

Nature-based Solutions in a cross-border area

Critical implementation factors in Flanders and the Netherlands



M.A.P.M. Verbunt
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Author: Marieke Verbunt

Student number: S1065437

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Internal Supervisor: Sander Meijerink, Radboud University Nijmegen

External Supervisor: Leo Santbergen, Waterschap Brabantse Delta

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Summary

Climate change brings along changes which are not predictable and thus hard to take measures against (Moss et al., 2010). Measures against the effects of climate change can be divided in mitigating measures or adaptation measures. This thesis focusses on the adapting measures against the negative effects of climate change and especially on the implementation of Nature-based Solutions. The main research question of this research is: *'Which institutional conditions are enabling or disabling the realization of Nature-based Solutions in the Flemish-Dutch border region?'*

Three different cases were studied in the cross-border area of Flanders and the Netherlands. These cases involved the Boven-Mark on the Dutch side of the border, the Mark on Flemish side of the border and the Merkske with lies exactly on the border between these two countries. For the analysis of the implementation of Nature-based Solutions, a document study has been carried out, eleven interviews have been conducted and three workshops of the Interreg 2 seas Prowater have been observed. The Policy Arrangement Approach was the structuring principle in this study. Together with the list of barriers for the implementation of Nature-based Solutions by Sarabi et al. (2020) it formed the conceptual framework.

First, it is useful to explain the concept of Nature-based Solutions. The concept of Nature-based Solutions is part of a new discourse and is challenging the traditional engineering paradigm (Randrup et al., 2020). Ivo Demmers (Wageningen University & Research, 2018) states that engineered solutions are made for today's situation, but that they will leave us vulnerable for changes in the future. Natural solutions like Nature-based Solutions move with such changes. This does not mean that Nature-based Solutions are by definition better than engineered solutions, a combination of these two is often the most ideal situation.

The factors which had a positive influence on the implementation of Nature-based Solutions were the factors 'political will and long-term commitment' and 'available financial resources'. Both of these factors scored a '+' at all three cases. The factors which had a negative influence on the implementation of Nature-based Solutions are 'property ownership complexities', 'supportive policy and legal framework' and 'counter-discourses'. These three factors scored a '-' at all three cases. The factor which had influence on every case, but with different outcomes is 'public awareness and support'.

This study showed that there are six factors of high importance when it comes to the implementation of Nature-based Solutions. These six factors are 'political will and long-term commitment', 'available financial resources', 'property ownership complexities', 'supportive policy and legal framework', 'counter-discourses' and 'public awareness and support'.

Preface

Dear reader,

In front of you lies the thesis 'Nature-based Solutions in a cross-border area'. In the context of my master Spatial Planning at Radboud University Nijmegen, the thesis was commissioned by water authority Brabantse Delta. The assignment was completed by means of an internship in the period 01/03/2021 – 02/07/2021.

In my thesis I tried to find the factors which influence the implementation of Nature-based Solutions in the cross-border area of Flanders and the Netherlands. I learned a lot about Nature-based Solutions and was able to give Waterschap Brabantse Delta as organization interesting insights which factors influence this implementation.

The assignment was a result of an introductory meeting with Leo Santbergen, the internship supervisor. My motivation for this graduation project concerns the affinity with spatial planning and my master specialization 'Cities, Water and Climate Change. A combination of which I can confirm after the internship that they have lived up to my expectations.

During graduation, the corona virus reigned in the Netherlands. Water authority Brabantse Delta had clear guidelines for creating a safe working environment. Unfortunately, I have written a large part of my thesis from home. I would like to thank the colleagues involved for their online participation.

Within water authority Brabantse Delta, I also would like to thank Leo Santbergen as my internship supervisor. After completing the research, I am convinced that the results of this research, in combination with the current team, will help make future transitions more successful.

Within the course I would like to thank Sander Meijerink as my supervisor for thinking along, giving feedback and motivating the past period.

I hope you enjoy reading my thesis.

Marieke Verbunt

Breda, August 2021

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Chapter 1

1.1 Introduction

Climate change is a hot topic nowadays. Countries, companies and citizens have been made aware and try to reduce its effects. The climate protests are more popular than ever (Zoelen, 2019) and there are investments of big companies like Apple of 200 million for reforestation (RTL Nieuws, 2021). Finally, there is also a tightening of the climate goals of the European Union which concerns a reduction of 55 per cent CO₂ emission in 2030 compared to 1990 (RTL Nieuws, 2020a). But still, this seems not enough. Record after record was broken, 2020 was the hottest year together with 2014 (RTL Nieuws, 2020) and there was a record amount of damage due to natural disasters in 2020 (Rodenburg, 2021).

Climate change is the change of the average weather or climate over a long period of time (IPCC, 2007). From the 19th century, there is a clear rise of the average temperature on earth. Natural processes in combination with human activities have caused a high concentration of greenhouse gases in the atmosphere (Moss et al., 2010). These gasses increase the greenhouse effects which leads to a higher temperature on earth. As said earlier, the effects of climate change are increasingly visible, not only as natural disasters but also as increasing droughts, floods and the rise of the sea level.

This thesis will focus on one aspect on which climate change has an impact, namely water management. Climate change brings along changes which are not predictable and thus hard to take measures against (Moss et al., 2010). Measures taken in the past are not a guarantee for success in the future because of the changing conditions and technical innovations. Measures against the effects of climate change can be divided in mitigating measures of adaptation measures. Mitigating measures are about limiting global warming where adaptation measures are about adapting to a different climate (Milieu Centraal, n.d.). This thesis focusses on the adapting measures against the negative effects of climate change.

Europe has set up the Water Framework Directive (WFD) to set long term goals with leaving freedom for the European Union Member States for the accomplishment of solving issues related to water management (Lieverink, Wiering & Uitenboogaart, 2011). This directive contains two important standards, it obliges the Member States to define the river basin districts and it pursues an ecosystem approach. A measure that suits the standards of the WFD are the Nature-based Solutions. Nature-based Solutions are solutions to sustainably adapt to climate change, and thus to decrease the increasing droughts. Let nature do the work is the principle here. The concept of Nature-based Solutions is part of a new discourse in water management, and it is challenging the traditional engineering paradigm (Randrup et al., 2020). Where an engineered solution used to be considered, a natural solution will be the focus with NbS. For example, where a weir would have been placed before, wood is now being brought into the stream.

Ivo Demmers, lead program of Food Security and Valuing Water Program at Wageningen University & Research came up with a good example of the benefits of Nature-based Solutions in contrast to the engineered solutions (Wageningen University & Research, 2018). Our system of dikes, for example, is an artificial solution. Those dikes have protected us against the water over centuries, but we have disrupted the natural dynamics of our delta. This has been at the expense of the flexibility of such a delta system. He states that our technology solutions are made for today's situation, but that will leave us vulnerable for changes in the future. Natural systems move with such changes.

By the way, this does not mean that Nature-based Solutions are better than engineered solutions, there are situations where nature has no solutions for which call for engineered options. That is why a combination is often so ideal according to Demmers (Wageningen University & Research, 2018).

There are a lot of Nature-based Solutions regarding different aspects of climate change. This research will focus on the NbS that contribute to better land use and water management. These kinds of Nature-based Solutions can be seen as a way to organize the land-water system in such a way that nature itself does its job and where water does not adapt to man, but man adapts to water (Witteveen+Bos, n.d.).

1.2 Problem statement

There are plenty of bordering areas to investigate, but this thesis will focus on the border region between the Netherlands and Flanders. One of the reasons for this choice is the dependence of the Netherlands on Flanders regarding the water flows. The Netherlands is situated downstream in contrast to Flanders, all the rivers flow from Flanders to the Netherlands. If Flanders lowers the water quality, the Netherlands has to deal with the consequences. Therefore, it is especially important for the Netherlands to have a good alignment with Flanders. Another reason for this border region is the interest of Water Authority Brabantse Delta where an internship will take place during this thesis. Brabantse Delta is part of a project called Interreg 2 Seas PROWATER where this thesis connects to one of the focusses of this project, a river basin approach between the Netherlands and Flanders and how to deal with the effects of climate change. While this thesis focusses on the implementation of Nature-based Solutions in the bordering area, it is not about creating a river basin approach between these two countries.

Due to climate change, water networks are changing, as is our relationship with water. We are used to adapt the system to our needs and with the current climate change, this no longer seems to be possible. This not only asks for behavioral changes, but also needs systematical changes for a more efficient use of water. People need to be aware that they cannot fill their pools in times of drought and the landscape will have to be arranged in such a way that the water can be retained at times when this is necessary. Climate change in the case of the Netherlands and Flanders means dealing with worsening drought, water scarcity, more local intensive rainfall and floods where the focus of this thesis is the worsening drought. Some of the effects of these droughts are the loss of biodiversity, lower agricultural production and the endangering of drinking water (B., 2020).

This research will focus primarily on Nature-based Solutions for coping with droughts. This concept requires a new way of thinking and acting, as said earlier 'let nature do the work' is the principle. NbS require a different layout of the landscape, for example agriculture will not be possible everywhere any longer in the same way as it is now. A change is needed that better matches natural processes.

There are several factors that influence the implementation of Nature-based Solutions, in the positive and negative sense. Some examples of these factors are the involvement of people, the investments, the maintenance and so on. This research tries to find out how the different factors influence the implementation of Nature-based Solutions by analyzing three implementations of Nature-based Solutions in the river basin in the border area between the Netherlands and Flanders.

These cases are; Merkske, Boven-Mark and the Mark on the Flemish side of the border. The choice of these cases will be elaborated further in section 3. These implementations will be analyzed on a regional level, but the national level will not be forgotten.

To investigate the factors which influence the implementation of Nature-based Solutions, the Policy Arrangement Approach (PAA) (Arts & Leroy, 2006) is used. The PAA consists of four interrelated dimensions which are used to describe the policy arrangement. Three of them have an organizational nature and one of them is related to the substance of the arrangement. The organizations dimensions are; the actors, the rules of the game and resources. The substantive dimension is the discourse. When one of the four dimensions change, the other dimensions will also change (Lieverink, 2006).

1.3 Scientific and societal relevance

Scientific relevance

One of the articles about the collaboration between the Netherlands and Flanders comes from Crabbé and Wiering (2010). They wrote about the implementation of the Water Framework Directive where the Netherlands and Flanders are compared to a turtle and a hare. The Netherlands often starts with ambitious plans and prospects but end pragmatically with sometimes even downright meager results. The Flemish are known for their hard workers but behave less ambitiously than the Netherlands. To come back to the turtle and the hare, the turtle, Flanders, goes slow and steady and the hare, the Netherlands, goes fast but does not get that far. Heylen (1997) spoke in 1997 about instruments for a global water management in the Dutch-Flemish border region. Every cross-border project has to deal with the same general challenges as different policies and different points of attention. The instruments include the foundation of a Dutch-Flemish integral water management consult and four cross-border river basin committees. The specific aspects of the implementation of Nature-based Solutions in this cross-border area remain unexamined.

The concept of Nature-based Solutions knows a lot of definitions, but the general definition is clear; “Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions.” (European Commission, 2020). This definition only highlights the positive aspects of Nature-based Solutions, but there is a con concerning the investment. Unlike the mainstream engineered counterparts, there is limited experience with calculating the benefits of NbS over time and how they might be evaluated. There are concerns about their cost-effectiveness compared to engineered solutions. Upscaling NbS will require major investments which requires a new investment model that also includes the changes in climate and other framework conditions and the long lifespan of urban infrastructure (Frantzeskaki et al., 2019).

This thesis will contribute to the expansion of the current knowledge about the barriers for the implementation of Nature-based Solutions in a cross-border area. The Policy Arrangement Approach, which is applied in other studies like Kooij et al. (2021), will be applied to the cases in the border region of the Netherlands and Flanders. The knowledge gap about the barriers and chances regarding the implementation of Nature-based Solutions in cross border areas can be filled with this research.

Societal relevance

The factors that limit or stimulate the implementation of Nature-based Solution in the border area of Flanders and the Netherlands are central in this research. There may be differences between Flanders and the Netherlands, but this does not necessarily mean that these differences must be resolved.

As stated earlier, water networks have no national boundaries which makes international water management essential. The Netherlands and Flanders will always depend on each other regarding water management. It is to say that the Netherlands is more dependent on Flanders than the other way around, but for both countries it is important to coordinate with each other. Not only for the Netherlands coordination is useful or even necessary, but also for Flanders this is the case. When the same agreements are made in this region, people cannot complain that their neighbors are allowed to do it while different rules apply to them.

The need and attention for water management is increasing due to the increasing periods of drought in the cross-border area of Flanders and the Netherlands. People directly involved with the rivers, like companies and residents, will be more vulnerable and dependent of the river. This research not only focusses on the institutional barriers experienced during the implementation of Nature-based Solutions, but also on the opportunities during the implementation. The definition of the institutional barriers used ensures that the cultural side of this collaboration is also being researched. Both countries can benefit from the outcomes of this research to see what the differences are when it comes to the implementation of Nature-based Solution. This research shows the barriers and opportunities from which both countries can learn from each other.

Thus, this research contributes to several aspects. It shows where Nature-based Solutions are already being implemented and how far this process already is. It also gains insight in the implementation processes of Nature-based Solutions on both sides of the border. Lessons can be drawn from these insights for the implementation of Nature-based Solutions on both sides of the border.

1.4 Research aim and research question

The objective of this exploratory research is to analyze the implementation of Nature-based Solutions on both sides of the border between the Netherlands and Flanders. The focus of this research will be on three different projects where NbS are implemented. One of these projects will be on the Dutch side of the border, one on the Flemish side and the final one in the bordering area where the Netherlands and Flanders are working closely together. As stated earlier, the PAA will be used as a research framework in this thesis.

The following research question has been formulated:

“Which conditions are enabling or disabling the realization of Nature-based Solutions in the Flemish-Dutch border region?”

The main research question remains quite broad about the specific conditions researched in this study. The formulated sub-question will specify this research further and through them it will be possible to answer the main research question. The sub-questions are as follows:

- What are Nature-based Solutions?
- Which factors influence the implementation of Nature-based Solutions?
- What are the action options for water managers to promote the implementation of Nature-based Solutions?

1.5 Reading guide

This thesis is structured as follows. Chapter 2 concerns an overview of the relevant theories from which a conceptual model is made. This chapter also includes the operationalization. Chapter 3 is about the methodology used in this thesis. The research philosophy, research strategy, data collection, data analysis methods and the credibility, transferability, dependability and confirmability will be discussed in this chapter. Chapter 4 is about the findings of this research where the factors for the implementation of Nature-based Solutions will be discussed for three different cases. The main research question and its sub-question will be answered in the last chapter. Chapter 5 will also include a discussion of the limitations of this research project.

Chapter 2

2.1 Theoretical framework

This chapter provides a better understanding of the theoretical framework where the different theories used will be specified and operationalized in the analytical framework. This will lead to the conceptual framework on page 19. The theories used are the Policy Arrangement Approach developed by Arts & Leroy (2006) and the barriers of implementing Nature-based Solutions by Sarabi et al. (2020).

2.1.1 Nature-based Solutions

Nature-based Solutions are about understanding the ecosystem, as well as the social system. They are actions for societal challenges that are inspired by processes and functioning of nature. By developing and implementing solutions that are supported by nature, resilience is achieved while producing societal, environmental and economic benefits. Some examples are restoring the reefs, building with nature and spatial development for flood protection. (Witteveen+Bos, n.d.).

NbS can be seen as an effective way to reverse the trend of degradation of natural resources. Therefore, it is important to have a clear definition and principles. It is also useful to understand the relationship with related approaches.

When these concepts remain vague, it will not be possible to develop standards and guidelines or even to implement or upscale NbS. The IUCN (International Union for Conservation of Nature) has developed a list of eight principles for NbS which can be seen in Table 1 (Cohen-Shacham et al., 2019).

Principle 1	NbS embrace nature conservation norms (and principles)
Principle 2	NbS can be implemented alone or in an integrated manner with other solutions to societal challenges.
Principle 3	NbS are determined by site-specific natural and cultural contexts that include traditional, local and scientific knowledge.
Principle 4	NbS produce societal benefits in a fair and equitable way in a manner that promotes transparency and broad participation.
Principle 5	NbS maintain biological and cultural diversity and the ability of ecosystems to evolve over time.
Principle 6	NbS are applied at a landscape scale.
Principle 7	NbS recognize and address the trade-offs between the production of a few immediate economic benefits for development, and future options for the production of the full range of ecosystem services.
Principle 8	NbS are an integral part of the overall design of policies, and measures or actions to address a specific challenge.

Table 1: The principles for a good implementation of Nature-based Solutions (Cohen-Shacham et al., 2019)

Ecosystem-based adaptation, urban green infrastructure and ecosystem services are prominent in academic debates and are increasingly referred to in policymaking. Nature-based Solutions is the most recent and broadest concept of the four. Therefore, NbS can be considered as an umbrella to the other concepts, but with a clear focus on the deployment of actions in the field. The ecosystem-based adaptation is a subcategory of Nature-based Solutions that concerns climate change adaptation through the use of nature. Urban green infrastructure can provide a strategic guide for the integration of NbS into the developing of multifunctional green space networks. Finally, ecosystem services value the benefits that humans can have from urban nature. It can also support policy making for prioritizing strategies and actions to maximize the benefits of Nature-based Solutions. It can thus be seen as a kind of connecting concept between the other concepts (Pauleit et al., 2017).

Nature-based Solutions have recently gained popularity as an integrated approach that addresses the crises of climate change and biodiversity loss. Most of the focus recently has been on tree planting for carbon catchment. This focus can be distracting from the need to rapidly phase out the need of fossil fuels. The study of Seddon (2021) urges policymakers to follow four guiding principles to enable NbS to provide sustainable benefits to society. These principles are:

- Nature-based Solutions are not a substitute for the rapid phase out of fossil fuels
- Nature-based Solutions involve a wide range of ecosystems on land and in the sea, not just forests
- Nature-based Solutions are implemented with the full engagement and consent of local communities in a way that respects their cultural and ecological rights
- Nature-based Solutions should be explicitly designed to provide measurable benefits for biodiversity

There is quite some knowledge about Nature-based Solutions within cities. The study of Augusto et al. (2020) showed that Nature-based Solutions have a local cooling effect on the short term due to an increase in green/blue spaces. They mitigate the urban heat islands (Harlan et al. 2006, Gill et al. 2007, Gabriel and Endlicher 2011, Depietri et al. 2013) and they enhance well-being (Martens et al. 2011, Gulsrud et al. 2018). However, there is little academic literature about the effects or implementation of Nature-based Solutions in rural areas. Smith et al. (2017) studied the restoration of habitats along shorelines which contributed to climate change adaptation by protecting people and infrastructures from flooding. The study of Van Hattum et al. (2019) mainly refers to supplementing knowledge of Nature-based Solutions in the rural area.

