on December 7th, 2021: "820,000 new houses planned in vulnerable areas" (NRC, 2021). This is concluded in a report written under the leadership of Delta Commissioner mr. Peter Glas, who is the policy advisor for, amongst other things, reducing the risk of flooding in the Netherlands. Out of the one million houses that are planned to be built in the Netherlands by the year 2030, a total of 820,000 happen to be planned in an area where the risk of flooding and other climate consequences is high (NRC, 2021). According to Glas's advice, the consequences of climate change are hardly taken into account when determining residential destinations in the Netherlands. Since technocratic measures as raising dikes are no longer sufficient to the consequences of climate change (Glas, 2021), a new approach and vision towards combining Flood Risk Management and spatial planning is highly necessary.

1.2. From technocratic to spatial approach in FRM: Multi-Layer Safety

From technocratic to spatial approach

Extreme flood events are not new in the Netherlands. The most recent floods took place in 1906, 1916, 1953, 1993 and 1995 and 2021. These floods led to technical solutions to protect the Netherlands from water, such as the *Zuiderzeewerken*, *Deltawerken*, *Maaswerken* and the *Hoogwaterbeschermingsprogramma* (Rijkswaterstaat, 2022). The Netherlands gained worldwide fame for its expertise in constructing dikes and dams to manage water (Huisman, 2004), which from now on will be referred to as the *technocratic approach*. The general vision that water can be managed in a technocratic way with dikes and dams, shifted towards a more spatial approach after two major flood events in 1993 and 1995. These events resulted in the start of a famous spatial planning program called Room for the River (*Ruimte voor de Rivier*), where the water of the main rivers in the Netherlands literally got more space. In addition to these measures, a lot of new dikes have been constructed as well after the flood events of 1993 and 1995 (*Deltaplan Grote Rivieren*). This resulted in the rivers Rijn and Maas to carry bigger quantities of water during high water levels (Rijkswaterstaat, 2022).

Multi-Layer Safety

In line with the spatial approach of creating more room for the river, the concept of Multi-Layer Safety (MLS) has been introduced in the Dutch National Water Plan in the year 2009 (see Figure 1). The main idea behind this was to achieve sustainable Flood Risk Management policy for floods from the main water system (Nationaal Waterplan, 2009). The Dutch government argues that Multi-Layer Safety fits well to provide flood protection, whilst also reducing the societal damage in case of a flood event. The approach makes use of three different layers (Rijksoverheid, 2009b, p. 12), which will be further elaborated in Chapter 2:

- Layer 1. Flood prevention;
- Layer 2. Sustainable spatial planning;
- Layer 3. Disaster management.

Figure 1. Three layers of Multi-Layer Safety (Nationaal Waterplan, 2009)



The shift from a technocratic to spatial approach, displays a broader change of perspective in Flood Risk Management: from high water protection towards risk management. But even whilst the concept of Multi-Layer safety has been used in policy documents since 2009, the focus of FRM strategies in the Netherlands is still dominantly focused on Layer 1: Flood prevention (Ministerie van Infrastructuur en Milieu, 2014b). The responsibility for taking measures in Layer 2: Sustainable spatial planning is up to municipalities and provinces, but this is not mandatory or binding (as will be discussed in the Societal Relevance at the end of Chapter 1). This explains how 820,000 houses can be planned in flood prone area – which is in clear contradiction with Layer 2 of MLS. Therefore, there is a need for improvement in (policy) decision making regarding Flood Risk Management.

1.3. The need to improve flood governance: an institutional perspective

Governance and institutions

The concept of *governance* can be understood as executing the policies, control, power, rules and principles of organisations (Oxford Dictionary, 1974). In the work of Ostrom, the founder of the theoretical framework this thesis is based on (see Chapter 2), the concept of *institutions* is described as “the prescriptions that humans use to organize all forms of repetitive and structured interactions” (2005, p. 3). Institutions can also be understood as all the rules, norms or strategies which create “incentives for behaviour in repetitive situations” (Van den Hurk et al., 2014). The concept of an *institutional field* is defined by Scott (1994, p. 206) as “a social arena in which individuals and organizations partake of a common meaning system and interact more frequently with one another than with actors outside of the field”.

Flood governance

In Europe, flooding is the most frequently occurring natural disaster and it causes the highest amount of economic damage (Driessen et al., 2016). Recent studies mention the importance of developing some sort of connectivity between different Flood Risk Management strategies, but also between governmental levels (Gilissen et al., 2016) and between different policy domains (Suykens et al., 2016). According to Driessen et al. (2016, p. 7) “a better coordinated and complementary suite of strategies will ensure effective Flood Risk Management”. Therefore, the increase in flood risk due to climate change and spatial planning decisions stresses the need to improve *flood governance*. Flood governance is necessary, since changes in a specific strategy tend to lead to a lack of integration amongst different strategies (Hegger et al., 2016). This becomes visible in the disbalance between measures in Layer 1 versus Layer 2 of Multi-Layer Safety.

Institutional perspective

Since water governance covers a combination of multiple overlapping disciplines (e.g. spatial planning, environment, agriculture) and multiple issues (e.g. sea level rise, droughts, floods), a well-structured flood governance system is necessary to maintain and improve the current policy domain of Flood Risk Management. “Flood risks are often managed by water managers, but it is important to remember that spatial planners and risk managers also have an important role in cross-sector coordination” (OECD Report, 2019, p. 44). The OECD Report stresses the importance of integrating FRM and spatial planning to reach effective cross-sectoral coordination.

To study the topic of Flood Risk Management and decision-making in flood governance, the use of an institutional perspective can give clear guidance and structure. The institutional perspective is a part of flood governance. The OECD Report (2019, p. 2) explains that FRM strategies are spread between multiple levels of government, “resulting in interdependencies across levels of government that require coordination to mitigate fragmentation”. This means that flood governance does not only focuses at *what* to do, but also at *who* has to do something and at *which level* of government (local, regional or national). Therefore, an institutional analysis can help to give better understanding of why and how certain FRM strategies are being implemented. This will help to answer the question how to improve the decision-making process regarding planned housing developments in flood prone areas in the Netherlands.

1.4. The floods in Limburg, July 2021

The flood event in Limburg

The most recent flood event in the Netherlands took place in the Province of Limburg, in July 2021. Extreme rainfall occurred in a couple of western European countries, such as Belgium, Germany, and the Netherlands. During these floods, on Wednesday the 15th of July the peak level of water discharge in the river Maas reached its highest level of 3.260 m³ water per second – which is around 100 m³/s more than the floods of the Maas in the winter of 1993. In only a couple of days' time, an amount of rain fell which only occurs once between every two hundred to a thousand years' time. Nevertheless, even with the extraordinary amount of water discharge, due to the measures that have been taken in the past decades (*Maaswerken; Ruimte voor de Rivier*) the Maas did not overflow in July 2021. The Room for the River projects in the Province of Limburg were completed earlier that year. This happened to be exactly on time for the summer floods in July 2021. All the extra room for the river, e.g. bigger water buffers and floodplains, ensured that no lives of people from Limburg were taken during the floods (Deltaprogramma, 2022).

Main water system versus regional water system

However, this case study specifically focuses on the regional water system of streams as the Geul, instead of on the national water system of the Maas. Even whilst the main water system of the Maas did not overflow, the floods still caused major damage and critical circumstances in the regional water system of Limburg. An example of this are the floods next to the Geul stream. The water of the Geul could not flow into the Maas because the water levels of the Maas were so high, which resulted in the Geul stream to overflow itself (RVO, 2021). Therefore, the areas right next to the Geul, i.e. the Municipality of Valkenburg aan de Geul, experienced major flood damage. The high density of buildings next to this regional water system, which does not have dikes, raises questions about Layer 2 of Multi-Layer Safety: Sustainable spatial planning.

Shock event as an impulse for change

As mentioned in Chapter 1.2., the flood events of 1993 and 1995 created an impulse for the development of the Room for the River programme. Likewise, the floods of July 2021 started a new discussion regarding spatial planning in the Netherlands: where should those 820,000 homes be built, if a safe living environment near river bed areas cannot be guaranteed anymore? This raises the question how this housing problem must be tackled, whilst also prioritising Flood Risk Management to ensure water safety. After the catastrophic consequences of the floods in Limburg (which will be discussed more in-depth in Chapter 4 Case study), it might sound obvious not to build houses next to a river bedding or in a low-lying areas anymore. Nevertheless, this does not mean that such straightforward spatial planning recommendations regarding where to build are always being followed.

The floods of July 2021 could be seen as a trigger, since it created an impulse in the national awareness regarding the topics of flooding and Flood Risk Management. This raises the question if the floods in Limburg in July 2021 can be seen as a so-called *shock event* which leads towards a change in the current Flood Risk Management policy. If so, this shock event could be used as an opportunity window, since the floods might have given a wake-up call to the Dutch government, which creates the possibility to prioritise a diversification of Flood Risk Management strategies on the political agenda.

1.5. Research goal

Research goal

In the following research, the recent changes and developments in Flood Risk Management will be studied, assuming that the floods in Limburg figured as a shock event which opens windows for change. How could the current Flood Risk Management strategies of the Netherlands be improved, in such a way that the consequences of future flood disasters can be prevented or minimised during heavy rainfall caused by climate change? This could make not only a significant difference in future reconstruction costs, but in national safety as well. In the Province of Limburg there were no casualties, but the floods of July 2021 caused almost 240 casualties in neighbouring countries Germany and Belgium.

The research goal is to study the impact of the flood event and to figure out how policy documents and strategies regarding Flood Risk Management could be improved. New policy frameworks have to be developed to determine flood proof residential areas (*where to build*) and to determine how to construct buildings in a flood proof manner (*how to build*).

To figure this out, all the different elements of the institutional field will be investigated to get a clear image of the context. To give some focus to the institutional field, the planned housing developments in Park de Valkenier in the Municipality of Valkenburg aan de Geul will be used as an in-depth longitudinal case study. In short, this research aims to get a better understanding of the interactions between different governmental levels (local, regional and national) by studying the Flood Risk Management policies, spatial strategies and decision-making process in Park de Valkenier, regarding whether or not to allow housing developments in a flood prone area – and if so, under which conditions.

The final aim is to give conclusions and recommendations regarding the combination of Flood Risk Management and spatial planning (*where* and *how* to build in flood prone areas). In addition to that, specific recommendations for further research and for engineering consultancies (such as Witteveen+Bos) will be given. This gives engineering consultancies the possibility to improve their own water and housing related spatial planning projects, so that less flood damage to residential areas in flood prone areas will occur in the future.

1.6. Research questions

Research questions

The research aim has led to the formulation of the following research question and sub questions:

What lessons can be learned from the planned developments in the (in July 2021 flooded) former amusement park Pretpark de Valkenier in the Municipality aan de Geul, in a way to improve the (policy) decision-making process regarding planned housing developments in flood prone areas of the Netherlands?

- a. How can Flood Risk Management be conceptualised?*
- b. What does the current Flood Risk Management policy look like – on both the national (National Government), regional (Province of Limburg) and local (Municipality of Valkenburg aan de Geul) level?*

- c. *Assuming the shock event Floods in Limburg, 2021 created a window of opportunity for (policy) change, which elements changed as a consequence of this shock event, and how?*
- d. *Which of these elements could be improved, to overcome similar flood disasters in residential areas in the future? And how could this be improved?*

1.7. Societal and scientific relevance

Societal relevance

The effects of climate change cannot be ignored anymore and the Netherlands will have to deal with this. Or as described by the senior Policy Advisor in Water Policy Processes and Evaluation, from the Department of Waterways and Public Works (RWS), in a discussion about the floods in Limburg: “We cannot promise that we can prevent a similar event. That is why we have to calculate that this will happen again, so that we can minimise the consequences by dealing with it in a different way” (personal communication, orientational interview, 13th of Jan 2022). Therefore, this research is relevant to society because there is a need to improve Flood Risk Management, to decrease the risk of floods and to minimise the costs of reconstruction after a future new flood event. The occurrence of the floods in Limburg support this line of thinking, since the estimated costs of damage in Limburg caused by the floods are approximately about 1.8 billion euros (RVO, 2021). In addition to that, this research aims to help to determine *where* and *how* to construct new housing developments, which could provide support to the housing crisis the Netherlands is currently facing.

A number of developments took place as a reaction to the floods in Limburg. An example of this is the letter from Delta Commissioner mr. drs. P.C.G. Glas from the 7th of April, 2022. In an unsolicited letter to the Ministers of four departments (Infrastructure and Water Management; Agriculture, Nature and Food Quality; Nature and Nitrogen and Public Housing and Spatial Planning), mr. Glas stresses the importance of using the window of opportunity to deal with climate change and to incorporate climate adaptation measures. Glas explains that simply giving the Water Assessment “a more compelling character” (as decided in Coalition Agreement 2021-2025) and mentioning that “soil and water should get a more steering character” (as mentioned in the National Water Program 2022-2017) is not sufficient, more action must be taken by the national government to change the current Flood Risk Management approach. He states his concern about how the agreements from the Coalition Agreement will be put into practice, and how the translation of those agreements (*doorvertaling*) into rules and norms in all levels of flood governance will look like. The Environment and Planning Act (*Omgevingswet*) will aim to help and simplify the current laws and combine them, but this will only take effect from 2023 onwards – and this date has been postponed multiple times already. In addition to that, it is questionable how beneficial the new Environment and Planning Act will be for the developments in Layer 2 of Multi-Layer Safety, since tight rules and legislation only apply for Layer 1 of Multi-Layer Safety (Dijkman, 2015). The lack of concrete rules and norms about whether or not to build in flood prone areas (Layer 2 of MLS) make spatial planning a neglected topic in FRM, which stress the necessity of this research.

Scientific relevance

The effectiveness of technical measures are well grounded in Flood Risk Management literature (Dieperink et al., 2016), but the effects of flood risk are still hardly being taken into account in the field

of spatial planning (Layer 2 of Multi-Layer Safety). This is in line with the findings of Hegger et al. (2016), who found that changes in FRM strategy tend to lead to a lack of integration amongst different strategies. This is caused by the lack of specific requirements (*toetsbare en handhaafbare eisen*) for measures in Layer 2 of Multi-Layer Safety, which makes it less attractive to invest in Layer 2 than in Layer 1 (Kolen et al., 2010). In addition to that, recent studies mention the importance of developing some sort of connectivity between different Flood Risk Management strategies, but also between governmental levels (Gilissen et al., 2016) and between different policy domains (Suykens et al., 2016). According to Driessen et al. (2016, p. 7) ‘‘a better coordinated and complementary suite of strategies will ensure effective Flood Risk Management’’.

The question of how to improve FRM and flood governance actions received only little attention (Van den Brink et al., 2011; Jongman et al., 2015). Matczak & Hegger (2021) explain that the scholarly debate about Flood Risk Governance is highly fragmented, which complicates the production of new insights. The IAD framework has been used to study Flood Risk Management (Van den Hurk et al., 2014), but only a few studies conducted an institutional analysis on local, regional and national level to study governance processes in FRM (Pahl-Wostl et al., 2013; Dieperink et al., 2016). Therefore, more research regarding the combination of FRM strategies and governance could help to get a better understanding of this topic.

The flood event of July 2021 in Limburg is an outstanding opportunity to shed new light on Flood Risk Management, whilst incorporating an institutional perspective on local, regional and national governance levels. Analysis of the case of the planned developments in Park de Valkenier in the Municipality of Valkenburg aan de Geul will help to give insight into these complex governance interactions, and will show if a shock event influences these interactions. The institutional perspective will provide theoretical guidance and structure in understanding why and how certain FRM strategies are being implemented. This will help to answer the final research question, about how to improve Flood Risk Management in the Netherlands and where and how to construct new housing in flood prone areas in the Netherlands.

1.8. Reading guide

The remainder of this thesis will be structured as followed. Chapter 2 will introduce the theoretical perspective of this study, which is mainly based on the IAD and CIAD framework by Ostrom. Chapter 3 presents information about the case study selection of Park de Valkenier in the Municipality Valkenburg aan de Geul. It will also describe the research methodology, which is a longitudinal in-depth single case study with qualitative data retrieved from a Policy Document Analysis and with the use of fifteen in-depth interviews. Chapter 4 provides information about the case of Park de Valkenier and the main findings of the this research. In Chapter 5, the research question will be answered by the use of the four sub-questions. Multiple conclusions will be drawn from this. Also, the relevance of the theoretical and methodological framework for this type of research will be discussed. Finally, recommendations will be formulated for further research and some concrete advice will be given for the role of engineering consultancies regarding the topic of housing developments in flood prone areas.

2. THEORY

In this chapter, the main strategy of Dutch Flood Risk Management will be discussed: Multi-Layer Safety. This will be followed with information about flood governance, the institutional perspective, shock events and the window of opportunity. The theoretical underpinning of this research is based on the IAD and CIAD framework, which therefore will be described as well. Finally, the adjusted theoretical framework will be schematically visualised in 2.3. Conceptual Framework and explained in 2.4. Operationalisation, where all the concepts will be subdivided into indicators.

2.1. Literature and theories

2.1.1. Flood Risk Management: Multi-Layer Safety

Flood types

According to a recent world-wide study by the World Health Organisation, floods are the most frequently occurring type of natural disasters (WHO, 2019). A flood can be defined as a temporary covering of land by water, outside of its normal borders (Schanze et al., 2006). This can occur at river basins, in estuaries and at the coast line. There are three different types of floods can be distinguished: flash floods, river floods and coastal floods. A flash flood is a short, intense flood caused by the immediate response to high-intensity precipitation, which usually occurs in areas with an impermeable soil (Schanze et al., 2006). River floods and coastal floods are floodings which take place respectively near river embankments and the border between land and sea.

Flood Risk Management

The concept of Flood Risk Management can be defined as the “continuous and holistic societal analysis, assessment and mitigation of flood risk” (Schanze et al, 2006, p. 4). From the 21st century onwards, there has been a shift from flood protection to Flood Risk Management (Merz et al., 2010). The technological or technocratic approach to protect the Netherlands from water (i.e. by the use of dikes and dams) has been dominating flood risk management for a long period of time (Vitale et al., 2022). This technocratic perspective on flood control contributes to a “lack of flood awareness and a false sense of security to increased long-term flood risk” (Pielke, 1999; Correia et al., 1998). Since the effects of climate change are increasing the frequency of floods worldwide (De Moel et al., 2009), other measures to protect the low-lying country of the Netherlands must be taken: for example limiting or adapted building in flood prone areas near river bed.

According to De Moel et al., (2009), Flood Risk Management can be divided into three elements: flood probability (hazard reduction), enhancing the capability to deal with floods (vulnerability reduction), and by limiting the potential flood damage (exposure reduction) – which is visually represented in Figure 2. Flood risk can be measured by multiplying the probability of a flood event and the consequences of that flood (De Moel et al., 2009).



Figure 2. A systematic view of Flood Risk Management. As retrieved from Sitka Science

The technocratic measures as dikes and dams can be interpreted as hazard reduction measures. As Van den Hurk, Mastenbroek & Meijerink (2014) explain in their article, the risk-based approach emphasises the connection between spatial investments and water safety. This could be realised by shifting from the focus on hazard reduction (e.g. reservoirs for water storage, which have been implemented all over the Netherlands for the last couple of years) towards a combination of exposure reduction measures (e.g. limiting or adapted building in new residential areas near river beds or other flood prone areas) and vulnerability reduction measures (e.g. adjustments to individual houses, such as not using the first floor as a living area). These last two element are still lacking in Flood Risk Management. Therefore, the integration of these kind of spatial strategies could create a significant difference in water safety.

Multi-Layer Safety

The concept of Multi-Layer Safety (MLS) was introduced in the Dutch National Water Plan in the year 2009, to achieve sustainable Flood Risk Management policy for floods from the main water system (Nationaal Waterplan, 2009). The Dutch government argues that Multi-Layer Safety fits well to provide flood protection, whilst also reducing the societal damage in case of a flood event. The approach makes use of three different layers (Rijksoverheid, 2009b, p. 12).

1. Flood prevention;
2. Sustainable spatial planning;
3. Disaster management.

The first layer focuses on prevention measures, which means that floodings should be prevented as much as possible. The second layer aims at realising a sustainable way of spatial planning. The third layer focuses on a better organisational preparation for a possible flood – or in other words: disaster management (Nationaal Waterplan, 2009, p. 6). See Figure 1 in Chapter 1 for a visual representation of the layers. On the bottom is Layer 1, visualised by the construction of a dike. In the middle is Layer 2, by only building high enough not to get flooded by the river. On top is Layer 3, visualised with an evacuation map and a trauma helicopter to rescue people during a flood.

The concept of Multi-Layer Safety is based on a risk approach, as it concerns the need to address both the probabilities and possible consequences of floods (Maaskant et al., 2012; Asselman & Slager, 2012). This is contradictory to a more traditional flood defence approach (Kaufmann et al., 2016). Lowering the probability of floods is in Layer 1, lowering the consequences is incorporated in both Layer 2 and Layer 3.

The concept of Multi-Layer Safety has been introduced into spatial planning in the Netherlands in try-outs and pilots between 2009 and 2015. MLS turned out to be highly suitable for developing an area-oriented risk approach. It stimulated a change from the traditional vision that Flood Risk Management only consists of technical measures for flood control (being the first layer). MLS created an insight into the idea that sustainable spatial planning and impact reduction (the second layer) and the way in which an unexpected flood is dealt with in disaster management (the third layer) are important as well for sustainable Flood Risk Management. As a result of the successful pilots up to 2015, MLS found its way into national policy documents such as the Delta Program and the National Water Program (Nationaal Waterprogramma 2016-2021). Note that in policy documents written in the English language the three layers are being referred to as the three P's: respectively protection, prevention and preparedness. This is not in line with the terminology mentioned earlier, therefore the Dutch translations of the concept of Multi-Layer Safety will be used (prevention, sustainable spatial planning and disaster management).

Layer 1: Prevention

Every layer has its own measures that can be taken. The first layer contains of measures that try to decrease the probability of a flood (up to a certain level). Measures in the first layer can be: constructing new dikes and dams; raising and strengthening existing dikes and dams; lowering the chance of failure of embankments; fighting the occurrence of piping (water flow through a dike); realizing a Delta Dike (which is an extremely wide dike that does not collapse during high water flows and extreme conditions); reducing the hydraulic pressure on dikes (by creating more Room for the River or making adjustments in the distribution of water discharge into the river); and/or using Building With Nature measures (Stowa, n.d.)

Layer 2: Sustainable spatial planning

In the second layer, water safety can be achieved by making changes in spatial planning. This leads to a decrease in the consequences of a flood, if a flood actually occurs. Or in other words: reducing the negative effects of floods through applying changes in the physical spatial structure (Bosoni et al., 2021). Measures in the second layer can be: changing the location choice for new residential areas; limiting building in flood prone areas near river beds; risk zoning; building in a different way (elevation of houses, building on piles, wet-proof constructions, dry-proof constructions, floating constructions, amphibious homes) and protecting critical infrastructure (Stowa, n.d.). When looking back at Figure 1 and 2, adjustments in Layer 2 can be seen as *exposure reduction*.

Layer 3: Disaster management

In the third layer, water safety can be achieved by improving the disaster management. This will help when a flood actually takes place. Measures in the third layer can be: improving the evacuation plans; evacuation training; improving the awareness of citizens regarding their vulnerability of floods; informing citizens about how to take action during a flood; developing shelter areas; developing evacuation routes; developing adaptive evacuation strategies (combining horizontal and vertical evacuation) and developing communication strategies that can be used during a flood (Stowa, n.d.). In addition to that, flood insurance can be incorporated into the insurance system (Van den Hurk et al., 2014).

Lack of measures in Layer 2 of MLS

This research will focus on Layer 2 of Multi-Layer Safety. As mentioned in the Introduction, the river Maas could cope with the high water load in July 2021 in Limburg, because of the investments in Layer 1: Room for the River and flood defence projects (Deltares et al., 2021). Nevertheless, the tributaries of the Maas in the regional water system *did* overflow, which caused damage to the built area near the Geul stream. This shows that the FRM strategy around the regional water system in Limburg could use improvement in Layer 2 of Multi-Layer Safety. This is in line with the findings of a recent Dutch case study, which shows that the Flood Risk Management strategy of the Netherlands focuses mainly on Layer 1 (Dijkman, 2015). Kolen et al. (2010) explain the preference for Layer 1, because of the lack of specific requirements (*toetsbare en handhaafbare eisen*) for measures in Layer 2 of Multi-Layer Safety. Furthermore, the study of Dijkman demonstrates that measures in spatial planning (Layer 2) are not being incorporated, because of uncertainty regarding responsibilities and governance of spatial planning in FRM (Dijkman, 2015). This brings us to the next paragraphs about governance and institutions.

2.1.2. Flood governance and the institutional perspective

Flood governance and Flood Risk Management

The concept of *governance* has already been introduced as executing the policies, control, power, rules and principles of organisations (Oxford Dictionary, 1974). It refers to a system by which entities can be directed and controlled. Or as Koenen (1997) straightforwardly describes: governance is about control and power. Governance and government are not the same. The *government* of a country consists of (in the Netherlands elected) people who rule the state, whereas the concept of *governance* includes their actions and the way these (elected) representatives steer their country. This can contain multiple actors, such as non-governmental organisations, businesses and local communities. In summary, government are the people and governance are the procedures these people carry out.

The OECD Report from 2019 (OECD Principles on Water Governance to Floods) stresses the importance to enhance the coordination across local, regional, basin and national levels of government, since floods obviously do not take administrative borders into account. ‘‘Flood management is a shared responsibility with a primary role for national governments to develop policies, laws and institutions, and effective strategies for natural resources development’’ (OECD Report, 2019, p. 13). The report stresses that legislation is a proper tool to ensure policy coherence across these multiple authority levels which are responsible for water, spatial planning and other policy fields. Multiple sorts of governance can be distinguished. Hassenforder & Barone (2019) use Kooiman’s definition of governance, to explain *water governance* as such: ‘‘All those interactive arrangements in which public as well as private actors participate aimed at solving [water-related] problems or creating... opportunities, attending to the institutions within which these governing activities take place’’ (Kooiman, 1999 p. 70). Therefore, water governance strongly depends on the present *institutional* arrangements.

Institutions

In order to understand the governance processes regarding Flood Risk Management, it is important to look into *institutions*. North (1994, p. 8) describes institutions as ‘‘humanly devised constraints that structure human interaction’’. Polski & Ostrom (1999) and Ostrom (1992) define institutions as rules, norms and strategies which create ‘‘incentives for behaviour in repetitive situations’’ (Van den Hurk, Mastenbroek & Meijerink, 2014). An example of such rules could be the agreements of which governmental authorities are responsible for Flood Risk Management. In 2005, Ostrom defined the concept of institutions as ‘‘the prescriptions that humans use to organize all forms of repetitive and structured interactions’’ (Ostrom, 2005, p. 3). This shows why understanding the institutional field is important for a proper analysis in this research, because a change in policy (which might be necessary due to the effects of climate change on flood risk in the Netherlands), requires some form of institutional change (Giddens, 1979; 1984). Therefore, the institutional perspective is incorporated into this research.

Institutional perspective

The concept of an *institutional field* is defined by Scott (1994, p. 206) as ‘‘a social arena in which individuals and organizations partake of a common meaning system and interact more frequently with one another than with actors outside of the field’’. An institutional field can be understood as a bigger system of multiple actors (both organisation-wise and individual), which operate across boundaries of existing organisational fields. Institutions (and environmental factors) determine the possibilities within a society – which can be formal, such as laws, as well as informal, such as cultural standards or habits (Scott, 1994). Another explanation of the role of institutions in (spatial) planning by Alexander (2005,

p. 210) is the following: ‘‘All planning takes place within a specific institutional context, or often in sets of different and varying ‘nested’ institutional contexts as indeed do all societal activities.’’ There is a clear distinction between formal and informal institutions, which refers to the nature of certain processes or ways of communication (Pahl-Wostl, 2009). Official governmental authorities and legislation could be understood as a formal institution, whereas socially shared rules or discourses (such as norms and personal values) could be understood as informal institutions (North, 1994; Pahl-Wostl, 2009). Note that both the formal and informal institutional rules shape the (inter-)actions and behaviours of actors. Therefore, institutions determine the playing field of those interactions.

