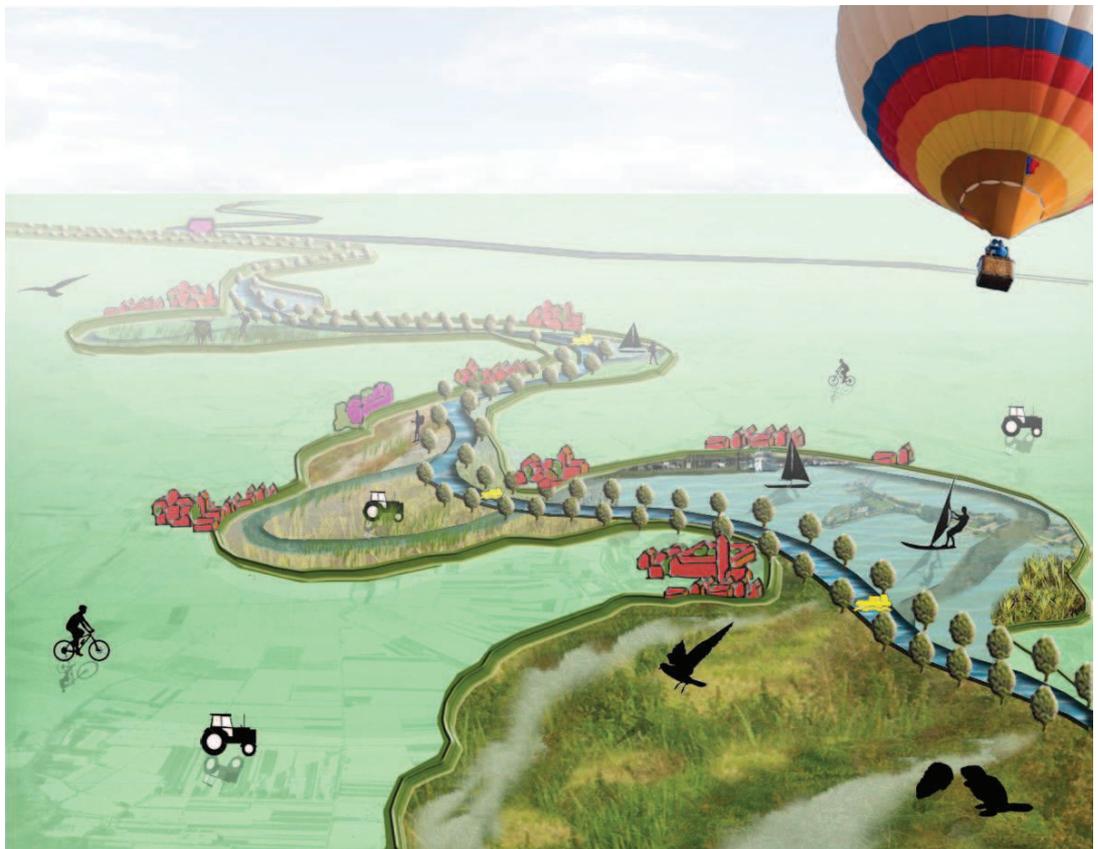


The influence of spatial scale on alternative designs

A case study of Meanderende Maas and Grip op de Maas



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1. Introduction

Spatial planners aim to coordinate practices and policies for the spatial organization of human activities in space and time. Spatial planning takes place in multiscale contexts. In such multiscale contexts, actors involved in solving physical problems and processes that need to lead to solutions operate on multiple scales (Zaleskiene, et al., 2015). Scale is defined here as “the spatial, temporal, quantitative, or analytical dimensions used to measure and study any phenomenon” (Gibson, et al., 2000: p. 218). Different scales can be distinguished, such as temporal scale and jurisdictional scale. This thesis focusses on spatial scales. Spatial scale, in this thesis, is the geographical extent of the considered area (Antrop, 2010).

Levels are the different locations on a scale (Gibson, et al., 2000). Spatial scale contains various levels, ranging from local to global levels. Spatial developments in the landscape are influenced by these different levels (Lieshout, et al., 2011). Levels can hardly be separated from one another, since there is interaction between them. Global processes, for example, interact with developments on national and regional levels (Karstens, 2009). Interactions happen among levels within a scale and interactions happen between different scales, for example between spatial domains and jurisdictions (Cash, et al., 2006). Such scale issues challenge planners to integrate among different levels.

Different spatial levels are interconnected and developments on levels occur at different moments in time, with varying speed, which makes decision-making more challenging (Karstens, 2009). Strategic planning offers approaches to deal with these challenges. Strategic planning aims to explore possible alternative outcomes for the future (long-term). Alternative development directions for spatial organization are about what is possible, probably or desired, and indicate consequences. It is important to evaluate alternatives to enable planners to take decisions (Loucks & Beek, 2005). Each alternative could have a different impact on the spatial organization at different levels.