Nelson et al. (2020) listed five challenges for Nature-based Solutions which are divided into three domains:

- Socio-political context
 - 1 Participation and equity
 - 2 Governance
 - 3 Valuation
- Infrastructures within landscapes
 - 4 Infrastructure integration
- Socio-hydrological risk and benefits
 - 1 Participation and equity
 - 3 Valuation
 - 5 Scale and feedback challenges

The extreme events and natural disasters could be a window of opportunity for change. A disaster associated with a natural hazard can lead to important changes in socio-ecological systems. When disasters happen, most attention is given to the direct effects of the disaster.

Birkmann et al. (2010) concludes that more research needs to be done about the strategic policy and that methodological lessons need to be learned for the future. A disaster can also lead to a window of opportunity for Nature-based Solutions. For example, the heath-island effect can be a trigger to implement Nature-based Solutions in the city to adapt these effects.

Sarabi et al. (2020) conducted a research where barriers for the uptake and implementation of Nature-based Solutions were identified. Fifteen barriers were identified from a literature study and expert interviews and then ranked through a questionnaire. The barriers will be described according to the ranking which is based on the questionnaire of Sarabi's research. However, this ranking is based on expert interviews in an urban area. Therefore, it may not completely be applicable in the case of the Netherlands and Flanders, but it gives a good overview which barriers are experienced somewhere else.

1. *'Silo mentality'* means that people are stuck in their way of thinking and doing (O'Donnel et al., 2018). For NbS as multifunctional solutions it is important that people from multiple disciplines can work together (Davis & Naumann, 2017).
2. *"Lack of design standards and guidelines for maintenance and monitoring"* concerns the uncertainties regarding the best way to plan, design, implement, maintain and monitor NbS. Guidelines that fit the local conditions are currently missing (Zuniga-Teran et al., 2019).
3. *'Lack of political will and long-term commitment'* is about the fact that political decision-makers tend to have more interest in short-term projects with direct outcomes than in projects for the longer term, especially for reelection purposes (Fee et al., 2009). Nature-based Solutions needs a relatively long time to produce its societal benefits and politicians are thus not willing to take the risk. However, for Nature-based Solutions to succeed political leadership and commitment is necessary to keep the stakeholders motivated and engaged (Clar et al., 2013).
4. *'Lack of sense of urgency among policymakers'* is a barrier to the mainstreaming of NbS. "An inadequate event-based risk perception is widespread, and it results in the sense of security that denies any sense of urgency among policymakers" (Clar et al., 2013, p. 5). Politicians are therefore not aware of the potential positive effect of NbS on urgent societal challenges, such as climate change.
5. *"Functionality and performance uncertainties"* is about the lack of information about the benefits of NbS, which is a key barrier to uptake them (Sarabi et al., 2019). The literature about NbS has an academic character and the information and evidence about their functionality is scattered (Nesshöver et al., 2017).
6. *'Risk aversion and resistance to change'* is a barrier that concerns the responsibilities of the municipality. The municipality is most of the time responsible for the implementation and maintenance of NbS, but it is also responsible for the safety and well-being of its citizens. Because of its uncertain (long-term) outcomes, city planners and engineers fear to use NbS (Dhakai & Chevalier, 2017).
7. *"Lack of skilled knowledge brokers and training programs"* refers to the lack of weight to NbS studies. To provide professionals the required knowledge, studies to NbS should be more emphasized. Training programs are mostly focused on the traditional solutions instead of NbS (Davies & Laforteza, 2019).
8. *'Lack of public awareness and support'* includes the limited public awareness and negative feeling of the community toward NbS. (Wamsler et al., 2020). An important element for the development of NbS is to come to solutions through co-creating with citizens (Kabisch et al., 2016). Not only the lack of support of citizens is important for NbS, but the local business also play a big role in this.
9. *"Misalignments between short-term plans and long-term goals"* are about the importance of long-term goals for NbS. Adoption, implementation and maintenance of NbS require long-term plans, which is in conflict with the short-term vision of many municipal administrations (Burch, 2010).
10. *"Lack of available financial resources"* means that municipalities have limited options to invest in NbS, they are still more focused on the grey infrastructure (Droste et al., 2017).
11. *"Lack of supportive policy and legal frameworks"* complicate the implementation of NbS when there are conflicts between municipal, regional and national policies and regulations. Regulations are not updated most of the time so that they fit with the NbS (Li et al., 2019).
12. *"Perceived high cost"* is about the perception of people that the implementation and maintenance of NbS involve more costs compared to gray infrastructure (Fernandes et al., 2019). There are cases where the perceived benefits outweigh the perceived costs.
13. *"Lack of financial incentives"* concerns the lack of financial incentives to encourage the implementation of NbS (Li et al., 2019). The benefits are not always clear for citizens and entrepreneurs and there isn't an appropriate business model yet.
14. *"Space constraints"* concerns the lack of suitable locations. The implementation of Nature-based Solutions can be restricted by several factors like the size of the sites, type of soil and underground facilities (O'Donnel et al., 2017).

15. “Property ownership complexities” is in this study separated from other legal barriers. This means that it not only has a legal dimension, but also includes the attitude of the landowner (Hoang & Fenner, 2016). Landowners are more likely to prioritize financial benefits over sustainability goals. “Space constraints” concerns the lack of available space and suitable locations (O’Donnel et al., 2017).

2.3 Policy Arrangement Approach

The Policy Arrangement Approach is an analytical concept to describe and analyze the processes and outcomes of institutionalization in a specific policy domain (Wiering, et al., 2010). The Nature-based Solutions are viewed from a policy discourse angle in this research. This means that when the PAA is being used, the Nature-based Solutions fall under the discourse dimension of the PAA. The other dimensions in this approach are, actors, rules of the game and resources (Arts et al., 2016). The PAA in this research is used to add structure to the research. All different cases will be analysed according to the dimensions of the PAA to make a good comparison possible.

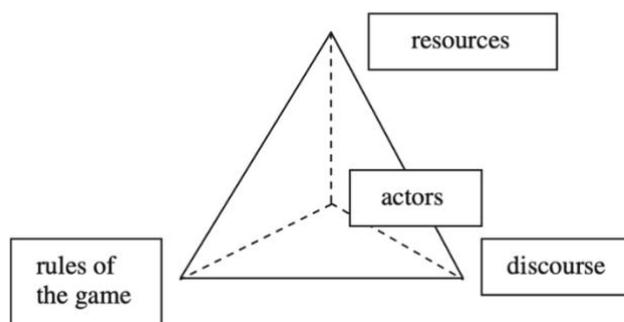


Figure 1: Visual representation of the Policy Arrangements Approach (Arts et al., 2016)

Figure 1 symbolizes the relationship between the four dimensions. Arts et al. (2006) specified them as follows: The *actors* are involved in the policy domain. The power between these actors is divided, where power refers to division, mobilization and deployment of *resources*, as is the influence on the policy outcome. The *rules of the game* are the actual rules for political and other forms of interaction, and the rules for the formal procedures for decision-making. The concept of *discourse* refers to the views and narratives of the actors involved, where NbS is actually an example of a narrative.

Nature-based Solutions can be seen as a change of discourse where there is a new way to look at problems. A new narrative of letting nature do the work is the principle here where ‘function follows level’ instead of ‘level follows function’.

The object of the discursive institutionalist explanation (Schmidt, 2008) consists of ideas and discourse. Ideas differ in levels of generality, like specific to policy, a wider program or about an underlying philosophy. Ideas also differ in type, cognitive ideas shape interest and normative ideas appeal to values. Discourse on the other hand not only represents the ideas but it also exchanges them between policy actors and the public. A discourse contributes to the success or failure of ideas by how it expresses their content. The success factors of a discourse are mostly the same as for an idea.

These factors are the relevance of the issue, adequacy, applicability and appropriateness (Schmidt, 2008). Another important aspect for the credibility of the discourse is the consistency and coherence across policy sectors (Schmidt, 2008). The discursive institutionalism explanation differs from the older new institutionalisms in terms of its logic and its explanations.

As Schmidt (2008) also mentions, the interests here are not objective, but the discursive institutionalism explanation has no room for uncertainty. Finally, the norms are subject to the zeitgeist rather than being the same forever.

The PAA provides a structure to study the implementation of NbS in three different cases. It provides the factors that may have something to do with the barriers or opportunities for the implementation, the factors are listed by the PAA which makes it appropriate for this research.

2.3.1 Actors

The actors involved in the investigated domain play a very important role with their interactions with the other three domains. For this research it is important to find out who is involved, at what level they are involved and if there are any coalitions between actors. This results in a full understanding of the policy processes (Arts & Leroy, 2006). Actors may be experts, residents, companies, organizations and other involved players. The importance of actors for this research lies in the influence on the implementation of NbS. Is someone stimulating the implementation or counteracting, and what may be the reasons for that.

2.3.2 Resources

Resources involve the distribution of power and influence between the actors. Where power refers to the available resources, refers influence to the who and in what way he/she influences policy outcomes. Actors can be either empowered or limited by their available resources as they can or cannot implement different policy arrangements (Verwijmeren & Wiering, 2007). Differences in resources can create differences in power relations, therefore it is important to know the relationship between actors and the available resources because this influences their policy choices (Arts & Leroy, 2006). For this research, it is important to find out how the resources are divided among the actors and whether they are all used most efficiently for the implementation of NbS.

2.3.3 Rules

The rules of the game refer to the actual policy rules, but also other forms of interlinkages between the Netherlands and Flanders. The formal, as well as the informal procedures are important. Some examples are regulations, plans, norms, procedures and legislation (Eerd, Wiering & Meijerink, 2014). These rules can be in favor of the implementation of NbS or limit the progress. Therefore, it is important to have a clear overview of the rules of the game that are in place in this study.

2.3.4 Discourses

Discourses include the existing narratives of the various actors, the way they perceive the problem, the many approaches to solve the problem and the existing policy document as this influence the interactions (Wiering, 2006). The concept of Nature-based Solutions can be seen as a new paradigm and thus a new way of thinking. It remains a question whether everyone is evenly enthusiastic about this concept.

2.4 Discourse analysis

A discourse analysis is mostly associated with linguistic analysis, but it can also be applied to the social studies. Where other language studies focus on the individual parts of language, such as words and grammar, a discourse analysis focusses on the conversation involving a speaker and listener. Discourse is defined by Hajer (2002, p. 63) as “an ensemble of ideas, concepts, and categories through which meaning is given to phenomena.”

A discourse analysis takes into account what is being said, as well as the context of a conversation. This context consists of a cultural and social framework like the location and time of the conversation or written piece (Van Dijk, 1997). A discourse is capable of creating a shared logic and thus capable of controlling of expectations, emotions and mentality.

Nature-based Solutions is a relatively new concept which has become popular in recent years. The European Union has becoming the promotor of NbS when it incorporated the concept. Mendes et al. (2020) state that the concept of NbS is still shadowed by other environmental concepts such as ecosystem services. The results of NbS are also not that promising, there is a lack of concrete planning and policy recommendations (Mendes et al., 2020). This highlights the importance to address both policies and planning recommendations to be more concrete. A discourse analysis can help to find the differences or similarities between the definition of NbS by the actors.

In this research, the discourse analysis will be used to find out how these different actors think, work and talk. For the concept of counter-discourse, one counter-discourse is chosen. It has been assumed that the discourse of civil engineered solutions has the greatest effect on the implementation of Nature-based Solutions (Disco, 2002).

2.5 Operationalization

The PAA has different factors within its dimensions that can influence the implementation of NbS.

Within the dimension of the actors, it is important to include all of the involved actors. It also matters what the current relationships are between them.

The rules of the game dimension is about the regulation within the policy arena. As stated by Wiering & Verwijmeren (2007) it is an interesting dimension because of the regulations of different countries need to be applied on one case. The rules of the game are not only about national and international laws, but also about the availability of policy instruments and some agreements that have been made (Dewaelheyns, et al., 2018).

Resources are intertwined with the actor’s domain, because these resources are able to give some actors power to realize or to influence within the policy domain. According to Wiering & Verwijmeren (2007) the important aspects are: financial resources, knowledge and political and legal power.

The last dimension regards discourse, which is the totality of opinions and beliefs. The discourse here is the concept of Nature-based Solutions and the dominant counter discourse of the civil engineered solutions.

The properties of and interaction between actors, resources, rules of the game and discourse determine to what extent NBS can be successfully implemented. By arranging the barriers of Sarabi et al. (2020) under the PAA dimensions, you add more structure to the research into which factors are most determinative for NBS implementation.

Actors	Resources
<ul style="list-style-type: none"> - Public actors/ private actors - Partnerships - Conflicts 	<ul style="list-style-type: none"> - Financial resources - Knowledge - Political land legal power
Rules of the game	Discourse
<ul style="list-style-type: none"> - National formal rules in planning and environmental law - Municipal laws - Informal spatial processes 	<ul style="list-style-type: none"> - Definition - Counter-discourse

Table 2: Operationalization of the PAA based on Wiering & Verwijmeren (2007)

To operationalize the barriers, the ranking of Sarabi et al. (2020) is used in Table 3. The barriers are subdivided into the three dimensions of the PAA. The list of barriers by Sarabi et al. (2020) does not include any barriers that fit in the dimension of discourse. That is why the possible barriers or opportunities for the discourse are based on Table 2. The barriers are compared to the experienced factors in the three cases to see if they match.

Type of barrier applied to the PAA	Barriers to uptake and implementation of Nature-based Solutions
Actors	Lack of sense of urgency among policymakers
	Lack of political will and long-term commitment
	Lack of public awareness and support
	Silo mentality
	Risk aversion and resistance to change
Resources	Lack of financial incentives
	Lack of available financial resources
	Perceived high cost
	Lack of skilled knowledge brokers and training programs
	Property ownership complexities
	Functionality and performance uncertainties
Rules of the game	Lack of design standards and guidance for maintenance and monitoring
	Lack of supportive policy and legal frameworks
	Misalignment between short-term plans and long-term goals
	Space constraints

Table 3: Subdivision of the barriers for the implementation of Nature-based Solutions

Conceptual model

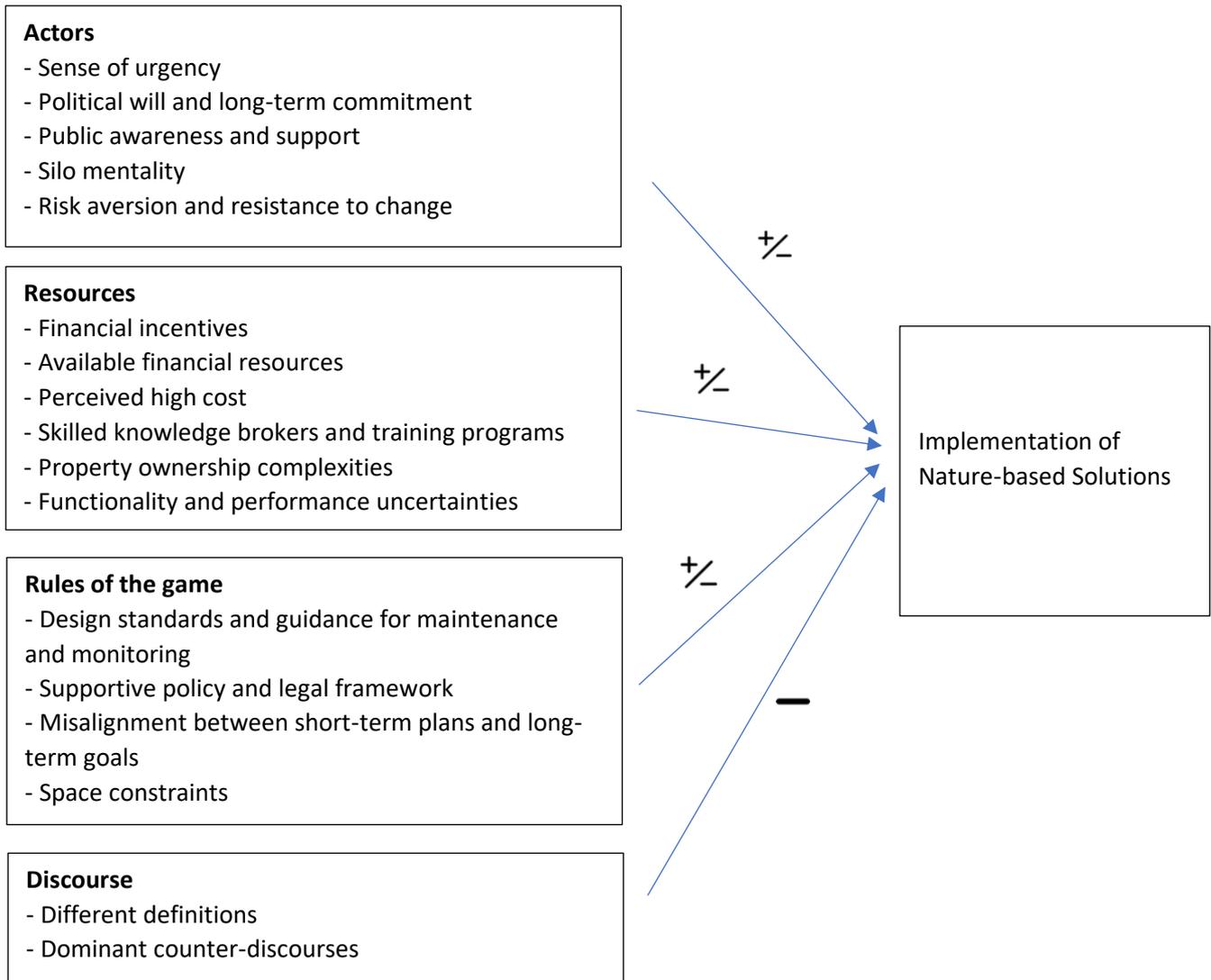


Figure 2: Conceptual model

Figure 2 shows the conceptual model for this thesis. The implementation of Nature-based Solutions is influenced by a few factors that are part of the list of Sarabi et al. (2020). These factors are divided under the dimensions of the Policy Arrangement Approach. The plus/minus above the arrow means that these factors can have a positive or negative influence on the implementations of NbS. The minus above the discourse arrow is because of the expectation that these factors will have a negative influence on the implementation of NbS. All three cases will be analyzed following this conceptual framework in order to see the similarities and differences in factors during the implementation. This thesis studies how these factors have an influence in every case, or that there are factors which weren't included in the list in Table 2.