Recently, *water institutions* have been defined as ‘‘normative and cognitive frames – formal or informal – which concern water actors when they are engaged in collective action. Water institutions therefore include, among others, water laws, water-sharing rules, irrigation procedures, and beliefs linked to rivers, lakes and other water bodies’’ (Hassenforder & Barone, 2019, p. 2). According to the definition of Hassenforder & Barone, institutions have the power to shape (policy) choices in water management. Therefore, a better understanding of institutions and institutional dynamics is important to understand the processes that are taking place in Flood Risk Management, such as improving the (policy) decision-making process regarding planned housing developments in flood prone areas of the Netherlands.

2.1.3. Shock events, path dependency and window of opportunity

Shock events

Shock events can be interpreted as focusing events, which is an event that creates a considerable shock wave or stress wave in society (Kingdon, 1995; Birkland, 1998). Birkland defines the concept of a focusing event as ‘‘an event that is sudden; relatively uncommon; can be reasonably defined as harmful or revealing the possibility of potentially greater future harms; has harms that are concentrated in a particular geographical area or community of interest; and that is known to policy makers and the public simultaneously’’ (1998, p. 54). This means that a focusing event does not necessarily need to create harm, but it has the potential to do so. Shock events lean more towards emphasis on the shock wave an event creates, and therefore influences the inhabitants, media and politicians of a country. According to Kaufmann et al., (2016, p. 13), shock events ‘‘open up institutional arrangements and make them more susceptible to change. Shock events test the capacity to resist and bounce back, thus giving opportunities for adapting and learning’’. The article explains how this provides room for innovation and change. Focusing events (Kingdon, 1984), triggering events (Kagan, 1989), or shock events (Wiering & Immink, 2009) are highly important in Flood Risk Management, since floods can act as events which trigger and catalyse policy development. From now onwards, the term shock event will be used in this research.

The role of shock events in Flood Risk Management

Recently, Ingold and Gavilano (2019) tried to investigate the role of shock events towards governance in Flood Risk Management in Switzerland. They found that there is a relation between major changes in policy, actor arrangements and institutions and the occurrence of disasters and shock events. Ingold and Gavilano figured that major shock events such as floods, can lead towards a shift in paradigm in the national policy system. Whilst also investigating local and regional floods (shocks) and policy change, the main focus of their research is on ‘‘laws and regulations introduced by the national government and its related agencies’’. They conclude that flood events can have an effect on policy change: the bigger the flood, the wider scale the effect (Ingold and Gavilano, 2019).

Shock events, such as a major flood, create attention and momentum and therefore change the urgency of political action. This could lead towards a change in policy in the long term. Shock events can therefore function as a warning system to focus on structural problems (Kaufmann et al., 2016), but according to Kingdon (1995) this attention can easily fade away if people feel like the problem is solved, because the government tried to fix it “through (perhaps symbolic) legislation”.

Path dependency

Such vague, “perhaps symbolic” legislation could be interpreted as that “shock events do not necessarily account for radical policy change” (Meijerink, 2005, p. 16). *Path dependency* means that earlier steps or actions in a particular direction, could induce further movement in a similar direction (Arthur, 1989). From the perspective of policy analysis, path dependency refers to policies in which “preceding steps in a particular direction induce further movement in the same direction” (Pierson, 2000, p. 252). This means that path dependency has to do with the difficulty of changing a path, once it has been chosen (Wiering et al., 2018). Or as Van Buuren et al. (2016) more recently explained it: once a path is chosen, it might be too costly to leave that path.

The concept of path dependency explains that certain political processes (such as formulating new policy documents or Flood Risk Management strategies) can only be implemented if the factors that would normally constrain those processes, are opening up the way. By doing so, the *window of opportunity* for political action can be used (Van den Hurk et al., 2014).

Note that if the shock event of the floods of July 2021 changed the situation previous to the floods, it means that the window of opportunity has been used. If the situation did not change due to the shock event of the floods, that could probably be explained by the presence of path dependency. But since path dependency is an element in time, it is impossible to place it into the loop of the Conceptual Framework. Therefore, this concept will be not incorporated into the CF. After analysing the results in Chapter 4, the presence or absence of path dependency in Flood Risk Management will be discussed in Chapter 5.

Window of opportunity

When a disaster such as a flood occurs, it will create attention towards the direct impacts of the disaster and on how to recover the affected area. In addition to that, disasters can “catalyse structural and irreversible change by creating new conditions and relationships within environmental, socioeconomic and political structures, institutions and organisations” (Birkmann et al., 2010, p. 3). This could be seen as a *window of opportunity*. Kingdon (1995) explains that such a window can be opened by either the appearance of a problem (such as a flood) or an event in the political realm – such as a change in Flood Risk Management.

According to multiple studies in the field of extreme weather events caused by climate change, it is evident that “climate-related shocks can offer window of opportunity in which latent local adaptive capacities are triggered, leading to systemic improvement” (McSweeney et al., 2011, p. 1). A policy window can be of short in time-length, but it can also cast long shadows (Zahariadis, 2014). This means that the (policy) changes after a shock event could continue on for a longer period of time.

The Multiple Streams Framework by Kingdon

Kingdon (1995) explains policy change and policy dynamics in terms of three separate streams: *problems, policies and politics*, which is visually presented in Figure 3. According to Kingdon, these three streams come together at critical moments. “Solutions become joined to problems, and both of them are joined to favourable political forces. This coupling is most likely when policy windows – opportunities for pushing pet proposals or conceptions of problems – are open” (Kingdon, 1995, p. 20). This Multiple Streams Framework by Kingdon contributes to a better understanding of public agenda setting. The three streams of problems, policies and politics interact with each other and together produce a so-called window of opportunity.

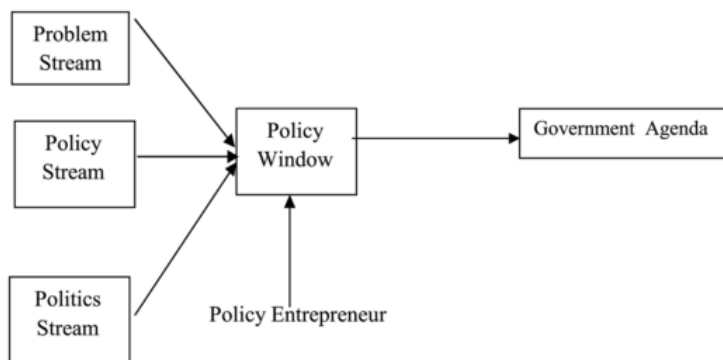


Figure 3. The Multiple Streams Framework by Kingdon (1995)

The problem stream is rather subjective, based on perceptions and focuses on public problems that need governmental action to be solved (Kingdon, 1995). The policy stream refers to the existing policy documents. The political stream refers to the factors that influence the political discourse.

The streams flow independent of each other, until they happen to cross. At that point, we can speak of the opening up of a policy window (Kingdon, 1984). This creates new opportunities for on-going discussions and topics to be put high on the government agenda (as seen on the right side of Figure 3), which in the end can lead towards a new impulse for policy change. The Multiple Streams Framework by Kingdon helps to explain how the framing of solutions to certain problems take place. For instance, flood events can be interpreted from different perspectives: technocratic (dike reinforcement) versus spatial planning (limited or adapted building in flood prone areas).

Spatial planning, or “land use and land management” is a primary component of Flood Risk Management (Hartmann et al., 2018b). By incorporating spatial planning within Flood Risk Management, the current policies could be further improved. The OECD stresses the fact that there should be more attention towards water governance and water management, to be better prepared for future floods (OECD, 2017).

2.2. Institutional Development Frameworks

To study a complex process such as Flood Risk Management, the urge for cross-sectoral and multi-level coordination arises. Termeer et al. (2010) stress that implementing climate change measures is in need of collaborative approaches across sectors and scales. This makes the Flood Risk Management a highly complex process, which causes the urge for a theoretical framework to unravel this topic in a detailed manner.

As explained previously in Chapter 2 Theory, flood risk can be measured by multiplying the probability of a flood event and the consequences of that flood (De Moel et al., 2009). Flood Risk Management tries to reduce the risk of flooding, by the process of implementing FRM plans, strategies and measures (Schanze et al., 2006). To streamline the analysis of all the relevant elements that are taking regarding Flood Risk Management, a theoretical framework will provide some structure.

Positioning of institutional theories and frameworks

There are various kinds of institutional theories, which will be discussed in the following paragraph. There are two elements that are fundamental to every sort of institutional analysis: 1) to distinguish the relationship between institutions and behaviour, and 2) how the process where institutions change can be explained (Hall & Taylor, 1996). In a reaction to the behavioural perspectives that were dominant during the 1960s and 1970s, three analytical approaches appeared, which could all be labelled as *new institutionalism* (Hall & Taylor, 1996). These three schools of thought are historical institutionalism, rational choice institutionalism and sociological institutionalism. According to Hall & Taylor (1996, p. 1) ‘‘(...) all seek to elucidate the role that institutions play in the determination of social and political outcomes. However, they paint quite different pictures of the political world’’. The institutional perspective tries to reduce the uncertainty in behaviour of others. This explains how strategic interaction can determine the outcome of policy.

Historical institutionalism puts emphasis on elements such as timing, sequences and path dependency, and how this influences institutions and how it shapes behaviour and change (Farrell & Newman, 2010). By studying longer time horizons and by focusing on history and path dependency, historical institutionalism can help to get a better understanding of why certain events took place (Pierson & Skocpol, 2002). Therefore, this school of thought is suitable for comparative case studies.

Rational choice institutionalism argues that actors make use of institutions, to maximise their utility, whilst institutions affect the rational individual behaviour (Knight & Sened, 1996). The idea behind this school of thought is that institutions will reduce the transaction costs of collective behaviour and activities (Williamson, 1985). The prime assumption is that rational individuals choose the alternative which is likely to give them the greatest satisfaction or profit, by using a cost-benefit calculation. People will act rationally within the bounds of institutions, also known as the rules of the game (Taylor & Hall, 1996). Examples of rational choice institutionalism are the *IAD* (Ostrom, 1990; Ostrom, 2005), the *politicised IAD* (Clement, 2010) and *CIAD* (Whaley, 2018) Framework.

Sociological institutionalism uses a constructivist nature to explain the way institutions create meaning for individuals (Meyer & Rowan, 1977). It connects to the more inclusive and cultural view on institutions. Sociological institutionalism is about formal organisations, rules and procedures, but more importantly, it focuses on topics such as informal rules, symbols, ideology, frames of meaning and interpretation (Taylor & Hall, 1996). Another important element is the focus on appropriateness, which tries to explain human decision-making. A sub-stream in the school of thought of sociological institutionalism, is *discursive institutionalism*. This discursive view focuses on discourses which are generated in certain institutional contexts (Schmidt, 2008).

Suitability of the CIAD Framework for this research

What distinguishes the CIAD Framework from these other institutional frameworks, is the delicate manner where *rules* are being studied. The advantage of the CIAD Framework is the specific operationalisation of rules, which cannot be found in other frameworks. In addition to that, the CIAD

Framework also benefits from some strong elements of the politicised Framework by Clement, such as its ability to define and link the key variables which affect the decisions and outcomes in Flood Risk Management plans. Therefore, the Critical Institutional Analysis and Development Framework by Whaley (2018) will be used in this research. The CIAD Framework provides a clear structure to analyse what happened as a consequence of the floods of 2021, on the field of spatial planning and FRM related policy. Adapted from the original IAD Framework by Ostrom (1990; 2005) and building further on Clement's (2010) politicised IAD Framework, the CIAD Framework "reflects the theoretical and conceptual insights that underpin critical institutionalism" (Whaley, 2018 p. 1). The C stands for Critical. Before diving deeper into CIAD, a brief description of the original IAD Framework by Ostrom will be given.

2.2.1. Institutional Analysis and Development Framework (IAD)

The Institutional Analysis and Development Framework was devised by Elinor Ostrom to explain and predict situations by zooming in at governance structures, the positions of the relevant actors (both high and low in the hierarchical ladder) and the (formal and informal) rules. This makes the IAD Framework a suitable technique to analyse policy decisions, which is often used in both physical and social sciences to gain better understanding of how institutions work and slowly change over a longer period of time.

A central element in the IAD Framework is the division of all components of an institutional field into different *action areas*, which can be understood as sub-pieces of the whole (see Figure 4). The relevant actors have different possibilities and choices to perform in this existing structure, based on (formal and informal) rules. The general idea is that actors get influenced by the present institutional arrangements, the socio-economic conditions and the physical environment. According to Polski & Ostrom (1999), seven different rule types can be identified in these institutional arrangements.

The IAD can be used to explain the causes for patterns of interaction in policy processes. It can also be used to give insight into certain outcomes of policy processes (Van den Hurk et al., 2014). Because the structure of the IAD framework is on multiple different levels, it can link the decisions and choices of actors across different institutional layers (Blomquist & De Leon, 2011).

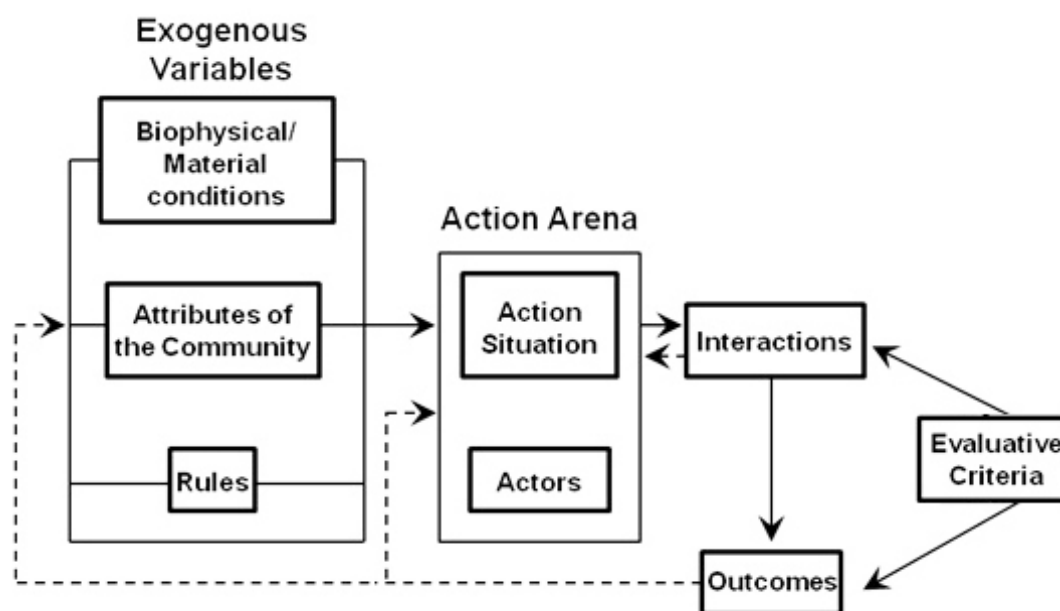


Figure 4. The IAD Framework adapted from Ostrom (2005). As retrieved from Research Gate

Critique on and lacking elements of the IAD Framework

Despite the fact that IAD has been used often to give insights into complex institutional fields, there is some critique on the usefulness of the framework. In example, Clement (2010) stresses the lack of consideration of power relationships that are embedded within the so-called rules-in-use. That is why Clement designed two additional element to Ostrom's framework: the *politico-economic context* and *discourses* (the role of values, beliefs and norms which shape the preferences of the involved actors in a decision-making process, which gives meaning to both physical and social realities (Hajer, 1995)). Clement & Amezaga (2009) explain the politico-economic context as the power distribution of the actors who can make decisions, and how certain politic and economic interest motivate the decisions that actors make within a certain set of rules-in-use. The thought behind this was that these two elements also influence the decision-making process in the *action arena* and therefore deserve their own place in the framework.

According to Whaley (2018, p. 4), it must also not be forgotten that both power and culture have a great impact in the way that governance arrangements are embedded in "historically specific social relations and ecological conditions". This is what he refers to as Critical Institutionalism. Since institutions are intertwined with power relations and cultural meanings, Whaley (2018) stresses the importance to analyse the embeddedness of institutions.

2.2.2. Critical Institutional Analysis and Development Framework (CIAD)

To overcome these critiques, the more inclusive framework of Critical Institutional Analysis and Development (CIAD, see Figure 5) has been developed by Whaley. The frameworks have a lot of similarities, but CIAD incorporates the critical realist perspective. According to Whaley, the CIAD Framework could become useful whilst trying to fight problems that occur whilst addressing some of the main challenges faced by Critical Institutionalism. "These challenges relate to: 1) the 'complex-embeddedness' of institutions, 2) making critical institutional research amenable to the world of policy, 3) investigating the more hidden, informal, and everyday dimensions of institutional life, and 4) providing explanations of commons governance that foreground the workings of power and meaning" (Whaley, 2018 p. 3). This explains why CIAD facilitates a more nuanced analysis than IAD, regarding the relationship between the elements of structure, agency, and the social situation. This makes the CIAD Framework suitable for understanding governance processes, since it helps to explain and interpret institutional change.

According to Crawford & Ostrom (2005), institutional analysis can help to get a better understanding of how institutions work and change over time. In the literature, institutional analysis has been applied extensively to study interactions between people and their environment, such as in Flood Risk Management (Thomson, 1992; Ostrom, 2007). Furthermore, Flood Risk Management has to do with multiple governance layers. This makes the CIAD Framework highly suitable for a delicate topic as the institutional field regarding Flood Risk Management. Therefore, the CIAD Framework will be used to further investigate the contextual, discursive, and institutional factors which might explain the outcomes of the choices that have been made regarding the decision-making process of (local, regional and national) Flood Risk Management. Note that the decision-making process will from now onwards be formulated as the *interactions in the arena*.

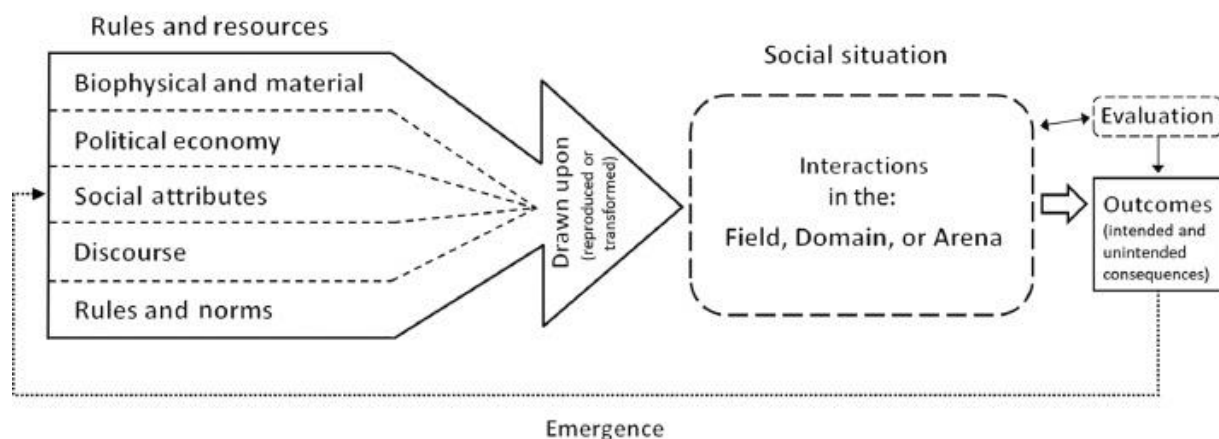


Figure 5. The CIAD Framework by Whaley (2018). As retrieved from The Commons Journal

As schematically shown in Figure 5, there are five categories (*rules and resources*) that have influence on the interactions in the arena of the *social situation*. Note that this has replaced the *action arena* from the IAD Framework, since Critical Institutionalism is also focused on the thoughts in the social world, rather than only focused on actions and behaviour. The five rules and resources of the left are 1) biophysical and material, 2) political economy, 3) social attributes, 4) discourse and 5) rules and norms. On the right side, there is a feedback loop with outcomes: the intended and unintended consequences. The outcomes have an arrow which goes back to the left side again, where it influences the rules and resources. This framework will be used to theoretically support this research.

The main difference between the politicised IAD Framework by Clement (2010) and the CIAD Framework by Whaley (2018) are the dotted lines between the five categories of rules and resources. This indicates the interrelationships between the rules and resources and helps not to treat the categories in isolation of each other. In Figure 6 by Vitale & Meijerink (2021) the difference between IAD and CIAD is represented by the grey boxes. The original IAD Framework (Ostrom, 2005) is shown in white, whilst the added dimensions by Clement (2010) are in grey: the political-economical context and the discourses.

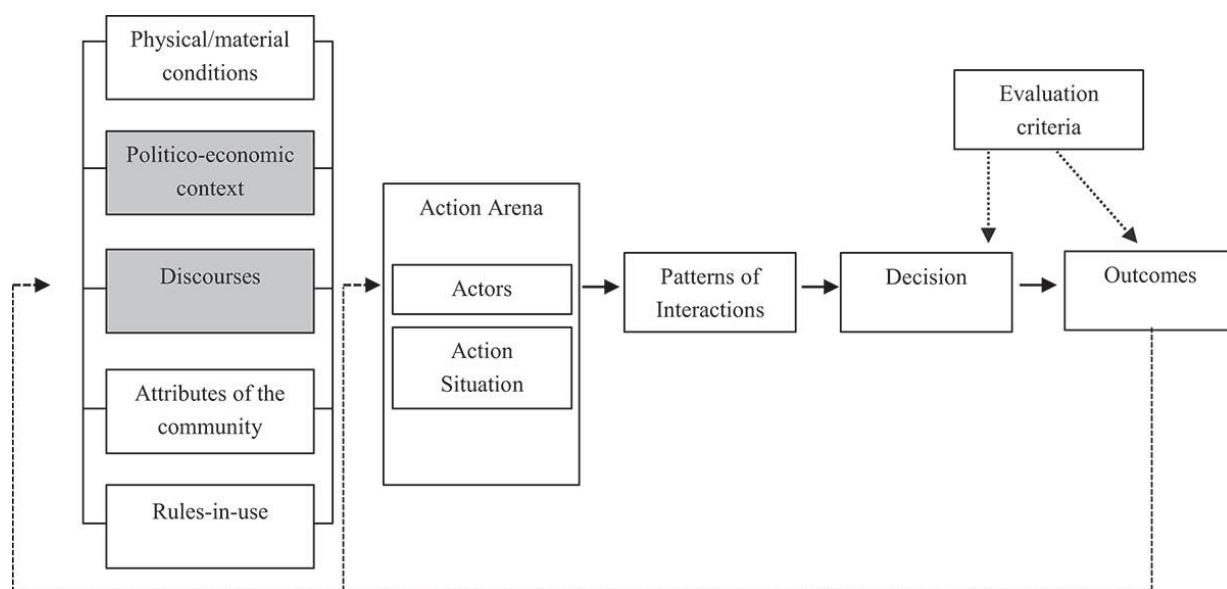


Figure 6. Politicized Institutional Analysis and Development Framework by Vitale & Meijerink (2021)

The 7 rules-in-use

The institutional setting or institutional field can determine a large part of the outcome of a governance strategy. Polski and Ostrom (1999) describe seven institutional rules affecting the interactions in the arena in governance processes. These seven rules explain the influence that institutions have on different aspects and interactions in this arena. The cumulative effect of these seven rule-types affects the seven elements of an action. This means that a change in one rule has an effect on the working of other rules, which means that the rules are *nested* (Vitale et al., 2022). The rules-in-use is the minimum set of rules which is necessary to explain the interactions and outcomes of a certain policy.

The 7 rules-in-use are the following (Polski & Ostrom, 1999; Ostrom, 2005; Ostrom, 2011):

- 1. Position rules.** These rules specify the set of positions or rules that participants assume in an action situation and the number and type of participants that hold each position.
- 2. Boundary rules.** These rules affect which participants enter or leave positions and how they do so.
- 3. Choice rules.** These rules specify the actions participants in a given position might take.
- 4. Aggregation rules.** These rules determine how decisions are made in an action situation.
- 5. Scope rules.** These are criteria or requirements that determine the final outcome of an interaction.
- 6. Information rules.** These rules affect the amount and type of information available to participants.
- 7. Pay-off rules.** These rules affect how costs and benefits are divided in the game.

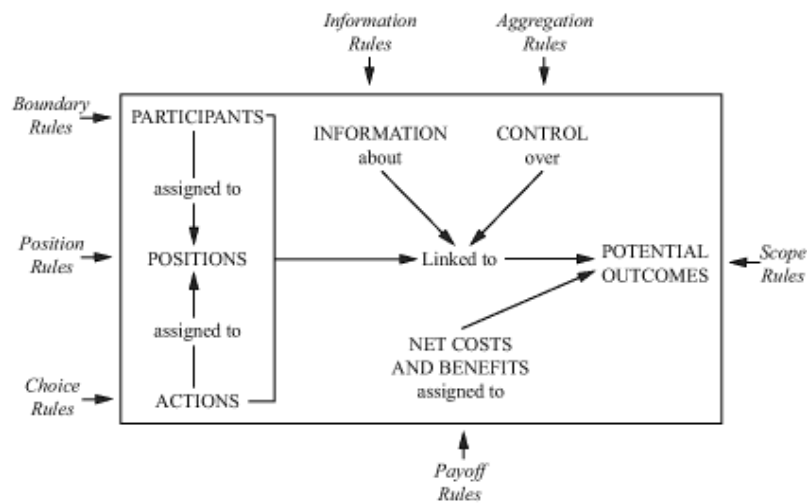


Figure 7. The 7 rules-in-use affecting a governance strategy (Ostrom, 2005)

Nested action arena

The structure of the CIAD Framework connects the decisions of the actors across multiple institutional layers (Clement, 2010). This suits well within this research, which focuses on both the local (Municipality), regional (Province) and national level (National Government). These *nested action arenas* are studied because Flood Risk Management ‘‘does not reside at one single level, neither top (only highest level government enforcing decisions), nor medium (only states/provinces enforce decisions beneficial for their region without considering others), nor individuals with complete freedom to act or being connected in a market structure only’’ (Pahl-Wostl et al. 2012, p. 27). Multiple studies analysed the processes in nested actions arenas while using a theoretical framework based on Ostrom’s IAD Framework (Huntjens et al., 2010; Clement, 2010).

2.3. Conceptual Framework

Since the CIAD Framework suits well in governance focused research, it has been used as a basis to design the Conceptual Framework of this research on. As shown in Figure 5 in the previous paragraph, the CIAD Framework contains of five categories (*rules and resources*) that have influence on the interactions in the arena of the *social situation* (which Ostrom originally called the action arena).

As shown in Figure 8 below, the Conceptual Framework focuses on the rules and resources dimension. The rules-dimension of the CIAD Framework is the most important dimension in this research. It determines what the rules of the games are, and how these rules can be studied to get a better understanding of the outcomes. This is why the 7 rules-in-use of the CIAD Framework are being mentioned in the Conceptual Framework as well, in addition to the regular rules and resources dimension based on the original IAD Framework.