Because of the alternating impact of spatial choices on different levels, different governments and actors need to be involved and consensus is needed before spatial planning can occur (Susskind, et al., 1999). Regional councils prepare spatial development plans describing a vision for the region they make policy for. Municipal councils put their strategy and objectives in a municipal plan for their particular jurisdiction. To link them together, involvement and cooperation of the different (sectoral) governmental organizations is essential (Metternicht, 2018). On the different levels of policy-making; decisions are made, spatial interventions implemented and consensus about developments sought.

One task for planners is to plan water systems. Water systems, ranging from small water sheds to large river basins, are managed to provide protection against flooding, sufficient freshwater supply and an accessible and reliable navigation network. Water management is, thus, a multifunctional and multidisciplinary activity (Vuren, et al., 2017).

Water systems are managed by hydraulic structures. Hydraulic structures play an important role in retaining, regulating, or controlling the flow of water (Vuren, et al., 2017). Water engineers make sure hydraulic structures work. However, dams, barrages, sluices, locks and pumping stations will deteriorate in time (Vlist, et al., 2015). Decisions have to be made whether to renovate, replace or remove them (Reilly & Adamowski, 2017). Moreover, society changes because of rapid technological developments, and this change has impact on the way we should plan for the long-term. The functions

a hydraulic structure should have on the long-term is difficult to predict and a subject so far understudied in planning.

Water management involves activities at different levels and therefore many actors are involved in this field, including water authorities, municipalities, engineers and national governments (Karstens, 2009). The multiple services and functions water systems provide, can conflict (Loucks & Beek, 2005). The planning of water systems involves identifying alternatives for addressing opportunities or problems. There are many alternatives for the choice of scale (designed at different spatial levels) which demands a proper consideration of all relevant scale levels (Karstens, 2009). For example, the spatial organization of the land-water interface in one part of a river basin can affect the land-water interface in other parts of the river basin. Each choice will have different implications across the spatial scale (Reilly & Adamowski, 2017).

The development of alternatives might also be different and become more interesting when taking interacting spatial levels into account. The main goal of this research is therefore to explore the influence of interacting spatial levels on the development of alternatives for spatial development of water systems.

This thesis answers the following research question: *What is the influence of interacting perspectives on spatial scale on alternative spatial design?*

I first address the research design for this study. This will be followed by an explanation of the case study. I then elaborate on the results of my analysis of the collected data and offer the reader my conclusions and discussion of the findings.

2. Research Design

2.1 Case study research

A case study is chosen as research approach. According to Yin (2003) (Yin, 2003) a case study research allows the researcher to explore individuals or organizations, simple through complex interventions, relationships, communities or programs. Case study research has the potential to explore a phenomenon in its context using a variety of data sources. This approach enables me to answer my research question, because I can explore and investigate a case through detailed contextual analysis and their relationships.

2.1.1 Introduction Case Study

To get a deeper understanding of the subject, a single case study was executed. A single case study was chosen to get insight in the issue, which could be an example for all cases. Within the case study, there are two projects in which spatial design alternatives are created at different spatial scales.

The research specifically analyzed the connection between enlarging the flood risk safety along a particular stretch of the Meuse and replacing seven hydraulic structures upstream in the river Meuse. The case is particularly about developing spatial alternatives at two levels: river basin and local flood protection.

The project Meanderende Maas is about adjusting the river and the dike between Ravenstein and Lith (figure 1). Due to climate change, the future water level will be higher. Therefore, the land behind the dike must be protected. The need to take measures for increasing water safety, offers at the same time opportunities for nature, recreation, economy, culture and environment. Which makes it an integral project. Several partners are involved in the project: the water boards Aa and Maas and Rivierenland, the provinces of Noord-Brabant and Gelderland, municipalities of Oss, West Maas and Waal and Wijchen, NGO and the Ministry of Infrastructure and Water Management, and Rijkswaterstaat. In addition, the project works closely with the national flood protection program (HWBP) and the Long-term Infrastructure, Space and Transport (MIRT) program (Meanderende Maas, 2018). Within the project, six possible alternatives for the restoration and development of the banks of the Meuse are prepared (Meanderende Maas, 2018).