Chapter 3

3.1 Methodology

This chapter focuses on the methodology of this study. The first thing discussed is the research philosophy, second is the research strategy, then the case study will be specified, the data collection and analysis will then be discussed and finally the validity and reliability of this research will be addressed.

3.2 Research philosophy

Before talking about the methodology of this research, it is important to mention the research philosophy because this is directly connected to the research methods, the data collection and analysis (Guba & Lincoln, 1994). This research follows the critical realism paradigm. The reality here is assumed to exist but it is impossible to know it perfectly. Critical realism is the approach in the middle of positivism and post-modernism and includes characteristics from epistemic relativism and realism. It allows the researcher to be aware of the fact that the reality is always subjective. It also believes that observations are theory-laden and that scientists are biased by their own experiences and culture. The research philosophy critical realism is thus about the different interpretations of one reality. The reality in this case is the water system which cannot be denied, however, people can attach different values to it and thus have different interpretations of the water system. Critical realism makes the researcher aware of the subjectivity of reality, people will most of the time speak from their own experiences and knowledge. This is important to keep in mind during this study, the water system is undeniable, but people may give it their own reality.

3.3 Research strategy

To be able to give answer to the main research question and sub-question, a qualitative approach will be used. This approach suits this type of research because it enables the investigation of the deeper meaning of the problem (Creswell, 2012). A quantitative approach is about the collection of statistical data, and thus not fits this research as it is about the feelings and opinions of people. The feelings and opinions of people are important in this study because they can clarify the conditions that enable or disable the implementation of NbS, they are looked at from an agency perspective. The research is about how those involved in the implementation process perceive obstacles or conditions which are conducive to a smooth implementation. An in depth understanding of how they perceive the implementation process of NbS is gained in this study. Perceptions can be deceiving, therefore not only opinions are asked but documents will also be consulted. As said earlier, the study is divided by different cases with the substantiation that a case study is ideal for gaining knowledge for a particular subject and analysis of the complex situations (Creswell, 2012). In this research an embedded case study is being used, which will be clarified later on.

3.4 Case study

This research looks into the implementation of Nature-based Solution within a border region. It is a single embedded case study of the Netherlands and Flanders. The single case is the border region of the Netherlands and Flanders, the embedded cases will be the projects on the Dutch side of the border, the Flemish side of the border and projects on the border. All embedded cases will be investigated with the same structure as proposed in the conceptual framework. The three cases selected are Merkske, Boven-Mark and the Mark on Flemish side of the border. In all three the cases there are projects concerning Nature-based Solutions. These projects may not have the concept of Nature-based Solutions in the description, but if the same principles are involved, the projects are included in the research. Merkske is the area on the border, Boven-mark is in the Netherlands close to Breda and the Flemish Mark is in the province of Antwerp in Belgium. In each of these cases several Nature-based Solutions projects will be specified further. The areas have the name of the waterway but involve also the branches of them to have a better chance that there is a project that has to do with Nature-based Solutions. Further specification of the cases and their projects of Nature-based Solutions will be giving in Chapter 4.

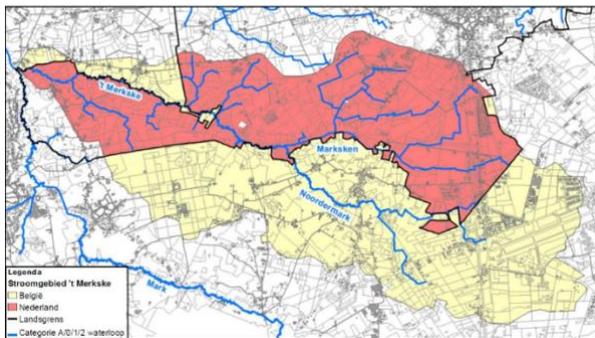


Figure 3: River basin Merkske. (Beers et al., 2018)

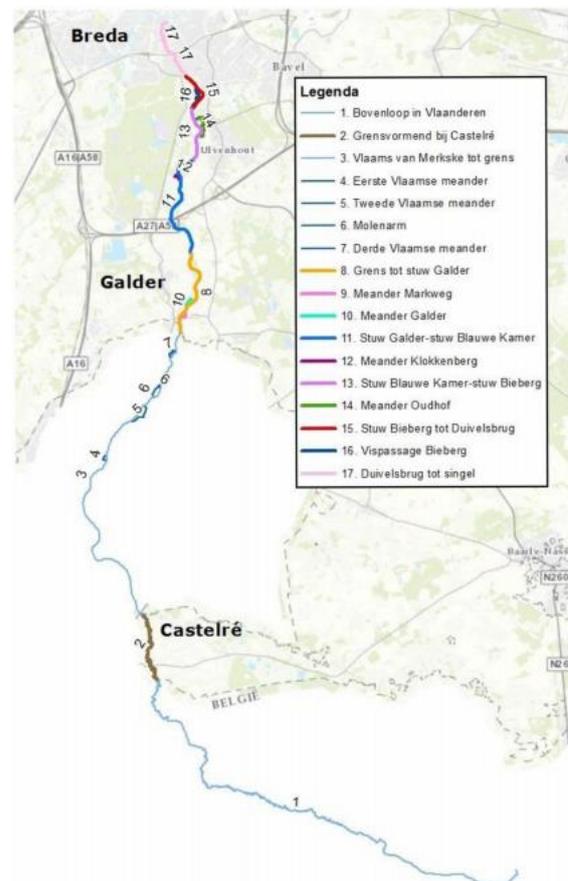


Figure 4: Location river Mark on both sides of the border. (Beers et al., 2018)

3.5 Data collection and analysis

This research consists of qualitative research methods like semi-structured interviews, a document analysis and the results of the Interreg 2 Seas PROWATER project workshops I obtained as a participatory observer.

The interviews are semi-structured in order to respond to the interviewee's answers. Not all factors of the conceptual framework were questioned in the interview. The researcher was free to come up with the barriers or opportunities they experienced during the implementation of Nature-based Solutions. A general scheme was used with some predetermined, somewhat more generally formulated, questions. With a semi-structured interview, it is possible to deviate from this (Dingemanse, 2021).

The interviewees are chosen based on the basis of their knowledge about Nature-based Solutions projects in the three indicated areas, and on recommendations of my thesis supervisor who has already some connections in these areas. 11 people were interviewed on both sides of the border to gain proper knowledge about the implementation of the different projects. Appendix I shows a list of the respondents' institutions. The interviewees were asked about their personal experience of the implementation, what their role was in the project and what changes they would like to see. The interviews were recorded and transcribed afterwards. The data from the interviews is also being cleaned, meaning that information is being removed from which the interviewees can be identified (Wahyuni, 2012). When a person was involved in multiple cases, he/she was questioned about both cases. For each case it is important to have a diverse set of interviewees, as there are several parties necessary for the implementation of NbS. For example, think of the water authority, spatial planning, grounds managers and residents. The interviews will have an addition to the already gained knowledge through the document analysis.

The Flemish-Dutch PROWATER workshops give an overall view about the barriers and opportunities within the cross-border area and how to come to a collaborative approach to water scarcity by means of NbS. The workshops also give an insight in why, in some areas, Nature-based Solutions do not come about and what the reasons for these positions are. The knowledge gained from the workshops is more general than from my interview, therefore, these methods are a good match.

Finally, the discourse analysis is being used to find out how different actors define the concept of Nature-based solutions and what the influence of the counter-discourse on the implementation of NbS is. It is assumed here that civil engineered solutions compete with Nature-based Solutions. The transcribed interviews placed in the computer program Atlas.ti where relevant elements of the text were coded. This coding method made it easier to find the influence of the different factors experienced by the interviewees. The codes will be analyzed and interpreted to answer the question how actors define NbS and if there are discourses working against or stimulating this concept.

3.6 Credibility, transferability, dependability and confirmability

The validity and reliability criteria ensure that the research has a scientific result. Qualitative research has been criticized for the lack of generalizability in contrast to the quantitative research (Wahyuni, 2012). Where reliability refers to the consistency of the measures refers validity to the extent to which it reflects the social phenomena being observed. These traditions of validity and reliability do not fit perfectly into the qualitative research methods.

Guba and Lincoln (1989) developed a set of criteria that matches qualitative research.

Credibility, which parallels internal validity, deals with the accuracy of the data. In other words, it is concerned with whether the study really measures what is intended. The triangulation methods can be used to increase the credibility (Guba & Lincoln, 1989).

This research tried to increase the credibility via triangulation. Different methods of data collection have been used to create triangulation. There have been 11 interviews, a document analysis has been carried out and three workshops of the 2 seas PROWATER project have been observed.

Transferability, which refers to external validity, is about the level of repetition of the study in other settings. It is important to have a rich explanation of the case selection and characteristics of the research to be transferable (Guba & Lincoln, 1989).

These cases were selected because of the interest of the researcher and water authority Brabantse Delta. This study tries to learn about the complexity of the implementation of Nature-based Solutions. The cases have a detailed explanation. Because of these details it similar cases could be found, but it is not clear if other selected cases will have the same outcome.

These cases are very time and location specific. The institutions interviewed are listed in Appendix I and Appendix II consists of the interview questions. The interviews could be held again, but there is a possibility that they lead to different outcomes because of the semi-structured character of the interviews. The interviewees were selected based on the recommendation of the thesis supervisor at water authority Brabantse Delta. Someone else may choose different persons for the interviewees.

The part of this research which cannot be repeated concerns the workshops. These workshops were held with people from Flanders, the Netherlands and these was one workshop where English people were also present. Notes were taken during the workshops and the results were shared. So, the workshops cannot be held again that easily, but the notes should already give a good indication.

Dependability, referring to reliability, concerns the repeatability of the research. This can be achieved by a detailed explanation of the research design. (Guba & Lincoln, 1989)

The dependability of this research has been attempted to increase by a detailed explanation of the research design. The methods used are a document analysis, interviews and workshop observations which will be compared according to the list by Sarabi et al. (2020) which is ordered by the Policy Arrangement Approach.

Confirmability, resembling objectivity, deals with extent to which others can confirm the findings to ensure that the results are objective (Guba & Lincoln, 1989).

To increase the confirmability the interviews were transcribed. There is no own interpretation present in these transcriptions. The notes taken during the workshop are based on the researchers own interpretation. Not everything is written down in the notes, only the important parts are included. This interpretation means that someone else may have written down other aspects of the workshops.

Chapter 4

The findings of this research are presented in this chapter. The analysis will be organized by the three different cases: Boven-Mark, Mark on Flemish side of the border and Merkske. Each case will be explained after which the implementation process will be analyzed based on the barriers listed by Sarabi et al. (2020) as ordered with the dimensions of the Policy Arrangement Approach. The results are based on a document analysis, interviews with people who are involved in these implementations and observations from the workshops of the Prowater project. Finally, the results of the analysis of the three cases will be compared in the last part of this chapter.

4.1 Case 1: Boven-Mark

This case concerns the implementation of Nature-based Solutions in the Mark on the Dutch side of the border. This project is initiated by the citizen's initiative Association Markdal. First, the case will be explained on the basis of its location and characteristics, the involved actors and the Nature-based Solutions in this area. The implementation of the Nature-based Solutions will be analyzed then according to the conceptual model. This analysis will be structured according to the following dimensions: actors, resources, rules of the game and discourse and is based on three interviews and a document analysis. Finally, a short summary of the case will be given.

4.1.1 Case explanation

Geographical location and characteristics

The brook valley of the Mark is located south of Breda and flows past the village centers of Strijbeek, Galder and Ulvenhout (Figure 5). The Boven-Mark is an R6 type waterway (WFD-typology) which means that it is a slow flowing small river (Griffioen & De Vries, 2016). It has a length of 14 kilometers and a basin of 21.950 hectares (Waterschap Brabantse Delta, 2020).

The water system analysis of 2017 (Waterschap Brabantse Delta, 2020) points out some ecological key factors for this stream. Due to strong dewatering, the drainage dynamics are disrupted and in summer the drainage is too low to achieve the desired flow. There is also too little groundwater flowing to the stream, which reinforces the low discharge. Weirs impede continuity for organisms, sediment and organic matter. The phosphorus and nitrogen concentrations are too high and finally, the layout of the surrounding land is insufficient to function as a natural buffer zone.

The water depths are about 3 meters too deep for aquatic plants, so there is no suitable biotope for fish, aquatic plants or animals. The width is also oversized, avoiding eddy currents, which are important for creating different biotopes (Vereniging Markdal, 2017). All these points of attention make it clear why measurements need to be taken in the Boven-Mark.

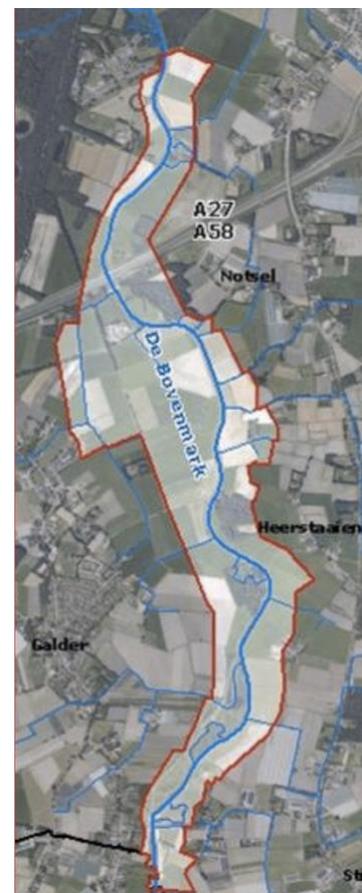


Figure 5: Boven-Mark (Wols, 2009)

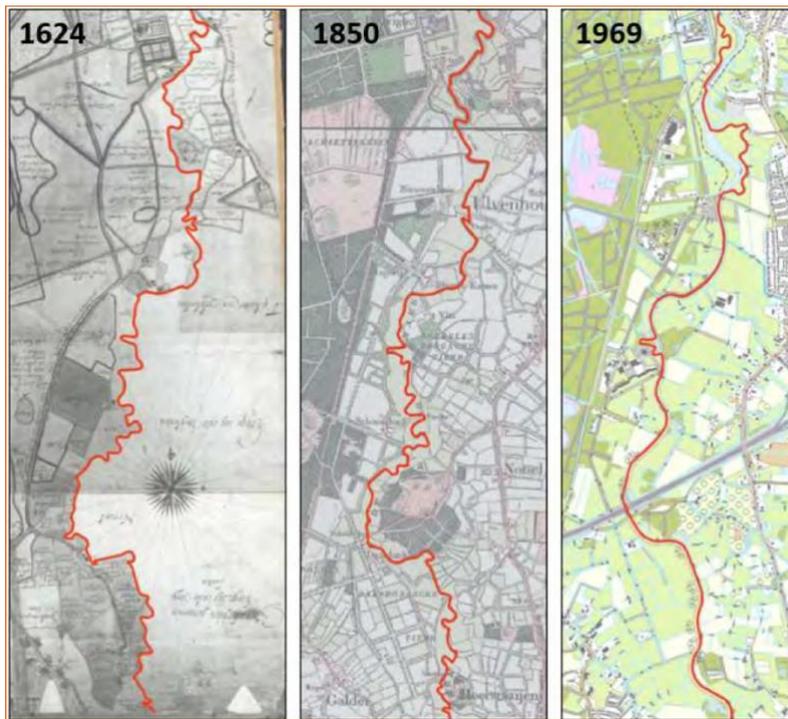


Figure 6 clearly shows the channelization of the Mark over the years. Where the stream had an erratic character in 1624, it has been straightened in the map of 1969.

Figure 6: Channelization of the Mark over the years (Arcadis, 2019)

Actors

Association Markdal plays a big role in the project of the Boven-Mark. This association was founded in 2011 and has over 150 members nowadays (Vereniging Markdal, n.d.-a). These members are former administrators, people with a nature background of which it is now their hobby, residents, farmers people who live and work here and simply people who are interested. It runs entirely on the deployment of unpaid employees which are working in different project groups. After the foundation the ideas were put on paper in the Markdal implementation program and a deputy of the province of North Brabant signed this plan in 2013. This made more than 11 million available for the reconstruction process of the Markdal (Vereniging Markdal, n.d.-a). This association is the initiator of the redesign project of the Markdal which makes this project different than the other standard redevelopment projects where normally a governmental institution is the initiator of redevelopment. The citizen's initiative here is the driver of the project and works together with different actors.

Other actors in this area (Arcadis, 2019):

- Province of Noord-Brabant
- Municipalities of Breda and Alphen-Chaam
- Water authority Brabantse Delta
- Natuurmonumenten, Staatsbosbeheer, Brabants Landschap, Brabantse Environmental Federation
- Recreational associations, nature associations Natuurplein de Baronie. Natuurplein de Baronie is a partnership of nature associations in the Baronie van Breda region. Some affiliated associations are KNNV Breda, Markkant and Mark en Leij (Natuurplein de Baronie, n.d.).
- People living and working people in the area
- Land owners

Policy context

The Water Framework Directive is an important guideline here (Twynstra Gudde et al., 2018). This European regulation states that the clean and healthy water targets should be met by 2027 at least. According to the WFD, this stream has the following usage functions: water management, flood protection and drainage (Planviewer, n.d.).

The assignment of the WFD for this area concerns: reducing the use and emissions of fertilizers and pesticides, restoring the free flow of the Mark and providing sufficient capacity for the Mark to be able to store water and discharge peaks.

On the basis of the WFD, the aim is to achieve a Good Ecological Potential for the Boven-Mark (Vereniging Markdal, 2016). Association Markdal is working on a sustainable and vital Markdal, they strive for a Markdal with more space for water and nature, but also for an innovative Markdal with a future for the people who live and work there (Vereniging Markdal, n.d.-b). To achieve this goal, the association came up with a set of principles. These principles are not always about water management and biodiversity, but also about the economic interests in this area. Some examples of these principles are (Vereniging Markdal, n.d.-b): The area also has to be attractive for visitors, the landscape quality is based on the image of a stream valley landscape and the cultural-historical values can be experienced in the landscape. These examples show that the goals of Association Markdal not only are about promoting nature and water management, but also include the socioeconomic values.