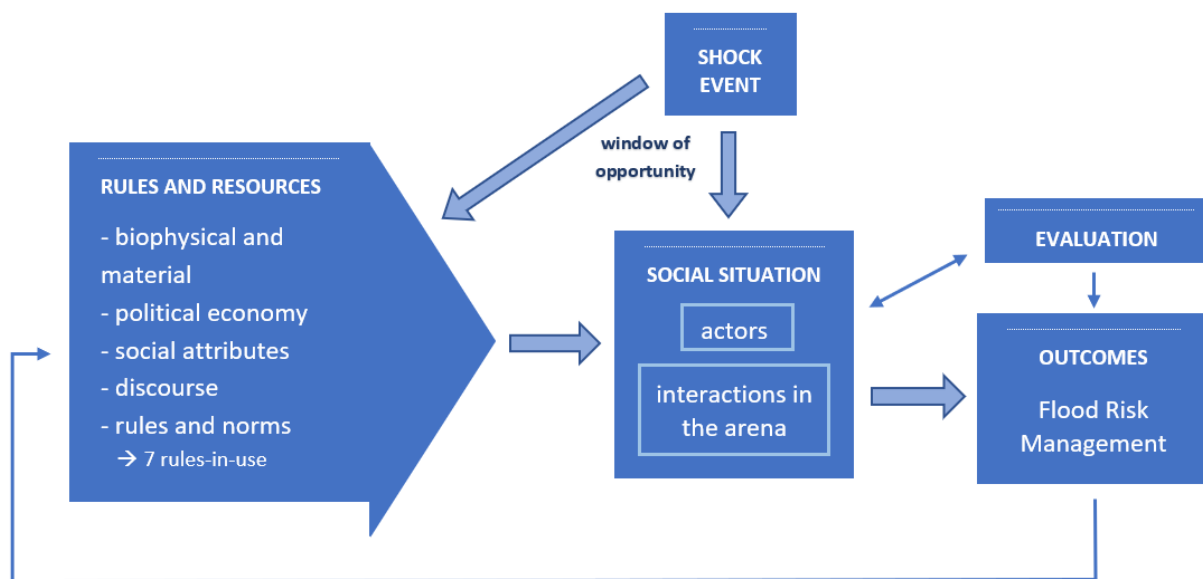


Figure 8. Conceptual Framework (author's design, 2022). This framework is inspired by the IAD and CIAD Framework. The 7 rules-in-use and the influence of a shock event and the usage of the window of opportunity are added to this.

In addition to this (C)IAD-based Conceptual Framework, the dimension *shock event* is used. The arrow from the box shock event points at the social situation and at the rules and resources, since it can influence both of them if the window of opportunity is being used (McSweeney et al., 2011).

To make use of the window of opportunity, the Multiple Streams framework by Kingdon (1995) is relevant. The three streams of problems, policies and politics interact with each other and if they cross, they produce a so-called *window of opportunity*. The Multiple Streams Framework by Kingdon helps to explain how the framing of solutions to certain problems take place. The theory of Kingdon has a relationship with the theory of Ostrom, since they both aim for an interpretation of how problems and solutions are being framed.

The choices that are being made in the central dimension *social situation* are influenced by both the rules and resources (including the 7 rules-in-uses) from the left side, and the shock event (flood event) from above. This is visually represented in Figure 8. The interactions in the arena between relevant actors result in certain outcomes in the current Flood Risk Management policy – as can be seen in the *outcomes* dimension on the right side of the Conceptual Framework. All the dimensions are connected

with arrows to show their relationship. Note that a feedback loop has been incorporated into this framework, which suggests that the outcomes of the Flood Risk Management policy can result in new or adjusted rules and resources.

Finally, on the top right of Figure 8, there is a box referring to the *evaluation criteria*, similar to the CIAD Framework in Figure 5. This gives the opportunity to evaluate the interactions in the arena. Evaluation is necessary to answer the fourth sub-question ‘‘Which of these elements could be improved, to overcome similar flood disasters in residential areas in the future? And how could this be improved?’’. Improvement can only be distinguished if there is an evaluative element in the Conceptual Framework. This evaluation will be dependent on whether or not certain Flood Risk Management measures cover Layer 2 of Multi-Layer Safety: Sustainable spatial planning.

All the above means that in order to understand the current Flood Risk Management strategies and policy (as shown on the right side of Figure 8), the concepts of rules and resources and social situation need to be studied in-depth. Operationalising the Conceptual Framework makes it possible to conduct focused interviews to retrieve relevant data to help answer the research question. Therefore, all these elements will be operationalised into multiple indicators in the following paragraph.

2.4. Operationalisation of the framework

By operationalising the categories of the theoretical framework, the Conceptual Framework can be studied. The elements of the operationalisation have been used to formulate questions for in the semi-structured in-depth interviews with experts in the field of Flood Risk Management that have been conducted (see Chapter 3 Methodology and Appendices 1 and 2 for the list of consulted interviewees and the interview guides).

1. Rules and resources

1.1. Biophysical and material

The biophysical and material category refers to the broader physical landscape, such as the presence of hills or of a low-lying polder area. From the perspective of Flood Risk Management, hills are responsible for the strength or power river water gets, when flowing over the river edges. Therefore, height differences can be an important element in flood events, because height differences can cause as a funnel, which leads towards powerful flash floods. In addition to the level of elevation there are two other important aspects: 1) the level of urbanisation and 2) the soil type. Furthermore, the biophysical and material category could be described as the characteristics of the water system and the current building stock near the regional water system. It is important to know what the (bio)physical system looks like, to get a better understanding of the measures that should be taken to achieve sufficient Flood Risk Management strategies.

1.2. Political economy

As explained previously, the category of political economy is about power and interest. It encourages to analyse the processes back in time, ‘‘to understand the events and processes that have given rise to present-day conditions’’ (Whaley, 2018, p. 8). This can be investigated by studying policy documents and political debates. Another element of the political economy, is the presence (or lack) of interactions

of actors from multiple governance levels: municipal, regional and national. The more governmental layers are involved, the more complex the interactions and division of responsibilities in an institutional field can get. Whilst referring to the political economic context, it is also important to get a better understanding of the political changes in the broader context. Also, the cyclical wave of centralisation and decentralisation is relevant for the political economy, which depends on the level of governmental steering.

1.3. Social attributes

The category of social attributes refers to factors as ‘‘race, gender, class, caste, ethnicity, religion, sexuality, age, kinship status, and wealth’’ (Whaley, 2008, p. 8). By describing the social context of the case on municipal level (and on regional and national level), insight could be given about why certain events or choices took place. Another factor which is part of the social attributes is the educational background. This could influence their discourse and the Multiple Streams Framework by Kingdon (1995), since educational background influences one’s perspective on certain situations.

1.4. Discourse

The discourse category focuses on the way that people give meaning to certain events. The *problem stream* from the Multiple Streams Framework by Kingdon (1995) could help to determine how actors view and interpret certain problems, which contributes to a better understanding of public agenda setting. The Framework by Kingdon can help to understand how framing of solutions to certain problems takes place, or in other words: what the present discourse is. For example, in Flood Risk Management, one’s discourse could be *technocratic* (with a preference for measures in Layer 1 of Multi-Layer Safety) or based on a *spatial approach* (with a preference for measures in Layer 2 of MLS, such as limited or adapted building in flood prone areas).

1.5. Rules and norms

The fifth and final category focuses on rules and norms. This is similar to the original IAD Framework, where this was mentioned as the rules variable. The difference is that there is now also focus on people’s norms and behaviour, instead of solely looking at strict rules. In the words of Hodgson (2006, p. 6) ‘‘a hard and fast distinction between rules and norms is often difficult to maintain’’. This means that there is a grey area between the concepts of rules, norms and practices. Critical institutionalism accepts these grey areas as an inevitable aspect of academic research into the field of institutions. An example of the rules and norms could be the policy documents and instruments (e.g. the Water Assessment) and the national laws regarding Flood Risk Management. Note that in the politicised CIAD Framework, the rules dimension is highly sophisticated, which allows for a very finely detailed analysis. There can be made a distinction in seven different rule types: the *7 rules-in-use*, which are presented below.

2. The 7 rules-in-use (Polski & Ostrom, 1999; Ostrom, 2005; Ostrom, 2011)

Position rules define the roles that involved parties can fulfil, and if they are able to move position. It also shows the number and type of participants, and which actor is taking which position in the social situation. Furthermore, position rules give insight into whether or not there is collaboration across multiple stakeholders from different levels of the government. Position rules ‘‘reflect the capabilities

and responsibilities of the actors in the assigned positions, defining who can act as a regulator, promoter or supporter” (Laeni et al., 2021, p. 3).

Boundary rules define which participants can enter or leave positions, and how they do so. It explains who is included, and who is excluded. Boundary rules do not only show the boundaries of the social situation, but also the (physical) boundaries of the case study or the Municipality. This rule type focuses on who are involved in the process of decision-making regarding Flood Risk Management, and who are excluded. It gives insight into whether or not there is cross-sector and cross-governmental (multi-level) coordination in this decision-making process.

Choice rules define the possible choices and actions that actors are allowed, obliged or prohibited to take. It gives insight into the possible options they have, according to their role in the social situation. For example, policy documents and policy rules can limit certain choices, as well as local, regional and national laws regarding Flood Risk Management, such as the Water Assessment.

Aggregation rules define the decision-making process in the social situation. It shows how much control actors have, and if they are (in)dependent of each other. Aggregation rules give insight into the power distribution amongst the actors, e.g. who has the power to make final decisions regarding FRM.

Scope rules define the criteria or requirements that determine the final outcomes of interactions in the arena. It shows the scope: the actual range of outcomes, by specifying the jurisdiction of certain outcomes (e.g. via legislation). Scope rules give insight into how one actor can affect the outcome of interactions between actors, in a different way than other actors can. It explains the conditions that can constrain a certain range of outcomes.

Information rules define the amount and type of information that is available to actors in the social situations. It gives insight in the way actors communicate and exchange information with each other. Information rules define the channels that are used for this (e.g. a formal or informal meeting), and if there is room for open communication and a continuous dialogue. Note that certain information could also be kept secret to certain actors.

Pay-off rules define the division of costs and benefits in the social situation. It gives insight into which actors have the possibility to make use of certain benefits or opportunities, and who has to pay for the costs. Pay-off rules show how the financial aspects are arranged, and which sanctions should be used if a rule is broken. It shows who is responsible to finance the outcomes of the interactions in the arena.

3. Shock event and window of opportunity

A shock event such as a flood can create a window of opportunity for a change in the (local, regional and national) Flood Risk Management policy, since it puts FRM higher on the political agenda. This creates awareness for extreme flooding events. Therefore, a flood event can offer a window of opportunity to bridge the gap and incompatibility between water management and spatial planning.

4. Social situation

The social situation (which Ostrom originally called the action arena) is under influence of the rules and resources. The social situation describes all the relevant actors and their interactions in the arena: it gives insight into which actors are present in the discussion, and who has a say in the development of policy regarding Flood Risk Management. It shows the distribution of decisive power and political influence.

Also, studying the social situation explains the roles each actors fulfils, and which responsibilities come along with that. Finally, the social situation gives insight into the structure of the cross-sectoral and multi-level coordination between different layers of governmental organisations.

5. Flood Risk Management policy

As shown in the Conceptual Framework in Figure 8, Flood Risk Management policy is influenced by the actors and their interactions in the arena. By studying this social situation, the final outcome of (local, regional and national) Flood Risk Management decisions can be understood and explained.

CONCEPTS	VARIABLES	INDICATORS
Rules and resources	Biophysical and material	<ul style="list-style-type: none"> - physical landscape: hills / elevation - characteristics of the water system - building stock, level of urbanisation - soil type
	Political economy	<ul style="list-style-type: none"> - different levels: local, regional, national - political changes in the broader context - centralisation and decentralisation
	Social attributes	<ul style="list-style-type: none"> - race, gender, class, state, ethnicity, religion, sexuality, age, kinship status and wealth (Whaley, 2008) - educational background
	Discourse	<ul style="list-style-type: none"> - the way people give meaning to events - problem stream (Kingdon, 1995) - technocratic vs. spatial approach
	Rules and norms → 7 rules-in-use (Polski & Ostrom, 1999; Ostrom, 2005; Ostrom, 2011).	<ul style="list-style-type: none"> - policy documents and instruments - local, regional and national laws regarding FRM <p>Position rules</p> <ul style="list-style-type: none"> - roles that participants assume: regulator, promoter or supporter (Laeni et al., 2021) - number and type of participants <p>Boundary rules</p> <ul style="list-style-type: none"> - which participants enter or leave positions - how they do so <p>Choice rules</p> <ul style="list-style-type: none"> - the possible choices and actions that actors can take

		<p>Aggregation rules</p> <ul style="list-style-type: none"> - how decisions are made in the social situation <p>Scope rules</p> <ul style="list-style-type: none"> - specification of the jurisdiction of outcomes <p>Information rules</p> <ul style="list-style-type: none"> - available information for participants in the social situation <p>Pay-off rules</p> <ul style="list-style-type: none"> - division of costs and benefits in the social situation
<p>Shock event + Window of opportunity</p>	<p>Flood event</p> <p>Policy development</p>	<ul style="list-style-type: none"> - shock event (flood catastrophe with economic damage) - window of opportunity (policy makers use the momentum to change Flood Risk Management policy)
<p>Social Situation</p>	<p>Actors</p>	<ul style="list-style-type: none"> - Municipality - Province - Water Authority - Delta Commission - Physical Environment Consultative Council (<i>OFL</i>) - Department of Waterways and Public Works (<i>RWS</i>) - Ministry of Infrastructure and Water Management (<i>MinIenW</i>)
	<p>Interactions in the arena</p>	<ul style="list-style-type: none"> - governance arena / institutional field - cross-sectoral and multi-level coordination
<p>Flood Risk Management policy</p>	<p>Policy documents</p>	<ul style="list-style-type: none"> - (local, regional and national) policy documents

Figure 9. Operationalisation based on the Conceptual Framework (author's design, 2022)

3. METHODOLOGY

In the following chapter, the methodology of this research will be explained. This includes the research philosophy, research paradigm, research strategy and research design and the methods of data collection. To conclude the methodology chapter, a brief explanation of the validity and reliability of this research will be given. This will justify the chosen methodology and explains the choice for the methods of data collection.

3.1. Research philosophy and paradigm

The research paradigm of this research is characterised by the research philosophy. In 1994, Guba & Lincoln stated that a research paradigm is a belief system, which is based on the ontological, epistemological and methodological assumptions of a researcher. Defining the perspective of the researcher helps to develop a suitable research philosophy to tackle the research question.

Where ontology is solely based on assumptions about the reality in the world (in which the world-view is formed by the researchers own perspective on reality), epistemology focuses more on the nature of knowledge and the relation between the research and the researcher (so the methods you use to study things). Methodology is the method a researcher uses to find his or hers required knowledge in the *real world* (Guba & Lincoln, 1994).

There are four research paradigms: positivism, post-positivism, critical theory and constructivism. In this research about the floods in the Province of Limburg and the planned housing developments in the Municipality of Valkenburg aan de Geul, the critical realism research paradigm will be used. This paradigm assumes that there is a difference between the *real world* and the *observed world*. According to critical realism, the real world cannot be observed and exists independently from human perceptions, theories, and constructions.

3.2. Research strategy, research methods and data analysis

3.2.1. Research strategy

A research can be either inductive or deductive (see Figure 10). According to Van Thiel (2014), a deductive approach is based on research which is examined on the base of the theoretical framework and the operationalisation of that framework. This is the core guiding strategy of this research, since it is based on theory. Contrary to that, inductive research tries to generate meaning and build theory.

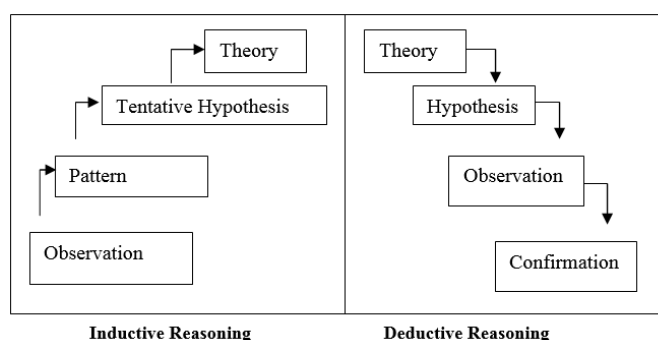


Figure 10. Inductive and deductive reasoning (Trochim & Donnelly, 2006). As retrieved from Research Gate

Longitudinal single case study

The strategy of this research is a longitudinal, single case study. In qualitative research, a case study is considered an appropriate research method when studying a complex phenomenon (such as Flood Risk Management) within a real life setting (Eisenhardt, 1989). In addition to that, a case study is a suitable approach when answering research questions such as ‘‘how and why things are done in a certain way’’ (Yin, 1984, p. 13).

A case study is a phenomenon which is drawn from multiple sources of evidence (Leonard-Barton, 1990). Therefore, a case study can test a theory with a degree of freedom, ‘‘coming from the multiple implications of (the) theory. The process is a kind of pattern-matching’’ (Campbell, 1975). To get a better understanding of the shock event of the flood of July 2021 and the results this has for Flood Risk Management policy, a case study approach gives the opportunity to obtain data from multiple governmental levels and perspectives.

Chronological periods of time, or periods of certain events can be included as an independent variable (Street & Ward, 2012). Longitudinal case studies incorporate the element of time and help to investigate chronological timelines or events over time. By covering an extended period of time, it allows for an in-depth exploration and analysis of change. Therefore, this method has been incorporated into this research by implementing a longer time frame: before and after the shock event of the floods of 2021. This will help to determine the differences and changes in policy development and general discourse towards Flood Risk Management, both before and after the flood of 2021. Furthermore, a case study can help to get a better understanding of the influence of a shock event (flood) on the decision-making in spatial planning.

Criteria for case selection and characteristics of the case study

There are three main criteria for case selection of this research: 1) the presence of planned housing developments, 2) the plot must be located near the regional water system, and 3) the plot must be situated in an area which got flooded during the flood event of July 2021. This combination has been chosen, since planned housing developments in a proven flood prone area near the regional water system stimulate the current spatial discussion in Flood Risk Management – or in other words: the lack of measures in Layer 2 of the Multi-Layer Safety strategy.

An example of the planned housing developments that have been investigated as possible case study, are the housing developments in the Roerdelta in the city of Roermond. With development plans right next to the river bed this case seems to be suitable, but because of recent dike elevations the flood probability had already been reduced to 1:125. Also, Roermond is situated near the main water system, instead of the regional water system. Some municipalities are planning housing developments in combination with dike improvement, for example in the Municipality of Venlo. This is also not suitable for this research, since this has to deal with Layer 1 of the Multi-Layer Safety (technical measures around the main water system of the Maas). Other cases in the affected area of the floods of 2021 are not suitable for this type of research because they are inland, on the protected side of the dike (*binnendijks*). In the Netherlands, this means that the local Water Authority will guarantee water safety since river flooding has been made nearly impossible because of technical measures. However, one case of planned housing developments ticked all three criteria: the planned housing developments in Park de Valkenier. During a quick scan analysis of several housing plans in multiple municipalities, the planned developments in Park de Valkenier turned out to perfectly fit into this research.

Case study Park de Valkenier

As mentioned in Chapter 1 Introduction, the extreme rainfall of July 2021 caused a flood event in the Province of Limburg. Former amusement park Park de Valkenier in the Municipality of Valkenburg aan de Geul got severely affected by the flood, and the owner decided to close and sell the park. A project developer bought the plot and wants to develop a residential area in that particular flood prone area near the Geul stream. By studying the interactions in Park de Valkenier after the shock of the floods in July 2021, new insights could be gained to help improve the (policy) decision-making process regarding planned housing developments in flood prone areas of the Netherlands. Therefore, case of Park de Valkenier will be the central point of focus in this research, since the flood event can be seen as a shock event which created an opportunity window for policy change in Flood Risk Management.

3.2.2. Research methods

Policy Document Analysis

In practice, there are three types of policy instruments to govern Flood Risk Management that can be distinguished: regulatory, financial and communicative instruments (De Bruijn et al., 2008). The combination of a set of various policy instruments can increase the national safety, because the flood risk will be diminished from different point of views. In Chapter 1 Societal Relevance, some recent political developments after the floods of July 2021 have been described. This research will elaborate on that quick scan with a Policy Document Analysis. All the relevant policies and documents regarding Flood Risk Management have been investigated to form a clear picture of it (both on local, regional and national scale level). Detecting the presence or lack of measures in Layer 2 of Multi-Layer Safety in these documents, will help to improve strategies regarding Flood Risk Management and housing development in flood prone areas of the Netherlands.

In-depth semi-structured interviews

The qualitative data that will add to the Policy Document Analysis, has been collected by semi-structured in-depth interviews with multiple relevant (national, regional and local) governmental organisations, with persons who have specific knowledge about the topic of Flood Risk Management or about the case study of the planned developments in Park de Valkenier. The interviewees represent the Municipality of Valkenburg aan de Geul; the Province of Limburg; the Water Authority of Limburg; the Delta Commission; the Ministry of the Interior and Kingdom Relations (MinBZK); the Ministry of Infrastructure and Water Management (MinIenW); the Department of Waterways and Public Works (RWS); the Physical Environment Consultative Council (OFL); Project Developer Grouwels Daelmans Projectontwikkeling B.V. and Architectural Company Mecanoo.

The respondents have been approached based on the level of government they work for (local, regional, national), their expertise in Flood Risk Management or their specific knowledge about the case of Park de Valkenier. Two semi-structured interview guides have been used: one with more general questions for policy advisors who work for MinIenW, MinBZK, RWS and OFL (see Appendix 2.1.). The other interview guide contains case specific questions about Park de Valkenier, which has been used with the interviewees of the Municipality of Valkenburg aan de Geul, the Province of Limburg, the project developer and the architect (see Appendix 2.2.). For the complete list of interviewees, see Appendix 1.

3.2.3. Data analysis

Policy Document Analysis and interview transcript analysis in Atlas.ti

The policy documents have been analysed manually, by dividing them with focus on Layer 1 or Layer 2 of Multi-Layer Safety. In addition to that analysis, the recordings of the in-depth semi-structured interviews have been analysed after making an transcription of the audio. These transcriptions have been coded and analysed with the help of the concepts from the Operationalisation (see Figure 9). The CIAD Framework by Whaley (2018) has been used in the codes to intertwine the theory with the practice. Coding can be done by means of open, axial and selective coding (Corbin & Strauss, 1990). With open coding, the text is being labelled and selected. In axial coding, these labels are grouped into a number of overarching core labels. This makes it easier to compare data with each other, in order to formulate at a thorough analysis. Then, selective coding ensures that the overarching core labels and categories will be integrated into the initial theoretical framework (Pandit, 1996). All three steps of encoding have been performed with use of the programme Atlas.ti. This program allows the user to systematically analyse all kinds of qualitative data (Smit, 2002).

3.3. Validity and reliability

3.3.1. Validity

Validity is the extent to which a study measures what it is supposed to measure. A difference can be made here between construct validity, internal validity and external validity (Yin, 2003). A study is *construct valid* when the correct operational measures are being used to study a certain concept. In the case study of Park de Valkenier, the CIAD Framework by Whaley (2018) and the 7 rules-in-use by Polski and Ostrom (1999) will help to reach valid results, by ensuring a complete overview of the in the institutional field.

A study is *internally valid* if the correct conclusions can be drawn with the research method used (Yin, 2003; Jochems & Joosten, 2005), which means there is a correct causal relation. In this research into the planned housing developments in Park de Valkenier, the aim is to achieve the highest possible internal validity. This will be done by speaking with several respondents about the same topics, which will result in different perspectives and therefore benefits the internal validity. In addition to that, the combination of a literature interview and interviews will improve the internal validity, as well as the interpretation of experts in this field – retrieved via two validation interviews with an experts from Witteveen+Bos, to help interpret the conclusions of this research (see Appendix 1, Table 3).

A study is *externally valid* if the results can be generalised (Yin, 2003). This refers to the extent to which the results of the case study can be related to a broader scope than just this study (Jochems & Joosten, 2005). In order to ensure strong internal validity within this study, there has been decided to use multiple types of data sources, which is also known as triangulation (Verschuren and Doorewaard, 2007). A literature study, a Policy Document Analysis and semi-structured in-depth interviews will be used. By applying triangulation, the reliability and validity of the obtained data is increased (Creswell et al., 2007) and this allows a better understanding of the case.

3.3.2. Reliability

Within this research, the aim is to guarantee a high degree of validity and reliability. *Reliability* concerns the reproducibility of a study, i.e. whether an observation is stable with different measurements

(Jochems and Joosten, 2005). By explaining all the steps, research findings and interpretations of a study, reliable results can be ensured. Also, the interview questions are added to this research (see Appendix 2), to ensure the reproducibility of this study.

Furthermore, the reliability within this case study into the developments in Park de Valkenier will be guaranteed by using a proper interview guide. The interview questions are formulated with the help of an operationalisation scheme which is based on the theoretical framework. By formulating the interview questions in advance, the same or similar information can be retrieved during a subsequent interview. In addition to that, the reliability of this research will be increased by using a diverse group of respondents on multiple governance levels: from local (i.e. Municipality of Valkenburg aan de Geul), to regional (i.e. the Province of Limburg) and the national well (i.e. the Ministry of Infrastructure and Water Management). Finally, a number of respondents large enough to be reliable has been ensured, with 15 respondents in total. Since this research focuses on a single case study, there are multiple interviewees per organisation (e.g. three interviews with people from the Water Authority of Limburg, three interviews with people from the national government (MinIenW and MinBZK), two interviews with people from the Province of Limburg, etc.). This guarantees that the data which has been retrieved has a high reliability.

4. CASE STUDY PARK DE VALKENIER, VALKENBURG AAN DE GEUL

Planned housing developments in former amusement park Park de Valkenier, by project developer Grouwels Daelmans and architectural company Mecanoo

As explained in Chapter 3 Methodology, this research is based on a longitudinal single case study. In the following chapter, the analysis and findings of this case will be presented. In the first paragraph, a brief introduction to the case of Park de Valkenier is given. The second paragraph shows the outcomes: the planned housing developments in Park de Valkenier. From the third paragraph onwards, the following concepts are presented: the biophysical and material conditions; the actors in the social situation; and the shock event of the floods of July 2021 together with the window of opportunity this has opened. After that, the interactions in the arena regarding the planned developments in Park de Valkenier will be presented. Finally, the rules and resources (political economy, social attributes and discourse) and the 7 rules-in-use will be distinguished to help explain the interactions and planned outcomes. Some interactions on regional and national level will be discussed as well, since these are intertwined with the interactions on the local scale of the Municipality of Valkenburg aan de Geul.

4.1. Introduction to the case study

Area description of Valkenburg aan de Geul

Valkenburg aan de Geul is a municipality in the Province of Limburg, situated close to the Provinces capital city of Maastricht. Valkenburg aan de Geul is located next to the Geul in the *Heuvelland* region, which freely translates into the land of the hills: this explains the run-off water and flash floods in July 2021. The municipality of Valkenburg aan de Geul was established in 1982, by merging the already existing municipalities of Valkenburg-Houthem and Berg en Terblijt. Valkenburg is a small municipality with about 16.000 inhabitants, but the characteristic city centre, marl caves, coal mines, castles and the unique valleys, slopes and plateaus in the area which provide a perfect scenery for hiking and cycling, attract over a million of tourists per year (CBS, 2022).

Area description of Park de Valkenier

Park de Valkenier is a former amusement park. It is situated on the west side of the city centre of Valkenburg, next to the Geul. The park is designed as a playground for young children. The park area is surrounding a large pond, as can be seen on the top left of Figure 11. The park is confined by the Prinses Beatrixsingel and by the village of Broekhem. The plot has a surface of around five hectares (50.000 square meters). The southern side of the park is connected to nature: the Geul, trees, hills, and the marl caves. All the other sides of the park are connected to residential areas.