The other project 'Grip op de Maas' concerns the seven weirs in the Meuse between Borgharen and Lith (figure 1). The weirs and locks in the Meuse were constructed at the beginning of the 20th century to make the Meuse navigable for transport. Grip op de Maas is currently working on the assignment of the weirs. The question is whether to, for the future 50-100 years, pursue the same line of thought (1:1 replacement) or go for other alternative spatial designs. The aim of the project is to look, together with market parties, knowledge institutions and governments, for an optimal design. Already, during several meetings, six alternatives have been developed (De bouwcampus, 2018).

2.1.2 Case Study Selection

The case study of the river Meuse is selected for multiple reasons. First, it is an example of a case that involves different spatial levels on which planning activities take place. Meanderende Maas and Grip op de Maas interact due to the hydraulic dynamics of the river Meuse. An additional reason to choose this case is that both projects have a track-record of activities and both are ongoing, which offers sufficient information and allows to actively engage with the projects.

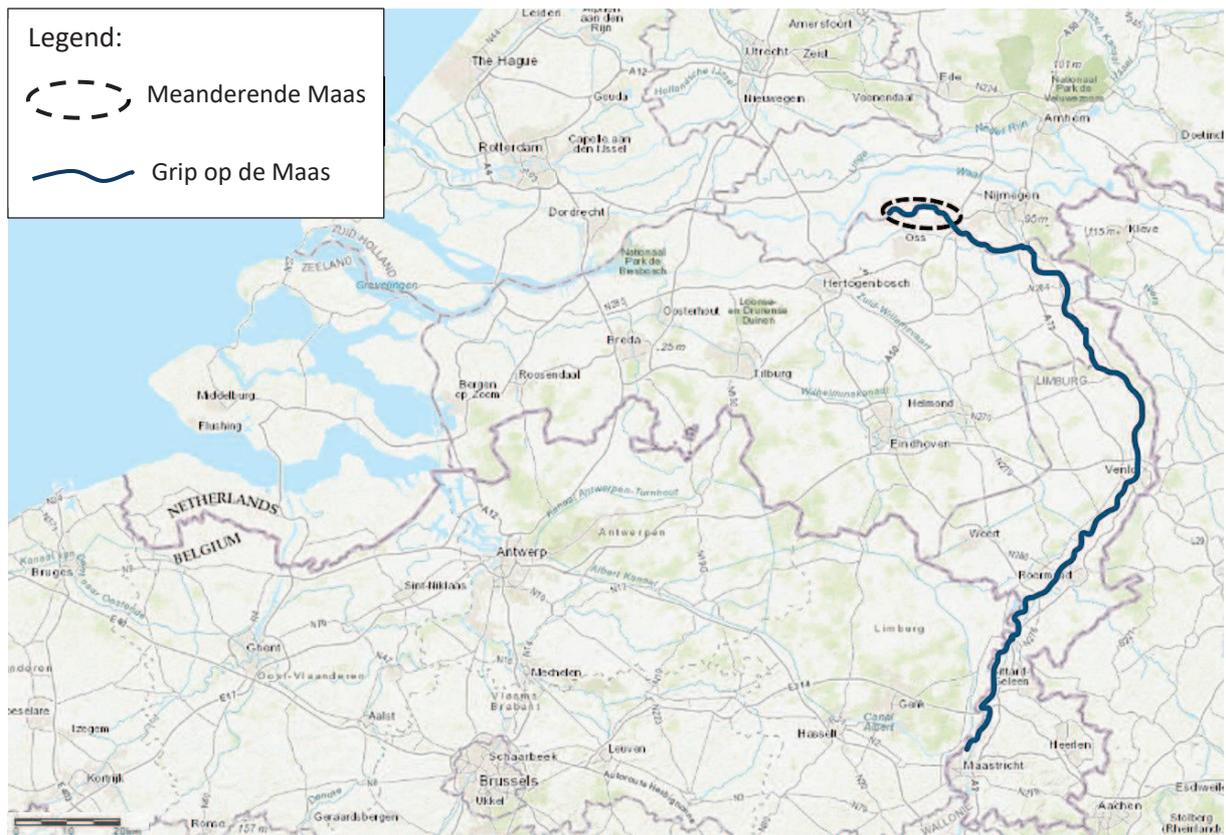


Figure 1: Position Meanderende Maas and Grip op de Maas Source: ArcGIS

2.2 Data collection

To explore the research objective, an appropriate research design is needed. For this thesis, I chose a qualitative approach, because this is appropriate to explore and describe the situation in which there are multiple spatial levels interacting. For this thesis, the methods I have used are interviews, participant (observation) and a desk study into the project documents, policies and other secondary literature.