Association Markdal, together with the municipality of Breda and the municipality of Alphen-Chaam have submitted the perspective for Markdal to the province (Planviewer, n.d.). The goals for the Markdal are as follows:

- Achieving the Water Framework Directive targets before the end of 2027.
- The realization of high-quality new nature both along the banks of the Mark and for a connection with the surrounding large nature areas.
- The construction of recreational facilities and solving bottlenecks related to car traffic.
- Increasing the landscape quality and biodiversity in the area.
- Solving a number of social and spatial bottlenecks in Strijbeek, such as creating a high-quality living environment where there is no place for intensive livestock farming in particular (Vereniging Markdal, 2019).

Nature-based Solutions

In 2013, association Markdal took the initiative in collaboration with residents of the Markdal, the province of North Brabant, Waterboard Brabantse Delta the municipality of Alphen-Chaam and the municipality of Breda to come up with a plan that takes the construction of the Nature Network Brabant in the Markdal another step further and that enables the realization of the measures arising from the European Water Framework Directive.

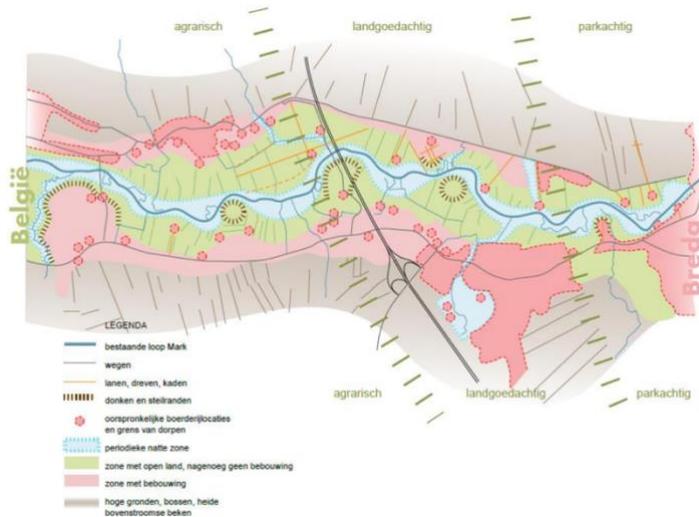


Figure 7: Zoning plan for the Boven-Mark (Vereniging Markdal, 2015)

Figure 7 shows the vision of Association Markdal where zones indicate which function goes were. The blue line is the existing Mark, the light blue area around it becomes the flood area. Close to the stream there is a zone with open land with almost no buildings, behind this zone is the red zone with buildings. According to this vision, there are almost no buildings close to the river.

Figure 8 below shows the preferred alternative for the hydrological layout of the Markdal where the left side shows the northern part and the right side the southern part. This alternative is presented and discussed with input from the citizens, members of association Markdal, experts and other stakeholders.

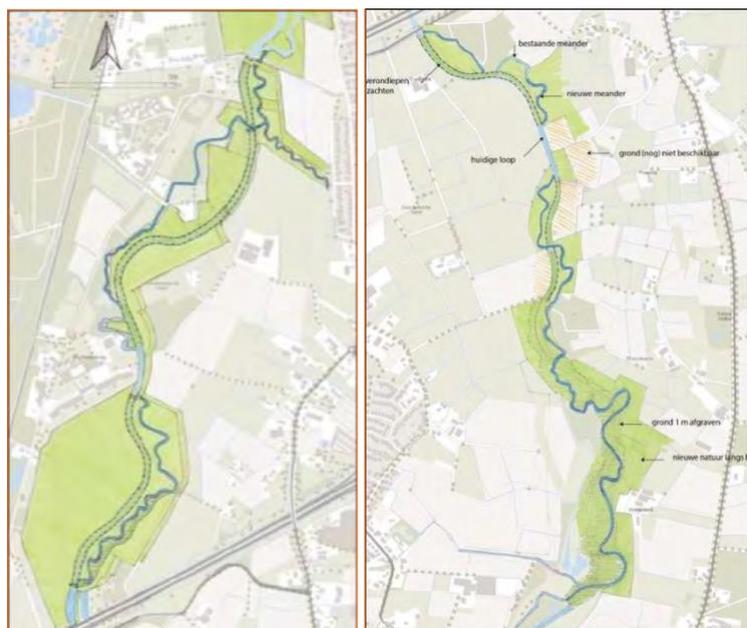


Figure 8: Preferred alternative Markdal (Arcadis, 2019)

There are several Nature-based Solutions in this area. Some of them are listed below in Table 4.

Table 4: Initiatives from people in the Boven-Mark area (Vereniging Markdal, 2016)

<i>Initiative</i>	<i>Where</i>	<i>Stakeholder</i>	<i>Progress</i>
Land consolidation to give land back to nature	Near Ulvenhout	Residents Association Markdal Municipality Breda	Yet to be acquired
Re-meandering of existing waterway Mark	Along the entire Mark	Landowners Municipalities Association Markdal Water authority Brabantse Delta	Plan proposed but has delay
Developing swampy bank edges along the Mark	Along the entire Mark	Landowners Municipalities Association Markdal Water authority Brabantse Delta	Plan proposed but has delay

The first project contains plots that still need to be acquired to. Figure 9 below indicates which parts are still missing and which will not yet be included in the current zoning plan of the municipality of Breda. If these lands do not become available, parts of the preferred alternative cannot be realized (Arcadis, 2019).

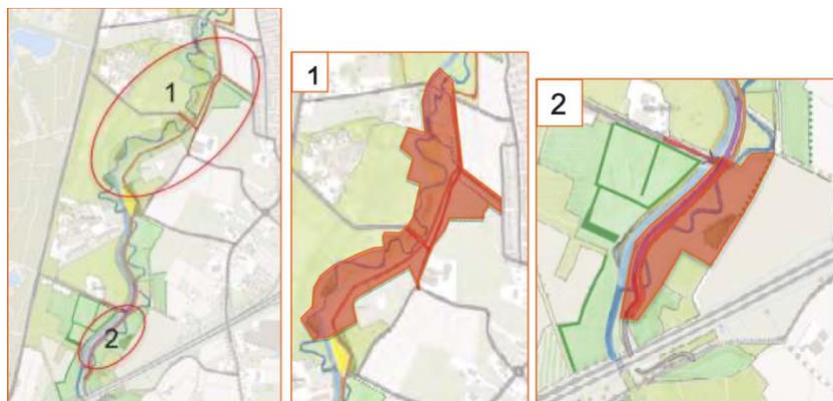


Figure 9: Plots that still need to be acquired (Arcadis, 2019)

The second project contains the re-meandering along the entire Mark. Figure 6 shows the waterway with a more capricious character than it is now. The third project contains the development of swampy bank edges along the Mark. For both of these projects a plan has been proposed by association Markdal, but these plans have been delayed. Better said, almost the entire project is put on hold. Some institutions/associations do not agree with the plan proposed by association Markdal. Not because they simply do not like it, but also because it has a negative influence on some parts of nature for example (Arcadis, 2019). More of this delay will be discussed in the analysis of the implementation.

4.1.2 Analysis implementation Nature-based Solutions case Boven-Mark

The analysis is structured by the dimensions of the Policy Arrangement Approach and the matching barriers in the conceptual model. Table 5 gives an overview of the influence of the factors on the implementation of Nature-based Solutions according to the interviewees. A '+' represents a positive influence on the implementation, a '-' represents a negative influence on the implementation. A 0 means a neutral influence, so no negative, but also no positive influence on the implementation of Nature-based Solutions. The last category N.F. means that some of the factors are not found in this case. This does not mean that these factors aren't present, but simply that they were not found in this research and the respondents did not mention this factor.

Table 5: Influence of the factors on the implementation of Nature-based Solutions Boven-Mark

<i>Dimension</i>	<i>Factors</i>	<i>Boven-Mark</i>	<i>Dimension</i>	<i>Factors</i>	<i>Boven-Mark</i>
Actors	Sense of urgency	+	Resources	Financial incentives	N.F.
	Political will and long-term commitment	+		Available financial resources	+
	Public awareness and support	+		Perceived high cost	N.F.
	Silo mentality	0		Skilled knowledge brokers and training programs	-
	Risk aversion and resistance to change	0		Property ownership complexities	-
Rules of the game	Design standards and guidance for maintenance	N.F.		Functionality and performance uncertainties	N.F.
	Supportive policy and legal framework	-	Discourse	Different definitions	N.F.
	Misalignment between short-term plans and long-term goals	N.F.		Counter-discourses	-
	Space constraints	N.F.			

The factors discussed below have a positive or negative influence on the implementation of Nature-based Solutions. These statements are interpretations of the opinions from the interviewees. The factors with a neutral influence and the factors not found are not discussed in the following subchapters.

4.1.2.1 Actors

Sense of urgency

There is a high sense of urgency within project Markdal according to respondents E and K. Especially association Markdal wants to see some changes as fast as possible. Other site management organizations and governmental institutions also find that something has to be done about the Markdal says respondent K. This project is a pilot project and is structured in a different way than most of the redevelopment projects (Vereniging Markdal, n.d.-a). The citizen's initiative association Markdal is the initiator here. There is a high sense of urgency among the volunteers within the association according to respondent E. That may be the reason why there are so many people involved in this association. Respondent E praises the involvement of the association members. Even though the project takes a lot of time, these association members are still actively involved in the redevelopment of the Markdal. This project is one of the first to stem entirely from a citizen's initiative where the province and the water authority have a role in the background. According to both respondents E and K, this project could count on a lot of support from other institutions like the province and the water authority, especially in the beginning. The association would achieve something that the province had not yet achieved itself. Even though there is a high sense of urgency among several stakeholders, this

does not have to mean that the project will run smoothly. This depends on several factors discussed below.

Political will and long-term commitment

Water authority Brabantse Delta is part of the Interreg Prowater project which is a cross-border project with Belgium and England (Interreg 2 Seas Prowater, n.d.). This project stands for 'protecting and restoring raw water sources through actions at the landscape scale', and it contributes to climate adaptation by restoring the water storage of the landscape through ecosystem-based adaptation measures. This connection to the project also ensures some commitment from the water authority. Within a certain deadline the project needs to be far enough or finished to be eligible for the Prowater subsidy (Waterschap Brabantse Delta, n.d.).

The start of the redevelopment of Markdal also showed some political will and long-term commitment. Parties were willing to do things different this time and governmental institutions were willing to provide and support this new structure. In spite of this sign of political will and long-term commitment, the relationship between the government and the association is not so good anymore according to respondents E and K. Not all parties feel that they are sufficiently involved in the planning process. Overall, there is still political will and commitment to redevelop the Markdal. It will just take a little longer.

Public awareness and support

As already said, the initiator of project Markdal is association Markdal which is a citizen's initiative. According to respondent E, a lot of people with different backgrounds are part of this association. You can think of former board members, people with an interest in nature, residents, farmers or just interested people. This broad range of people from different backgrounds has a positive influence on the public awareness and support. One of the principles of the association is that it works on the basis of consensus (Vereniging Markdal, n.d.-a). It took a lot of time, but consensus has been reached about the plan in which nature, water goals and recreational goals have been brought together. Not everyone can get their way, so some of them are disappointed according to respondent E. Especially the recreational associations are disappointed. Nature is the most important factor in Markdal, and recreation is allowed, but in an extensive way. Not only the recreational associations were let down, also some of the nature reserve managers do not support the redevelopment plan for the Markdal according to respondent K.

With disappointing some people or associations it can occur that they lose their enthusiasm for the plan, this can be dangerous for the public support when too many people do not support the plan anymore. Luckily this is not the case at Markdal according to respondent E. The recreational associations were a bit disappointed but still supported the new plans.

According to respondent E there is one thing that does not work in favor of public support here and that is the length of time it takes. The difficulty lies in the fact that the pace of the living environment of the people is much higher than that of the government. In the daily dynamics of people in the living environment, a year is long. You should realize that a procedure with the government takes two, three or four years. Those procedures are not at all attuned to the daily living environment of those people according to respondent E. This respondent also understands that the government has to be careful, but they have been waiting for a decision from the Council of State on the appeal of the zoning plan for almost two years now. This is partly why this project is taking so long. Once a project becomes unclear or just takes a long time, people are more likely to drop out (Blom et al., 2010). It costs Association Markdal a lot of energy to keep people involved and interested in this project. The

dedication of this association is in favor of the implementation for Nature-based Solutions, but the length of time works counteracting according to respondent E from association Markdal.

Other actors like the nature reserve managers and water managers consider the length of the project to be less of a bottleneck. They consider the quality of the plan to be very important. For example, Natuurmonumenten likes to see an elevated stream which can have a positive effect on the area and its nature according to respondent K. Not only Natuurmonumenten, but also water authority Brabantse Delta does not agree with all the plans of association Markdal. This is one of the reasons why this project is put on hold for an amount of time. So, it is not only about the content of the plans, but also about the way of working together.

4.1.2.2 Resources

Available financial resources

The many available financial resources are conducive to the implementation of Nature-based Solutions in this area. The signed implementation program by the province of North-Brabant and association Markdal made more than €11 million available for the reconstruction process of the Markdal (Vereniging Markdal, n.d.-a).

The Green Development Fund Brabant also subsidizes the redevelopment of the Markdal. This fund focusses on creating a continuous nature network and creating new nature. The blue parts on Figure 10 along the Boven-Mark are plots that still need to be acquired and turned into nature. A lot of these plots have an agricultural function now which is no longer possible when the Markdal will be redeveloped. The financial resources for this acquisition come from the Green Development Fund Brabant (Provincie Noord-Brabant, n.d.). Where the province likes to see as little intensive farming as possible, association Markdal wants to give farmers an opportunity to find space for other kinds of agricultural purposes like extensive farming. They want a space where agriculture goes together with nature and nature goes together with agriculture (Vereniging Markdal, 2015).

Another financial resource is the one from the Interreg 2 Seas PROWATER Project (Waterschap Brabantse Delta, n.d.). This subsidy from PROWATER is intended for the system recovery of Markdal. About €600.000 euros is available from this subsidy (Algemeen Bestuur Waterschap Brabantse Delta, 2020). Financial resources are not a bottleneck for the implementation of Nature-based Solutions here. There is sufficient money available to implement them.

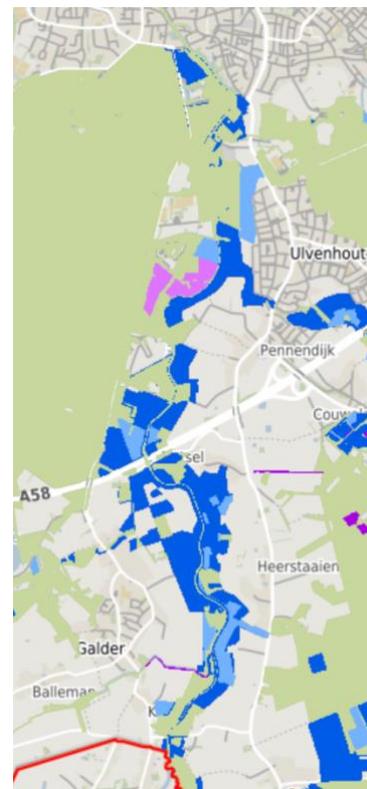


Figure 10: Land yet to be acquired (Provincie Noord-Brabant, n.d.)

Property ownership complexities

The document 'Perspectief voor het Markdal. Plan voor het Markdal in het Provinciale Meerwaardetraject deel III. Situatieschrijving van de initiatieven per cluster' (Vereniging Markdal, 2016) describes all the initiatives by the residents or people who are working there. One of the initiatives of a resident is about exchanging agricultural land for nature. Land close to the Boven-Mark is being transformed into nature. Figure 11 is the old situation where the black outlined grey area has an agricultural function. Figure 12 is the new situation where a swap of land is visible. The area closest

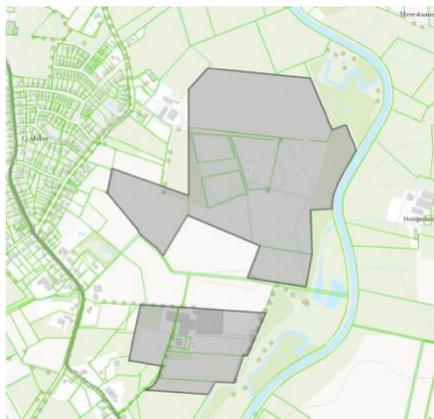


Figure 11: Old situation Galderseweg (Vereniging Markdal, 2016)



Figure 12: New situation Galderseweg (Vereniging Markdal, 2016)

to the river is now nature which means that this area is less vulnerable during floods than when there were strawberry plants.

Not all initiatives do already have a specific location like the re-meandering. This needs to be done along the entire Mark. Figure 8 already gives an example of the new waterway of the Mark. The straight line in Figure 5 is now a winding river where old meanders are connected. As can be seen in Figure 10, a lot of land still needs to be acquired and turned into nature. These acquisition processes are not yet in progress. Therefore, it is unknown whether these parties are willing to cooperate. Natuurmonumenten owns some plots in this area and thus has a say in the redevelopment of the area. As already said, Natuurmonumenten and other site management organizations do not support the plan proposed by association Markdal according to respondent K.

Skilled knowledge brokers

A lot of knowledge is present because of the citizen's initiative. People with different expertise's are part of the project group which means that there is, for example, a lot of knowledge about water, ecology and cultural-historical value. Some of this knowledge may even not be obtainable when you hire an agency for it because it is so area specific thinks respondent E. All this area specific knowledge can be in favor of the implementation of Nature-based Solutions. People are aware of the climate effects of this area and are thus willing to take some measures to avoid any damage. The land use in this area is divided as follows: 26% agricultural land, 72% nature and 2% other land uses (Waterschap Brabantse Delta, 2020). The biggest natural part makes it easier to choose Nature-based Solutions than when those 72% belonged to agricultural land. This also is again in favor of Nature-based Solutions.

But not everything in the field of knowledge is conducive to Nature-based Solutions. Association Markdal relies on its volunteers and has no specialists in service. Respondent E, working at Natuurmonumenten, is not that enthusiastic about this project. The Mark is very deep and broad at the moment and nothing is being done about this in the plan. There are things planned for this stream, but it will actually be just as deep in the landscape as it is now.