The Geul stream flows right next to Park de Valkenier. One of the Spatial Planners of the Municipality of Valkenburg aan de Geul mentions that the plot of Park de Valkenier used to be a swamp area. The shallow pond in the middle of the park, with an average depth of about 50 centimetres, is connected to the Geul (interviewee 7, personal communication, June 30th 2022). In the summer of 2021, the Geul Valley got flooded after a period of heavy rain. The Spatial Planner from the Municipality of Valkenburg aan de Geul explains that the pond usually waters towards the Geul, but during the floods the water of the Geul flowed towards the pond – as could be seen on the cover image. The park closed after the floods of July, 2021. The plot has been bought by project developing company Grouwels Daelmans, who hired architectural company Mecanoo to design a plan for new housing development on the plot of Park de

Valkenier. The project developer wants to construct about 250 to 300 housing units on the plot near the Geul. The planned outcomes will be presented in the next paragraph.

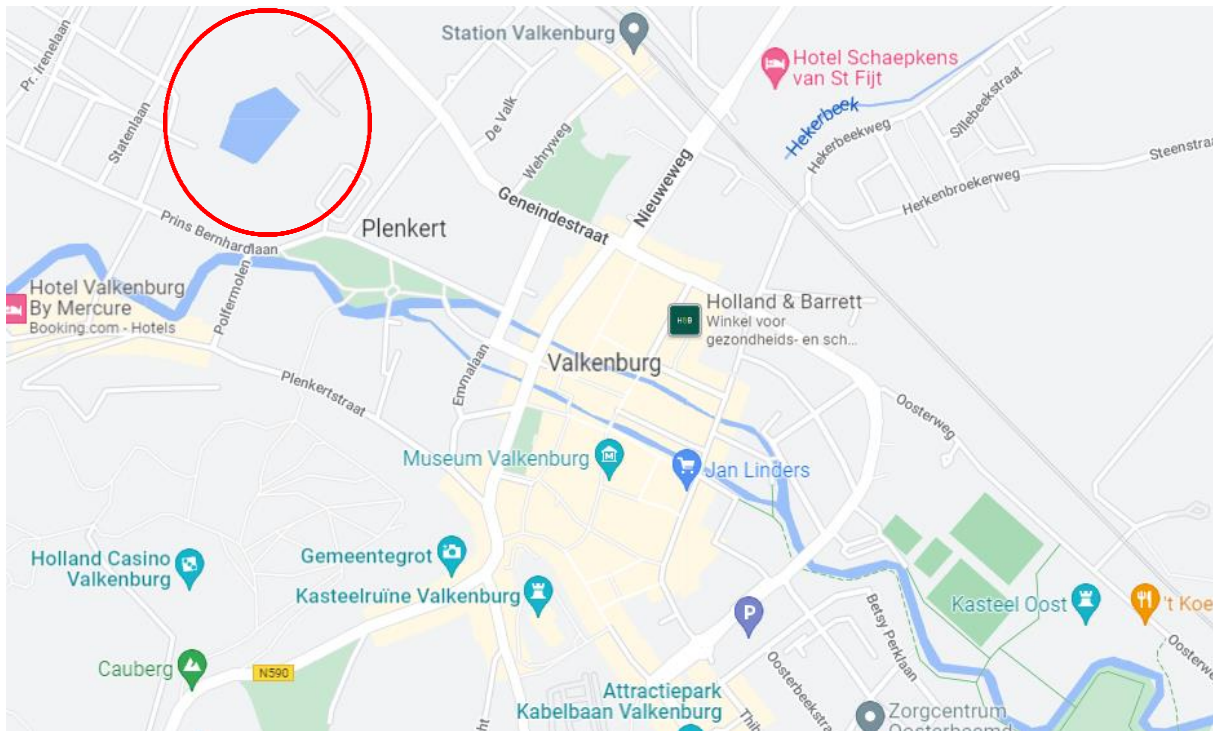


Figure 11. Valkenburg aan de Geul, with the plot of Park de Valkenier in the top left corner. As retrieved from Google Maps

4.2. Outcomes: planned developments in Park de Valkenier

Planned outcomes

With the Conceptual Framework in mind, the planned housing developments in previously flooded Park de Valkenier can be interpreted as the outcomes. This means that the design of the new residential area in Park de Valkenier is the result of the interactions in the arena, influenced by the shock event of the floods in July 2021. Nevertheless, there has not yet been taken a final decision regarding the planned developments in Park de Valkenier: the Municipality of Valkenburg aan de Geul has not yet decided if they will allow the plans for housing development – and if so, under what requirements. This means that it is an ongoing case study. Therefore, the outcomes that will be presented in this paragraph are *planned* outcomes. Appendix 3 (Fig. 17-21) provides visual support to these outcomes, designed by Mecanoo.

Flood risk measures: adding a mound, water square and sluice

The architect from Mecanoo mentions how important it is to use data from the local Water Authority (interviewee 5, personal communication, June 29th 2022). Therefore, project developer Grouwels Daelmans contacted the Water Authority for information and for data sets, such as maps with the elevation level and the risk of flooding on the plot of Park de Valkenier (see Figure 14 and 15). Using such data helps to take flood risk into account from the designing stage onwards. The maps of Park de Valkenier show how the area surrounding the pond is the deepest area of the neighbourhood, which causes water to run off to that area. This inspired the architects to incorporate elevated building

principles into their design of the planned housing developments in Park de Valkenier. Therefore, architectural company Mecanoo takes flood risk into account, by creating a mound (*terp*). This is typical Dutch: it means elevated living on a hill. Connected to the mound, on the side of the Geul, is a large water square (*waterplein*) to collect and store water during heavy rain showers and high water levels of the Geul. This water square has the Geul on its left and on its right side it is connected to the pond in the middle of the plot of Park de Valkenier. There is a sluice (*sluis*) in between the water square and the pond, which creates the possibility to disconnect the water bodies when desired (see Appendix 3 for the designs by Mecanoo for a visual representation). The design includes 250 to 300 houses, of which 30 percent will be social housing.

Water as a key feature in the design

In line with their ‘‘People, Place, Purpose’’ philosophy, one of the desires by Mecanoo was to create a connection with the landscape surrounding the plot. They did this by incorporating natural elements, such as hills: the mound blends smoothly into the hilly landscape of Valkenburg aan de Geul. The characteristic pond in the middle of Park de Valkenier will be retained – not only for water storage, but to keep the area recognizable as well. Some other traditional elements of the former amusement park will be kept as well, to preserve the connection to the previous owners of the park. In addition to that, some new elements have been implemented into the design, such as a primary school, sports facilities and a walking path over the pond. The Associate Architect from Architectural Company Mecanoo explains: ‘‘The pond has a depth of only about 50 centimetres, you can basically walk right through it. We thought it would be nice if you could walk over it, to really experience the water. Of course, some of the houses are next to the water side, but that is only a benefit for those people. By creating a pathway over the pond, it gets a common space for everyone. We really want to use the water in our plans. Not only is it beautiful, but by walking over it, people can really experience the water’’ (interviewee 5, personal communication, June 29th 2022).

Lack of concrete water safety norms

Mecanoo mentions that water safety norms have not yet been taken into account, since the proposed plan is only a rough sketch to give the municipality an idea of the possibilities with the plot of Park de Valkenier. If the plan gets approved by the Municipality of Valkenburg aan de Geul *and* when the Municipality changes their zoning plan (which currently only allows recreational purposes, instead of housing), Grouwels Daelmans will hire engineering-consultancy firms to finalise the plans by incorporating the current water safety norms and a stress test and Water Assessment (interviewee 5, personal communication, June 29th 2022). Therefore, it is debatable whether or not project developer Grouwels Daelmans sees water safety as something genuinely important, or just as a box to tick. When being asked about this, they mention that they only want to build plans ‘‘we would like to live in ourself as well, so it must be safe against future flooding’’ – Real Estate Acquisitor from Project Developer Grouwels Daelmans (interviewee 12, personal communication, July 7th 2022). But when looking at their design critically, and taking into account that the plot severely flooded in 2021, it is remarkable that they have not implemented any specific measures regarding water safety yet. Therefore, one could say that the importance of water safety measures is not prioritised as much as other interests, such as to make money by contributing to solve a part of the housing crisis. Nevertheless, this choice is defensible, since investing in a stress test and Water Assessment would cost a lot of money for a plan which has not even got some sort of approval by the Municipality of Valkenburg aan de Geul.

In the following paragraphs, the case of Park de Valkenier will be studied. This research will zoom in on the case with use of the concepts of the Conceptual Framework. The order is as such: 4.3. Biophysical and material conditions; 4.4. Social situation – Actors; 4.5. Shock event and window of opportunity; 4.6. Social situation – Interactions in the arena; and 4.7. Rules and resources, including the 7 rules-in-use.

4.3. Biophysical and material conditions

Physical geography of Valkenburg aan de Geul

Valkenburg aan de Geul is situated in the Geul Valley (*Geuldal*) enclosed between two chalk plateaus, with the stream Geul flowing right through the heart of the centre (see Figure 11). Or as the Strategic Plan Advisor Project Manager from the Water Authority of Limburg explains it: “The centre of Valkenburg is situated in the riverbed of the valley of the stream, so the whole centre of Valkenburg is not on a very fortunate location” (interviewee 1, personal communication, June 8th 2022). Immediately south of the city start the steepest slopes of the area, leading to the famous plateaus which were used for extraction of marl (MIP, date unknown). The steep slopes surrounding the Geul Valley are not suitable for agricultural purposes and are in most cases filled with forests or grasslands.

The river Maas

The Maas is a *rain-fed river* (see text box) with a length of approximately 950 kilometres. The Western European river starts in France and flows through Belgium into the Netherlands, where it ends into the North Sea. The river Maas and its catchment area are unique in the country, since the river bed is enclosed between so-called terraces (grounds on a higher altitude than the rest of the landscapes) and the catchment area of the river is intertwined with multiple streams and both high- and low-lying areas (Deltaprogramma Magazine, 2017).

A **rain-fed river** is a river which is completely fed by rain and/or groundwater. This is in contrast to mixed rivers and glacial rivers. The main characteristic of a rain-fed river is that the water levels can fluctuate strongly. During rainy periods the flow of the river is high, while in (longer) dry periods the river often has a low water level.



Figure 12. Catchment area of the river Maas. As retrieved from <https://nl.wikipedia.org/wiki/Maas>

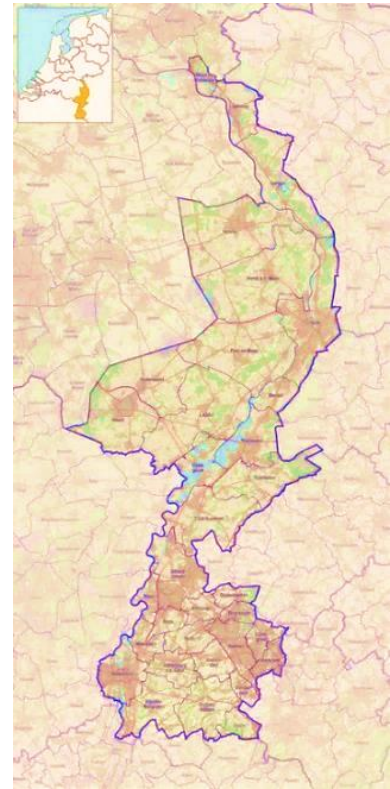
As the Maas is a rain-fed river, the water level strongly fluctuates depending on level of precipitation. Most of this rain falls in the French and Belgium Ardennes, where the soil is very impermeable and rocky. Generally, the water levels of the Maas are high in winter and low in summer, since in winter there is less vegetation to soak up rain water and there is little to no evaporation. In addition to that, the height difference in the catchment area of the Maas is rather large, which causes the water to stream rapidly. This causes a lot of floods in the Maas area. Due to climate change and intensifying precipitation levels, these floods can also occur in summer instead of winter.

The stream Geul

Connected to the Maas is the smaller stream the Geul, which drops a total height of about 250 meters over a length of nearly sixty kilometres. After these 60 km, the Geul flows into the Maas itself. The Geul therefore officially belongs to the river basin of the Maas, but it is part of the regional water system instead of the national water system. The Geul flows through Belgium and the Netherlands and a lot of tributaries are connected to it. Compared to the river Maas, the Geul is extremely shallow, with normal water level depths between only 30 to 80 centimetres.

Due to the great decay of the stream, the Geul could be described as a mountain stream, which has the tendency to overflow during heavy precipitation. In the late 1900s a lot of flooding events occurred near the Geul. Therefore, in the 20st century, the Geul has been put into straight cannels and the sides of the stream were being strengthened. This reduced the water storage capacity of the Geul. The canalisation of the stream and the construction of sluices and quays, caused the Geul to change from a natural, meandering water into a regulated stream. This is a typical example of Layer 1 of the Multi-Layer Safety: flood prevention by using technical measures.

Figure 13. Catchment area of the stream the Geul. As retrieved from [https://nl.wikipedia.org/wiki/Geul_\(rivier\)](https://nl.wikipedia.org/wiki/Geul_(rivier))



The Geul Valley: soil type and biophysical and material conditions

With a surface area of almost 2500 hectares, the Geul Valley is one of the largest Natura 2000 areas in the Netherlands. The area is characterised by large differences in height, soil type and water levels, which causes a rich ecosystem that is suitable for many different types of plants and animals (Natura2000, 2017).

A lot of the aeolian deposit in the Geul Valley contains of the typical Limburg's *löss* (Natura2000, 2017), a really fine and fertile soil with very small particles. Other parts of the area have a lack of *löss* due to erosion, but contain out of sand, clay, marl, flint and lime or chalk (Vleeshouwer et al., 1990). The marl and flint stones have been extracted in the past, which created the caves and mines that attracts tourists to Valkenburg. Note that these soil types all have a low permeability, which means that during heavy rain falls, the sponge effect of the soil is negligible small – which leads to run-off water from the hilly, sloped landscape into the streams and rivers.

The interviewees stress the soil type and its impermeable character as well. The Technical Manager in Flood Protection from the Water Authority of Limburg stress that it is difficult to infiltrate water into *löss* soils, “Yes, it is possible to infiltrate water in the soil in Limburg, but it is harder in loss. (...) Water infiltrates less quickly in *löss* than in sandy soils” (interviewee 1, personal communication, June 8th 2022). Another interviewee from the Water Authority of Limburg, the Advisor Plan Assessment, confirms this. “Limburg is hilly with *löss* soils, (...) so this asks for another way of anticipating to this (flooding) problem” (interviewee 10, personal communication, July 6th 2022).

4.4. Social situation – Actors

In the planned developments in Park de Valkenier, there are multiple actors on both local, regional and national level who play a role in the social situation. In the following paragraphs, the relevant actors and their roles will be explained.

Municipality of Valkenburg aan de Geul

One of the major roles in the social situation is fulfilled by the Municipality of Valkenburg aan de Geul. The municipality has the decisive power whether or not to change the current zoning plans from recreational to housing, in their new policy document *Gebiedsvisie Valkenburg-West*. If they do so, the project developer can start the planned housing developments in Park de Valkenier. If the municipality decides otherwise, the housing developments cannot take place. Since the Municipality only has about 16.000 inhabitants, the number people who work for the Municipality is not large either, as the Spatial Planner of the Municipality of Valkenburg aan de Geul explains. “There are only about three to four people working on the new zoning plan (*Gebiedsvisie Valkenburg-West*): a policy advisor, a colleague from the tourism and economy department, someone who takes housing into account, and someone for the spatial planning part” (interviewee 7, personal communication, June 30th 2022).

Water Authority of Limburg

The role of the Water Authority of Limburg is to take care of regional waters, such as canals and streams, and of drinking water, fish stock, enough water for crops and the purification of waste water. In addition to that, Water Authority also has to protect inhabitants to high water levels and river floods. Therefore, the Water Authority of Limburg is responsible to ensure water safety if an area will undergo a spatial redesign. This explains their role in the planned developments in Park de Valkenier: both the project developer and the municipality are dependent on and advice of the Water Authority regarding water safety.

Province of Limburg

The role of the Province of Limburg is to make a connection between all the overlapping policy fields, such as housing, nature and agriculture, as the Senior Advisor Spatial Planning from the Province of Limburg explains (interviewee 2, personal communication, June 8th 2022). Nevertheless, the role of the Province of Limburg in the planned developments in Park de Valkenier is limited, since the planned houses are within the housing contour (*rode wooncontour*) of the Municipality of Valkenburg aan de Geul. This means that the Municipality can decide over the plans herself, without having to consult the Province.

Ministry of Infrastructure and Water Management (MinIenW)

The Ministry of Infrastructure and Water Management is responsible for infrastructure and water management of the Netherlands. This includes dike strengthening programs, but also policy development regarding Flood Risk Management. Some of the topics MinIenW are working on are sustainability and climate adaptation (Rijksoverheid, 2022). The Policy Advisor Climate Adaptation from MinIenW explains that they are also responsible to make rules and norms regarding water safety, and to stimulate and facilitate new plans (interviewee 13, personal communication, July 13th 2022). MinIenW is currently working on two new policy that are relevant for the planned developments in Park

de Valkenier: the *Landelijke Maatlat Klimaatadaptief Bouwen* and the *Beleidskader Bodem en Water Sturend*.

Project Developer Grouwels Daelmans Projectontwikkeling B.V.

Project developer Grouwels Daelmans has been active in project development for more than thirty years. They work with real estate projects in the Provinces of Limburg and North Brabant. They bought the plot of Park de Valkenier from the former owner and they hired architects from Mecanoo to develop a design for 250 to 300 housing units on the plot. On their website, they mention the following: “The former amusement park Pretpark de Valkenier, with an area of over five hectares situated near the picturesque centre of Valkenburg aan de Geul, will be turned into a beautiful new neighbourhood in the next coming years” (Grouwels Daelmans, n.d.).

Architectural Company Mecanoo

The architectural company Mecanoo from Delft has been hired by Grouwels Daelmans to create the urban planning design. The company started as a small company run by architectural students from the TU Delft about thirty years ago. Nowadays, Mecanoo is a well-known architectural company that works with the philosophy of “People, Place, Purpose” (interviewee 5, personal communication, June 29th 2022). In Appendix 3, some images of the architectural design by Mecanoo on Park de Valkenier are given. This plan includes flood risk measures such as a mound, water square and a sluice.

4.5. Shock event and window of opportunity

4.5.1. Shock event

Shock event Floods in Limburg, July 2021

In the summer of 2021, a major flood event occurred in the Netherlands, Belgium, Germany, France, Italy, Luxembourg, Austria, the United Kingdom and Switzerland. In a period between the 13th and the 15th of July, the catchment areas of the rivers Rijn and Maas overflowed due to extreme precipitation. The saturated soils and local water buffer reservoirs were unable to store such large quantities of water, which caused the water to run-off the hills of the Eifel, Ardennes and the hills in the Dutch Province of Limburg. The most intense damage took place in Germany and Belgium. Rivers overflowed, houses got flooded, roads were unable to use, and almost 240 people lost their lives – 196 in Germany and 42 in Belgium (RVO, 2021). Whilst no deaths occurred in the Province of Limburg, the damage around the streams of the Geul and the Gulp was enormous. Powerful flash floods caused serious damage and a major social disruption in the area, since thousands of people had to leave their houses. On Tuesday the 13th of July and Wednesday the 14th of July, over 150 mm of precipitation fell in the south of Limburg. 150 mm is more than twice the normal amount of precipitation for the whole month of July in the Netherlands, comparable to a 1:1000 situation (KNMI, 2021). This means the chances of that level of precipitation are estimated to occur only once every thousand years’ time. In the Province of Limburg, the regional water system in the southern part was affected the most, together with the areas outside of the dikes of the river Maas (NWP, 2022).

Floods in Park de Valkenier, July 2021

In the Netherlands, the Municipality of Valkenburg aan de Geul was effected the most by the floods. Since the stream the Geul flows right through the city centre of Valkenburg, the damage of buildings and the infrastructure network was enormous. About 2300 households suffered from flooding damage and 700 houses became uninhabitable for a temporary period of time. In addition to that, 270 hotels, restaurants and cafes and 180 shops in the city centre of Valkenburg were flooded (NOS, 2021).

Pretpark de Valkenier got severely flooded as well. Not only due to its location next to the Geul, but also because of the pond, which functioned as a natural water storage point for the run-off water from the hills surrounding Valkenburg aan de Geul (see Figure 14 and 15 below: the area near the pond is lower than the surrounding area). The floods destroyed some of the technical installations of the amusement park and it caused a lot of overall damage to the attractions and the park itself. The floods of July 2021 pulled the final trigger to definitely close the park. Following the terminology of the Conceptual Framework, this means that the floods in Park de Valkenier did function as a shock event, which gave an impulse to certain interactions in the arena: the owner closed the park and decided to sell it.

Inventarisatie

Overstromingsdiepte (scenario's)

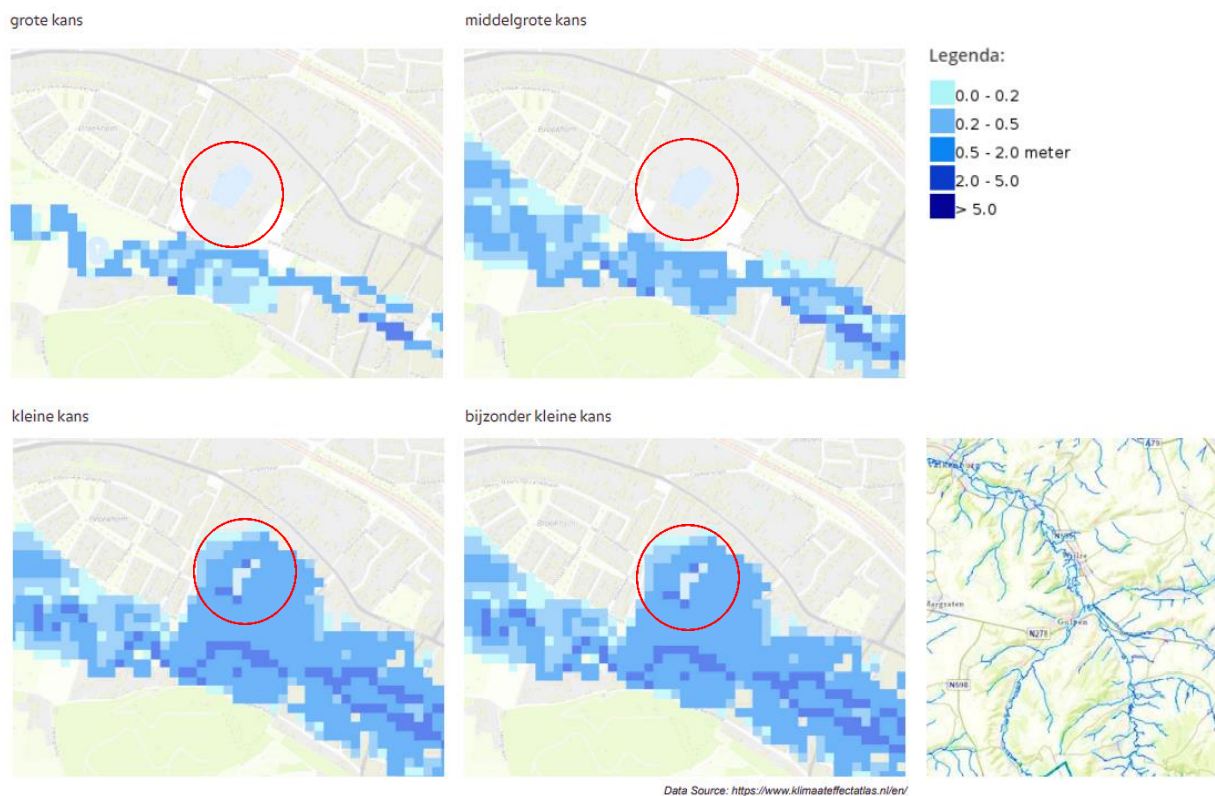


Figure 14. Water depth in Park de Valkenier during multiple flood risk scenarios. As retrieved from Klimaateffectatlas.nl

Inventarisatie

Topografie

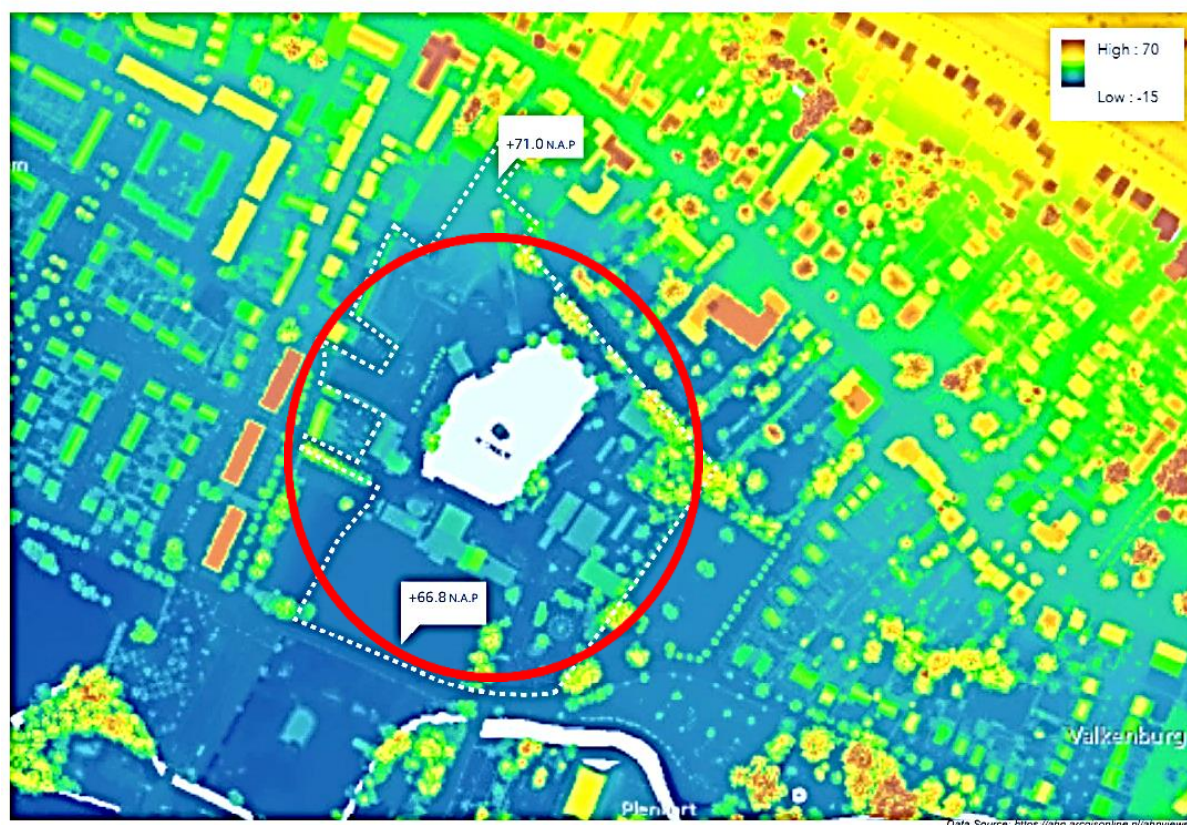


Figure 15. Elevation map of Park de Valkenier and its surrounding neighbourhoods. As retrieved from Mecanoo

4.5.2. Window of opportunity

In the following paragraph, the usage of the window of opportunity caused by the shock event will be discussed. The assumption from the Conceptual Framework is that the shock event created a window of opportunity for new policy development regarding Flood Risk Management. Using the window of opportunity after a shock event, such as a major flood, is not new in Dutch politics. The Policy Advisor Water Safety from MinIenW explains that political choices are always event based, “Because that creates momentum in the political field to change things and to spend money on it. Before a flood event happens, you can put water safety on the political agenda, but not much will happen then – since there are other things that feel more urgent at that time” (interviewee 8, personal communication, June 30th 2022). The interviewees answered unanimously positive to the question whether or not the floods could be seen as a shock event. The Program Manager Spatial Planning from RWS even refers to it as a wake-up call, which caused the topic of Flood Risk Management to gain political attention. “We should make use of this political-institutional (*politiek-bestuurlijk*) momentum” (interviewee 11, personal communication, July 6th 2022).