2.2.1 Semi-structured interviews

Interviews made it possible to gather information from participants related to my research objective in an in-depth manner by answering why and how questions. Three individuals with an outspoken view on the future of Meanderende Maas were interviewed (Appendix 1). I selected interviewees by going through project documents of the Meanderende Maas, where individuals connected to the project were mentioned. The interviews were semi-structured. Before an interview, a number of topics were identified which were addressed during the interview. However, there was space to broach to other subjects. Semi-structured interviews work with a guide whereby a certain degree of structure is used to enable comparison of the answers of interviewees and to obtain information with sufficient depth (Drever, 1995). The interviews were transcribed for analysis.

2.2.2 Participant observation

To gain insight in the different scale choices involved in the Meanderende Maas project, I used participant observation. I visited an open meeting of Meanderende Maas in Megen in which I used deliberate observation to broaden my insights in the project. During the observation, field notes were made. Making good field notes is important in observation studies (Tjora, 2006). By focusing more on developing field notes, one may be able to produce better input to research and makes it simpler to

analyze such data (Tjora, 2006). During the meeting I wrote down my notes in a systematic way. After the meeting, I immediately outlined my observations and secondary thoughts and insights. I identified who was talking based on their role (for example; landscape architect) and observed what the person said about spatial scale (choices). The notes were used as raw data.

2.2.3 Literature studies

Besides interviews and participant observation, literature and project documents were studied. The documents were interpreted, and information was gained through directed reading for scale and scale choices. Project documents were collected through searching on internet and by asking participants in the interviews and the session for useful documents on the project and its wider scope.

2.3 Data analysis

The analysis included the following steps (table 1): It started with studying project documents of both projects to get a sense of the general ideas about how the future of the river Meuse is described. In step two I aimed at contextual immersion. Contextual data was derived from semi-structured interviews with persons who have a relevant role within Meanderende Maas. Besides interviews, the mentioned walk-in-afternoon helped to expand contextual insights. In addition, contextual data was derived through citations in project documents. Step three was about interpreting relevant text fragments of all data sources and these text fragments were placed on certain themes. Three main themes were formed: local level, regional level and national level. I used Excel to structure the different perspectives on these five themes and, to be able to distill an overarching sense of the commonalities and differences between actors and documents in step four. The fifth and final step was about reflecting on these findings, and to establish insight in relationships and connections across themes.

Steps	Strategy	Analytic focus	Product
1	Analytic immersion in both approaches	Within each project: Meanderende Maas and Grip op de Maas	Sense of the general themes related to the future of the Meuse
2	Contextual immersion in Meanderende Maas	Semi-structured Interviews with persons who have a relevant role in Meanderende Maas, participant observation: visiting meeting of Meanderende Maas, project documents	Insights in how they look at different spatial scales
3	Immersion in both approaches	Within each interview, project document and other data sources	Identification of text fragments with themes related to spatial scale
4	Comparison of text fragments	Across all data sources	Commonalities and differences for each theme were identified
5	Integration among and across themes	Within the results from steps 3 and 4.	Relationships and connections were found

Table 1: Steps in analysis

2.4 Validity and reliability

In order not to restrict later analysis of the interviews, they were recorded and transcribed. Interviews are always biased due to the particular role and position of an interviewee and the background of the interviewer. Every individual has own expectations, starting points, self-evidence and attitudes which influence the validity and reliability of interview data. Besides, when asking questions, it is important

that 'leading' questions are not asked because they can send the interviewee in a certain direction (Cohen, et al., 2000). I ensured reliability through recording the interviews and systematic analysis of the interviewees. Also, my semi-structured design helped to elaborate on themes without foreclosing any answers.

Coffet (1996: p. 66) outlines that field notes are 'encoded with the author's conscience, understandings and interpretations'. Thus, my own experiences and thoughts can influence what I see and how I interpret the situation during observing, and therefore affects the validity of the data. Interpretative studies are, however, a viable way of conducting such research because the line of reasoning and argumentative aspects can be assessed on their merits.

One principle for addressing validity and reliability of my research is through the means of data triangulation. I therefore used multiple data collection methods to get information from various data sources. Because of this triangulation, I was able to compare and combine the results of the different data sources, which strengthens the validity of the argument and the narrative of this study.

3. Results

This chapter provides the results of this thesis. Meanderende Maas is an integral project in which several partners work together to realize the project. Partners with different interests are involved who all bring different (scale) perspectives with them. As this thesis addresses spatial scale and spatial levels, the main themes to structure this section are the three distinct spatial levels: local level, regional level and national level.