The most favorite scenario is when the peak discharges can be collected outside the bank and not all in the stream. Natuurmonumenten only has small pieces of land there and respondent K thinks that their opinion is therefore less heard. During a field excursion a while ago, an ecologist from Wageningen University was present according to the same respondent from Natuurmonumenten. This ecologist had the same remarks as Natuurmonumenten. Removing the weirs would lead to a level rise in part of the area, but also drops the water level in other parts of the area. When nothing is done about the depth of the Mark, nature still remains dried up in parts of this area. It can be said that the skilled knowledge brokers who can guide this process and spread knowledge among the actors are missed here.

4.1.2.3 Rules of the game

Supportive policy and legal framework

As already mentioned, the pace of the living environment of the people is much higher than that of the government. The policies of the province and municipality match with the goals of the project, but this does not mean that the implementation would go fast. Respondent E notices that the authorities are sometimes a bit apprehensive about the number of volunteers and how they should control it. A citizens' initiative is all nice and they all support it as an association, but the system world of governments is not ready for it according to respondent E. The same respondent also states that the different processes are taken apart such as first purchasing land, then changing the zoning plan and only then furnishing it. Using integral design could have saved the association three years. Integral designing is all new and therefore the association has not been able to use this in the process, to great frustration of some of the members according to respondent E.

On the one hand, a lot of trust has been given, and on the other hand, the governmental systems are not designed for it. Respondent E does not blame anyone but finds it frustrating. This project was a pilot and would therefore go faster, but there is simply an inspection period and other stumbling blocks. According to respondent E "A pilot like this is nice to try out new things, but they also have to arrange things on governmental side to make it go smooth."

A number of desired changes to the use of space are not possible according to the provincial State Regulations, but they do contribute to existing policy and policy objectives. One example of the desired changes is that opportunities must be offered to situations and their initiators that do not currently fit into the zoning plans (Vereniging Markdal, 2015). That is why Association Markdal has submitted a report for the provincial added value process (Vereniging Markdal, 2015). The added value trajectory is an instrument to achieve the desired changes in the use of space. In the Markdal, for example, this makes it possible to compensate for land that is made available for the realization of the ecological main structure. This kind of added value trajectory can work in favor of the implementation of Nature-based Solutions. Money has been made available to realize space for nature, which is positive for Nature-based Solutions.

On the other hand, the so called 'windows of opportunity' from Kingdon (Birkmann et al., 2008) occur here. The farmers in the area are getting older and have no successor. They are more eager to move than they were for example 10 of 20 years ago. In that respect, this project has the time on its side. If this project had started a few years earlier, these windows of opportunity would not be there.

4.1.2.4 Discourse

Dominant counter-discourse

Association Markdal has conducted a research into building with nature (Vereniging Markdal, 2015). Existing meanders from before the 1970s are still in the Markdal and Association Markdal is going to reconnect them. These meanders are now standing water. The farmer in this area grows his crops up to the entrance of the meander and does not want his land to slowly disappear when the river starts flowing through the meander again according to respondent E. You can prevent this with concrete or with a sheet pile. Association Markdal is going to solve this in a natural way with wood packages according to respondent E. They are looking for possibilities to set up the system in a natural way as much as possible, but sometimes they will not be able to avoid the fact they have to reinforce something with concrete or wood. As responded E said, “you let nature do its work, but with the regulating hand of man.”

Nature-based Solutions are thus gaining ground in the project, but most of the things will contain a civil-engineered solution. This is due to the fact that a lot of agricultural land is located next to the river. Farmers don't want their land to be flooded and therefore there are limited flooding opportunities here. The flooding possibilities are determined and regulated by man. This project tries to work with nature but doesn't dare, or simply want, to give it up completely.

4.1.3 Summary

This case has association Markdal as its driving force. Association Markdal is a citizen's initiative with around 150 members nowadays (Vereniging Markdal, n.d.-a). The implementations of Nature-based Solutions here are part of pilot project Markdal where different actors are involved like water authority Brabantse Delta, province of Noord-Brabant nature reserve managers, nature associations and so on. The water/nature-related goals of this project are achieving the Water Framework Directive, the realization of high-quality new nature and increasing the landscape quality and biodiversity (Planviewer, n.d.)

As for a pilot project, a lot of things are done here for the first time. This means that this process does not run smoothly either, there are several bumps in the road. Not everything here has a negative influence on the implementation of Nature-based Solutions. There is a high sense of urgency and great public awareness and support for the redevelopment of this area among the members of association Markdal according to respondent EE. There is also political will and long-term commitment shown by starting this project. Another positive aspect are the available financial resources (Vereniging Markdal, n.d.-a). Project Markdal possesses sufficient financial resources for designing and implementing the plan. These finances come from the province, the Green Development Fund (Provincie Noord-Brabant, n.d.) and the Interreg 2 Seas PROWATER project (Waterschap Brabantse Delta, n.d.).

The high public awareness and support have also another side here. The members of association Markdal are in favor of the project, while other institutions do not agree with the plans according to respondent E and K. The waterway is still too deep in the landscape according to respondent K from Natuurmonumenten. As they own some pieces of land here, this can also be linked to the property ownership complexities. The relationship between association Markdal and other involved institutions is not so good, governmental institutions are not properly included in the redevelopment although several collaboration agreements have been signed.

The absence of skilled knowledge brokers has a negative influence of the progress of this project. Knowledge is not shared much which led to a plan that not everyone agrees with.

The last factor that has an influence on the implementation of Nature-based Solutions is the counter discourse of civil engineered solutions. Nature is partly free here, but within the limits and the guiding hand of man. Where possible, nature is used, but then it must remain within the indicated limits.

4.2 Case 2: Mark on Flemish side of the border

This case concerns the implementation of Nature-based Solutions in the basin of the Mark on Flemish side of the border. First the case will be explained based on its location, the involved actors, the policy context and finally the Nature-based Solutions in this area. After that, the implementation will be analyzed following the dimensions in the conceptual model: actors, resources, rules of the game and discourse. Finally, the case will be briefly summarized. The analysis is based on a document study and five interviews.

4.2.1 Case explanation

Geographical location and characteristics

The Mark on the Flemish side of the border (Figure 13) is classified as a first order waterway which means that this waterway is managed by the Flemish Environmental Agency (Vlaamse overheid, n.d.). Some of its tributaries are classified as second order and the majority is not classified (Geopunt Vlaanderen, n.d.). The second order is managed by the province and the watering. The not classified waterways are managed by the municipality or by the owner of the adjacent plot (Vlaamse overheid, n.d.).

The surrounding area of the Mark is mostly used for agricultural purposes, forest can be found in the areas of Castelre and Wortel (Teekens et al., 2004). This stream has a moderate water quality, e.g., due to a high concentration of nutrients. In the upper reaches of the Mark and the side streams like Heerlese Loop, Muntloop and Kleine Mark, the water quality is worse compared to the rest of the stream. The high nutrient load contributes to unhealthy oxygen-poor conditions in the summer. The nutrients come from the sewerage infrastructure and the load from the agricultural sector (Integraal Waterbeleid Maasbekken, n.d.).

The seepage present dilutes the pollution of surface water and increases the self-cleaning capacity of the waterways. Because of the positive influence of the seepage system, all factors that threaten this system are bottlenecks. Those bottlenecks are for example water abstraction, decrease in infiltration through drainage and pavements. Measures that lead to increased seepage pressure should therefore be prioritized (Integraal Waterbeleid Maasbekken, n.d.).



Figure 13: Mark on Flemish side of the border (Vlaamse overheid, n.d.)

Actors

The actors in this area exist of private and public parties on the Flemish side of the border. These actors involve:

- Municipalities of Hoogstraten, Rijkevorsel and Merksplas
- Province of Antwerp
- Water manager watering Beneden-Mark
- Flemish Environmental Agency (VMM)
- Flemish Land Agency (VLM)
- Agency of Nature and Forest
- Sewer manager Hidrosan
- Nature and agricultural organizations: Natuurpunt, Boerenbond, Coordination center for information and guidance on sustainable fertilizations
- Brook secretary Maasbekken

Other actors in the area:

- Private owners
- People working and living people in the area
- Recreation associations

The watering doesn't exist in the Netherlands, whereas Belgium has no water authorities. The similarities between the Dutch water authorities and the Flemish Watering are about achieving a healthy water management. At the watering it is about carrying out clearance, maintenance and repair work on the unnavigable waterways (Watering De Beneden Mark, n.d.). The Dutch water authorities are bigger and have more powers than the Flemish watering. For example, in the Netherlands there is not a different authority for every type of watercourse or canal, in Flanders this is the case.

Watering the Beneden Mark concerns the area of Hoogstraten, Minderhout, Wortel, Meer, Meerle and Loenhout. The duties of a Watering (Watering De Beneden Mark, n.d.) consist of;

- Water management, achieving healthy water management, integrated water policy;
- carrying out clearance, maintenance and repair works on unnavigable waterways, canals, ditches:
- Classified waterways 2° category are cleared annually (approximately 132 km)
- Public canals are cleared alternately (about 95 km)
- Providing water advice in the context of the water test (when issuing an environmental permit)

Policy context

The Water Framework Directive is also an important guideline here (Twynstra Gudde et al., 2018). This European regulation states that the clean and healthy water targets should be met by 2027 at least. In addition, various directives, such as the Habitats Directive, are in force. The most important policy instrument here is the assignment of functions to the waterways. This function gives direction to all policy and management measures that apply to the Mark and its flood plain, so that a specific ecological quality can be achieved (Teekens et al., 2004).

Integraal Waterbeleid has a vision to achieve the goals of the Water Framework Directive Maasbekken (Integraal Waterbeleid Maasbekken, 2015). Because the current landscape is strongly shaped by intensive agriculture, it does not seem to be appropriate to fully restore the original meandering character and groundwater level.

According to the vision, in first instance, structural improvement must take place within the waterway. Then meanders can be reconnected, excavated again or the waterway can be made narrower, or a new meander can be constructed. Upstream the center of Hoogstraten there is room in the valley for the development of a more natural stream valley landscape.

The aim here is to achieve an optimal agricultural layout within the main landscape structure and outside the stream valley. There are few critical floods in the Flemish side of the border, but in the Netherlands the problem is increasing with threats to Breda. A combination of the construction of flood zones, meanders, increased infiltration and water retention are needed to reduce the peak discharges (Integraal Waterbeleid Maasbekken, 2015). This source-oriented approach is also relevant for sustainable water use in the strongly agricultural sector.

Almost the entire Markvallei has been designated as a habitat directive area. In 2020, the Agency for Nature and Forests started drawing up a nature management plan. Alignment of this plan with the objectives of the Water Framework Directive is important to maximize the benefits of the measures for both objectives (Integraal Waterbeleid Denderbekken, n.d.).

Nature-based Solutions

Table 6: Several projects along the Beneden-Mark (Integraal Waterbeleid Maasbekken, n.d.)

Project	Initiator	Stakeholder	Progress
Improving stream structure within the land consolidation Rijkevorsel-Wortel	Flemish Land Agency	Flemish Environment Agency Province of Antwerp	Land consolidation approved
Improving water conservation in the soil within the drainage area of the Mark	HidroSan Flemish Land Agency	Municipality of Hoogstraten Watering Beneden-Mark	Research and implementation
Remediation of fish migration bottlenecks	Flemish Land Agency	Municipality of Hoogstraten	Research and implementation



Figure 14: Location of land consolidation Rijkevorsel-Wortel (Vlaamse Landmaatschappij, 2020)



Figure 15: Approved land consolidation Rijkevorsel-Wortel (Provincie Antwerpen, 2019)

The first project concerns improving the stream structure withing the land consolidation project Rijkevorsel-Wortel. The land consolidation Rijkevorsel-Wortel is initiated by the Flemish Land Agency.

The problems in this area concern the high demand for agricultural land and the declining natural values. The concept for the layout of this land consolidation area is an optimal agricultural layout within the main landscape structure and outside the stream valley of the Mark, Kleine Mark, Bolkse Beek and Hollandse Loop. The water quality will be improved by increasing the self-cleaning capacity of the waterway through the construction of natural-technical profiles. This will be done by exchanging intensive agriculture from the valley of the Mark and by constructing open buffer basins at sewer overflows. The land consolidation proposal has been approved by the competent minister. The land development is planned for 2022. Figure 14 shows the location of this land consolidation project. Figure 15 shows a part of the approved land consolidation project. The blue parts are located next to the Mark and represent the nature development areas in the valleys and depressions.

The second project involves area-oriented projects to promote water conservation and to combat desiccation in the drainage area of the Mark, with the focus on the areas outside the stream valley. This will be done by placing weirs, revaluing canals or level-controlled drainage. Given the sensitivity of the sandy Noorderkempen, maximum use should be made of the infiltration and water conservation, also in agricultural areas. This project is also planned for 2022 (Integraal Waterbeleid Maasbekken, 2020b).

Desiccation and water conservation can be prevented outside the valley in various ways:

- increased infiltration of rainwater in the infiltration areas and replenishment of groundwater supplies
- revaluation of canal systems and fens
- level controlled drainage in agricultural areas
- placement of weirs in agricultural areas
- active water level management in the relevant sections of the surface water body.

The third project concerns the fish passages in the Mark. Figure 16 shows the fish ladders in orange, the fish passages in green and the possible fish passages in yellow (Baeyens et al., 2006). The green dots represent fish-passable weirs or meanders. The orange dots are the fish ladders and the yellow dots are the places where it is investigated what is possible with regard to fish migration. As can be seen, a lot of vis passages are already present. The yellow one of Laermolen is planned for after 2021 (Integraal Waterbeleid Maasbekken, 2020c)

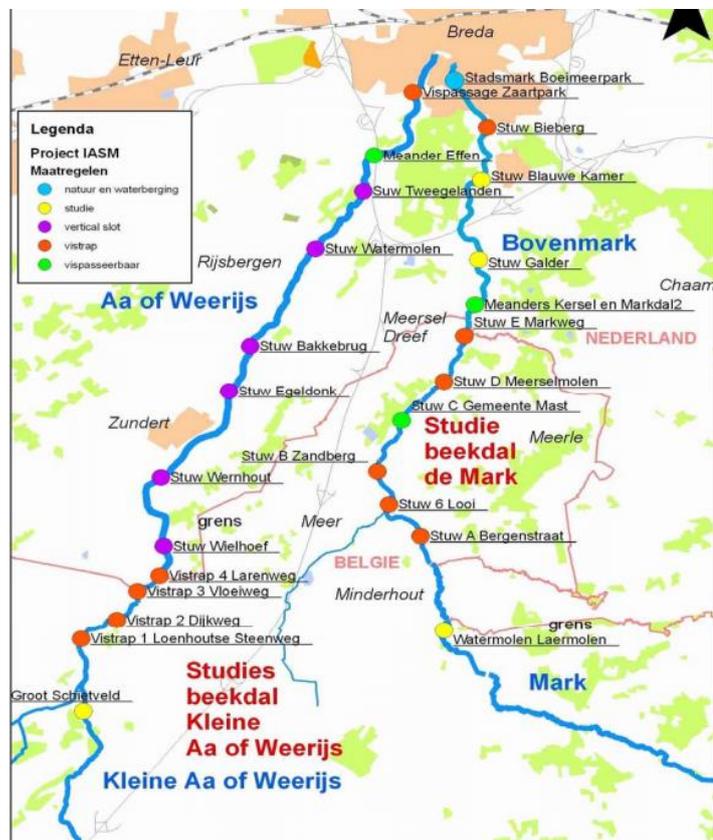


Figure 16: Fish passages in the Beneden-Mark (Baeyens et al., 2016)

4.2.2 Analysis implementation Nature-based Solutions case Mark Flemish side

The analysis is structured by the dimensions of the Policy Arrangement Approach and the matching barriers in the conceptual model. Table 7 has the same principle as the previous table about the influence of the factors on the implementation of Nature-based Solutions

Table 7: Influence of the factors on the implementation of Nature-based Solutions Mark Flemish side

<i>Dimension</i>	<i>Factors</i>	<i>Mark</i>	<i>Dimension</i>	<i>Factors</i>	<i>Mark</i>
Actors	Sense of urgency	N.F.	Resources	Financial incentives	+
	Political will and long-term commitment	+		Available financial resources	+
	Public awareness and support	-		Perceived high cost	N.F.
	Silo mentality	N.F.		Skilled knowledge brokers and training programs	N.F.
	Risk aversion and resistance to change	-		Property ownership complexities	-
Rules of the game	Design standards and guidance for maintenance	N.F.		Functionality and performance uncertainties	N.F.
	Supportive policy and legal framework	-	Discourse	Different definitions	N.F.
	Misalignment between short-term plans and long-term goals	N.F.		Counter-discourses	-
	Space constraints	N.F.			

The factors discussed below have a positive or negative influence on the implementation of Nature-based Solutions. These statements are interpretations of the opinions from the interviewees. The factors with a neutral influence and the factors not found are not discussed in the following subchapters.

4.2.2.1 Actors

Political will and long-term commitment

The vision of Integraal Waterbeleid Maasbekken shows that there is political will and commitment for the redevelopment of this area. Compared to the other two cases, this area has several different project/implementations instead of one overarching project like at the Markdal. However, this does not mean that there is less political will and commitment compared to the other cases. If we look at the land consolidation of Rijkevorsel-Wortel (Vlaamse Landmaatschappij, 2020) you can see the will and commitment of rearranging this area by the Flemish Land Agency and other involved parties. This project started in 1996 and in 2019 it was declared to be useful by the Flemish minister of environment, nature and agriculture.

As a result of changed policy priorities in the period of 2003-2013, no further work was done on the Rijkevorsel-Wortel land consolidation (Vlaamse Landmaatschappij, 2020). Except from this break of ten years, there is a long-term commitment visible to successfully complete this project. The next step here is the actual reparcelling of the plots.

Public awareness and support

In this area, agriculture has the largest share of land. Drainage is for the farmers very important to always have access to their lands according to respondent G. In winters, farmers want to open their weirs so that the water can flow away, and they can access their land with heavy tractors. In the past, there were carts with a little bit of manure on them, so they did not weigh that much either. Now that is not possible anymore because of those heavy tractors. Therefore, the water must be removed from those fields as quickly as possible so that they can plow and work the land as quickly and as early as possible according to respondent D. That is of course problematic, because if you buffer and store water tomorrow, they can start their cultivation later and they will have crop losses. The respondents D, F and I say that the support among farmers was very low.