New policy frameworks by the Ministry of Infrastructure and Water Management

An example of the usage of this political-institutional momentum, is the set-up the *Beleidsstafel Wateroverlast en Hoogwater*, shortly after the floods in Limburg. The goal of this panel is to learn from the floods in Limburg and to give advice reports on practical short and long term measures, to help prevent similar flooding events in the near future (H2O Waternetwerk, 2021). It is a temporarily panel

to help discover possible solutions in multiple directions, such as the regional water system of Limburg, the connection to the main water system, climate adaptation, spatial planning and land use, improvements for climate adaptation policy, international connections and risk awareness of residents and the national government in similar flood events. The *Beleidsstafel* consists of representatives from different governmental parties, being the Water Authority of Limburg, the Province of Limburg, the Municipality of Valkenburg aan de Geul, the Safety Region of the South of Limburg, the National Government, the Delta Commissioner, the Union of Water Authorities, the Interprovincial Council and the Association of Dutch Municipalities. One of the advices the *Beleidsstafel* gave, is to unify the goals for stress tests and risk analysis on multiple scale levels, and to connect these levels with each other.

Interviewees from both the Municipal and Ministry level explain that all those meetings and discussion groups are interesting, “But we need to stop talking for once, and start defining new norms!”, the Policy Advisor Climate Adaptation from MinIenW explains (interviewee 13, personal communication, July 13th 2022). Therefore, the Ministry of Infrastructure and Water Management is developing two new policy frameworks, as a result of the floods in Limburg. This shows that the window of opportunity is actively being used. The two new policy frameworks are the *Landelijke Maatlat Klimaatadaptief Bouwen* and the *Beleidskader Bodem en Water Sturend*. Both frameworks are still under development and are planned to be released at the end of 2022.

The *Landelijke Maatlat Klimaatadaptief Bouwen* aims at developing a framework for climate adaptive developments, whilst focusing on locational choices and ways of building. The framework touches themes such as heat, rain water, droughts and flood prevention. The Policy Advisor Climate Adaptation from MinIenW explains that the framework focuses on *how* to build in a climate adaptive manner. “Together with two other Ministries (MinBZK and MinLNV), we are developing guidelines with clear goals and requirements that will have to be met for every housing development that will take place. In example, this could be that every house must be resistant to 70 millimetres of rain water” (interviewee 13, personal communication, July 13th 2022).

The *Beleidskader Bodem en Water Sturend* aims at developing preconditions for the locational choice for new developments. Therefore, the focus is on *where* to build (instead of *how* to build). The Policy Advisor Water Safety from the MinIenW explains that they try to develop this framework in such a way that it is strict and legally binding, instead of just another vague and non-binding advisory document (interviewee 8, personal communication, June 30th 2022). The framework is based on a bigger or higher system level, with focus on rainfall (interviewee 13, personal communication, July 13th 2022). Therefore, it could discourage planned building developments in flood prone areas such as polders or near river beds of the regional water system, such as in Park de Valkenier.

Extended financial investment in the regional water system in Limburg

Another example of the usage of this political-administrative momentum, can be found in financial investments. Way before the flood event of 2021, the Delta Program (*Deltaprogramma*) ensures that there is a constant amount of money available for water safety, which can be used for dikes and maintenance. From 2007 onwards, this program caused water safety to *always* be on the Dutch political agenda, independent of the political attention due to flood events. “This makes water safety a non-political topic”, explains the Policy Advisor Water Safety of MinIenW (interviewee 8, personal communication, June 30th 2022). Therefore, the Delta Fonds, which is the finance system from the Delta Commission, is not dependent of the political changes that take place every four years. On a yearly basis, the Delta Fonds gets a structural amount of money – 1.3 billion euros. But: this continuous investment is only focused on the main water system.

The regional water system of the Netherlands is dependent on another structural non-event based finance system: the Water Authority Tax (*Waterschapsbelasting*). Every resident has to pay for this, and the Water Authorities use this tax money to achieve their main goals – one of them being water safety. However, this amount of money seems to be not enough to ensure water safety in the regional water system of Limburg. The Strategic Advisor from the Water Authority of Limburg explains that Flood Risk Management is a costly business: ‘‘Only constructing a water buffer will already cost up to three or four hundred thousand euros. These measures are really expensive’’. Therefore, in addition to the Water Authority Tax, the Delta Program Spatial Adaptation can be used by municipalities and regions to finance climate adaptation measures. ‘‘But for the period of 2022 up to 2027, for the whole Province of Limburg, which consists of 34 municipalities, this budget is only 14 million euros...’’, (interviewee 15, personal communication, July 19th 2022). Therefore, more money is needed: an extended financial investment is desired to ensure water safety in the regional water system of the Province of Limburg.

‘‘That continuous finance system (of the Delta Fonds) is what we are aiming for in the regional water system in Limburg as well’’, explains the Strategic Advisor from the Water Authority of Limburg. This means that the floods in Valkenburg aan de Geul should be used as an incentive to realise an extended structural finance system, regardless of the political attention the topic gets. ‘‘By doing so, you say: we think this topic is of such great importance, that we disconnect it from the yearly political decision-making process’’ (interviewee 15, personal communication, July 19th 2022). The window of opportunity to invest more money into the regional water system, has clearly been used for the past year. An example of this is the Coalition Agreement from December 2021, in which 300 million euros have been set aside for water safety in the tributaries, streams and rivers near the Maas – the regional water system. In 2023, 2024 and 2025, the parties want to spend 100 million euros per year for water safety in Limburg (Coalitieakkoord, 2021).

Own initiative by Grouwels Daelmans to design a waterproof plan

When zooming in from national level to the level of Park de Valkenier, the usage of the window of opportunity can be seen as well. In Park de Valkenier, there are no new or more strict rules for rain water storage or climate adaptation measures yet. The rules and norms are still similar to the situation before the floods in July 2021, since the current frameworks are still under construction at national level (MinIenW). The Spatial Planner from the Municipality of Valkenburg aan de Geul explains that they must first decide whether or not they want a residential neighbourhood in Park de Valkenier, which should be followed by testing the possible risk of flooding. ‘‘But we cannot test the risk of flooding in the design of Grouwels Daelmans yet, since the policy framework we need to test it with, has not yet been released’’ (interviewee 7, personal communication, June 30th 2022).

Nevertheless, project developer Grouwels Daelmans understands the importance and relevance of taking climate adaptation measures, such as constructing new houses in a flood prone way. They explain that this understanding has been increased by the flood event in Valkenburg aan de Geul (interviewee 12, personal communication, July 7th 2022). Therefore, even whilst the new flood risk norms are not even developed yet, Grouwels Daelmans made it very clear to the architects from Mecanoo to take flood risk into account in their design. This resulted in a design which has a major focus on storing rain water and water from the Geul on the plot of Park de Valkenier. So even whilst the project developer was not obliged to take new Flood Risk Management norms into account, they did it voluntarily, since they saw the impact of the floods. This can be understood the result of using the window of opportunity after the floods of July 2021.

4.6. Social situation – Interactions in the arena

The observed interactions in the arena regarding the planned developments in Park de Valkenier will be described in the following paragraph. Some of the interactions on the regional (Province) and national (MinIenW) level will be mentioned as well, since the national discussion about FRM policy is relevant for the final interactions on the case study level for the planned developments in Park de Valkenier.

Before the flood

Former amusement park Park de Valkenier was opened in 1934 by mr. Jan Otermans, which makes it one of the oldest amusement parks of Europe. The southern side of the park is connected to nature, whereas all the other sides of the park are connected to residential areas. Figure 1 in Appendix 3 shows how this happened: Park de Valkenier used to be right next to the city centre and connected to all the nature around it, but in the 1970 and 1980s, the city of Valkenburg expanded with housing developments characterised by winding paths and courtyards (the typical Dutch *bloemkoolwijken*). These housing developments enclosed the amusement park, which made it impossible for the former owner to expand the Park de Valkenier any further. In the 1980s, two of the sons of mr. Otermans took over the park: Albert and Hub Otermans.

In 2004, the Municipality of Valkenburg aan de Geul wanted to introduce a new restriction for the amount of attraction parks in the municipality. Meanwhile, the residents of the neighbourhoods connected to the park have been complaining to the municipality about noise disturbance from Park de Valkenier. Therefore, the family Otermans was doubting to close the park in May 2004. Nevertheless, the restriction for the amount of attraction parks never got implemented and the park stayed open. The zoning plan of the park always has been, and still is, dedicated to recreational purposes for the length of one day (*dagrecreatie*). In 2019, the first non-Otermans family member took over the park: Jeffrey Driessen. In the beginning of 2021, Driessen was in a discussion with the Municipality of Valkenburg aan de Geul to close the park due to new noise disturbance complaints from the residents living in the surrounding neighbourhoods.

During the flood

During the floods of July 2021, Pretpark de Valkenier got severely flooded. The floods destroyed some of the technical installations of the amusement park and it caused a lot of overall damage to the attractions and the park itself. The costs of cleaning and fixing the broken technical installations, together with the noise complaints, pulled the final trigger to definitely close the park. The owner mr. Driessen decided to close the park and put it on the market.

After the flood

In December 2021, Park de Valkenier has been sold to project developer Grouwels Daelmans, who aspires to build a residential area on the plot (De Limburger, 2022). After Grouwels Daelmans bought the park, they hired architectural company Mecanoo to design a flood proof park with 250 to 300 housing units on it. Meanwhile, the Municipality of Valkenburg aan de Geul did not change the zoning plan from Park de Valkenier from recreational purposes to housing yet. Therefore, the initiator of the planned developments in Park de Valkenier, Grouwels Daelmans, bought the land speculatively (interviewee 12, personal communication, July 7th 2022). This means it is still unsure whether or not they will be allowed to build houses, but they took the risk anyway.

Since the plot of Park de Valkenier lays within the residential contour (*rode wooncontour*) of the municipality, the Municipality of Valkenburg is the authorised supervisor. The Province of Limburg therefore has nothing to say about this plan, nor does the Ministry of Infrastructure and Water Management. Nevertheless, there is close cooperation with the Water Authority (both with the municipality and the project developer), since they have specific knowledge about the flood sensitivity of the area. The Real Estate Acquisitor from Project Developer Grouwels Daelmans mentions that his team involved the Water Authority of Limburg early on in the development in their plans (interviewee 12, personal communication, July 7th 2022), which has been confirmed by the Water Authority. The Water Authority has been invited to multiple meetings with both the municipality and project developer. The Strategic Advisor from the Water Authority of Limburg explicitly mentions that the collaboration is going really well. ‘‘About half a year ago, the Municipality of Valkenburg aan de Geul approached us to check with us how to deal with the situation. They involve us in an active manner. I think that is the only way to deal with this: put everything out in the open before starting a project: what is the problem, what are the solutions? Who has which role and where do these roles meet? How can we help each other?’’ (interviewee 15, personal communication, July 19th 2022).

The role of the Water Authority is to give advice regarding water safety in the planned developments in Park de Valkenier. Municipality of Valkenburg aan de Geul is dependent of the knowledge of the Water Authority, since they lack the specific knowledge themselves to decide whether or not it is safe to live near the Geul (interviewee 7, personal communication, June 30th 2022). Note that their advice is not legally binding. ‘‘The Municipality has the option to do not take our advice into account, but if they decide to do so, they have to openly motivate this in the Municipal Council (*Gemeenteraad*)’’. Furthermore, the Water Authority provided some models (e.g. the flood risk map and elevation map, see Figure 14 and 15) to architectural company Mecanoo which they used for their design.

When architects from Mecanoo finished their flood proof design, including a mound and a water square, they presented it to the Municipality of Valkenburg aan de Geul in 2022. Conflicting interests emerged during this process of the interactions in the arena. Project developer Grouwels Daelmans and architectural company Mecanoo prefer new housing, whilst maintaining aware of the consequences of climate change (adapted building). Meanwhile, the Municipality of Valkenburg aan de Geul does not even know yet if they want to give permission to build new houses. Their zoning plan need to be changed in order to do so, which is not scheduled yet. Therefore, they call the project developer opportunistic, since they have not gotten permission to build yet (interviewee 7, personal communication, June 30th 2022). In addition to that, the municipality questions their need for new, expensive houses.

This means that the decision making process in the case study of Park de Valkenier in the Municipality of Valkenburg aan de Geul is not finished yet. There has not been made a final decision about whether or not the Municipality of Valkenburg aan de Geul will allow Grouwels Daelmans to construct housing units in the former amusement park. The next steps will be the development of the local policy document *Gebiedsvisie Valkenburg-West*, in which the Municipality will decide their need for houses. This document is still under construction. Likewise, the policy documents *Landelijke Maatlat Klimaatadaptief Bouwen* and *Beleidskader Bodem en Water Sturend* from MinIenW are still under construction. It seems that the Municipality is waiting for national rules and norms to use in their local plans.

4.7. Rules and resources

In paragraph 4.6. Interactions in the arena, the interactions before, during and after the flood event of 2021 have been presented in a chronological manner. In this 7th and final paragraph of Chapter 4 Case

study, the rules and resources (political economy; social attributes; discourse; and the rules and norms including the 7 rules-in-use) will be discussed to try to explain the interactions and their outcomes – being the planned developments in Park de Valkenier.

4.7.1. Political economy

As explained in Chapter 2, the political economy refers to topics as power and interest. Analysing the political economy during the flood event of 2021, will help to understand the interactions that led to the current situation in Park de Valkenier. To help understand the political economy in Park de Valkenier (but also on a regional and national scale), the key findings from the Policy Document Analysis are presented below. This is followed by general information about three observed changes in the national political economy.

Policy Document Analysis

Multiple relevant policy documents regarding FRM are have been studied, both dated and recent versions (before and after the flood event of 2021). The policy documents are divided into three levels: local, regional and national. Analysis of the change in documents before and after the flood event of 2021, gives insights into whether or not the presence of measures in Layer 2 of Multi-Layer Safety has changed in these policy documents, due to the shock event. The most important and outstanding findings from the Policy Document Analysis are:

1. *Soil and water steering* is being mentioned a lot, but remains vague
2. There is a focus on technical measures, such as dike improvement (Layer 1)
3. There is a lack of concrete and specific spatial measures, such as where and how to build (Layer 2).

Note that soil and water steering (*bodem en water sturend*) is not a new concept in Dutch policy documents. It used to be referred to as function follows water level (*functie volgt peil*). This concept has been mentioned in policy documents for over two decades ago: in the Vierde Nota Waterhuishouding (1998), the ground water level was used as a basis for regional spatial planning. In 2022, the term *soil and water (more) steering* still gets mentioned frequently, but in practice this does not seem to lead to prohibiting new construction in flood prone areas near the regional water river bedding, as seen in the case of Park de Valkenier.

Political economic changes in a broader context

Next to the Policy Document Analysis, there are also some political changes taking place in a broader context. Analysing these changes will help to get a better understanding of the interactions in Park de Valkenier. Three of those political changes are mentioned below: 1) the cyclical political wave from centralisation to decentralisation, 2) the shift from sectoral to integral approach and 3) the political balance of interests.

The extremely high water levels and river floods in 1993 and 1995 led to the development of *Beleidslijn Grote Rivieren* in 1997. According to the Senior Advisor Water from the Province of Limburg this national steering in Flood Risk Management was necessary back then, since everyone understood the problem of flooding, but everyone wanted to be exempted from the rules due to personal circumstances. That is why the national government made strict, national rules for everyone – without exceptions (interviewee 9, personal communication, July 5th 2022). This major change in political power can be labelled as the cyclical political wave from centralisation to decentralisation, back to centralisation, et

cetera. Or as a Program Manager Spatial Planning from RWS calls it: ‘‘A pendulum motion’’, a swing going back and forth (interviewee 11, personal communication, July 6th 2022). Note that this pattern is not caused or changed by some sort of shock event, it is just a tendency that changes throughout the decades.

The Program Manager explains: ‘‘Ten years ago, the idea was that the National Government should let go of the steering. The central role of direction on spatial planning was given completely to the Provinces, and now you see the responsibilities shifting back again. Think about the letters to the House of Representatives, to explain that the National Government should take back the lead... Note that it was a wish, from the Provinces themselves! This is a good example of the pendulum motions you see more often. A solution is to make centrally steered guiding lines – but it is questionable if that is feasible in the political system. I’m sure that the people who ask for more rules and more guidelines now, are the same people who will say in ten to fifteen years’ time: the National Government drives me crazy, since we cannot decide anything on our own!’’ (interviewee 11, personal communication, July 6th 2022). Another Program Manager, from MinBZK, mentions the cyclical wave in centralisation as well. ‘‘We made a miscalculation. Ten years ago, we thought the spatial planning in the Netherlands was finished’’, but now central steering seems to be needed again, since solving large problems on a decentral level did not seem to work out properly (interviewee 6, personal communication, June 29th 2022). This might sound easy to solve: more involvement of the government. ‘‘But the National Government is not used to this role, and it has not enough capacity to steer in such a way’’.

In line with this shift from decentralisation of spatial planning (about ten years ago) to centralisation (in the present: after the floods of 2021 in Limburg), is the shift from *sectoral to integral approach*. This means that sectoral tasks should be looked at in a more broad, inclusive manner. In the case of Park de Valkenier, the need for housing should not only be solved by construction, but viewpoints such as climate change, sustainability and water safety should also be incorporated whilst designing new houses. By looking at tasks more broadly, traditional sectors come together. It requires a different working method, instead of just stacking sectoral measures: it desires to seek a connection with other sectors (Omgevingswet, 2021). Whilst aiming for an integral approach, there will always be some political decisions left to be made regarding what sectors to invest in. Not only in the Municipality of Valkenburg aan de Geul, but in the whole of the Netherlands the discussion arises regarding the question to invest in new housing stock, or in water safety measures. Multiple interviewees mention that (even whilst the shock of the floods in Valkenburg put water safety higher on the political agenda) the need for housing usually gets more priority than topics as water safety. ‘‘It is really hard for the people from the Province of Limburg to decide over high water safety, since they also have to make choices over nitrogen, the angry farmers, the energy transition and the housing shortage’’, as the Strategic Advisor from the Water Authority of Limburg explains (interviewee 15, personal communication, July 19th 2022). This shows the complexity of the integral approach.

In addition to that, almost every interviewee refers to *the political balance of interests* between the topics of housing and water safety. These interests seem to be conflicting. Generally speaking, advice from people working at the administrative level, is not always taken serious on the political level. This is mostly because of economic interests: developing housing without FRM measures is less expensive. Therefore, housing usually gets prioritised over water safety – which explains the 820,000 planned housing developments in flood prone areas (as mentioned in Chapter 1 Introduction). Both the Water Authority and MinBZK use the word game to describe these conflicting interests between the administrative level and political level (or in Dutch: *ambtelijk versus bestuurlijk*). ‘‘It is a game that is played on the political level’’, says the Advisor Plan Assessment from the Water Authority of Limburg (interviewee 10, personal communication, July 6th 2022). ‘‘It is a political game. In the end, the choice

has to be made on the political level: what do they think is the most important? We give advice, but that does not mean that they have to listen to it!”, says the Program Manager of MinBZK (interviewee 6, personal communication, June 29th 2022). In the case of Park de Valkenier, the advice from the Water Authority of Limburg focuses on taking flood risk into account. Therefore, and also influenced by the flood event of the Geul in 2021, the architects of Mecanoo included multiple flood risk measures into the design. But all of this does not mean the Municipal Council also prioritises FRM, because the political level of the Municipality has other interests to serve as well.

4.7.2. Social attributes

As explained in Chapter 2 Theory, the category of social attributes refers to factors as race, gender and class. The factor educational background will be discussed later on in this chapter, as a part of the 7 rules-in-use. In the following paragraph, a description of the social attributes will be given of the case study in the Municipality of Valkenburg aan de Geul. This will create insight into why and how certain interactions are taking place after the flood event of 2021.

Race, gender and class

The colour of skin of the Council members was not mentioned or discussed explicitly, but all the Dutch surnames of the Council members (and other influential people regarding this topic, such as the Delta Commissioner mr. Peter Glas) give away that the majority of the people in this discussion are Dutch, and therefore are most likely white. Even whilst there has not been much focus on the topic of gender during the interviews, some of the interviewees themselves started to mention the fact that the Council members (on both Municipal, Provincial and National level) consists mainly of elderly men. The Policy Advisor Climate Adaptation from MinIenW, who’s appearance and working experience give away that he is under thirty years old, answers the question if he has a harder time in the Ministry since he is younger than most of his colleagues with the interesting answer: “No, I don’t think so. I *do* think that it plays a role that I am a man, I think people accept more easily what I say (than if I were a woman)” (interviewee 13, personal communication, July 13th 2022). The (female) Coordinating Advisor from the Delta Commission gives a similar insight in the meetings with the people on National Council level (*Bestuurlijke Overleggen*): “It’s usually men around the table” (interviewee 14, personal communication, July 15th 2022). Both quotes show how gender structures in a social situation work, or as Whaley would explain it: this reveals the working of a typical patriarchal structure. It could be observed that mostly men “occupy certain positions, or they may observe that one or more of the practices typically associated with a position may not be available to the participant in question if they are a woman” (Whaley, 2018, p. 8). This does not mean that women are not accepted in such positions, but it is a male dominated world. Therefore, there is a preference towards men in political functions regarding Flood Risk Management.

4.7.3. Discourse

In Chapter 2 Theory, the concept of discourse has been touched upon briefly. To summarize: discourse could be interpreted as the way people give meaning to certain events. It shows how priorities are framed. The present discourses that are found in both the case of Park de Valkenier and in the regional and national level, are: 1) climate change and flood risk awareness, 2) soil and water should have a steering/guiding role in spatial plans, and 3) prioritisation of the housing crisis over water safety.

Multiple interviewees mentioned a change in discourse regarding climate change and flood risk awareness. ‘‘For the last couple of years, the awareness that we have to be more careful with our planet is growing. We must take more care of nature, we must take water into account. In the past, we did that way too little. The idea was, that we could fix it with the *Deltawerken* and with dikes – until the climate changed so much that that was not enough anymore’’, – Senior Advisor Spatial Planning from the Province of Limburg (interviewee 2, personal communication, June 8th 2022). He confirms that this awareness has been growing even more due to the floods in Limburg in 2021. This quote is a perfect example from the change in discourse from flood prevention with technical measures (Layer 1 of Multi-Layer Safety), to keeping climate change and flood risk into account, by focusing on sustainable spatial planning (Layer 2 of MLS). Note that the change from Layer 1 to Layer 2 is not easy, since measuring the effects of spatial changes can be more complex than measuring the effects of technical changes, such as raising a dike. The Senior Advisor Water from the Province of Limburg mentions this explicitly during his interview, since this explains why technical investments are being preferred over spatial measures. ‘‘It is difficult to measure ‘‘soft’’ measurements. It is a lot easier to measure the profit in cubical meters of water storage, when working on a dam or a dike’’. He uses the example of changing paved area into grasslands, or changing grasslands into a forest. The exact difference such changes makes in water storage capacity, is not easy to calculate. That explains why technical measures are still being preferred over spatial adaptations, even whilst the climate change and flood risk awareness is growing (interviewee 9, personal communication, July 5th 2022). Nevertheless, it must be said that climate adaptation is being incorporated in the new policy documents that launched shortly after the floods. Or as the Coordinating Advisor from the Delta Commission explains: ‘‘It is not possible to read an *Omgevingsvisie* anymore without climate adaptation being mentioned in it’’ (interviewee 14, personal communication, July 15th 2022). This confirms the new discourse about climate change and flood risk awareness.

As mentioned previously, some new policy documents were released shortly after the floods (*Deltaprogramma*, *HWBP*, *NWP*, *Provinciaal Waterprogramma Limburg 2022-2027*, et cetera). Remarkably, these documents give clear rules about technical water safety measures and dike strengthening, but they do not give clear rules about where (not) to build (Layer 2 of Multi-Layer Safety). There seems to be a lack of rules that prohibit housing developments in flood prone areas. The interviewees confirm this. A key term in these policy documents is that ‘‘soil and water should have a steering/guiding role’’ in spatial plans (*bodem en water moet sturend worden*), but it is never explicitly mentioned how to do so. This could cause problems, according to the Program Manager of MinBZK: ‘‘The hard thing is that you can interpret this in multiple ways: is it about water quality, water pollution, ecological values, or should it be seen from a spatial planning point of view? The conclusion is: it has to be more specific. Just mentioning that soil and water should have a more steering or guiding role is too vague’’ (interviewee 6, personal communication, June 29th 2022).

The third and final discourse is the need for houses, which seems to be prioritised over water safety because of the current housing crises. This results in Flood Risk Management not being as high on the political agenda as the development of the building stock (‘‘1 million new houses by 2030’’, as mentioned in the Introduction). In case of Park de Valkenier, the Municipality of Valkenburg aan de Geul has multiple interests they must represent. They must not only protect their inhabitants from future flood events, but they must also provide enough housing for asylum seekers from the war in Ukraine, and for the residents from Valkenburg aan de Geul who still have not been able to return to their own home, ever since it got destroyed by the catastrophic power of the floods of July 2021 (interviewee 13, personal communication, July 13th 2022). This shows how the discourse is prioritising housing over water safety.

4.7.4. Rules and norms: the 7 rules-in-use

As the name implies, the category of rules and norms focuses on both strict, formal rules as well as on the norms and behaviours of the actors. In this paragraph, the rules, norms and practices in and around the planned developments in Park de Valkenier will be touched upon. By following the line of Chapter 2.4. Operationalisation, the rules and norms will be divided into the 7 rules-in-use, which allows to give a detailed analysis of the situation.

As explained in Chapter 2 Theory, the CIAD Framework can be used to get a better understanding of interactions between certain actors and their outcomes (Ostrom, 2010). The interactions in the arena will be used to explain and predict the outcomes of policy. The 7 rules-in-use (Polski & Ostrom, 1999) explain the influence that institutions have on different aspects and interactions in this arena. The rules-in-use is the minimum set of rules which is necessary to explain the interactions and outcomes of a certain policy. The 7 rules-in-use of the case of Park de Valkenier are presented below.

1. Position rules ‘‘identify the sets of positions that are assigned to the actors involved. These rules reflect the capabilities and responsibilities of the actors in the assigned positions, defining who can act as a regulator, promoter or supporter in the action situation’’ (Laeni et al., 2021, p. 3). In the case of Park de Valkenier, the position rules specify the number, type and roles of the actors. It explains who has power to make decisions and whom they are collaborating with. The quotes in this paragraph try to give insight and some sort of indication in the position rules and power relations in the social situation.

If the Municipality of Valkenburg aan de Geul will decide to *not* change the current zoning plan, the planned housing development of project developer Grouwels Daelmans cannot take place at all. Therefore, in the case of Park de Valkenier, the municipality has the biggest power in the social situation. Their position can be labelled as *regulator*. The Spatial Planner from the Municipality of Valkenburg aan de Geul acknowledges that they have too little knowledge to decide about Park de Valkenier by themselves, therefore they use the knowledge of the Water Authority of Limburg (interviewee 7, personal communication, June 30th 2022). The interviewees from the Water Authority of Limburg and Mecanoo both mention that they use the knowledge of consultancy companies to execute all the technical and engineering measures, such as rain water flooding levels and stress tests and the Water Assessment (interviewee 10, personal communication, July 6th 2022). This makes both the Water Authority, Mecanoo and consultancy companies *supporters* of the planned developments in Park de Valkenier.