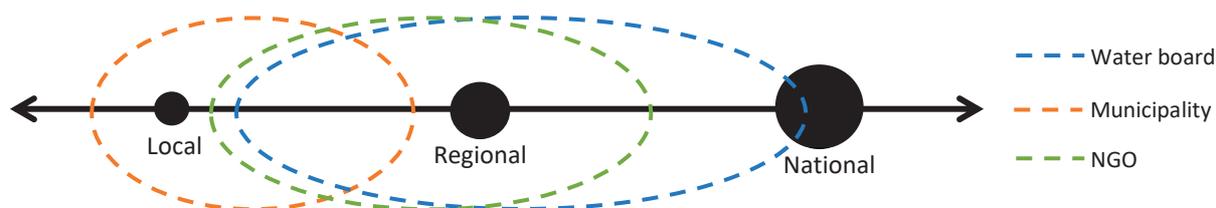


Figure 2: Three spatial levels

3.1 Local level

The local level in this thesis refers to the scale of the project plan Meanderende Maas. According to interviewee 1, the primary interest of the municipality of Oss is on the local and regional level. The municipality is focused on the opportunities which river widening, besides dike reinforcement, may provide for the area. Therefore, the municipality looks for characteristics in and around the project area. They try to explore what the project can mean for recreation, nature and culture in the area. For example, they want to strengthen their leisure economy, coupled with recreational ambitions for the dike area where old towns are situated. They want to recover old meanders which act as the focal points for their ecological infrastructure. And they want to strengthen accessibility of the religious heritage. Besides their ambitions, interactions with the other municipalities West Maas and Waal and Wijchen (local level) were discussed. The collaboration is good; however, each has its own set of ambitions and the river is experienced as a spatial boundary. I found that the municipality formulates their opportunities with a focus on the local level and mostly for the area where the municipality is responsible for.

It became clear from an interview with the water board that, at the local level, the Meanderende Maas project offers opportunities to create a more attractive dike by solving a section with river widening. In this way, lower water levels are achieved while a lower dike can increase the attractiveness of the area. This physical effect of the project is primarily local. What's more, the Demen-Dieden (DD) project, a project on a smaller level within Meanderende Maas, is a project the water board looks very closely at (figure 3). For them, the DD project is interesting because it is a forerunner of Meanderende Maas, and therefore offers new insights in, for example, how to alter the dike. This test-bed for solutions was indicated as:

"[i]t is actually very nice that we have a smaller scale to discover how we can solve [issues], so that we can perform well in the rest of the area without mistakes".¹

The quote suggests a connection between different scales through, in this case, offering a pilot area.

¹ En het is eigenlijk heel mooi dat we nu op kleine schaal kunnen ontdekken hoe we dat goed op kunnen lossen en kunnen we dat in het rest van het gebied in een keer goed doen.



Figure 3: Location project area Demen-Dieden (Natuurmonumenten & Rijkswaterstaat, 2017) in relation to project area Meanderende Maas project (Meanderende Maas, 2018)

The NGO looks at the characteristics of the region in order to find out which nature fits best on the local level in the project Meanderende Maas. So, the NGO do not just look at the local level but extends it further. They want to create nature that best fits the riverine characteristics, and thus go for river and swamp landscapes which are embedded in a wider strategy of bringing nature back to the whole of the Meuse river. As far as Demen-Dieden, the smaller level project, is concerned, NGO believes that the plan fits seamlessly into Meanderende Maas.

The project area of Meanderende Maas, here defined as the local level, is the basis for the designed alternatives. Furthermore, when looking at interactions within the local level; the project team Meanderende Maas wants to create a safe dike together with the environment to make the project area more attractive. Stakeholders from the local area are being asked about their interests, goals and what is valuable. The input is, if possible, given a place in the alternatives (Meanderende Maas, 2018). The alternatives of Meanderende Maas are focused on the local scale.

When looking at the local level point of view, I found commonalities. Throughout the data, the local level was taken into account. All actors share the ambition to make this area ecologically and esthetically appealing for which the local level is highly important. However, there were also differences in the extent in which the different actors focus on the local level. The municipality focuses significantly more on the local level, where a water board or NGO focuses in a lesser extent. Their main interest is on the regional level.

3.2 Regional level

The regional level, in this thesis, refers to a larger area such as a region or province. It has become clear during the interview that the municipality considers the regional level as important and interesting. They want to show-off their local strengths at the regional level. The municipality is interested in being

continuously aware of what happens in the area, because the more river widening takes place at other places, the more effect it has on the local level within their jurisdiction, i.e. for the Meanderende Maas. A continuous coordination with other projects such as Bedijkte Maas and Maas Brede is necessary to anticipate and accommodate change. However, for the municipality:

"Our options and our instruments to influence this are not there. We follow it, we also participate in the Bedijkte Maas and the Maas Brede projects, but of course there is a dependency on what is determined [for projects], based on these regional plans".²

The fact that they participate in projects such as the Bedijkte Maas and Maas Brede implies that even though it is not in their jurisdiction, the municipality looks on this regional level. However, the municipality does not have much control on the regional level and depend on what is determined in regional plans.