It is not only a lack of public support but also of public awareness. Respondent I thinks that the farmers are not aware of the possible risks and losses when they keep draining that much. It is important that farmers eventually realize that when it gets wet, this also benefits their crops because this means that there will be less droughts in the summer.

During the old land consolidation, the Mark was straightened and the canals were made deeper according to respondent D. As a result, the adjacent agricultural plots were drained anyway to get the water out of their property as quickly as possible. This lack of public awareness and support is problematic for the implementation of Nature-based Solutions. Especially because the farmers are the biggest landowners in this area.

Risk aversion and resistance to change

As farmers are the biggest landowners here, a lot of contrasting interests are present here according to respondents D and I. Farmers want the water to go away as quick as possible and want to be able to irrigate their land in times of drought. Nature-based Solutions mean to hold/store the water where it falls for as long as possible. As respondent I mentioned, the farmers think that Nature-based Solutions are not in favor of them. Maybe they are right, on the short term. They need to move and get used to a new plot. But on the longer term, Nature-based Solutions also have a positive effect on the agricultural functions in this area. The farmers show resistance to these changes and are not willing to take the assumed risk that they no longer can use their land because it is too wet according to respondents F and G. Some nuance may be necessary, respondent F mentioned that farmers are getting more and more positive about water conservation through Nature-based Solutions. According to the respondent this has to do with the drought of the past years. The risk aversion and resistance to change occurs the most among the farmers group. As they have the biggest amount of land here, this is a bottleneck for the implementation of Nature-based Solutions. It is not that no farmer is willing to cooperate, the land consolidation project Rijkevorsel-Wortel has been approved by the government (Vlaamse Landmaatschappij, 2020).

Property ownership complexities

As long as it lacks public awareness and support, there are property ownership complexities in this area. Not all farmers are willing to sell their land in favor of nature development according to respondent I. This doesn't mean that no land can be purchased at all. The properties that the nature organizations have acquired were less suitable for agriculture, which made it possible to acquire them according to respondent D. Almost all land for the new meander in the Mark is purchased. The resistance of the agricultural sector to create riparian strips along the Mark is quite high. These lands are more appropriate for agricultural activities and farmers are not willing to give them up so easily according to respondent D.

Not all Nature-based Solutions need a large amount of land. The fish passages for example were made in the bed of the stream, or on government plots by the Flemish Land Agency according to respondent D. The most downstream fish ladder was built entirely in the stream, for the other governmental land a short fish ladder around a weir was used. This kept the expropriation to a minimum.

Financial incentives and available financial resources

Respondents D and I say that a proposal for a Life-project (Rijksdienst voor Ondernemend Nederland, n.d.) has currently been submitted from the city of Breda together with the Flemish nature association Natuurpunt. The first submission of this project was declined, now they have to wait and see if this application will be approved. The involved Flemish and Dutch partners are reconsidering submission of an adapted project proposal in 2022.

Most of the projects of Table 7 already have a cost estimate and a division into investments cost among the initiators and stakeholder. The first project about the improvement of the stream structure withing the land consolidation project Rijkevorsel-Wortel has expected investment costs of 1.800.000 euros. These costs will be paid by the Flemish government for 70%. The remaining 30% has yet to be seen who will pay for it (Integraal Waterbeleid Maasbekken, 2020a).

The second project involves area-oriented projects to promote water conservation and to combat desiccation in the drainage area of the Mark, with the focus on the areas outside the stream valley. This project has two investors, the Flemish government and the province of Antwerp. The Flemish government will pay 630.000 euros and the province of Antwerp will pay 270.000 euros with an extra 1000 euros of operational costs per year. Both of these investments are 100% provided (Integraal Waterbeleid Maasbekken, 2020b).

The third project concerns the fish passages in the Mark. The implementation of fish passages is part of a bigger project in this area. The whole project concerns the restoration of the structure quality, the restoration of the natural water storage and implementing the fish passages. The total investment for this project is 2.000.000 euros of which 50% is provided. The other 50% have yet to b provided (Integraal Waterbeleid Maasbekken, 2020c)

The lowest percentage is 50% of the budget of a project and it seems that for the biggest part of the projects the investments have no negative influence on the implementation of Nature-based Solutions. Almost in every project a 100% of the costs is already provided.

4.2.2.3 Rules of the game

Supportive policy and legal framework

The watering is a separate body in the municipality of Hoogstraten. The management of the waterways here is still under the management of the watering. This area is completely dominated by agriculture and people get a voice in the board depending on the properties they own. People can also pass their vote to one of the larger landowners there.

Natuurpunt owns quite a lot of land there according to respondent I, about 110 hectares, but they still can't compete with the farmers because the entire watering administration is dominated by agriculture. Everything they propose is swept of the table. Even the municipality has no say in this watering, which makes it a very independent institution. The minister is working on abolishing the watering and transferring the responsibilities to the province, which seems to be better according to respondent J.

As said before, it lacks public support among farmers, and this is why this construction of the watering is also not in favor of the implementation of Nature-based Solutions.

The policy is very strong along the waterways that are owned by the government in this area. On the other hand, they have no control over the capillary system where someone else is the owner of the land. The Flemish Land Agency is quite powerless in those waters because everything has to be agreed with the owners. Respondent F of the Flemish Land Agency finds it a pity that a framework is missing here. Another missing supportive framework concerns compulsion. When someone doesn't want to sell their land, expropriation is the only option. This instrument has to have a good reasoning before it can be implemented.

4.2.2.4 Discourse

Dominant counter discourse

As the farmers are the biggest group in this area the dominant discourse is the civil engineered one. The most important thing for farmers is the drainage of their land so that the water can get away as quickly as possible according to respondent I. During dry summers they extract water from the stream or the ground to solve the drought problem. A principle of the Nature-based Solutions is the retention of water to replenish groundwater and to be able to store peak discharges (Witteveen+Bos, n.d.). These two ways of handling water clash. Farmers want to open their weirs to let the water go according to respondent I, and for example wood in the stream is used to prevent rapid drainage. This dominant counter-discourse is problematic for the implementation of Nature-based Solutions as long as farmers are the dominant land user in this area.

4.2.3 Summary

The Mark on Flemish side is a first order waterway and is mainly surrounded by land with an agricultural function. The aim here is to achieve an optimal agricultural layout within the main landscape structure and outside the stream valley (Integraal Waterbeleid Maasbekken, 2015). The most important actors involved in these implementations of Nature-based Solutions are municipalities of Hoogstraten, Rijkevorsel and Merksplas, province of Antwerp, water manager watering Beneden-Mark, Flemish Environmental Agency, Flemish Land Agency and some nature and agricultural organizations. Some of the projects here are: improving the stream structure within land consolidation Rijkevorsel-Wortel, improving water conservation in the soil within the drainage area of the Mark and the remediation of fish migration bottlenecks.

The positive factors according to respondents D, F, G and I are the political will and long-term commitment, financial incentives and available financial resources. The land consolidation of Rijkevorsel-Wortel is an example of the political will and long-term commitment. This project started in 1996 and was declared to be useful in 2019 by the Flemish minister of environment, nature and agriculture (Vlaamse Landmaatschappij, n.d.). The financial aspect of these projects also has a positive influence on the implementation. For most of the projects, the costs are already estimated and divided among the initiators and stakeholders.

The negative influences mostly have to do with the farmers in this area. It is said by respondent I that they are not willing to take a risk and are resistance to change. Therefore, it also lacks public awareness and support as the farmers are the biggest landowners in this area. Most of the time they are not willing to sell their land because they are not aware of the benefits it has for them. Another negative influence is the supportive policy and legal framework, the watering is dominated by farmers in this area simply because they are the biggest landowners here according to respondent I. This means that a watering works in favor of the farmers which is not always favorable for the implementation of Nature-based Solutions. The missing supportive framework here concerns the land consolidation which is currently on voluntary basis. The only option when people do not want to sell their land is expropriation. The final factor that has a negative influence is the dominant counter discourse of civil engineered solutions. The agricultural land use in this area stimulated the engineered solutions because farmers think this can be controlled better.

4.3 Case 3: Merkske

This case concerns the implementations of Nature-based Solutions in brook the Merkske. Here, the implementation is looked at more broadly than just the Integral Water Project. First, the case will be further explained on the basis of its location, the involved actors, policy context and the Nature-based Solutions in the area. After that, the implementation of Nature-based Solutions will be analyzed according to the conceptual model, so based on the following dimensions: actors, resources, rules of the game and discourse. Finally, a comparison will be made between Flanders and the Netherlands after which this case briefly will be summarized.

4.3.1 Case explanation

Geographical location and characteristics



Figure 17: Location of the Merkske (Hoeymans et al., 2020)

It is said that 't Merkske is one of the most beautiful brooks in Flanders and the Netherlands and it is not thus without reason that this brook ended in the 10th place in the 'Living brooks in Flanders' report (Waterschap Brabantse Delta & Integraal Waterbeleid Maasbekken, 2017). It isn't that surprising that this brook differs from a lot of other brooks because it is situated in the bordering area of the Netherlands and Flanders where it forms the border between these two countries, which can be seen in Figure 16. Because of its location on the border, it was until the 1970s unthinkable to straighten this brook. After the 1970s, the awareness of nature was sufficiently strong to prevent canalization. Since the 1990's, the possibilities for this area are growing because of nature developments which results in preserving and restoring the unique stream valley landscape. This area also has a historical value and quite some possibilities for recreation. All these specific characters make this valley a unique area with diverse goals, interests and assets Merkske (Waterschap Brabantse Delta & Integraal Waterbeleid Maasbekken, 2017).

The Merkske is a slow flowing headwater on sand and has a basic discharge of seepage flow from deep groundwater, it has a stream type R4 (WFD typology) which means that it is a permanent slow flowing headwater on sand (Santbergen & Beers, 2020). The water system analysis is the basis for selection and implementation of the Water Framework Directive measures.

Some of the problematic points mentioned here are the too low water discharge to achieve the desired flow during summers, too little groundwater that flows to the brook, high phosphorus and nitrogen concentrations and the intensive mowing of the aquatic plants (Beers et al., 2018). With the current climate, the groundwater replenishment is about 383 mm, but looking at future climate change scenario's this will be a lot less. Looking at the W+ scenario a temperature rise of 1.4 – 2.3 degrees Celsius is expected in 2050. The groundwater replenishment in the W+ scenario will be about 350 mm, which is 30 mm less. There will also be more frequent dry summers and extreme rainfall events. These climate effects can cause a lowering of the basic drain which can endanger the ecological standards on small scale (Hendriks & Van Ek, 2009).

As can be seen in Table 8, the biggest differences between the two situations are the rainfall and the groundwater replenishment.

Table 8: Overview of differences between the water balances (Hendriks & Van Ek, 2009)

	Current situation (mm/year)	2050 (mm/year)
Rainfall	649	592
Crop evaporation	266	241
Groundwater replenishment	383	350
Total area discharge	304	271
Withdrawals	6	6
Horizontal in- and outflow	73	72
Seepage	62	61
Infiltration	94	92

Actors

Because this stream forms the border, the Netherlands and Flanders are both involved in the implementation of Nature-based Solutions here. So, for example, there are at least two nature reserve managers and two water managers involved. The Integral Water Project Merkske wants to provide a platform for all governments and organizations working in the drainage basin (Integraal Waterbeleid Maasbekken, n.d-a).

The partners of the integral water project Merkske are as follows:

- Municipalities of Hoogstraten, Merksplas, Baarle-Hertog, Baarle-Nassau, Ravels and Turnhout
- Water manager water authority Brabantse Delta, Flemish Environmental Agency (VMM), province of Antwerp, Watering Beneden Mark and Watering Oostelijke Mark
- Sewer managers Aquafin and PIDPA
- Other concerned administrations; Flemish Land Agency (VLM), Agency of Nature and Forest, Staatsbosbeheer, Department of Agriculture and Fisheries, Department of Environment
- The nature and agricultural associations; Natuurpunt, Boerenbond, ZLTO, Coordination center for information and guidance on sustainable fertilizations (CVBB), Association Markdal, Kempens Landschap and Nature Association Mark en Leij
- Brook secretary Maasbekken

Other actors in this area are:

- Private owners
- Green Development Fund Brabant
- Working and living people in the area
- Recreation associations

Policy context

The Water Framework Directive (Twynstra Gudde et al., 2018) also plays a big role in this area. There are some human interventions in this area, some waterways are normalized, there is a system of tertiary water courses for agricultural drainage drinking water is extracted just outside the area and in the summer period, irrigation takes place from groundwater. It is important that in Merkske attention is paid to the prevention of the ground water level and water quality. The Flemish and Dutch institutions are working together to keep this area healthy via several projects. An important document which is a guideline in some projects is the (Dutch) water system analysis, this analysis is part of the implementation process of the Water Framework Directive (Beers et al. 2018).

One of the projects is the Integral Water Project Merkske (Waterschap Brabantse Delta & Integraal Waterbeleid Maasbekken, 2017) where a collaboration has started between the brook secretary Maas, the Flemish Environment Agency and water authority Brabantse Delta. At the start of this projects the WFD has been analyzed by these parties. They want to set up integral, area-oriented projects with the aim of facilitating concrete realizations, creating support and promoting cooperation between the partners involved. Integral here means working across borders while taking into account all aspects of the water system. It is a pursuit of win-win situations and multifunctional use of space, with the water system as a guiding factor. The vision of the Flemish river basin management plan for the Meuse (2016-2021) includes a specific part about Merkske. The intention of this vision for the water system is to form a framework for formulating new actions within the area process and thus forms one of the foundation stones for the Integrated Water Project Merkske.

The goals for this project are as follows:

- The main goal is to achieve the goals of the Water Framework Directive as quickly as possible, if possible by 2021 and at the latest by 2027. The focus will be on the reduction of nutrients and on optimizing the structure quality and flow variation.
- Further refining the actions of the policy and implementing them in the short term within an integrated approach.
- Making an inventory of bottlenecks for the water system and looking for solutions together within an integrated framework.
- Striving for win-wins in function of multifunctionality, other objectives and other domains.
- Pursuing all the above together with all those involved through area-oriented consultation.

Besides this Integral Water Project, the water authority and partners implement a package of design measures based on the information from the water system analysis. These design measures are called; Climate-robust water system (Waterschap Brabantse Delta, 2020).

The goal of a climate-robust natural stream that flows through a valley where there is no agricultural activity close to the stream and where the land use of the river basin is aligned with the Water Framework Directive goals.

Nature-based Solutions

Some specific measures from this project that fit with the definition of Nature-based Solutions are planting trees along the stream, insertion of brook wood, experiments with sand replenishment and reducing mowing maintenance. These measures can be seen on Figure 13 below. Other action that needs to be taken before the implementation of Nature-based Solutions are research and land consolidation.

A lot of these measures in Figure 18 represent the researches that need to be done, like a research about the reduction of maintenance and the insertion of dead wood. Other projects include the realization of Nature Network Brabant and the Flemish Ecological Network. Available land is necessary for this realization, and in order to have available land, land acquisition is necessary first.

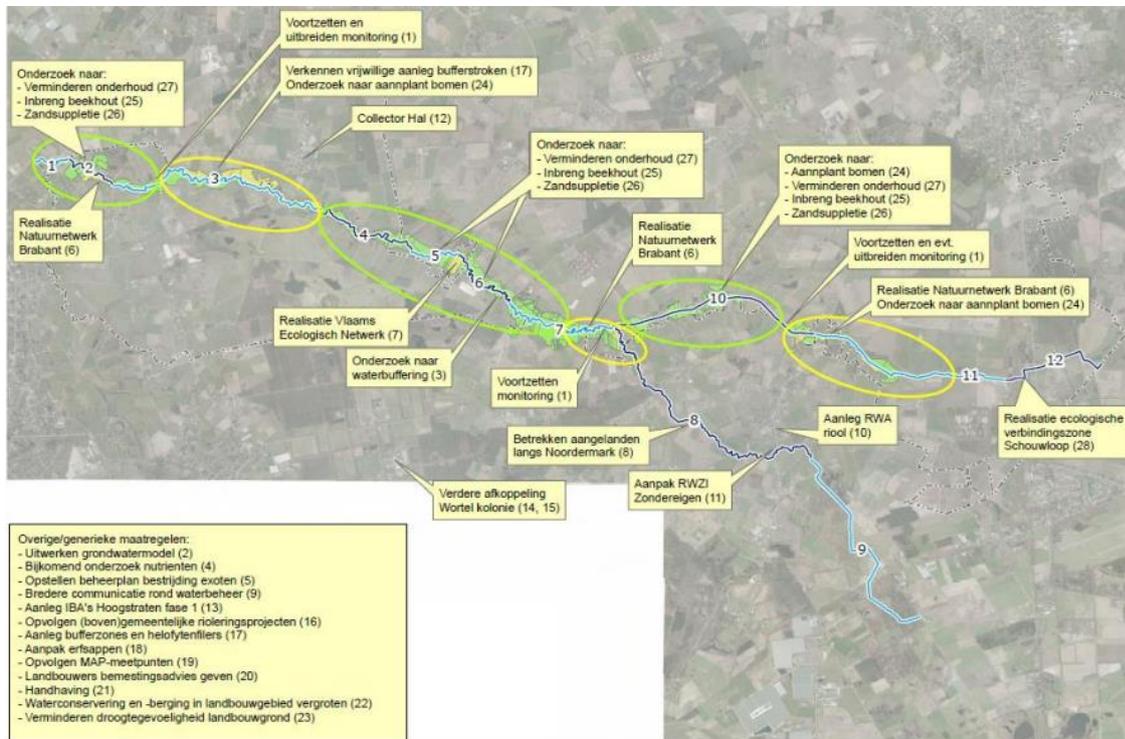


Figure 18: Measurements at the Merkske (Waterschap Brabantse Delta and Integraal Waterbeleid Maasbekken, 2019)

The action list of Water project Merkske contains actions regarding research, land acquisition and the implementation of measures. Table 9 shows a selection of these actions.

Integral Water project Merkske is now in the process of purchasing agricultural land. Natuurpunt and the province of Antwerp on the Flemish side are busy purchasing agricultural land on their side of the border. Staatsbosbeheer, (State Forest Management) is the buying party on the Dutch side of the border. This project is still in process, but most of the agricultural land is already owned by aforementioned organizations. The blue areas in Figure 19 are those that still need to be converted to nature by private owners or acquired by Staatsbosbeheer on the Dutch side of the border.