Remarkably, all the interviewees from the Water Authority of Limburg (interviewees 1, 10 and 15) stress how little their power in the social situation in Park de Valkenier is. All of them explain how the Province of Limburg and the Ministry of Infrastructure and Water Management are responsible for the rules and norms, whilst they have no say in the decision-making process themselves. Nevertheless, during both of the interviews with the interviewees from MinIenW (interviewee 8 and 13), they mention that the Water Authority *should* play a big(ger) role in the interactions in the arena, because of their practical knowledge of the local area. The Policy Advisor Water Safety from MinIenW: ‘‘The Water Authorities have a really clear water profile and they know the area much better than we do. (...) This makes the Water Authority a really important organisation’’ (interviewee 8, personal communication, June 30th 2022). Therefore, the Water Authority cannot only be labelled as a *supporter*, but also as a *promotor* in the case of Park de Valkenier.

Another actor who functions as a *promotor* in Park de Valkenier is project developer Grouwels Daelmans, since they initiated the plan. Their main pressure point is the fact that they have already bought the land of Park de Valkenier, and that the plot will deteriorate if they are not allowed to build

on it anytime soon. The Real Estate Acquisitor from Project Developer Grouwels Daelmans explains that they have no Plan B for the plot, if the zoning plan does not change (interviewee 12, personal communication, July 7th 2022). Since there are no other potential buyers, the Municipality of Valkenburg aan de Geul has to buy the plot with their own money, which is not desirable. This shows how Grouwels Daelmans discretely puts pressure on the Municipality, to change the zoning plan of Valkenburg-West in such a way that housing development is allowed.

2. Boundary rules ‘‘specify which actors are involved in the action arena and how they enter and leave the action arena, and thus concern how these actors are invited or selected to be part of an action-situation. These rules also set the number and characteristics of participants in an action situation’’ (Laeni et al., 2021, p. 3). In the case of Park de Valkenier, this regards which participants enter or leave powerful positions and how they do so. As discussed previously in this chapter, it is mostly men around the table. The actors who have a say in the developments in Park de Valkenier, are the Municipality of Valkenburg aan de Geul, the Water Authority of Limburg and project developer Grouwels Daelmans.

However, the main power is in hands of the Municipal Council, since they have the final political power in the decision-making regarding Park de Valkenier. There are multiple boundaries to get in that position. To get a say in the Municipal Council, one must first become a member of a political party, followed by being chosen democratically in the Municipal elections. If one gets chosen into the Council, they get a democratic mandate. Note that next to all these democratic boundaries, there are no educational boundaries to get in this position: everyone above the age of 18 years can apply. The Strategic Advisor from the Water Authority of Limburg confirms that there are a lot of people without any specific educational background knowledge regarding the choices they have to make. ‘‘There are plenty of Council members, alderman and provincial executives in the Netherlands, who are laymen’’ (interviewee 15, personal communication, July 19th 2022). Being a laymen (*leek*) means that they have no specific educational knowledge about the topics they have to decide on. So solve this, the people who work on the administrative level of the Municipality, such as Spatial Planners, give advice regarding the planned developments in Park de Valkenier. The Council members from the Municipality of Valkenburg aan de Geul can then make a final decision about the *Gebiedsvisie Valkenburg-West*, and therefore also about the planned developments in Park de Valkenier.

3. Choice rules ‘‘specify the possible actions that actors are allowed, obliged or prohibited to take. These rules thus concern the choices of allowable actions for actors to take according to their roles and tasks’’ (Laeni et al., 2021, p. 3). In the case of Park de Valkenier, this also includes certain policy documents and policy rules, since these can limit certain choices the actors can make. The main rules and norms that are important for the planned developments in the Municipality of Valkenburg aan de Geul, are the policy documents and local, regional and national laws regarding Flood Risk Management, such as the Water Assessment.

If project developer Grouwels Daelmans wants to build in the Park de Valkenier area, the zoning plan needs to be changed (*bestemmingsplanwijziging*). According to the current zoning plan, the only thing which is allowed to organize are recreational activities (*dagrecreatie*). The Municipality still has to decide whether or not they will change this zoning plan into ‘‘housing’’ instead of recreational activities. This will be decided in the vision document for the western part of the municipality (*Gebiedsvisie Valkenburg-West*). The Head of the Department from Physical and Economic Development from the Municipality of Valkenburg aan de Geul explains that this new vision document currently is being on

hold, since the Municipality wants to wait until they have more information about other developments in the nearby area (personal communication via e-mail, July 2022). Another plausible reason is that the Municipality wants to wait for the new policy documents from MinIenW to get published.

Planning new housing developments in a proven flood prone area in Valkenburg aan de Geul raises some questions. One of them is how the Municipality and the project developer will take water safety and possible future flooding events into account. A way to do so is by executing some tests, such as the Water Assessment and a stress test (Deltaplan Ruimtelijke Adaptatie, 2018). The Water Assessment in its current state is still the lightest, least binding form: a motivational obligatory (*motiveringsplicht*). The Senior Advisor Water from the Province of Limburg explains that this is a political choice, made by the Provincial Council (*Provinciale Staten*). He explains that the Water Assessment could become more obligatory in the future (interviewee 9, personal communication, July 5th 2022). A lot of interviewees mention something similar to making the Water Assessment more obligatory: it should be more legally binding. If this happens, it means that the choice rules will become more committal.

The Spatial Planner of the Municipality of Valkenburg aan de Geul mentions that the Water Assessment and stress test are not scheduled yet for Park de Valkenier whereas this is one of the mandatory choice rules the project developer has to fulfil. “We leave a lot of research obligations up to the project developers. They are expected to engage consultancy companies and to carry out all investigations, which must then show that there is proper spatial planning (*goede ruimtelijke ordening*). They must use this to demonstrate that they comply with all policies and regulations” (interviewee 7, personal communication, June 30th 2022). Therefore, Grouwels Daelmans has to engage a consultancy company to carry out these investigations. The only role for the Municipality left, is to test if they have done that correctly. It is remarkable that the stress test and Water Assessment not performed yet. This raises the question if guaranteeing water safety and preventing flood risk has priority, or that it is just about making money by building new houses. Incorporating a stress test does not seem to have priority for both the Municipality and the project developer, as if it is just “checking the box” after all other plans are being made. This is in contrary to the first Advice Letter by Delta Commissioner mr. Peter Glas, where he stresses that the stress test (and water and soil in general) should be the fundament of new plans (Glas, 2022).

4. Aggregation rules “affect how decisions about actions and activities can jointly be made by actors. These rules also determine where the decisions come from, for example, national government or local government, and whether there will be opportunities for marginalized groups to take part in decision-making” (Laeni et al., 2021, p. 3). In the case of Park de Valkenier, aggregation rules show how and by whom decisions are being made in the social situation. It explains the power distributions and in- and interdependencies between actors.

From a national point of view, the Ministry of Infrastructure and Water Management and the Province are the most powerful actors, since they can decide over national policy, rules and norms – but in local plans such as in case study Park de Valkenier, all the choices can be made by the Municipality of Valkenburg aan de Geul. This is because of the fact that planned developments of Grouwels Daelmans are inside of the housing contour (*rode wooncontour*) of the Municipality of Valkenburg aan de Geul, which means the Province of Limburg has nothing to say about this (interviewee 12, personal communication, July 7th 2022). Note that the Province of Limburg does not seem to *want* to have a say in this either: the Senior Advisor Spatial Planning from the Province of Limburg explains that spatial planning problems should be fixed at the level of the national government, not at the level of the province (interviewee 2, personal communication, June 8th 2022). Similar findings appear from both municipal as national level: the Municipality of Valkenburg aan de Geul and the Water Authority of Limburg

blame MinIenW for not making concrete rules and norms they can follow (interviewee 7, personal communication, June 30th 2022), whilst MinIenW explains that it is up to the municipalities and water authorities to adjust these purposely abstract and vague rules to the local situation – because *they* are the ones with specific knowledge of the area (interviewee 8, personal communication, June 30th 2022). It seems like all actors in the case of Park de Valkenier are trying to shirk responsibilities by saying someone else is responsible, which shows a disbalance in the distribution of responsibilities.

Another problem in the aggregation rules which is mentioned by multiple interviewees, is the difficulty to translate vague policy documents into more strict rules and norms (*doorvertaling*). Both interviewees from the MinIenW explain that the only thing they can make, are somewhat abstract rules and policy documents – since it is not possible to make strict rules and norms for the level of the whole of the Netherlands. This is also mentioned by the Program Manager Spatial Planning from RWS, who explains that it is impossible for MinIenW to develop specific guidelines for municipalities (interviewee 11, personal communication, July 6th 2022). “There are so many differences between the municipalities in the Netherlands, which makes it really hard to make a proper general rule for the whole country”, tells the Policy Advisor Water Safety from MinIenW (interviewee 8, personal communication, June 30th 2022). He explains that it is up to the Provinces to check if their Municipalities are turning the more abstract, general policy documents into concrete rules on local scale in a correct way (*regionale doorvertaling*). The Ministry of Infrastructure and Water Management does not interfere in this process, since they have not enough staff to do so. Nevertheless, the Policy Advisor Water Safety does not deny that this translating process is difficult (interviewee 8, personal communication, June 30th 2022).

In case of Park de Valkenier, this is exactly what seems to cause some friction. Both the Municipality of Valkenburg aan de Geul and the Water Authority of Limburg are unsure how to interpret the vague and abstract national policy documents. In addition to that, the Province of Limburg is lacking to ensure a proper translation of those rules into local developments, because they do not interfere or give advice about the planned developments Park de Valkenier – since it is in the housing contour of the Municipality.

5. Scope rules “determine the intended outcome that may, must, or must not occur. These rules can be related to framing and clarifying the policy goals in the planning process, such as water safety and spatial and ecological quality” (Laeni et al., 2021, p. 3). In the case of Park de Valkenier, this means the criteria or requirements which determine the final outcomes of interaction, being the choice about whether or not to allow the planned developments. Scope rules also explain how one actor can affect the outcome in a different way than other actors do. The final outcome will be chosen under certain conditions, such as legislation.

On the national level, this refers to both of the new policy documents that are still under construction: *Landelijke Maatlat Klimaatadaptief Bouwen* and *Beleidskader Bodem en Water Sturend*. These developments in FRM policy are a result of the shock event of the floods of July 2021. Coincidentally, a new version of various policy documents has been published shortly after the floods (such as the *NWP 2022-2027*). Nevertheless, the interviewees explain that the 2022-2027 policy documents were already almost finished when the floods in Limburg occurred. Multiple interviewees mention that it takes a lot of time to change the scope rules (e.g. policy documents; rules and norms; legislation). Therefore, not many changes to them were made as a result of the floods, with the exception of mentioning that soil and water should be more steering.

On the level of Park de Valkenier, the scope rules will be formulated in the new local vision document. The Municipality of Valkenburg is working on the *Gebiedsvisie Valkenburg-West*. This document will

give clarity about whether or not the zoning plan of the plot will be changed into housing. The housing vision of the *Gebiedsvisie* still has to be determined, since the municipality is unsure about how many houses are needed (interviewee 7, personal communication, June 30th 2022). Valkenburg aan de Geul has about 16.000 inhabitants, whilst Grouwels Daelmans wants to construct 250-300 housing units in Park de Valkenier. With a part of almost 2%, that is a large share of the current population. In addition to that, it must be taken into account for what kind of people these houses will be. Grouwels Daelmans aims at developing a lot of expensive villa's for wealthy people (interviewee 5, personal communication, June 29th 2022), whilst the Spatial Planner from Municipality of Valkenburg aan de Geul mentions that that does not match the demand of the people from Valkenburg aan de Geul: "In this sub-region *Maastricht Heuvelland* we have a regional policy vision for housing development. The population here is decreasing, which means we have to watch carefully what kind of new housing we develop. The project developer obviously wants to develop housing for the wealthier people (...), but we don't need expensive houses at all. We need only cheap rental apartments, and the developer will not want to build those kind of houses" (interviewee 7, personal communication, June 30th 2022). Since the intended outcome of Grouwels Daelmans is not in line with the ambitions from the Municipality of Valkenburg aan de Geul, the scope rules might be redefined. An Advisor Plan Assessment from the Water Authority of Limburg adds to that with the need of implementing national rules to protect the areas near river beds – which is similar to Layer 2 of Multi-Layer Safety (interviewee 10, personal communication, July 6th 2022).

6. Information rules "specify the essential conditions of how the information is made available to, sent to and received by the actors. These rules also reflect how information facilities and activities such as meetings, seminars, events, and workshops could be organized" (Laeni et al., 2021, p. 3). In the case of Park de Valkenier, this means the way in which the Municipal Council members receive information about the plans from Grouwels Daelmans. In addition to that, information rules refers to the way all other relevant actors receive their information in the social situation. The way their communication is structured, gives insight into whether or not an open dialogue about Park de Valkenier is possible.

As mentioned in 2. Boundary rules, there are plenty of Council members, alderman and provincial executives in the Netherlands are *laymen*, which means that they do not have specific educational knowledge about the topics they have to decide on. This is also the case in the Municipal Council of Valkenburg aan de Geul. The Strategic Advisor from the Water Authority of Limburg explains that the Water Authority tries to deal with this by inviting speakers to talk to these Council members to inform them about the status quo, i.e. about the causes of climate change. "I think that that is the only way to take a step forward, we must show the people who make the decisions, what is really going on. And that the choices *they* make have an influence in how we deal with this (climate change)" (interviewee 15, personal communication, July 19th 2022).

As explained in Chapter 4.2. Outcomes, the Water Assessment has not been executed yet in Park de Valkenier. Nevertheless, the Spatial Planner of the Municipality of Valkenburg aan de Geul already doubts the usefulness of the Water Assessment in the case of Park de Valkenier. "In my experience, the Water Assessment focuses on the water which falls on the plot itself, and not enough on the water which flows next to the plot, in this case the Geul. The Water Assessment only looks at the amount of pavement in the area and the drainage of rain water – so only how to deal with the water which falls on the plot. (...) How do you deal with that water as a project developer? You hold it, you store it, you drain it. But the water which caused the floodings in Valkenburg came from somewhere else!" (interviewee 7,

personal communication, June 30th 2022). This quote shows that the information needed to fulfil the Water Assessment might need to be expanded, to become relevant for Park de Valkenier.

Another example of information rules in the case of Park de Valkenier, is the way Grouwels Daelmans received information from the Water Authority. The Real Estate Acquisitor from Project Developer Grouwels Daelmans mentions that an acquaintance him works at the Water Authority of Limburg. ‘‘So I contacted him for some information. He provided the water flow models and flood risk maps for Mecanoo, which they were allowed to make use of in their design’’ (interviewee 12, personal communication, July 7th 2022). Using such data helps to take flood risk into account from the designing stage onwards. In Park de Valkenier, these maps show how the area surrounding the pond is the deepest area of the neighbourhood, which causes water to run off to that area. Critical information such as flood risk maps and elevation maps are essential to design a flood proof plan for Park de Valkenier. The Water Authority communicated their information openly, by sharing important maps with the architect and the project developer. This shows that the information needed to design a flood proof housing plan, was easily accessible – which ensures a better final outcome for Park de Valkenier.

7. Pay-off rules ‘‘determine the benefits and costs that have to be distributed, paid and received by the actors involved. The pay-off rules consider the important question of how funding is guaranteed, mobilized, and activated’’ (Laeni et al., 2021, p. 3). In the case of Park de Valkenier, this means the division of costs and benefits regarding developing the planned housing, and who is financially responsible for the incorporation of the flood risk measures in the design, such as the mound and the water square.

As explained in paragraph 4.5.2. Window of Opportunity, there is a desire to extend the financial system for the regional water system, in a similar way as the costs for the national water system are being paid. In the Coalition Agreement from December 2021, 300 million euros have been set aside for water safety in the tributaries, streams and rivers near the Maas – the regional water system. In 2023, 2024 and 2025, the parties want to spend 100 million euros per year for water safety in Limburg (Coalitieakkoord, 2021). This is still not a long term, non-event based finance system such as the Delta Fonds is for the national water system, but it is a great start. The costs and benefits of such a payment system are divided as such: everyone in the Netherlands pays for it with taxes, and the people who need the protection from the regional water system will benefit from it. If the Province of Limburg will decide to help expand the finance system for the regional water system, a part of these costs will be paid by the government as well.

In the case of Park de Valkenier, the planned developments will be more expensive than in a regular housing development, due to the flood risk measures such as the mound, water square and sluice. The people who will benefit from this, are the people who will buy or rent a house in Park de Valkenier. Project developer Grouwels Daelmans and the Municipality and Water Authority have not agreed yet on who is responsible to pay or subsidise the flood risk measures in Park de Valkenier. The project developer first wants to know if the zoning plan will be changed, before discussing the costs (interviewee 12, personal communication, July 7th 2022). One of the wishes from the Municipality is a bigger amount of social housing. In response to that, the Real Estate Acquisitor from Grouwels Daelmans explains that up to 30% of the houses in their plan has to be social housing. ‘‘It will still be cost effective, but either way: it has to be paid. If one house gets less expensive, the other house will get more expensive. So yeah, who do you help with this problem? That is the question. Because the change in costs will have to be paid by the people who buy the more expensive houses’’ (interviewee 12, personal communication, July 7th 2022). This means that the pay-off costs in Park de Valkenier will be paid by the people with a bigger budget.

5. CONCLUSION, DISCUSSION AND RECOMMENDATIONS

5.1. Conclusions

In the following chapter, the most important findings to help answer the sub-questions and main research question will be presented. The research findings have been presented in Chapter 4, in line with the theoretical concepts from the CIAD theory. Below, the most relevant findings will be presented in a different manner: the structure of the sub-questions will be used as a guide line (rather than the CIAD terminology), with the goal to help answer the main research question.

The main research question is ‘*What lessons can be learned from the planned developments in the (in July 2021 flooded) former amusement park Pretpark de Valkenier in the Municipality aan de Geul, in a way to improve the (policy) decision-making process regarding planned housing developments in flood prone areas of the Netherlands?*’.

To help answer the main research question, the four sub-questions will be answered below.

5.1.1. Sub-question 1

How can Flood Risk Management be conceptualised?

The first sub-question is about the conceptualisation of Flood Risk Management. In Chapter 2 Theory, the concept of Flood Risk Management has been conceptualised using multiple theoretical concepts. Therefore, Chapter 2 Theory can be interpreted as the answer of the first sub-question. For the sake of readability and completeness, a short recapitulation of the FRM concepts is listed below:

First and most importantly, the concept of Multi-Layer Safety and its three layers has been used to conceptualise FRM: Layer 1. Prevention, Layer 2. Sustainable Spatial Planning, and Layer 3. Disaster Management – whereas this research focused on the lack of measures in Layer 2. This has been added with some theories about the institutional perspective of flood governance, which play an important role in Flood Risk Management. Furthermore, the concept of using a window of opportunity after a shock event also one of the key elements in Flood Risk Management in the Netherlands, since FRM is partially based on the political momentum, which gets an impulse after a major flood event. To tie all these concepts together in a framework, the IAD and CIAD Frameworks have been used to develop a conceptual framework to give this research some theoretical structuration.

5.1.2. Sub-question 2

What does the current Flood Risk Management policy look like – on both the national (National Government), regional (Province of Limburg) and local (Municipality of Valkenburg aan de Geul) level?

The second sub-question focuses on the current Flood Risk Management policy. In the Policy Document Analysis, it became clear that most policy documents have a lot of focus on Layer 1 of Multi-Layer Safety: the technical measures such as raising or moving dikes and dams. There is a lack of concrete plans regarding whether or not to build in flood prone areas (Layer 2), such as near the river bed of the Geul in the Municipality of Valkenburg aan de Geul.

In addition to that, the interviewees mention a lack of clear rules and norms. The sentence *soil and water steering* is mentioned abundantly in policy documents, but since this remains abstract, the actors in the arena do not know how to incorporate this. It remains unclear what this sentence really means, and what the consequences are if one does not listen to this adage.

Almost all interviewees indicate that there are opportunities for improvement here – at the Ministry of Infrastructure and Water Management they are therefore now developing a two new policy frameworks: *Landelijke Maatlat Klimaatadaptief Bouwen* and *Beleidskader Bodem en Water Sturend*. This should help to create clear guidelines and stricter rules and norms regarding what is allowed and what is not, regarding planned (housing) developments in flood prone areas. Simultaneously, the Municipality of Valkenburg aan de Geul is developing their *Gebiedsvisie Valkenburg-West*, which includes their housing policy for the upcoming years. The zoning plan for the plot will allow or prohibit the planned housing developments in Park de Valkenier.

5.1.3. Sub-question 3

Assuming the shock event Floods in Limburg, 2021 created a window of opportunity for (policy) change, which elements changed as a consequence of this shock event, and how?

The third sub-question focuses on the elements that changed after the floods in Limburg. During the qualitative data collection, it became clear that the floods in Limburg of July 2021 most certainly created a window of opportunity for change – which was already assumed from the start of this research. This window of opportunity for change does not only refer to policy change of the most recently published water-related policy documents (such as the *NWP 2022-2027*), but it also led to the foundation of the *Beleidsstafel Wateroverlast en Hoogwater* and to the letter from Delta Commissioner mr. Glas, as mentioned in Chapter 1 (see Societal Relevance).

It might be a bit too soon to see a clear content-related shift in the policy documents, since the floods happened only shortly before the new policy documents (2022-2027) were published. This means that these documents were already (almost) finished, so that they could not be adjusted that much. Nevertheless, the phrase *soil and water more steering* definitely found its way into these documents.

Policy documents are not the only things that experienced a change. The interviewees mentioned all kind of changes, such as a change in the general discourse regarding climate change and flood risk awareness. The interviewees from Limburg, such as the Water Authority, Municipality and project developer Grouwels Daelmans, explained that the general opinion about the effects of climate change has increased, since people experienced the consequences of the floods in Valkenburg aan de Geul with their own eyes.

In the case study of Park de Valkenier it can be noticed that the window of opportunity these floods created, is most definitely being used. Even whilst it is not mandatory yet, the project developer and the architect took water safety into account in their plans for the new housing developments in the park. They designed elevated housing units on top of a mound (*terp*) and they incorporated ample water storage with the use of a water square. Also, they designed a sluice between the pond and the Geul, which creates the possibility to disconnect the pond and the Geul from each other during excessive rainfall. All of this was not mandatory, but they did it out of their own accord. This shows how the flood event influenced the outcomes of the interactions in the arena.

5.1.4. Sub-question 4

Which of these elements could be improved, to overcome similar flood disasters in residential areas in the future? And how could this be improved?

The fourth and final sub-question focuses on how to improve the situation, to overcome similar flood disasters (as in the Municipality of Valkenburg aan de Geul) in residential areas in the future. In Chapter 4, multiple elements that could be improved are mentioned. Three of them seemed to be the most outstanding, since the interviewees did not only mentioned what is wrong with them, but also *how* they could be improved. These three elements are 1) the translation from more abstract, general policy documents into concrete rules on local scale in a correct way (*doorvertaling*); 2) responsibility issues and the role of the Water Authority; and 3) the finance system for the regional water system. These elements will be discussed one by one in the following paragraph.

1. The translation of national policy documents into local rules and norms

Both the interviewees from the Municipality of Valkenburg aan de Geul and the Water Authority of Limburg show a cry for help: the national policy regarding Flood Risk Management is not clear enough, there is a lack of strict guidelines they have to follow. The interviewees from MinIenW and the Province of Limburg agree on this, they deliberately make rules and guidelines as abstract as possible – so that they can be used in any municipality, in any case. They explain that it is hard to make these national policy documents more strict, since it must be useful in many different areas with many different circumstances. They explain that municipalities need to fix this themselves, with the help and supervision of the province. In the case of Park de Valkenier, this could be improved, since the Municipality of Valkenburg aan de Geul indicates that they do not get help from the Province of Limburg in their decisions regarding whether or not to change the zoning plan of Park de Valkenier from recreational into housing.

The way to improve this seems obvious: make the current rules and norms more strict. This is exactly what the Ministry of Infrastructure and Water Management is working on, with the development of two new policy frameworks: the *Landelijke Maatlat Klimaatadaptief Bouwen* and *Beleidskader Bodem en Water Sturend*. Also, the floods of July 2021 resulted in the formation of the *Beleidstafel Wateroverlast en Hoogwater*, which is a group of advisors who try to give concrete advice for water safety measures. The principles from these two new policy documents have to be incorporated in the translation towards regional and local documents (*regionale doorvertaling*), and the Provinces are responsible for that.

2. Responsibility issues and the role of the Water Authority

Another part of the interactions in the arena that could use some improvement, is the level of responsibility of the governance actors. Every actor should take its own responsibility for an overarching problem as water safety in flood prone areas, whether it is on the level of the Municipality or the Ministry. The interviewees explained the governance shift from centralisation towards decentralisation, and now back to centralisation again. The National Government should take its responsibility in water safety, since it seems to be such a big problem that local authorities need some steering from above. This does not mean that the municipality can lean back and wait for higher governmental authority levels to make decisions, since they have to participate actively in the conflicting interests of housing versus water safety as well. It seems that all actors are not taking enough responsibility of their own actions: the Municipality of Valkenburg aan de Geul blames the National Government for not making concrete

rules and norms they can follow, whilst the Ministry of Infrastructure and Water Management explains that municipalities do not want them to make concrete norms, since their power gets eliminated even further if there is nothing left open for a debate. This loop of responsibilities should be broken: every actor must take its own responsibility.

Whilst discussing these responsibilities with the interviewees, the idea of giving more power to the Water Authority of Limburg has been mentioned. Some of the interviewees, including the Water Authority themselves, are in great favour of this idea. The main idea behind this is that they are experts on the field of water management and water safety, whilst their opinion and advice (via the Water Assessment) is not being taken into account enough. To solve this, the current plan of the government is to give the Water Assessment a more compelling character (Coalitieakkoord, 2021) – but the interviewees are doubtful about this plan. They explain that it will still be just a box to tick, and that the final choice will remain in the hands of the Municipal Council. By giving the Water Authority a bigger role, some interviewees think that the water safety in new spatial (housing) developments could be guaranteed in a better way. This could be seen as a change in power and a change in the actions in the arena. If the Water Authority of Limburg would get a more powerful role, this could change the outcomes of debates similar to the planned developments in Park de Valkenier in the Municipality of Valkenburg aan de Geul. Note that not everyone is in favour of this idea. In the validation interviews with two experts from Witteveen+Bos (see Appendix 1, Table 3), one of them explains why it would not be a good idea to change the role and the influence of a governmental organisation – such as the Water Authority of Limburg.

3. The finance system for the regional water system

Thirdly, the finance system for the regional water system in Limburg has been discussed, including the Water Authority Tax. This tax can be used by to finance water safety measures. However, this amount of money seems to be not enough to ensure water safety in the regional water system of Limburg, due to high implementation costs of FRM measures. Therefore, the Delta Program Spatial Adaptation can be used by municipalities and regions to finance climate adaptation measures. But since this still does not seem to be sufficient: multiple interviewees express the need for an extended financial investment to ensure water safety in the regional water system of the Province of Limburg.

One of the interviewees explained that the Province of Limburg retrieved a financial buffer of 1.2 billion euros for the next ten years' time – but that is not a long term, non-event based finance system. Therefore, the interviewees desire an extension of the financial system for water safety in the regional water system. By investing a bigger amount of money into water safety, independent of political momentum right after floods, the water safety in the regional water system could be improved. Some of the interviewees mentioned the Delta Program and the Delta Fonds, which is used to finance the maintenance and expansion of the main water system in the Netherlands. This system has been described as a non-event based and non-politically driven, since the amount of money in the Delta Fonds is similar every year – it does not depend on shock events such as floods to boost the available budget. A similar fund is desired to improve water safety in the regional water system.