In the interview with the water board, it was said that they put their emphasis on their jurisdiction, this is from Vlieringsbeek to Waalwijk. The project area Ravenstein – Lith is part of their jurisdiction. They want to see coherence between Meanderende Maas and their jurisdiction. Water is an aspect that lends itself to being resolved at the regional or even national level. Water level reduction upstream has consequences for downstream water levels. This study thus found that water board focus on the regional level and takes places further away into consideration.

The interviewed NGO is active from Cuijk to Ravenstein and from Ravenstein to Heusden. They take part in Meanderende Maas, but this project closely aligns with what they wanted to do anyway. They set up an own project between Ravenstein to the Biesbosch, under the name MeerMaas. Meanderende Maas is located in the project MeerMaas:

"Yes, MeerMaas was initiated by [NGO] and was started to make the Meuse a more natural river and started to add crucial things on top of the nature policy of the Province and State".³

The above stated quote shows that the NGO is active on the regional level and that they start projects like MeerMaas which focuses on a larger scale than Meanderende Maas. The NGO looks at natural processes and these can be found on different spatial scales. Natural processes do not take place in a defined area, but gradually merge into each other. Changes at one level may have consequences for other scales. Thus, the NGO takes a look at the larger spatial scale with regard to the project Meanderende Maas.

The project documents clearly show particular links with the wider region. Projects such as MeerMaas, Maasmeanders, AgriFood Capital and Zuider Waterlinie are mentioned (Hulshof, et al., 2016). These are ongoing projects in the region. Furthermore, in this MIRT report, a map of the region is shown in which spatial connections are shown. This demonstrates that they take into account the regional level. However, only as long as they are not too distant and too uncertain in time.

The alternatives ask for good incorporation of the regional and national level, in the local level. The provincial nature policy trickles down to the local level alternatives. In (almost) all alternatives,

² Onze mogelijkheden en onze instrumenten om dit te beïnvloeden zijn er niet. We volgen het ook wel, we doen ook mee in het project de bedijkte Maas en de Maas brede verhaal maar je bent natuurlijk tot afhankelijk van wat er op die regionale plannen wordt bepaald.

³ Ja, dit is vanuit Natuurmonumenten geïnitieerd en MeerMaas werd gestart om van de Maas zeg maar een meer natuurlijke rivier te maken en dat traject en bovenop het beleid, natuurbeleid, van Rijk en Provincie om zeg maar cruciale ontbrekende dingen daaraan toe te voegen.

different forms of nature are presented (Meanderende Maas, 2018), which according to the nature policy should be destined for nature. The alternatives evoke different forms of nature such as parceled nature or combinations of agriculture and nature. However, the NGO already knows that they want to realize river- and swamp nature, this is not yet integrated in the alternatives. The alternatives still offer a variety of nature options. Besides nature, all alternatives have been made assuming that the flood protection standards are met. Attention is paid to the representation of most the interest of regional and local authorities in this project, to reflect diversity in the alternatives. The alternatives are, in this phase, mainly to show a large bandwidth.

If I look at the commonalities, I see that they all see the regional level as important because actions taken at the regional level have effects on the dike assignment Meanderende Maas. Therefore, the process is iterative, looking back and forth to other places. Again, the extent in which the actors focus on the regional level is different. The municipality does not really have much say on what is decided on the regional level but considers it as interesting a worth monitoring for their local activities. For the water board and NGO, their focus area has a larger spatial scale, which means that they automatically look at Meanderende Maas seen from their regional interests.

3.3 National level

In this thesis, the national level is on the scale of the entire Meuse. In general, the municipality said during the interview that they occasionally look at the entire Meuse, because Meanderende Maas is of course part of the flood risk management of the whole Meuse. Sometimes things are suddenly national, such as the port of Oss which operates on the national level. But the primary focus is not on this level. When the municipality was asked about Grip op de Maas, they did not know about this project. The national level lies outside their control and field of specialization. However, as far as the future of the weirs is concerned, they would like to contribute to these debates because the lock at Lith could offer many opportunities. For example, for the nature image it can be very beautiful or for sustainability goals of the municipality. They are not working on the weirs themselves, for which they indicate that it is the task of Rijkswaterstaat.