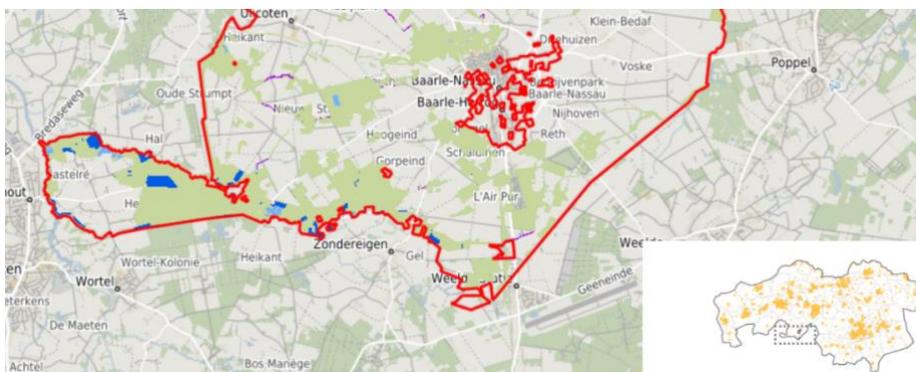


Figure 19: Land yet to be transformed into nature as part of the Nature Network (Provincie Noord-Brabant, n.d.)

The second project about the Laars van Baarle Hertog is also a project concerning land consolidation. It is here up to the Flemish institutions to find an appropriate piece of land for the farmers in this area so that they are willing to move.

The third project concerns a broader communication for a better understanding why this area is so important and why different measures are taken. This is the job of the water authority on Dutch side and the Brook secretary Maasbekken on Flemish side. This is an ongoing process during all projects and a good communication is key for a broad support (De Smet, 2014).

The fourth project is inserting wood in the stream, which has been done during a pilot project in Merkske earlier. Maintenance was then discontinued by the water authority, so fallen trees were no longer removed from the stream. Wickerwork packages were installed in the stream in 2015 (Verdonschot et al., 2021). Figure 20 and 21 show the fallen trees into the stream.



Figure 20 Fallen trees in the Merkske (Photo: Zuidgeest, M)



Figure 21 Fallen trees in the Merkske (Photo: Zuidgeest, M)

The last project is about reducing mowing maintenance. The two countries are again working together here, there is even a cooperation agreement for the management and maintenance of cross-border waterways (Van der Berg et al., 2018).

Table 9: Action list implementation Nature-based Solutions (Waterschap Brabantse Delta & Integraal waterbeleid Maasbekken, 2019)

Project	Initiator	Stakeholder	Progress
Purchase agricultural land so that agriculture in the stream valley can be converted into nature	Water authority Staatsbosbeheer	Green development fund Landowners ZLTO (farmer’s association)	Still in progress
Exchange of the land in ‘de Laars van Baarle Hertog’ so that agriculture in the stream valley can be converted into nature	Province of Antwerp Kempens Landschap Natuurpunt	Landowners VLM (Flemish Land Association)	Negotiations about the property

Broader communication for a better understanding of agriculture/nature/water management	Water authority Brabantse Delta Brook secretary Maasbekken	Project group	In its infancy
Inserting brook wood	Province of Antwerp Water authority Brabantse Delta	Province of Antwerp Watering Adjacent landowners	Already applied
Reduce mowing maintenance	Province of Antwerp Water authority Brabantse Delta	Individuals Adjacent property owners Watering	Ongoing agreement

4.3.2 Analysis implementation Nature-based Solutions case Merkske

The analysis is structured by the dimensions of the Policy Arrangement Approach and the matching barriers in the conceptual model. The data of the Merkske are based on a document study, observations of the workshops and five interviews with people from the province of Antwerp, nature organizations, site management organizations and water managers. The Merkske is a different case compared to the other two, this stream lies exactly on the Belgian-Dutch border. This means that two countries have to work closely together. The results of the Flemish and Dutch participants will not be separated, due to the fact that they do not differ that much from each other. The differences will be specified, if necessary, in the descriptive part of the dimension. Finally, some differences that do not fit into a dimension will be specified in the last section of this case.

Table 10 gives an overview of the influence of the factors on the implementation of Nature-based Solutions in Merkske. This table has the same principle as the similar tables before.

Table 10: Influence of the factors on the implementation of Nature-based Solutions in Merkske

<i>Dimension</i>	<i>Factors</i>	<i>Merkske</i>	<i>Dimension</i>	<i>Factors</i>	<i>Merkske</i>
Actors	Sense of urgency	+	Resources	Financial incentives	N.F.
	Political will and long-term commitment	+		Available financial resources	+
	Public awareness and support	-		Perceived high cost	N.F.
	Silo mentality	-		Skilled knowledge brokers and training programs	N.F.
	Risk aversion and resistance to change	-		Property ownership complexities	-
Rules of the game	Design standards and guidance for maintenance	0		Functionality and performance uncertainties	N.F.
	Supportive policy and legal framework	-	Discourse	Different definitions	0
	Misalignment between short-term plans and long-term goals	N.F.		Counter-discourses	-
	Space constraints	N.F.			

The factors discussed below have a positive or negative influence on the implementation of Nature-based Solutions. These statements are interpretations of the opinions from the interviewees. The factors with a neutral influence and the factors not found are not discussed in the following subchapters.

4.3.2.1 Actors

Sense of urgency

In this project, there is a high sense of urgency among the policy makers. A pilot project and some research about inserting wood in the brook give the impression that things are really going to change here. The land consolidation and purchasing agricultural land gives the impression that the following steps are also going to be taken to reorganize the landscape. Other things that help the sense of urgency are the results of the water system analysis (Beers et al., 2018). There already is a too low discharge to achieve the desired flow during summers and too little groundwater that flows to the brook. This can lead to a decline of the surrounding area of the Merkske. Not only is this a danger to nature, but also for the agricultural function further away from the stream. If the groundwater is not replenished enough, the farmers cannot always water their land if needed. This increases the sense of urgency that these effects of climate change need to be adapted.

Political will and long-term commitment

A bigger sense of urgency can have the result that the political will and long-term commitment also will increase. People are aware of the effects and feel that they need to do something about it according to respondent H. The letter of intent is a sign of political will and long-term commitment in this case according to respondent J. The document 'Samen grenzen overbruggen' (Waterschap Brabantse Delta, 2019) shows the priorities for a collaboration with Flanders. The Belgian minister for the living environment has a vision about the green-blue veins and its importance and is willing to give up some agricultural land for it. So, the overall political will and long-term commitment is present.

The more specific political will isn't always present, this is also shown by the example of expropriation according to respondent H. This respondent finds that expropriation is often used in new residential areas of highways but less often for natural purposes. It can be imagined that political parties with agricultural interests, like the CDA in the Netherlands, are not so quick to use expropriation by farmers to make way for nature. This also applies to the Flemish side, but of course with different political parties. This is something where political will and commitment come in, are you willing to force people to look for another place. Expropriation will further be discussed under *property ownership complexities*. Despite the lack of local political will sometimes, this factor has a positive influence on the implementation of Nature-based Solutions.

Public awareness and support

As you can imagine, there are many interests in an area that lies exactly on the border. For the Merkske the actors named by respondents C, F, H, I and J in general are users and owners, site managers, water managers, farmers, Forestry Commission, provinces, municipalities, land consolidation committee, Flemish environmental agency and the Flemish land agency. According to respondents C, F and I and the workshops (Appendix II), a problem at Merkske is the public awareness and thus also the public support for the measures that are planned or already taken. The public support under the farmers is the most problematic. As soon as farmers feel that their soil is getting wetter, they think of this as an obstacle while this is not always right according to respondent I. This may be a reason why there is little public support among farmers. Respondent I also thinks that it is the responsibility of governmental institutions to show farmers the need and the benefits of it and thus to create more public awareness. Because of this lacking public awareness and support it becomes harder to implement Nature-based Solutions in this area (De Smet, 2014).

Another striking example that came up during an interview with respondent C was about the difference in support between farmers. Some farmers on the Flemish side of the border were willing to implement nature-inclusive agriculture on their own land but this was not appreciated by other farmers. They came up with the title of 'the green ones' and did not mean this in a positive way. This example shows that not all farmers do support some natural measures, but the majority of this group is not happy when it comes to the implementation of Nature-based Solutions.

Risk aversion and resistance to change

Talking about the risks of Nature-based Solutions in this area, flooding is the most important one especially for farmers according to respondents C, I and J. There have been some discussions about the effects of the implementation of a Nature-based Solutions like inserting wood in the brook. According to respondent C the Dutch water authority had all the arguments based on research why flooding was physically impossible but when someone is so convinced of his own point of view it is hard to even have a discussion, let alone to convince someone. The farmers weren't able to assume that the person of the water authority was right because they wanted to avoid the risk of flooding so much. Maybe not only flooding but also a risk aversion for a higher groundwater level, which means that they cannot use their land in wet times. This kind of risk aversion has a negative influence on the implementation of Nature-based Solutions.

It is understandable that farmers are not willing to take a risk if that means that their crops fail, but if they are not willing to take a risk it can turn out negative in the future. If the risk aversion and resistance to change means that Nature-based Solutions cannot be implemented, it is possible that their crops cannot even grow on the same land because of drought. This refers to the need of public support and awareness, that they know what will happen if nothing is done in this area.

4.3.2.2 Resources

Available financial resources

The experience of respondent C is that there was a lot possible the past ten years within the budget of management and maintenance on the Dutch side of the border. Some parts have been taken out of maintenance which saved money that could be invested in the project. It is an important shift to go from money that you have left to a project-based budget where the money is being used for things like, research, implementation and maintenance. In order to achieve certain water targets, a tax is imposed on both sides of the border of which projects are set up to achieve these goals.

On the Dutch side are these the water authority taxes, on the Flemish side are these the provincial taxes because there is no water authority there. The wateringens on the Flemish side do collect taxes from the landowners whose land is directly adjacent to the waterway managed by the watering according to respondent G. Most of the budget is being used for purchase, furnishing and maintenance. Another source of income are subsidies by the province or other institutions or funds on both sides of the border. Respondent H came up with the example of the 'Green Developments fund Brabant'. This fund makes subsidies available for private individuals and farmers to realize nature on their own land (Waterschap Brabantse Delta & Integraal Waterbeleid Maasbekken, 2019).

Staatsbosbeheer in the Netherlands can also call on this fund to buy out farmers or to offer them another piece of land according to respondent H. This respondent provided an example to show how much the Green Developments fund Brabant subsidizes.

An agricultural plot costs about six euro per square meters, that is how much it's worth if you have to buy such a plot. Nature is sometimes only worth a euro per square meter, it is a common good but not something you can make money from. As soon as we can buy an agricultural plot somewhere, we as a nature organization cannot pay six euros per square meter. The day after it is only worth one euro per square meter, so all money will be lost then. The province of Noord-Brabant has money available from the Green Development Fund to resolve that difference. It can be said that they add five euros per square meter so that the value difference is covered by the government. As a site managing organization, but also as a private individual, you will be reimbursed for the difference. You should therefore not be able to drop out to realize nature for financial reasons. After that, it is the intention that the land will be furnished, then you also have the option of being reimbursed about 50% of the costs via the Green Development fund Brabant.

Property ownership complexities

The current land use may be one of the biggest barriers. We are running up against the limits of the feasibility of water management according to respondent H. Every square meter must be used in the most sufficient way which doesn't match with the definition of Nature-based Solutions. The current system doesn't allow Nature-based Solutions in every place if there is a destination possible that yields more money. Property ownership complexities play a role in this area when it comes to land consolidation. The acquisition is still mostly based on voluntary expropriation is seen as the last resort.

Recently, an area along the Merkske "de Laars van Baarle" was 'forgotten' by the Land consolidation 'Zondereigen' during this land consolidation according to respondent I. The destination in this area has been 'nature' (Flemish Ecological Network) since 2008, but farmers who worked the plots may continue to work them as agricultural plots up to one generation later. They are therefore not inclined to give up these agricultural plots, unless in the context of land exchange, but this area was spared precisely (because the destination is actually nature). It is squeezed between the areas along the Merkske in the Zondereigen land consolidation, where in the meantime agriculture has been exchanged for the benefit of wet nature. De Laars, with its a few agricultural plots in between, currently forms a bottleneck for the implementation of Nature-based Solutions according to respondent I.

Staatsbosbeheer has designated 90 hectares that they want to convert into nature on the basis of the natural underlay according to respondent H. About half of these plots is directly influenced by the stream. So you really have to acquire them to be able to do something with the water system. A respondent thinks that 1/3 is willing to sell the land, 1/3 of the people want exchange land in return and 1/3 of the people prefers to stay there and is not willing to sell the land. That is kind of the situation as it is now on the Dutch side of the border at Merkske. It's all voluntary, people can't be forced to leave sell their property. As long as people are not tempted with a good offer, it will be difficult to acquire all those lands in the short term. Another problematic issue for the implementation of Nature-based Solutions is the lease of land.

In the meantime, Natuurpunt in Flanders has been able to purchase most of the land in the Laars from the last farmers. Only about 3 hectares of 'agricultural land' (actually a nature reserve with temporary agricultural activity) still needs to be purchased according to respondent I. There is an agreement with the last owner, but the tenant does not agree. In Flanders those tenants are very well protected. He has the first presale right when the owner wants to sell. Another aspect is that he will just continue to lease so he can carry out agricultural activities there. It then is no longer interesting for Natuurpunt to buy this land if a farmer can stay there for about two generations.

Another important property ownership complexity here has to do with the border. When a Dutch farmer has a plot on the Flemish side of the border and wants to go back to the Dutch side of the border, the Flemish agencies cannot buy a piece of land on the other side of the border. This also applies to Flemish farmers who want to go back to Flanders. This makes the land consolidation in this specific area a lot harder compared to the other cases.

4.3.2.3 Rules of the game

Supportive policy and legal framework

The responsibility of water authority Brabantse Delta is laid down in laws and regulations. It is still legally the case that when a farmer has water damage caused by the water authority, he can file a claim for the damages there according to respondent C. It is questionable when wood is brought in the brook whether or not a permit is required for this. It is not per se that the rules are working against Nature-based Solutions, but they work somewhat in the disadvantage of them. The water authority is legally more focused on water damage, but perhaps more attention should be paid to drought damage according to respondent C.

The start of the land consolidation project was hard, the policy framework in Flanders was missing to create a valley structure according to respondent F. There was in the 1990s nothing present that justified or supported it which made the communication more difficult. There were political motivations involved, people knew that a land consolidation project was going to start and knew that it would be arranged. There was no need to establish a Habitats Directive area.

There is something else that does not work in favor of Nature-based Solutions and that is the lack of regulation. Much now is happening on a voluntary basis where making it compulsory is only the last step according to respondents F, H, and I. It can be frustrating that interesting measures can be taken in some places, but it depends on the voluntariness of people. Forcing through expropriation is the only institutional instrument on both sides of the border (Neefjes, 2008). If we go back to the example of the 'forgotten' land during the land consolidation of Zondereigen we see the same thing happening here. Together with the Flemish Agency of Nature and Forest, Natuurpunt Belgium owns about 75% of that piece of land that was forgotten, but there is still one farmer who is not willing to move according to respondent I. Now there is the Blue-Deal which says that when 90% of the plot is owned, the land may be expropriated.

The spatial planning law in Flanders demands that when design measures are taken which have the result that agricultural destination is no longer possible, a spatial implementation plan (Ruimtelijk Uitvoerings Plan – RUP) must be drawn in which the destination is changed according to respondent I. This relates to the rest of the Merkske stream valley for the 'Halsche Beemden' nature reserve further west. The destination here is still Landscaping Valuable Agricultural Area in the context of the AGNAS (Demarcation Areas for Nature and Agricultural Structure) according to respondent I. The stream valley has not yet been reconfirmed as an agricultural area. A definitive nature destination can therefore still be given to this, but this must be done via an RUP. This would be a strong signal whereby the design and management of the stream valley could be implemented in a more natural way on the Flemish side according to respondent I.

4.3.2.4 Discourses

Different definitions

There is a difference in the definition of Nature-based Solutions on the Flemish side and on the Dutch side of the border. Respondent J from Flanders thinks that Nature-based Solutions are more narrowly approached in Flanders than in the Netherlands. The Flemish mainly see Nature-based Solutions as solutions that are linked to environmental problems like the surface water quality. On the Dutch side of the border the translation is 'building with nature'. So that is also everything that affects the waterway such as introducing dead wood and no longer clearing the stream. In Flanders they call that ecological water management. On the other hand, this respondent thinks that this does not matter for the implementation.

The overall definition among all interviewees related to this case was that Nature-based Solutions are the solution for environmental pollution, drought and flooding. People try to improve the water quality by improving the self-cleaning capacity of nature in various ways such as re-meandering the rivers, the construction of helophyte filters and using micro reliefs to store water. Another thing which often has been mentioned are small measures like sand replenishment or the extensification of the mowing management. So there is a broad definition on both sides of the border.

Dominant counter-discourses

There has been a change visible within water authority Brabantse Delta where nature becomes more visible. In the current water management program 'building with nature' is specifically entitled as part of the Water Framework Directive approach. Over the past ten years it has been more person-dependent which made it very vulnerable according to respondent C.

Nature-based Solutions have not yet been carried out on a project-basis by the water authority until now, Water authority Brabantse Delta will work on that the next planning period to come to a solid project organization with the needed specialists according to respondent C. The water authority goes from a pioneer phase to a more structured way of working. This means that there wasn't a visible shift in practice until now, except for extensive mowing which has been happening for a number of years already. According to respondent C at the water authority Brabantse Delta it has been playing a role in people's minds for a longer time.

A disadvantage of Nature-based Solutions is its steerability according to respondent C and H. NbS are quite hard to steer compared to civil engineering solutions like a weir where you can determine how high or low the water level will be. This can work in favor of civil engineering solutions which are not always the best options. Citizens sometimes ask whether a weir can be installed, it is then up to the people of the water authority to look at different options according to respondent B. The citizens are not always aware that there are other solutions than the civil-engineered ones. Those are simply the solutions that they are used to.

The current thinking is 'level follows function', but as said earlier, for Nature-based Solutions this needs to change. According to respondent C it should be more that 'function follows level' which requires a new way of thinking and political and societal change. Nature-based Solutions may not be the only option to limit the effects of environmental changes as there is not always enough room for it, or other reasons why it is not possible.