5.1.5. Answering the research question

What lessons can be learned from the planned developments in the (in July 2021 flooded) former amusement park Pretpark de Valkenier in the Municipality aan de Geul, in a way to improve the (policy) decision-making process regarding planned housing developments in flood prone areas of the Netherlands?

The longitudinal case study of the planned housing developments in Park de Valkenier in Valkenburg aan de Geul has been studied, to create insights in the (policy) decision-making process after the flood event of 2021. It turned out that after the floods, water safety is being emphasized on by the Water Authority and the Municipal Council. Both parties decided that it would be better to postpone the new zoning plan next to the Geul, after the Ministry of Infrastructure and Water Management released their new policy documents and updated rules and norms regarding water safety. This shows that the floods created a shift from focus on Layer 1 of Multi-Layer Safety, towards Layer 2. In addition to that finding, there are multiple lessons that have been drawn from studying the interactions regarding the planned housing developments in Park de Valkenier. In line with the findings from sub-question 4, three of these lessons are the most outstanding.

First, there must be concrete agreements and rules and norms whether or not to build in flood prone areas, such as near the river bedding of the Geul in the regional water system of Limburg (more focus on Layer 2 of Multi-Layer Safety). Because of the lack of rules and norms, it is unclear *where* and *how* new housing can be developed. If the *where* is decided on, the *how* should be discussed as well – because with the use of adapted building, a lot of opportunities arise compared to prohibiting or limiting building. The design by Mecanoo perfectly illustrates this, by including multiple flood risk measures in their design.

Second, it must be ensured that municipalities can get advice from their province, whenever doubting about substantial important choices (such as changing their zoning plan near the river bed). In the case of the Municipality of Valkenburg aan de Geul, the municipality has to decide over this question themselves, because the plot is inside of the housing contour (*rode wooncontour*) of the municipality. Nevertheless, the Province of Limburg must still take its responsibility to support their municipality which such a complex choice with multiple interests. If every party or actor takes its responsibility and tries to work together, the best results will be reached.

Third, it is important to discuss financial options early on in the process. In the case of Park de Valkenier, this has yet not been discussed between the actors. If the housing developments will be allowed, the FRM measures (mound, water square, sluice) will be more costly than a regular housing development. By discussing this in advance with both the Municipality, Water Authority and project developer, no surprises will take place during the next steps in this process.

5.2. Discussion

5.2.1. Discussion of the results

The results of this research show how a recent flood event influences the decision-making process regarding housing developments in a flood prone area. The interviewees answered unanimously positive to the question whether or not the floods in Limburg could be seen as a shock event. Therefore, it can be stated that the floods in Limburg influenced the interactions regarding the planned housing

developments in Park de Valkenier. This was already assumed prior to conducting the interviews, due to the combination of the literature study about flood events and the analysis of letters and political discussions started by Delta Commissioner mr. Glas, as mentioned in Chapter 1: Societal Relevance.

The Policy Document Analysis showed the focus on technical measurements in Layer 1 of Multi-Layer Safety, instead of measures in Layer 2: sustainable spatial planning. With the flood event of 2021 in mind, the planned housing developments in a flood prone, recently flooded area near the Geul therefore seemed thoughtless. However, the interviewees stressed the importance of the *how* to build question, instead of *where* to build. Their general opinion was that with adapted building, a lot of things are possible in the Netherlands – even in flood prone areas. This finding is of high value, since it opens up a lot of opportunities instead of only focusing on restrictive measures. In line with that, the main vision from the architects from Mecanoo is to turn the water of the Geul from a threat, to an opportunity. In their design, they take the flood risk into account, but they try to add something to the area as well, by blending it in with the sloped surrounding neighbourhoods. This positive approach, which is based on thinking in solutions instead of limitations, shows perfectly how the window of opportunity after the flood in Limburg is being used.

Another interesting result was the shirking of responsibilities between multiple governance levels, from the Municipality of Valkenburg aan de Geul all the way up to the Ministry of Infrastructure and Water Management. In addition to that, almost every interviewee referred to the political balance of interest, being the difference between priorities on administrative versus political level. Whereas the focus on the administrative level of the Municipality of Valkenburg aan de Geul is on FRM and water safety, topics as economics, money and housing seem to play a more important role on the political level of the Municipality. This means that there is not only dissatisfaction between the governmental organisations (regarding responsibilities), but also within these organisations themselves (regarding conflicting interests). Another example of this are the interviewees from the Water Authority of Limburg, who seemed to be unsatisfied with the fact that their main interest in water safety might not find its way through the debate in the Municipal Council regarding Park de Valkenier – since their main interest is focused on economy and housing. To overcome such problems in the near future, MinI&W is working on new policy documents with more concrete rules and norms, to help prevent the political issue of conflicting interests. This should help to ensure FRM measures are taken into account, and do not get overshadowed by economic priorities.

The results of this research contribute to a better understanding of the influence of flood events to political discussions and policy development regarding Flood Risk Management. The case study of Park de Valkenier shows what difficulties there are in the interactions between the actors (lack of concrete rules and norms, responsibility issues and financial issues), and how to overcome such difficulties in future housing developments in flood prone areas. After answering and discussing the main findings of this research, it is time to reflect on the used methods and theory. These reflections will be discussed in the following paragraphs.

5.2.2. Methodological reflection

This research is based on qualitative research, consisting out of a Policy Document Analysis and fifteen semi-structured in-depth interviews. Due to the fact that the case study of Park de Valkenier includes multiple actors with an abundance of perspectives on the planned developments, the qualitative character of the methodology suits this case study very well.

The semi-structured interviews gave the opportunity to study all these different perspectives in detail, whilst keeping the option open to ask case specific questions about Park de Valkenier as well. Whereas a quantitative study with surveys and a statistical analysis might have given more generalisable data for other planned developments in flood prone areas, the in-depth interviews created the perfect opportunity to retrieve detailed information about the interactions and the decision-making process in the Municipality of Valkenburg aan de Geul. Such in-detail case specific data would not have been possible to retrieve with a quantitative research method. Another positive remark is the number of interviews that have been conducted, with a total of three orientational interviews, fifteen in-depth semi-structured and two expert validation interviews (see Appendix 1). By interviewing multiple people from the same employer, the findings are of a high reliability.

The Policy Document Analysis gave insight into the changes in policy before and after the shock event. Therefore, this methods was useful to support the longitudinal study of Park de Valkenier. Nevertheless, there are some downsides to this methodological choice, being 1) that new rules and norms are still under development (which makes the PDA from documents released *after* the floods difficult and in some cases even impossible); and 2) the longitudinal case study seems to be not finished yet, because the municipality has not yet made a decision whether or not to change their zoning plan and to allow the project developer to build the houses.

Whereas most of the interviews have been executed online via Microsoft Teams due to the fact that a lot of the interviewees were still working from home (context: Covid-19), five interviews did take place in a face-to-face meeting. This ensured a better understanding of the non-verbal communication, such as body language and facial expressions. Therefore, it became less difficult to ask in-depth questions about sensitive topics. In addition to that, these face-to-face interviews in Limburg (Water Authority and Municipality), The Hague (MinIenW, twice) and Delft (Mecanoo) ensured the research topics of FRM, flood events and the case of Park de Valkenier to really come to live, which motivated the researcher to investigate the case in detail. Also, the face-to-face meetings simplified having informal conversations before and after the interviews, which stimulated the snowball effect of getting in touch with new respondents.

5.2.3. Theoretical reflection

To conceptualise Flood Risk Management, the concept of Multi-Layer Safety and the institutional perspective of flood governance (Scott, 1994; Alexander, 2005) have been used. Following the idea that shock events create a window of opportunity for change (Kingdon, 1995; McSweeney et al., 2011), the floods in Limburg of July 2021 became the central shock event of this research. The Multi-Layer Safety concept turned out to suit the case of Park de Valkenier really well, since Layer 2 of Multi-Layer Safety is not only about *where* to build (e.g. prohibiting building in a flood prone area), but also about *how* to build: e.g. in a climate adaptive manner, such as elevated building.

To guide the data collection during the interviews in a theoretically sound manner, the conceptual framework, operationalisation and interview guide are all based on the CIAD Framework by Whaley (2018) – which is one of many institutional development frameworks that have been presented in Chapter 2 Theory. The 7 rules-in-use have been added to this (Polski & Ostrom, 1999), to help unravel the rules and norms in a detailed manner. Furthermore, the concept of path dependency (Pierson, 2000) could be used to explain why certain changes do *not* take place after a shock event. However, the floods in Limburg did figure as a shock event, and it therefore it influenced certain interactions and outcomes. This means that the window of opportunity is being used, which also means that there is no case of path dependency.

The CIAD Framework (Whaley, 2018) provided a structured manner to analyse the research findings. The addition of the 7 rules-in-use to the theoretical framework, created a perfect guide to present the findings. The lesson that can be drawn from this, is that the incorporation of the 7 rules-in-use to the CIAD Framework, succeeded to strengthen the theoretical framework. However, even whilst the theoretic foundation of this research is solid, there is also a downside to the CIAD Framework. This downside is that it leaves a some room for interpretation, mostly on the concept of discourse. Therefore, other researchers might interpret the same results in a different manner. This is tried to be overcome by interviewing experts to validate the research findings.

This research contributes to theory development, due to the fact that the element of a shock event has been added to the CIAD Framework. The combination of the CIAD Framework by Whaley (2018), the 7 rules-in-use by Polski & Ostrom (1999) together with the influence of a shock event (McSweeney et al., 2011) and using the window of opportunity (Kingdon, 1995) is new in institutional research. By incorporating a shock event in the theoretical framework, the influence of the floods in Limburg in 2021 on certain interactions and outcomes can be studied. This provided a suitable theoretical framework to analyse the interactions regarding Park de Valkenier in the Municipality of Valkenburg aan de Geul.

5.2.4. Limitations

Even whilst the methodology and theoretical framework happen to suit the research topic properly, this research still has some limitations. In the following paragraph, the three most prominent limitations will be discussed.

The first limitation is the nature of the case study. Since this research about Park de Valkenier is a single case study, it is hard to generalise the findings towards other cases. In addition to that, the longitudinal case study of Park de Valkenier has not ended yet. The Municipality of Valkenburg aan de Geul has not decided yet whether or not to allow housing developments on the plot, and if so, under which conditions. This means that the final outcomes of this case study could not be analysed yet.

The second limitation is the usefulness of the Policy Document Analysis. This analysis could not be performed in an optimal manner, since there are still a lot of policy documents under construction – regarding relevant topics such as FRM in the regional water system, and making soil and water more steering. In addition to that, MinIenW is currently developing new rules and norms regarding *how* and *where* to build in flood prone areas. If these new rules and norms will be taken into account by the Water Authority and the Municipality, Park de Valkenier will most likely be prone to future flood events. However, since these documents have not been released yet, they could not be incorporated into this research in a decent manner.

The third limitation are the interviewees. Even whilst the methodological choice of semi-structured in-depth interviews suits this research well, this does not mean that there is no room for improvement. All the interviewees work at the administrative level, whilst they all mention that the final decisions are being made on the political level. The qualitative data collection of this research could have been improved by interviewing different kinds of actors: i.e. by discussing this topic with officials from the Municipal or Provincial Council, instead of only people who work on the administrative level. However, the interviewees were from many different kinds of organisations, from a local project developer and architect all the way up to the Delta Commission, OFL and MinIenW. This ensured a broadly varying set of qualitative data, which became helpful when drawing conclusions from this research.

5.3. Recommendations

The following paragraph shows recommendations based on the case study in Park de Valkenier. These recommendations will be split up in the academical and practical field, due to the fact that this research has been performed under the guidance of consultancy company Witteveen+Bos.

5.3.1. Recommendations for further research

First of all, further academic research into the effects of shock events in FRM (policy) decision-making is recommended to get a better understanding of the opportunities for change after major flood event. From the literature study, it became clear that shock events have an influence in the interactions if the window of opportunity is being used, but studying this role of shock events more in-depth is necessary to provide information that can be generalised towards other situations as well. This is in line with the recommendation to expand research similar to this, to a bigger, comparative multiple case study – instead of a single case study about Park de Valkenier only.

Second, policy documents regarding the strategies from Multi-Layer Safety could be studied more extensively – whilst focusing on the documents that still have to be released after the flood event of July 2021 in Limburg. Unfortunately, this research was executed relatively shortly after this flood event, which resulted in a lot of policy documents and new rules and norms still being under construction. Repetition of this research in the year 2024 or 2025 will give a better understanding of the changes in policy, because it takes time to develop new policy documents and to incorporate new visions in them.

Third, studying the Multi-Layer Safety in policy documents could be further investigated in academic research. This will contribute to a better understanding of the lack of measures in Layer 2 of MLS, and how to improve this in a concrete way. This is recommended because of the focus on measures in Layer 1 of MLS throughout FRM policy in the Netherlands, which mainly focuses on dike protection. With both climate change and the housing crisis right in front of us, this focus on Layer 1 instead of Layer 2 cannot be ignored anymore. Further scientific research about how to apply a broader set of FRM strategies, such as the Multi-Layer Safety, is necessary to contribute to a better spatial planning for planned houses in the Netherlands.

Fourth and final, it is important to further investigate how measures in Layer 2 (and Layer 3) of Multi-Layer Safety can be established via law and institutions, since this will promote the effectiveness of measures in these layers. This can be done by further research regarding the concept of Multi-Layer Safety, which is needed to improve the Flood Risk Management in the Netherlands, which is still mostly focused on technical measures in Layer 1.

5.3.2. Recommendations for consultancy companies

First and most important, it is up to consultancy companies to keep flood risk into account in spatial plans, even whilst the Water Assessment does not (yet) include run-off water in sloped landscapes (such as in Limburg) or low-lying landscapes (such as in polder areas). It is important for consultancy companies to be aware of the fact that executing the Water Assessment by itself is not sufficient enough in some planned developments. With the flood event of July 2021 in mind, consultants must also focus on other water aspects, such as run-off water and river flooding. In summary: consultancies have to take their responsibility to look at the complete water system, not only the water system on the plot itself to just tick a box. Focusing on the complete water system is essential for developing climate proof and flood proof designs.

Second, it is up to consultancy companies to bring conflicting interest together, in the best way possible. In planned housing developments, there are multiple actors with multiple interests. The crux is that they all have different responsibilities: whereas the Municipality is responsible for rain water storage, the Water Authority is responsible for the regional water system. It is up to consultancy companies to bring these interests together, and to decide whether or not it would be beneficial to involve someone to control the stakeholder management.

Third, some practical building solutions became clear during the data analysis, which are important for consultancy companies who design spatial plans themselves. When discussing whether building in flood prone areas should be prohibited at all, most of the interviewees disagreed with this. They named multiple options for adapted forms of building, such as elevated building; floating houses; parking (instead of living) on the first floor; using a zoning system near the stream; using terraces to create height differences; using a horizontal or vertical buffer; hills; water squares et cetera. Most of the interviewees agree with each other that these forms of adapted building are better options than prohibiting new constructions in flood prone areas at all – which are both forms of Layer 2 of MLS. Space is limited in a small country as the Netherlands, so it is up to consultancy companies to help to make the best and most efficient use of this space. This can be done by using adapted building measures.

Fourth, it is more complex for consultancies to measure the profit of investing in Layer 2 than to measure profit of investing in Layer 1 of MLS. The Senior Advisor Water from the Province of Limburg stressed that it is important for consultancy companies to be aware of this fact, and to make a deliberate choice to still invest in Layer 2 – even whilst it might be more complex to calculate the profit in water storage compared to raising a dike (interviewee 9, personal communication, July 5th 2022). Even though measuring spatial changes is more difficult than measuring technical changes, it is important for consultancies to focus on this, because this investment will return its profit in the level of climate adaptivity to flood events.

Fifth and final, during the internship at Witteveen+Bos it has been discussed if engineering consultants should take another, more political role as well, e.g. by taking place in talk shows regarding topics as climate change and flood proof building. Even whilst this is not one of the main priorities for people working in a consultancy company, sharing their expertise with a broader public could help to increase the awareness of citizens regarding these topics. This could lead to a better understanding and less public resistance during spatial developments. However, there is not much room for personal preference here. The main responsibility of consultancy companies to deliver high quality content, which can be used to make well-founded decisions in the Municipal Council. Consultancies must always inform their public about the facts in a clear, understandable manner.

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APPENDICES

Appendix 1. List of consulted interviewees

	Date	Function	Employer
1.	April 7 th 2022	Project Engineer Urban Water Management, expert in the Water Assessment	Witteveen+Bos
2.	April 7 th 2022	Policy Advisor Water	Province of Limburg
3.	April 7 th 2022	Senior Advisor Sluices and Embankments	Water Authority of Limburg

Table 1. A list of the *orientational interviews* that have been conducted in April 2022

	Date	Function	Employer
1.	June 8 th 2022	Strategic Plan Advisor Project Manager + Technical Manager in Flood Protection	Water Authority of Limburg
2.	June 8 th 2022	Senior Advisor Spatial Planning	Province of Limburg
3.	June 13 th 2022	Spatial Planner	Municipality of Venlo
4.	June 27 th 2022	Senior Advisor Participation MinIenW + Secretary of the OFL	Ministry of Infrastructure and Water Management (MinIenW) + Physical Environment Consultative Council (Overlegorgaan Fysieke Leefomgeving)
5.	June 29 th 2022	Associate Architect	Architectural Company Mecanoo
6.	June 29 th 2022	Program Manager	Ministry of the Interior and Kingdom Relations (MinBZK)
7.	June 30 th 2022	Spatial Planner	Municipality of Valkenburg aan de Geul
8.	June 30 th 2022	Policy Advisor Water Safety	Ministry of Infrastructure and Water Management (MinIenW)
9.	July 5 th 2022	Senior Advisor Water	Province of Limburg
10.	July 6 th 2022	Advisor Plan Assessment	Water Authority of Limburg
11.	July 6 th 2022	Program Manager Spatial Planning	Department of Waterways and Public Works (Rijkswaterstaat)
12.	July 7 th 2022	Real Estate Acquisitor	Project Developer Grouwels Daelmans Projectontwikkeling B.V.
13.	July 13 th 2022	Policy Advisor Climate Adaptation	Ministry of Infrastructure and Water Management (MinIenW)
14.	July 15 th 2022	Coordinating Advisor	Delta Commission
15.	July 19 th 2022	Strategic Advisor	Water Authority of Limburg

Table 2. A list of the *in-depth semi-structured interviews* that have been conducted in June and July 2022

	Date	Function	Employer
1.	Aug 3 rd 2022	Project Engineer, expert in built environment, Systems Engineering (SE) and Stakeholder Management	Witteveen+Bos
2.	Sept 1 st 2022	Strategic Consultant, expert in decision making within governmental organisations and Water Authorities. Advises Water Authorities on strategic and political issues	Witteveen+Bos

Table 3. A list of the *expert validation interviews* that have been conducted in August and September 2022

Appendix 2. Interview guides – general and case specific

Appendix 2.1. General interview guide about FRM policy and the floods in Limburg

Date, time:
Interviewee:
Interviewer: Denise van Haastrecht
Location: Microsoft Teams / in person
Length of time: approximately 60 min.



Radboud Universiteit Nijmegen

Introduction

My name is Denise van Haastrecht and I am working on my graduation research for the master Spatial Planning at the Radboud University Nijmegen. My research concerns a policy study with regard to the floods that occurred in Limburg last summer. This ties in nicely with my specialisation within my spatial planning master: Cities, Water and Climate Change. I have received your contact details from ... (name), via (e.g. Witteveen+Bos). Thank you for finding time in your agenda to think along with me today.

Interview goal

The purpose of this interview is to find out what can be improved in the Flood Risk Management policy at local, regional and national level. This interview serves as a tool to answer this question, which is central to my thesis. Because of my educational background as a spatial planning student, the focus is not only on technical measures such as dyke improvements and raising the dyke (Layer 1), but also on sustainable Spatial Planning (Layer 2).

Interview structure

This semi-structured interview consists of several questions that help me to answer the main and sub-questions of my research. In addition to that, there is of course also room for your own input, because of your expertise in this field.

Data collection and confidentiality

The information I get from these and other similar interviews will purely and solely be used for my graduation research. In principle, the information is only accessible to my supervisors at Radboud University and my supervisor and direct colleagues at Witteveen+Bos. The information you share with me will not be shared with others. Anonymity can also be used in various ways. For example, you can remain completely anonymous (I will then refer to you as "Respondent 1"), or semi-anonymously (e.g. "Policy Officer Water of the Province of Limburg", so only your position and where you work), or not anonymous at all (your full name and surname including function). It would be valuable for my research if I could at least mention your position and employer. Do you give your permission for me to do so? Or do you have another preference? If you change your mind after this interview, that is of course no problem.

Recording

In order to be able to fully and correctly analyse our conversation and your statements, it is useful for me to make a recording of this interview. I can transcribe it and therefore analyse it more deeply than when I only take notes with pen and paper. This recording will of course be treated confidentially. Do you give permission for this interview to be recorded?

Do you have any further questions before the start of the interview?

Start interview

** start recording **

Work activities of the interviewee

- In what way did you, as a ... (position), have to deal with the floods that occurred in Limburg in July 2021 during your work at ... (employer)?
- What is your educational background (hydrologist vs. biologist vs. planner)? Do you notice that you have a different approach or set different priorities than your colleagues?

Social situation: actors

Flood Risk Management is a complex topic and various sectors (including housing, infrastructure, spatial planning) and various actors (RWS, MinIenW, Provinces, Water Authorities, Municipalities, residents) are involved.

- Which actors all play a role in developing and implementing FRM policy? Did I mention all the relevant actors, or am I forgetting some important actors?

Social situation: interactions in the arena

- A complex topic such as FRM requires an integrated approach and a great deal of collaboration. How is this organised? Can you tell me something about the relationships and cooperation between the relevant actors?
- How is the decision-making process regarding taking FRM into account organised? Is this purely hierarchical, or is the municipality itself allowed to bring in its own suggestions from below? → What does this look like in practice? Can you give an example?
- Does the difference in scale level or size of the actors play a big role? I can imagine that it is difficult to draw up a coherent policy between parties that vary in size (Province vs. Municipality). How do such actors collaborate?

Political economy / power / discourse

- How do you experience the power relations between different political levels (local, regional, national)? I can imagine that this can sometimes make the collaboration a bit complex, since the rules and norms are given from the highest or biggest political level (MinIenW).

Interactions in the arena, 7 rules-in-use

Aggregation rules

- Who makes the final decisions and is "in charge" when it comes to Flood Risk Management policy?

→ Which actors are supposed to just listen and follow up tasks?
→ Or is reaching consensus and an active dialogue the main goal?
→ How does the communication between actors take place?
→ Who is dependent on whom?

Position rules

- How large is the group of people who have something to say about the policy development regarding FRM? What is their role?
- What is your view on *your* position within this network? Are you aware of that position?

Boundary rules

- It seems to me that the people who have something to say about policy development are in an important and valuable (or even "mighty") position. How did they end up in that role?
- Is it also possible for others to reach the point where you can participate in decisions about national / regional / local choices with regard to FRM policy?

→ If so, how? How do you get to that place? Is it difficult to get in there?

Choice rules

- Can you tell me something about the rules and norms that are being mentioned in FRM policy documents? What choices are allowed when making choices regarding FRM, what is mandatory and what is prohibited?
→ Or in other words: what about the freedom of choice? Is everything regarding FRM defined in narrow frames, or is it a bit more "free"?

Scope rules

- If we look at the current policy regarding Flood Risk Management and high water safety in Limburg. What are the intended results, what is the end goal? What is the aim?
- Does this always concern the "whole situation", i.e. flood risk management in general at national level, or is it sometimes more specific? In other words: are local adjustments being made per Municipality or Province?

Information rules

- What information is essential / necessary to possess, to make decisions about FRM policy?
- What information is available for the people who make (policy) decisions about FRM? On the basis of which data are choices and decisions being made?

Pay-off rules

- If FRM policy finally gets changed (such as making the Water Assessment more mandatory, which was done in March 2022), which actors benefit from that? And who suffers from that? Who "pays" the price..?

→ In other words: what about the distribution of costs and benefits?

Floods in Limburg, July 2021

Shock event + Window of opportunity

- Can you tell me something about the difference in the policy / approach / vision regarding dealing with floods in Limburg *before* and *after* the floods in July 2021?
- Do you notice a difference yourself? Does water have a more important role in policy now than it did before July 2021? → If so, can you tell me a bit more about this?

Discourse

Housing vs. FRM / water safety

Since the floods in Limburg in July 2021 took place, some policy changes have already been made. In March 2022, for example, it was established in the National Water Program 2022-2027 that the Water Assessment will be more important and will therefore acquire a more compelling character.

I have studied various policy documents (Delta Program, HWBP, NWP, Provincial Water Program Limburg 2022-2027 etc.), and I noticed a few things in them. I found the most striking that there are hard rules regarding flood risk management/dyke improvements (Layer 1 of MLS), but no hard rules regarding where to build and where not to build (flood prone areas, stream valleys → Layer 2 of MLS).

• HOUSING VS. WATER, LACK OF RULES THAT PROHIBITING HOUSING DEVELOPMENTS NEAR THE RIVER BED OF THE REGIONAL WATER SYSTEM

• Do you think that more / stricter legislation is necessary (if so, what kind of rules)? Or should it be kept the way it currently is?

• If you were in charge of FRM policy development, how would you deal with this?

Dike reinforcement and water management is of course what the Netherlands is internationally known for, but there are also other options: taking sustainable spatial planning into account, such as simply no longer building in flood prone areas. During my Policy Document Analysis, I could not find a lot of information regarding limiting spatial plans in flood prone areas (Layer 2 of MLS).

- Is that in line with the picture you have, or have I overlooked policy documents?

→ If so, what is your opinion about that? And why do you think this is missing in current policy?

→ If not, in which policy documents can I find something about measures in Layer 2 of MLS?

Personal vision of the interviewee

Climate change cannot be denied and the heavy precipitation last summer in Limburg and the surrounding area will most likely occur more often in the future. Therefore, it is important to take this into account within spatial planning – which shows the reason for this as my master's thesis topic.

- Do others (direct colleagues or people from other organisations) agree on that? Or do they think otherwise?

- How are those differences dealt with? Does this lead to conflicts?

Thank you for your time and for thinking along with me! Before I start with the formalities of ending this interview, do you have any additions or comments to make that relate to my research?

End of the interview * *stop recording* *

Do you perhaps have contact details of people that are relevant to my research? For example direct colleagues, or other people you have ever worked with?

I would like to use some of your statements in my analysis (semi-anonymous, so without a name, but with function and employer) to support my findings.

Are you interested in receiving the final version of my graduation research?

If after this conversation something is still unclear to me, may I send you another email / call for verification?

Thank you for your time and have a nice day.

Appendix 2.2. Interview guide about the planned developments in Park de Valkenier

Date, time:

Interviewee:

Interviewer: Denise van Haastrecht

Location: Microsoft Teams / in person

Length of time: approximately 60 min.



Radboud Universiteit Nijmegen

Introduction

My name is Denise van Haastrecht and I am working on my graduation research for the master Spatial Planning at the Radboud University Nijmegen. My research concerns a policy study with regard to the floods that occurred in Limburg last summer. This ties in nicely with my specialisation within my spatial planning master: Cities, Water and Climate Change. I have received your contact details from ... (name), via (e.g. Witteveen+Bos). Thank you for finding time in your agenda to think along with me today.