The water board tries to act well in the ensemble. The water framework directive forces water managers to look beyond their own specialism. For the water board, it makes not much sense to look at one spatial level. They look at the interplay and that means from Maastricht to Geertruidenberg of the Meuse. The water board tries to look at the Meuse as a whole because:

“The more issues concerning river widening, and water level decrease are fixed for the entire area, the easier it is for us to make sharper choices and to adjust less on the dike. That is actually what we prefer. We have a lot of interest in clarity of all water levels along the Meuse”.⁴

It becomes clear that the water board has a lot of interest in what is decided on the national level, because then their interventions become smaller. Water related interventions affect each other and therefore a look on larger spatial scales is needed. Like the municipality, the water board did not know about Grip op de Maas. It is much further in the future so that gives insufficient reason to look at it. They look at what is going to happen in a certain time frame, and for the weirs this is something that lies too far in the future away. Besides, Rijkswaterstaat is involved in all possible ways. So, the water

⁴ Hoe meer er vast gelegd is aan rivierversmalling en aan waterstandsval in het gehele gebied want het heeft allemaal met elkaar te maken, hoe makkelijker het voor ons is om scherpere keuzes te maken en minder aan de dijk te doen. Dat is eigenlijk wat we het liefst willen. Wij hebben heel veel belang bij duidelijkheid voor de hele Maas over de waterstanden.

board assumes that if Meanderende Maas needs to know about it, Rijkswaterstaat would reach out to the project.

During the interview with the NGO, it became clear that it is important that the Meuse will become a green natural link and therefore should have efficient hinterlands connections. From this it can be deduced that they focus on a large geographical scale. When Grip op de Maas was mentioned, the NGO knew the project. A clear opinion about the project of the future of the weirs came forward:

"Yes, you can hardly take them into account because if you have to wait for that, then you know for sure that you do not do anything for the first 50 years. So, you cannot wait for that".⁵

This is an interesting perspective, because this means that they do not really look at that large scale, and if they look at the larger scale on which future choices need to be made, they see it as irrelevant because it is only an issue for the longer term. The opinion of the NGO about the weirs is that it might be possible to look at what a dynamic stowing regime means, so that you can recreate some tidal treatment on the river which would be good for nature.

Measures upstream and downstream in the Meuse can influence water levels at higher peak discharges. The project team Meanderende Maas argues that such measures on the entire Meuse are being looked at. They mention for example concrete plans in Limburg as this quote demonstrates:

We keep a close eye on these projects and the consequences for our project. The national agreements that are made about this are included in our project⁶ (Meanderende Maas, 2018).

Besides, in a project document about the integral study Ravenstein-Lith, the conjunction with other (forerunner) projects along the Meuse is discussed (Ministerie van Infrastructuur en Milieu, 2016). Meanderende Maas is part of the so-called MIRT projects, where there have been made agreements regarding a number of river widening measures. Different parties along the Meuse chose to collaborate and have come to a joint proposal for the Meuse. The proposal opted for a combination of river widening and dike reinforcement for the short term. Eight projects have been included and the plans are regarded conjointly (Deltaprogramma Maas, 2016). These projects influence the water levels within Meanderende Maas. This shows the interest of the project team in the interplay between projects along the Meuse. Meanderende Maas is connected to higher spatial levels.

As Grip op de Maas lies far into the future, nothing was found in project documents related to Meanderende Maas. In addition, during the walk-in afternoon in Megen, I asked relevant people to Meanderende Maas if they knew about the project Grip op de Maas. Nobody knew about this project, this is interesting to note because it shows that they do not take into account the future replacement of the weirs. After an explanation about Grip op de Maas, everyone was curious about what a changing weir might mean for the area, but for Meanderende Maas they did not take it into account. In sum, nothing is done with the alternatives for the different weirs in the alternatives in Meanderende Maas because it lies too far away in time.

⁵ Ja, je kunt die nauwelijks meenemen want als je daar allemaal op moet wachten dan weet je dus zeker dat je de eerste 50 jaar niks doet. Dus daar kun je niet op wachten.

⁶ We houden deze projecten en de gevolgen voor ons project goed in de gaten. De landelijke afspraken die hierover worden gemaakt, nemen we mee in ons project.

4. Discussion

Studies have shown that spatial developments in the landscape are influenced by different levels and that levels can hardly be separated from one another, since there is interaction between them (Lieshout, et al., 2011; Karstens, 2009; Cash, et al., 2006). My results support and augment these findings by showing that Meanderende Maas is influenced by various levels, regional and national, and that these levels do not stand alone. However, when considering spatial developments much further in future (50 – 100 years) this influence was found to be seen as less significant.

Looking at the findings, they partly answer the research question; the results became more focused on scale perspectives than on spatial alternatives. An unexpected finding was that since nobody really was informed about Grip op de Maas project, the influence on the development of alternatives could not be examined because it was non-existent. Analysis of the results showed that Meanderende Maas is rarely linked to Grip op de Maas, and if it was there was no doubt about the irrelevance for the current dike reinforcement.