Interview goal

The purpose of this interview is to find out what can be improved in the Flood Risk Management policy at local, regional and national level. This interview serves as a tool to answer this question, which is central to my thesis. Because of my educational background as a spatial planning student, the focus is not only on technical measures such as dyke improvements and raising the dyke (Layer 1), but also on sustainable Spatial Planning (Layer 2). We will zoom in on FRM policy and decision-making in the stream valleys in the Province of Limburg, by use of the case of the planned housing developments in Park de Valkenier in the Municipality of Valkenburg aan de Geul.

Interview structure

This semi-structured interview consists of several questions that help me to answer the main and sub-questions of my research. In addition to that, there is of course also room for your own input, because of your expertise in this field.

Data collection and confidentiality

The information I get from these and other similar interviews will purely and solely be used for my graduation research. In principle, the information is only accessible to my supervisors at Radboud University and my supervisor and direct colleagues at Witteveen+Bos. The information you share with me will not be shared with others. Anonymity can also be used in various ways. For example, you can remain completely anonymous (I will then refer to you as "Respondent 1"), or semi-anonymously (e.g. "Policy Officer Water of the Province of Limburg", so only your position and where you work), or not anonymous at all (your full name and surname including function). It would be valuable for my research if I could at least mention your position and employer. Do you give your permission for me to do so? Or do you have another preference? If you change your mind after this interview, that is of course no problem.

Recording

In order to be able to fully and correctly analyse our conversation and your statements, it is useful for me to make a recording of this interview. I can transcribe it and therefore analyse it more deeply than when I only take notes with pen and paper. This recording will of course be treated confidentially. Do you give permission for this interview to be recorded?

Do you have any further questions before the start of the interview?

Start interview

** start recording **

Work activities of the interviewee

- What is your role within the planned developments in Park de Valkenier in Valkenburg aan de Geul? How are you involved / what are your activities?
- What is your educational background (hydrologist vs. biologist vs. planner)? Do you notice that you have a different approach or set different priorities than your colleagues?

Social situation: actors

Flood Risk Management is a complex topic and various sectors (including housing, infrastructure, spatial planning) and various parties (RWS, MinIenW, Province of Limburg, project developer Grouwels Daelmans, architectural company Mecanoo, Water Authority of Limburg, Municipality of Valkenburg aan de Geul, future residents) play a role.

- Which parties are involved in the planned developments in Park de Valkenier in Valkenburg aan de Geul? Did I mention all the relevant actors, or am I forgetting some important actors?

Social situation: interactions in the arena

- Whether or not to allow planned developments in a flood prone area, is a complex topic which requires an integrated approach and a great deal of collaboration. How is this organised? Can you tell me something about the relationships and cooperation between the relevant actors in the planned developments for Park de Valkenier?
- How is the decision-making process regarding whether or not to allow those developments being organised? Is this purely hierarchical (the Municipal Council decides), or are suggestions from other actors (such as the Water Authority) welcome as well? → What does this look like in practice? Can you give an example?

Political economy / power / discourse

- How do you experience the power relations between the actors that play a role in the planned developments in Park de Valkenier?

Interactions in the arena, 7 rules-in-use

Aggregation rules

- Who ultimately makes the final decisions and is "in charge" when it comes to Flood Risk Management policy in Park de Valkenier in Valkenburg aan de Geul?

→ Which actors are supposed to just listen and follow up tasks?
→ Or is reaching consensus and an active dialogue the main goal?
→ How does the communication between actors take place?
→ Who is dependent on whom?

Position rules

- How large is the group of people who have something to say about the policy development regarding whether or not to allow the zoning plan change in Park de Valkenier? What is their role?
- What is your view on *your* position within this network? Are you aware of that position?

Boundary rules

- It seems to me that the people in the Municipal Council of the Municipality of Valkenburg aan de Geul are in an important and valuable (or even "mighty") position. How did they end up in that role?
- Is it also possible for others to reach that position, so they can participate in decisions regarding local FRM policy in Valkenburg aan de Geul?

→ If so, how? How do you get to that place? Is it difficult to get in there?

Choice rules

- How are the consequences of high water levels in the Geul stream valley taken into account in the design for the planned developments in the Park de Valkenier in Valkenburg aan de Geul?
- What do you think about that, do you think these measures are sufficient?

→ If so, how does that work? Can you give a few examples of those FRM measures in the design?

→ If not, what are the consequences of that? And how can this be improved? How would you handle this yourself, if you could help to determine the FRM measures in the design for the planned developments in Park de Valkenier?

Scope rules

- If we look at the current policy regarding Flood Risk Management and high water safety in the Geul stream valley in the regional water system of the Province of Limburg. What are the intended results, what is the end goal? What is the aim?
- How does the Municipal policy documents differ from the Provincial policy documents?
- What is the goal for local FRM policy in the Geul stream valley in the Province of Limburg?

Information rules

- What information is essential / necessary to possess, to make decisions about FRM policy in the Municipality of Valkenburg aan de Geul?
- What information is available for the people who make (policy) decisions about FRM in the Municipal Council? On the basis of which data are choices and decisions being made?
→ Are stress tests, risk maps, climate scenarios for the plot of Park de Valkenier available?

Pay-off rules

- If the zoning plan of Park de Valkenier gets changed into housing, which actors benefit from that? And who suffers from that? Who "pays" the price..?

→ In other words: what about the distribution of costs and benefits if the housing developments in Park de Valkenier will take place?

Floods in Limburg, July 2021

Shock event + Window of opportunity

- Can you tell me something about the difference in the policy / approach / vision regarding dealing with high water levels in the Geul stream valley in the Province of Limburg *before* and *after* the floods in July 2021?
- Do you notice a difference yourself? Does water have a more important role in policy now in the Municipality of Valkenburg aan de Geul, than it did before July 2021? → If so, can you tell me a bit more about this?
- Do you think the flood event of July 2021 created more awareness, so that improving FRM (by means of interventions in Spatial Planning, Layer 2 of MLS) got a bigger role in the planned developments in Park de Valkenier in Valkenburg aan de Geul?

Discourse

Housing vs. FRM / water safety

Since the floods in Limburg in July 2021 took place, some policy changes have already been made. In March 2022, for example, it was established in the National Water Program 2022-2027 that the Water Assessment will be more important and will therefore acquire a more compelling character.

I have studied various policy documents (Delta Program, HWBP, NWP, Provincial Water Program Limburg 2022-2027 etc.), and I noticed a few things in them. I found the most striking that there are hard rules regarding

flood risk management/dyke improvements (Layer 1 of MLS), but no hard rules regarding where to build and where not to build (flood prone areas, stream valleys → Layer 2 of MLS).

→ Park de Valkenier in the Municipality of Valkenburg aan de Geul

• HOUSING VS. WATER, LACK OF RULES THAT PROHIBITING HOUSING DEVELOPMENTS NEAR THE RIVER BED OF THE REGIONAL WATER SYSTEM

• Do you think that more / stricter legislation is necessary (if so, what kind of rules)? Or should it be kept the way it currently is?

• If you were in charge of FRM policy development, how would you deal with this?

Dike reinforcement and water management is of course what the Netherlands is internationally known for, but there are also other options: taking sustainable spatial planning into account, such as simply no longer building in flood prone areas (such as next to the stream valley of the Geul, on the plot of Park de Valkenier). During my Policy Document Analysis, I could not find a lot of information regarding limiting spatial plans in flood prone areas (Layer 2 of MLS).

• Is that in line with the picture you have, or have I overlooked policy documents?

→ If so, what is your opinion about that? And why do you think this is missing in current policy?

→ If not, in which policy documents can I find something about measures in Layer 2 of MLS?

• It has been said for decades that *water and soil should become more steering*, but even after such a major flood in Limburg last summer, the focus still seems to be on the quantity of houses instead of on choice of location (NRC, 820,000 houses planned in flood-prone areas). How is that possible?

Personal vision of the interviewee

Climate change cannot be denied and the heavy precipitation last summer in Limburg and the surrounding area will most likely occur more often in the future. Therefore, it is important to take this into account within spatial planning – which shows the reason for this as my master's thesis topic.

• What is your vision on Spatial Planning in the municipality of Valkenburg aan de Geul? Do you think water is being prioritised enough within certain other issues - for example the development of housing, such as Grouwels Daelmans is planning to build near the Geul? What is your opinion about that?

• Do others (direct colleagues or people from other organisations) agree on that? Or do they think otherwise?

• How are those differences dealt with? Does this lead to conflicts?

Thank you for your time and for thinking along with me! Before I start with the formalities of ending this interview, do you have any additions or comments to make that relate to my research?

End of the interview * stop recording *

Do you perhaps have contact details of people that are relevant to my research? For example direct colleagues, or other people you have ever worked with?

I would like to use some of your statements in my analysis (semi-anonymous, so without a name, but with function and employer) to support my findings.

Are you interested in receiving the final version of my graduation research?

If after this conversation something is still unclear to me, may I send you another email / call for verification?

Thank you for your time and have a nice day.

Appendix 3. Images from Mecanoo regarding Park de Valkenier

Note that the following images are strictly confidential and may only be used or shown in the context of this specific Master's Thesis research project, regarding the planned developments in Park de Valkenier.

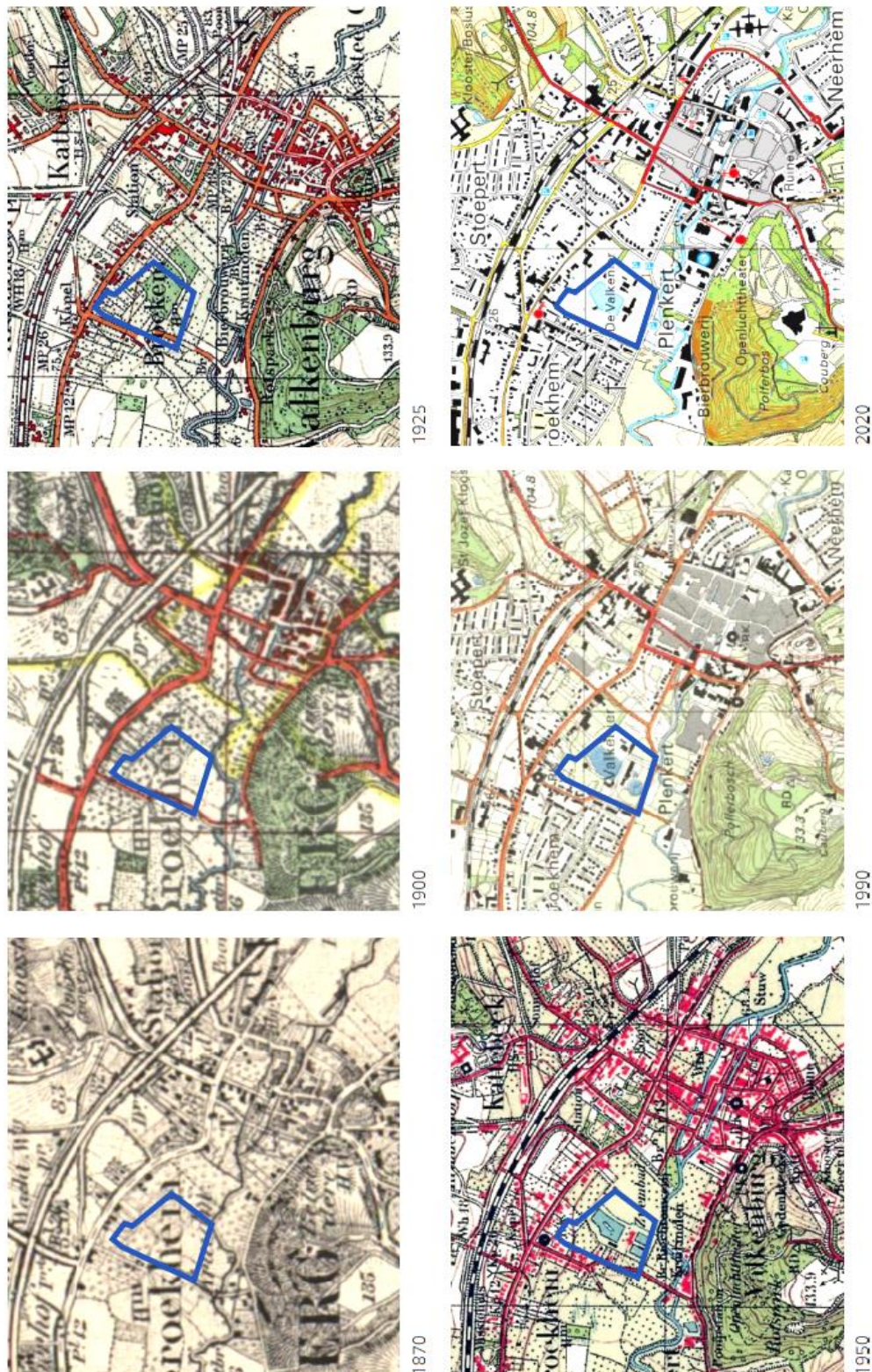


Figure 16. Housing developments surrounding Park de Valkenier from 1870 to 2022, with the typical 1970's neighbourhoods characterised by winding paths and courtyards (bloemkoolwijken) on the west side of Valkenburg, next to Park de Valkenier

Note that the following images are strictly confidential and may only be used or shown in the context of this specific Master's Thesis research project, regarding the planned developments in Park de Valkenier.

Bestaande situatie

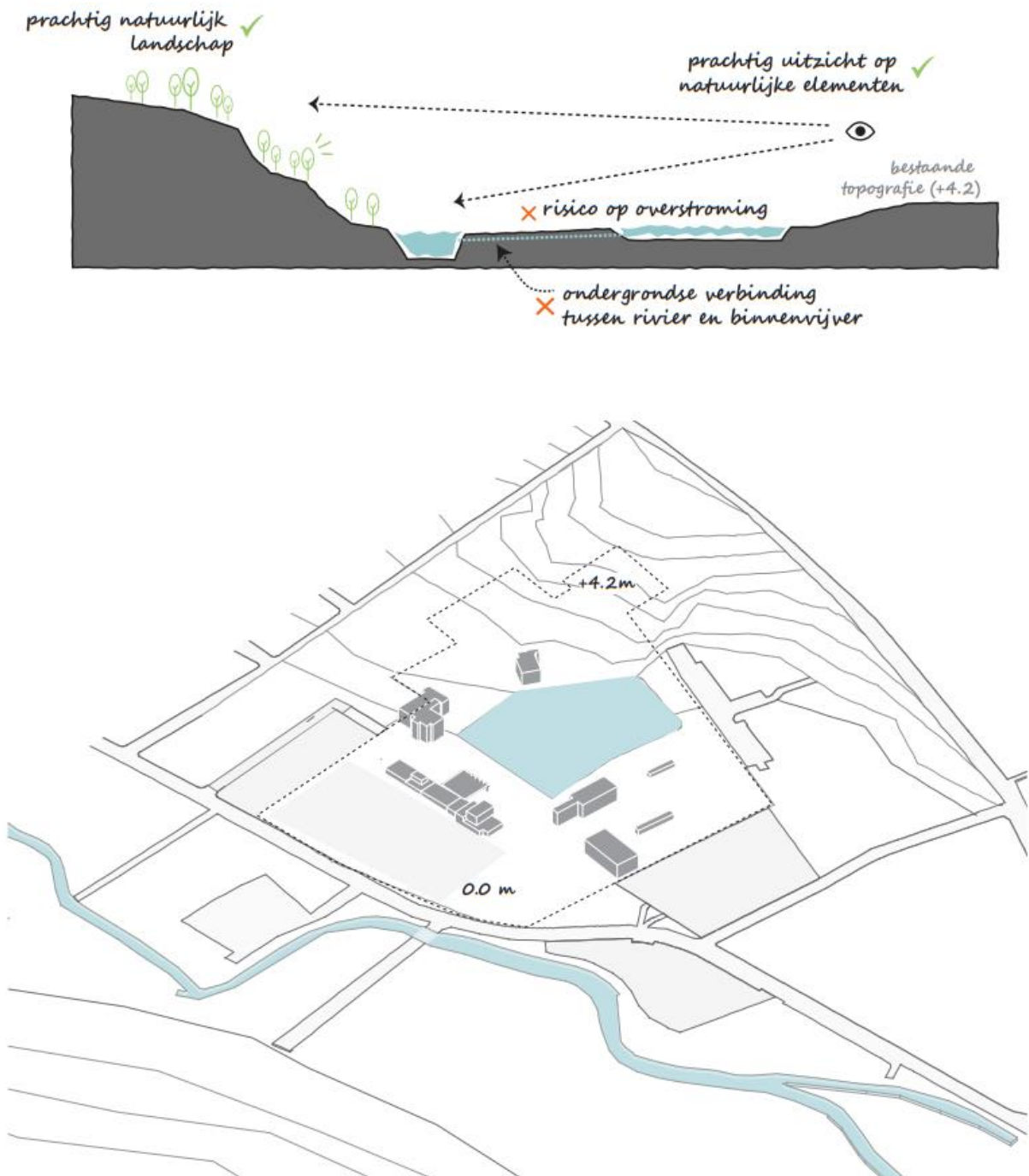


Figure 17. Current situation in Park de Valkenier: intersection and view from above

Note that the following images are strictly confidential and may only be used or shown in the context of this specific Master's Thesis research project, regarding the planned developments in Park de Valkenier.

Ontwerpprincipes

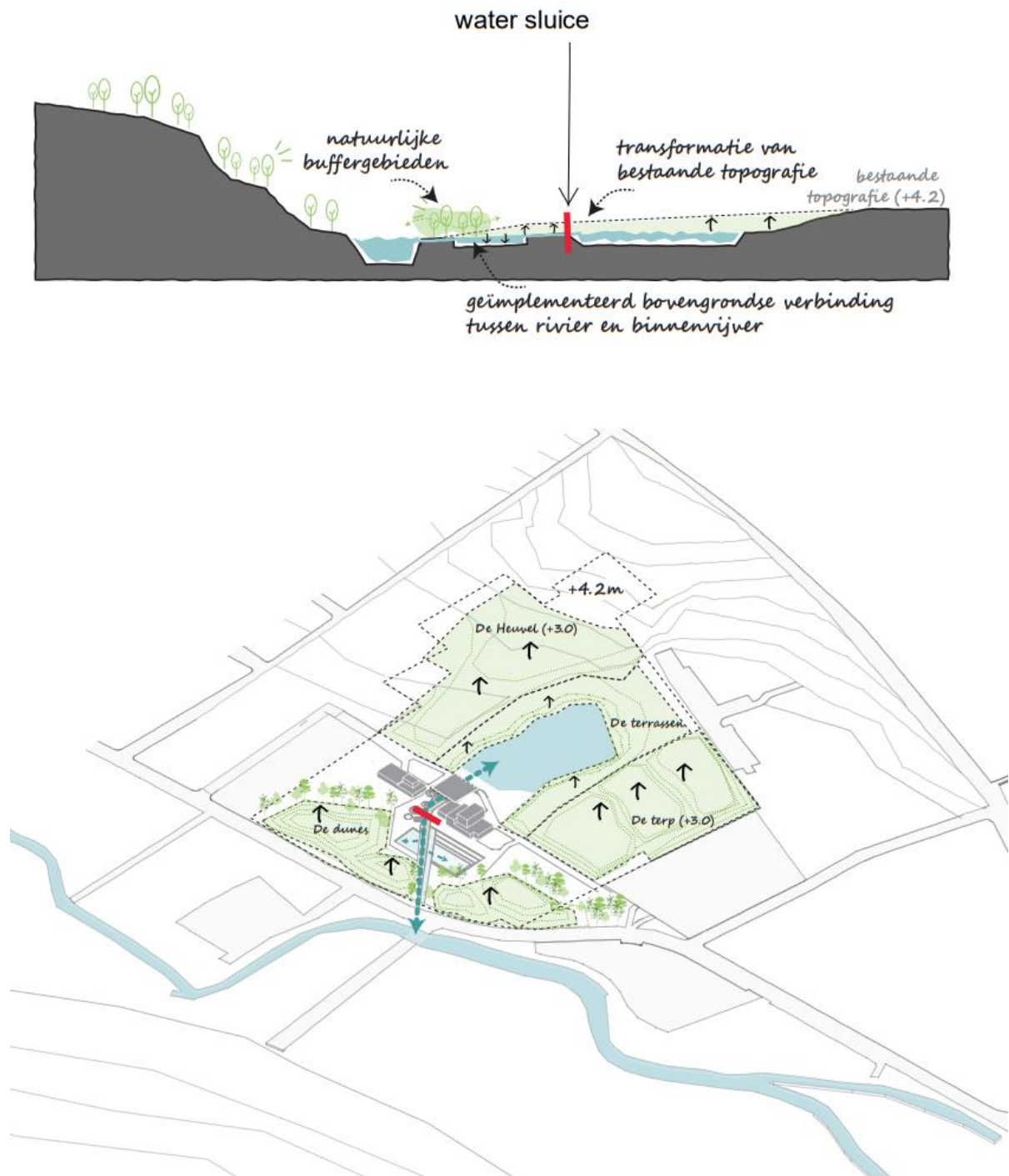


Figure 18. Planned situation in Park de Valkenier: intersection and view from above

Note that the following images are strictly confidential and may only be used or shown in the context of this specific Master's Thesis research project, regarding the planned developments in Park de Valkenier.

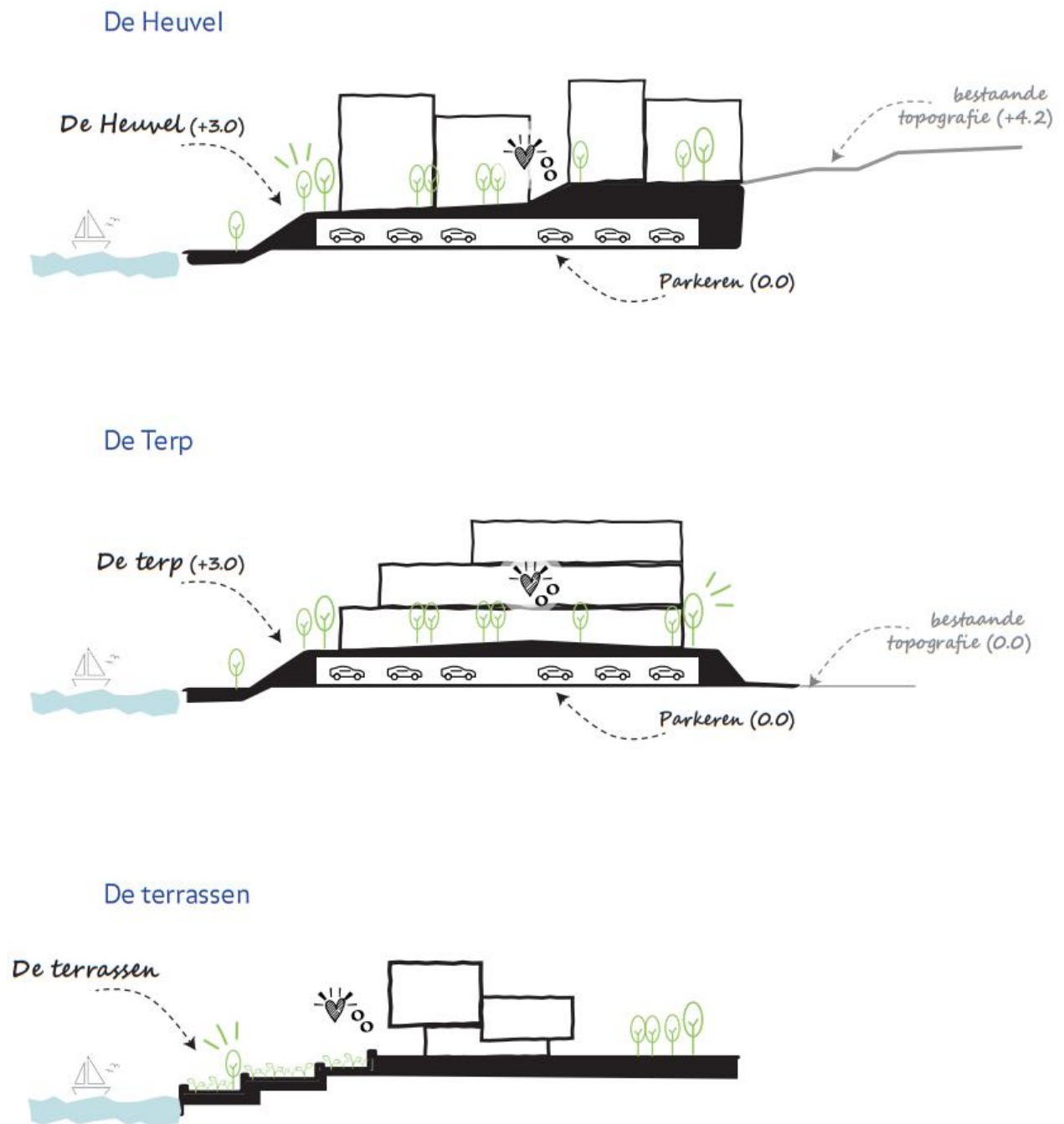
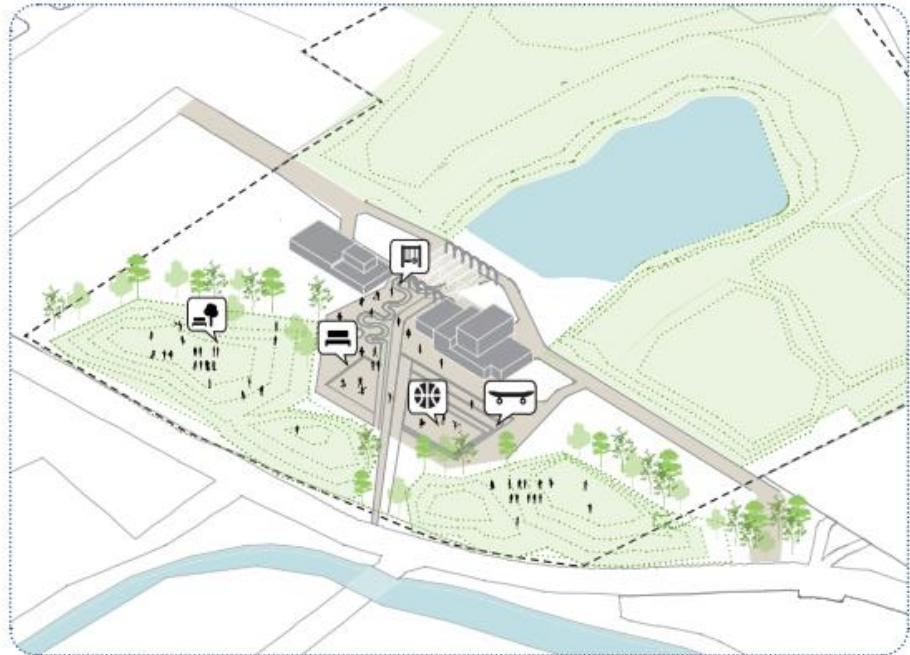


Figure 19. Planned situation in Park de Valkenier: intersection from the hill, mound and terraces

Note that the following images are strictly confidential and may only be used or shown in the context of this specific Master's Thesis research project, regarding the planned developments in Park de Valkenier.



droge situatie:
speeltuin,
stadsplein,
skatepark.



*storm, overstrooming
situatie:*
kanaal verbinden
met de rivier,
stroomgebied.



Figure 20. Planned situation in Park de Valkenier: function of the water square before and after a period of rainfall

Note that the following images are strictly confidential and may only be used or shown in the context of this specific Master's Thesis research project, regarding the planned developments in Park de Valkenier.

Scenario 1



Scenario 2



Figure 21. Artist impression by Mecanoo, two scenarios for the housing developments in Park de Valkenier