Looking at the results achieved this study; several findings have been identified. In Meanderende Maas, a lot of actors work together, which means that there is involvement of different spatial levels. Responses of different authorities were developed by the local, regional and national spatial level, which makes it an interacting multi-level project.

The first major finding is that there is a clear overspill of the scale of the jurisdiction of governmental actors: the biggest focus is on their own jurisdiction. They always look outside their own jurisdiction, but it seems to be only what may influence in close proximity. Additional distances become less relevant. An explanation might be their responsibility does not go farther than their own jurisdictional area, which is confirmed by the studies in responsibility where it is seen as an issue of duty for particular tasks (Gunder & Hillier, 2007).

Second, spatial developments which are expected to occur much later in time and only influence the project on a higher spatial level, are considered less relevant. It is noticed that ongoing spatial developments cannot wait for interventions of projects which are usually sought after a couple of decades. Incorporating the (long term) future was clearly shown as an issue, which is also shown for replacement of hydraulic structures elsewhere (Pot, et al., 2018). Certain interventions must be taken before a specific time; thus, this cannot wait but hampers future oriented decisions.

Third, an aspect of scale that emerged during this study is that authorities regard spatial scale differently. Each actor has its own responsibilities in a spatial area where measures are taken. For an NGO or water board, their focus area is such that they are 'forced' to look outside their area due to the natural dynamics of processes which happen on larger spatial scale levels.

Fourth, interaction within levels and between levels was found. The Demen-Dieden project was fully taken into account in Meanderende Maas. Meanderende Maas was perceived to interact with regional and national levels, for which actions at the project area, local level, are taken.

Fifth, it has been argued that the responsibility of linking Grip op de Maas with Meanderende Maas rests with the other party, in this case Rijkswaterstaat who is involved. This offers an interesting perspective: responsibility at the other party, they must bring the matter to the project.

There have been several limitations and weaknesses identified in this research. Interviews were conducted for this study to discover the interaction between different spatial scales. Three interviews were conducted with people who have a relevant connection with Meanderende Maas project. However, there are more authorities involved in the project who have not been spoken to. Also, the time period of this study was short, so more interviews and a more elaborate study of project related documents could offer deeper insight in the relation between different spatial levels.

5. Conclusion

The main goal of this research was to explore the influence of interacting spatial levels on the development of alternatives for spatial developments of water systems. For which (the interaction between) the projects Meanderende Maas and Grip op de Maas were studied. The results showed that different spatial levels are incorporated in the development (of the alternatives) for Meanderende Maas. Meanderende Maas, at the local level, includes interactions with other spatial levels, notably regional and national levels.

To conclude, this thesis found a project in which multiple actors are involved, and where the local, regional and national level engage in the spatial development of Meanderende Maas. The study revealed that spatial developments which are too distant and much later in time are considered less relevant or are not considered at all. Projects governed by a different time scale or farther into the future are difficult to take into account. I also conclude that different authorities consider scale differently. In addition, there is interaction between the levels but also within the levels, and across spatial scale.

Based on the findings of this study, spatial scale in planning is still a major issue. Planners should take into account that spatial development projects do not occur in isolation. For the planner, incorporating these kinds of spatial developments is complex but an essential task nonetheless.

Unfortunately, the study could not include all aspects of scale. There are more concepts related to scale. It must be borne in mind that this research focused mainly on spatial scale. Once focused more on other scales such as time scale and institutional scale, and their interaction, the results might be different. A recommendation for follow-up research is therefore to carry out a similar investigation whereby the temporal and institutional scale are better and more extensively studied.

Another recommendation is to study better which criteria are used both at alternative development as for narrowing down of alternatives in such integral projects with multiple actors involved. In this way, it could be studied how spatial plan alternatives are being determined and to study when an alternative is a high opportunity alternative.

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Appendix 1

Interview I Municipality of Oss: Interview with a planner with main focus on the rural area. Interviewee ensures the connection between the municipality and the project Meanderende Maas. Meanderende Maas is an integral area task, and how you combine and still keep integrality is something the interviewee is involved in too.

Interview II Water board Aa and Maas: Interview with policy advisor of the water board Aa and Maas. For a couple of years, interviewee is working on the Delta program for the Meuse. Works for a small part for Meanderende Maas and supports the project, particularly in the administration process, the connection with Delta program and the connection with other projects along the Meuse.

Interview III NGO (Natuurmonumenten): Interview with an area manager, interviewee manages an organizational unit and is fully responsible for everything that goes on there. The interviewee has been doing this for a long time in this unit, so involved from the very beginning in the process of Meanderende Maas.