So, the dominant counter-discourse is the one of the civil-engineered solutions. These solutions are still the most common ones, but Nature-based Solutions gain ground. More and more people start to realize that civil engineering solutions may not last as long as they thought to, and that they are not adapting to climate change.

4.3.2.5 Differences between Flanders and the Netherlands

Because the Merkske is situated in the bordering area between Flanders and the Netherlands, it is interesting to look at the differences between the two countries.

Because of the boundary-forming character of the Merkske there already was a close cooperation between Flanders and the Netherlands in the field of maintenance according to respondent C. Agreements were made in the beginning of this age so that mowing could be done by the same contractor. It is not convenient if you have this done by a Dutch contractor on the Dutch side of the border and by a Flemish contractor on the Flemish side of the border.

According to respondents F and H, the separation of political and official level is stronger in the Netherlands compared to Flanders. There is a high degree of political and official independency. According to respondent H “You sometimes have to go to Brussels to get things arranged, while in the Netherlands you could arrange it in Den-Bosch, for example. The province as a government layer is somewhat stronger in the Netherlands and more decentralized. This means that problems can also be solved closer to home.” The authorizations in Flanders are also much fragmented, respondent F from Flanders thinks this is a big issue for the Dutch colleagues. There is a sectoral policy, but these policies are working next to each other instead of with each other. The director role in the Netherlands lies most of the time by the province, while this lies (most of the time) by the land consolidation agency in Flanders. The Flemish province wants to take on the director’s role, but its powers are limited.

4.3.3 Summary

This case is a special one because of its location exactly on the border between Flanders and the Netherlands. The implementation of Nature-based Solutions aims to: achieving the goals of the Water Framework Directive and make a climate-robust natural stream that flows through a valley where there is no agricultural activity close to the stream. Some examples of Nature-based Solutions here are; the purchase of agricultural land and land consolidation in ‘Laars van Baarle-Hertog’ so that so that agriculture in the stream valley can be converted into nature and inserting dead wood in the brook. As this is a boundary-forming brook, there are many actors involved. Some examples are: municipalities on both sides of the border, provinces on both sides of the border, water managers on both sides of the border, nature and agricultural organizations on both sides of the border and private owners.

The positive factors here are, the sense of urgency, political will and long-term commitment and the available financial resources. There is a high sense of urgency among policy makers which results in political will and long-term commitment according to respondents C and J. The financial aspect is also something not to worry about here. There are most of the time enough financial resources available like the Green Development Fund Brabant and taxes according to respondent H.

The negative factors include the public awareness and support, risk aversion and resistance to change, property ownership complexities, supportive policy and legal framework and dominant counter-discourse according to all respondents related to this case.

The lack of public awareness and risk aversion originates from the farmers group in the area. This is comparable to the case of the Mark on Flemish side. They might not always be aware of the positive effects for them and are therefore not always willing to cooperate. The supportive policy and legal framework issues are comparable again to those of the Mark on Flemish side, a lot is on a voluntary basis. The counter discourse of the civil engineered solutions also has a negative influence on the implementation of Nature-based Solutions here. There is a change visible where the importance of Nature-based Solutions is stressed, but the engineered ones are still dominant.

This case also showed the differences between Flanders and the Netherlands. According to some of the Flemish interviewees, the separation of political and official level is stronger in the Netherlands compared to Flanders. The authorizations of Flanders are also much fragmented and working next to each other instead of with each other.

4.4 Comparison of the three cases

To be able to compare the factors between the three different projects a table is made for a quick overview of the effects of the different factors. Three different categories are used in this table, a '+', a '-' and a '0'. The plus stands for a positive influence on the implementation of Nature-based Solutions, the minus means a negative influence on the implementation of Nature-based Solutions and the zero means a neutral influence. So no negative, but also not a positive influence on the implementation of Nature-based Solutions.

Table 11: Comparison of the different cases

<i>Dimension</i>	<i>Factors</i>	<i>Case Boven-Mark</i>	<i>Case Mark Flemish side</i>	<i>Case Merkske</i>
Actors	Sense of urgency	+	N.F.	+
	Political will and long-term commitment	+	+	+
	Public awareness and support	+	-	-
	Silo mentality	0	N.F.	-
	Risk aversion and resistance to change	0	-	-
Resources	Financial incentives	N.F.	+	N.F.
	Available financial resources	+	+	+
	Perceived high cost	N.F.	N.F.	N.F.
	Skilled knowledge brokers and training programs	-	N.F.	N.F.
	Property ownership complexities	-	-	-
	Functionality and performance uncertainties	N.F.	N.F.	N.F.
Rules of the game	Design standards and guidance for maintenance	N.F.	N.F.	0
	Supportive policy and legal framework	-	-	-
	Misalignment between short-term plans and long-term goals	N.F.	N.F.	N.F.
	Space constraints	N.F.	N.F.	N.F.
Discourse	Different definitions	N.F.	N.F.	0
	Counter-discourses	-	-	-

Differences explained

Sense of urgency

The first difference visible at sense of urgency. The two cases Boven-Mark and Merkske have a plus here which means that this had a positive influence on the implementation of Nature-based Solutions. In the case of the Flemish Mark there is a N.F. which means that this was not mentioned by the respondents or documents. This may be explained through the characters of the projects, Boven-Mark and Merkske are two big projects in which there are several action points. The Mark on Flemish side has some different action points, but with a less strong overarching project. This could have the effect that it lacks sense of urgency here.

Public awareness and support

The public awareness and support has a plus at the Boven-Mark and two minuses at the Flemish side of the Mark and Merkske. This difference has two explanations. The first explanation is about the Boven-Mark being a citizen's initiative. This initiative that everyone from that area can join also means that there is a lot of support. The Flemish Mark and Merkske have a minus which means that it sometimes lacks public awareness and support. All the projects in these cases are initiated by governmental institutions and imposed to the residents.

The other explanation is about the number of farmers in the region. The Boven-Mark has 72% of nature directly around the stream while at the Flemish Mark this is almost the opposite. The biggest group at the Merkske also still are the farmers. The interviews showed that farmers do not always like to cooperate because they are the ones who need to leave. This is not in favor of the public awareness and support. Another thing is also that it seems that Belgian farmers are less aware of the effects of climate change. When their soils get wetter, they immediately see this as a problem. It can be said that they are unaware of the goals the projects like to achieve, because most of the time it is also in favor of the farmer on the longer term.

Silo mentality and risk aversion and resistance to change

Silo mentality has a zero at Boven-Mark, a N.F. at the Mark on Flemish side and a minus at the case Merkske. Risk aversion and resistance to change only differs from silo mentality at the Mark on Flemish side. Here it has a minus, which means that this factor is mentioned by the respondents. Again, this can be explained by two different influences. The Boven-Mark is a citizen's initiative which means that a lot of people of the area are involved in the project and have something to do with it. This makes that people exchange their ideas more and therefore exposed to different views. The other two cases are initiated by governmental institutions which means that people still have a say in the plan but aren't the ones who made the plans.

This has a negative effect on the silo mentality and resistance to change when the biggest group in the area are the farmers. As discussed above, the farmers aren't the most cooperative group of landowners and are quickly afraid that the measure will influence their business on a negative way. Most of them are used to the way they have been doing it for year and are not eager to change this. The farmers at the Boven-Mark only own 27% of the land and they are involved in the citizen's initiative, this makes that they may be more willing to cooperate with a plan the association has come up with.

Financial incentives

The N.F. at the Boven-Mark and Merkske means that this factor was not mentioned by the documents or the respondents. The + at the Mark on Flemish side shows not only that the projects have enough financial resources, but also that people are willing to invest in these projects. Most of the costs are already covered by the province or municipality, but the rest needs to come from entrepreneurs or owners and users of the projects.

Skilled knowledge brokers and training programs

There is a minus at the Boven-Mark and two N.F. at the Flemish Mark and Merkske. This minus can be explained by the fact that the project is owned by a citizen's association. There is a lot of knowledge of the area present, but sometimes this is not enough. For example, Natuurmonumenten and an ecologist from Wageningen University weren't completely happy with the plan. The brook was not raised which means that it is still too deep to work in favor of the whole landscape. For this kind of knowledge, some skilled people are necessary. Maybe because of this absence some important parts have been forgotten like raising the stream bed.

Where the barriers have the biggest influence, there also lie the opportunities for the implementation of Nature-based Solutions. When for example the public awareness is raised, it will have a positive effect on the implementation of Nature-based Solutions.

Design standard and guidance for maintenance

The two cases of the Mark both have a N.F. which means that they were not mentioned in the documents or by the interviewees. The Merkske has a zero which means that some standards are mentioned but do not have a negative or positive influence on the implementation. The guidance here mentioned concerns the maintenance of the brook.

Different definitions

In the two cases of the Mark on Flemish side and the Boven-Mark there is no difference in definition mentioned by the respondents. At the Merkske, there is a difference mentioned between the Dutch and the Flemish definition. This factor has a zero because it does not influence the implementation of Nature-based Solutions according to the respondents.

Chapter 5

5.1 Conclusion

The goal of this study was to investigate the factors that have an influence on the implementation of Nature-based Solutions in a cross-border area. These factors have been studied with the help of a document study, eleven interviews and observations from the three INTERREG Prowater workshops. This chapter is divided into three sections. First the answers on the main questions are presented. Second recommendations will be given for the implementation of Nature-based Solutions. The final part includes a discussion of the entire study.

The main research question: *‘Which conditions are enabling or disabling the realization of Nature-based Solutions in the Flemish-Dutch border region?’* is divided into three different sub-questions. Two of these sub-questions will be answered before we return to the main research question. The last one will be discussed after answering the main research question because this sub-question includes recommendations. The first sub-question was: *‘What are Nature-based Solutions?’*

Nature-based Solutions are solutions to sustainably adapt to the effects of climate change. ‘Letting nature do the work’ is the principle here. The general definition is: “Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions.” (European Commission, 2020).

The concept of Nature-based Solutions is part of a new discourse and is challenging the traditional engineering paradigm (Randrup et al., 2020). Ivo Demmers (Wageningen University & Research, 2018) states that engineered solutions are made for today’s situation, but that they will leave us vulnerable for changes in the future. Natural solutions like Nature-based Solutions move with such changes. This does not mean that Nature-based Solutions are by definition better than engineered solutions, a combination of these two is often the most ideal situation.

The second sub-question was: *‘Which factors influence the implementation of Nature-based Solutions?’* The most important factors are the factors with three pluses or three minuses in table 11. These factors are listed in table 12 below.

Table 12: The most important factors influencing the implementation of NbS

<i>Three pluses</i>	<i>Three minuses</i>	<i>Combination</i>
Political will and long-term commitment	Property ownership complexities	Public awareness and support
Available financial resources	Supportive policy and legal framework	
	Counter discourses	

The above-mentioned factors have an influence on the implementation of Nature-based Solutions in all three cases. The combination of 'public awareness and support' consists of a + at the Boven-Mark case and two minuses at the other two cases. When these found factors are compared to the list of Sarabi et al., (2020) there is a difference but also a similarity visible. The factor 'lack of political will and long-term commitment' is ranked third in the list by Sarabi, and it is also an important factor in the three cases of this study. The difference here is the influence on the implementation of Nature-based Solutions. Whereas the ranking of Sarabi et al., (2020) is based on barriers, this factor had a positive influence on the implementation in the three cases studied in this research.

'Lack of available financial resources' is listed tenth in the list of Sarabi, but in this study it proves to be of a bigger importance. As it is a barrier at the list by Sarabi, it is here experienced as a positive influence on the implementation of Nature-based Solutions, where it has a negative influence according to the list by Sarabi.

Another important factor is the 'property ownership complexities'. This factor is the last in the list by Sarabi but is of high importance in the cases of this study. A similarity here is that this factor had a negative influence on the implementation of Nature-based Solution in both studies.

The factor 'supportive policy and legal framework' is ranked third in the list by Sarabi. It also plays a big role in the implementation of Nature-based Solutions in the three cases of this study. The last factor with three minuses is 'counter discourses'. This factor is not part of the list by Sarabi and therefore cannot be compared to this list. This study shows that this factor has a big influence on the implementation of Nature-based Solutions in the negative way.

The last factor 'public awareness and support' has a combination of plusses and minuses but has an influence on the implementation of Nature-based Solutions in every case in this study. This factor is listed eight in the ranking of Sarabi and is part of the important factors in this study. The outcome of this study is comparable to the ranking by Sarabi et al. (2020) when it comes to this factor.

To come back to the main research question: *'Which conditions are enabling or disabling the realization of Nature-based Solutions in the Flemish-Dutch border region?'*, the list of barriers by Sarabi et al. (2020) was structured according to the different dimensions of the Policy Arrangement Approach. The PAA here was used as a method to structure the analysis of the different cases. The results were found through a document analysis, interviews and workshop observations. Upon this study, a table can be made in which three categories can be distinguished. These categories represent factors of high importance, of intermediate importance and of minor or no importance.

Table 13: Categorization level of importance

<i>High importance</i>	<i>Intermediate importance</i>	<i>Minor or no importance</i>
Political will and long-term commitment	Sense of urgency	Silo mentality
Available financial resources	Risk aversion and resistance to change	Financial incentives
Property ownership complexities		Perceived high cost
Supportive policy and legal framework		Skilled knowledge brokers and training programs
Counter discourses		Functionality and performance uncertainties
Public awareness and support		Design standards and guidance for maintenance
		Misalignment between short-term plans and long-term goals
		Space constraints
		Different definitions

The factors under the ‘high importance’ category have three influencing codes like the pluses and the minuses. The intermediate importance category represents factors with two influencing codes like two pluses or two minuses. The last category ‘minor or no importance’ has factors with one influencing code like a plus, factors with three zeros or factors with two or three N.F. The N.F mean that a factor is not mentioned by one of the interviewees, the documents or the workshops. As it is not mentioned, they did not experience this factor to have an influence on the implementation of Nature-based Solutions.

Table 13 shows that the financial part of the implementation plays a minor role compared to the list by Sarabi et al. (2020) where they were already in the lowest part of the ranking. Silo mentality, which was number one on the list of Sarabi, plays a little or no role in these cases. Two of the six ‘high importance’ factors belong to the actors-dimension of the PAA. These factors are political will and long-term commitment and public awareness and support. Two factors belong to the resources-dimension of the PAA namely, available financial resources and property ownership complexities. Supportive policy and legal framework belongs to the rules of the game-dimension. Finally, the counter discourses factor belongs to the discourse-dimension of the PAA.

As the resources-dimension includes the most factors in Figure 2, it could be assumed that this dimension would play the biggest role in the implementation of Nature-based Solutions. But this dimension plays no bigger role than other dimensions according to this study. It only has two factors of high importance, which is comparable to the actors-dimension. At the beginning it was expected that the discourse-dimension would have a negative effect on the implementation of Nature-based Solutions. This study showed that only the dominant counter-discourses had a negative effect on the implementation. The different definitions, where present, did not play a role in the implementation of Nature-based Solutions.

The last sub-question was: ‘*What are the action options for water managers to promote the implementation of Nature-based Solutions?*’ Based on the research, there are several options for water managers to promote the implementation of Nature-based Solutions.

Flanders and the Netherlands have in general the same problems, these problems concern the property ownership complexities, a supportive policy and legal framework, dominant counter discourses and a lack of public awareness and support according to table 12.

Property ownership complexities could be solved when people are made aware of the consequences and the possible benefits for them. If one knows what the benefits are when they are willing to move, or when they know the risks when they stay there, they may be more likely to cooperate. Sometimes the missing property ownership complexities arises because one is ignorant. Sharing knowledge and providing information is therefore an important step to promote the implementation of Nature-based Solutions.

To solve the problem of the lack of supportive policy and legal framework more focus should be given to Nature-based Solutions instead of the already applied civil engineered solutions. Nature-based Solutions ask for a different framework where activities can be combined on one plot. For example, a farmer assigns a part of his plot to water retention for his own benefits, but also for the benefits of its surrounding.

The civil engineered solutions are still dominant compared to Nature-based Solutions. The land is designed in a way that every part is used in its most efficient way. This is no longer possible when Nature-based Solutions will be implemented. This change needs a whole new way of thinking about the land and water usage. It starts with educating people and sharing knowledge about the benefits of it.

The lack of public awareness and support also may start with educating people. Resistance often occurs because of the ignorance of people. Another important aspect that could help the implementation of Nature-based Solutions is setting up a project team per project or implementation. This did not happen at the Markdal and we have seen how this project stands now. A joint preliminary exploration with the important involved actors and the joint development of a plan can lead to a proposal that everyone can agree with. Then it will almost no longer happen that institutions are against the plans and prevent them from implementation.

5.2 Reflection

The results of the research have been showed and the sub-questions and main research question have been answered. This section reflects on the theoretical and methodological aspects of this study.

First limitation of this research is the choice of two discourses, Nature-based Solutions and civil engineered solutions. It is assumed that these two oppose each other. Other possible discourses were left out of the research because of this assumption. This does not mean that there are any other discourses that are counteracting Nature-based Solutions. The choice of one counter-discourse made the research more specific, also looking at the time frame.

A follow-up research concerning the counter-discourses would be an addition to this research. It could be found out if the civil engineered solution is indeed counteracting Nature-based Solutions and if there are any other discourses counteracting or maybe even stimulating the implementation of Nature-based Solutions.

The theoretical aspect of this research shows a list by Sarabi et al., (2020) where 15 factors were ranked. This ranking was the basis of this research, but some factors were added. It could be possible that there are more factors influencing the implementation of Nature-based Solutions, but that they are not mentioned in this research. The focus of this ranking lied on the barriers for the implementation of Nature-based Solutions. This research also looked at the stimulating factors for the implementation of Nature-based Solutions. The list by Sarabi et al., (2020) was also used for the stimulating factors, but perhaps another list would fit these positive factors better.

Another limitation of this research concerns the interviews. The interviews in this study were semi-structured so the researcher could anticipate on the answers of the interviewee. Some general questions were asked about the process of the implementation of Nature-based Solutions and what things were counteracting this implementation. Things were discussed like the actors, the financial aspect and the rules/law. Not every factor of the conceptual model was questioned. An interviewee had to come up with a factor by its own. This means that the most obvious answers were mentioned like the available financial resources and public awareness and support. But factors like skilled knowledge brokers and training programs and design standards and guidance for maintenance are less common.

For future research a more structured way of interviewing is suggested. Some factors may have had an influence on the implementation of Nature-based Solutions, but a respondent simply has not thought about it. When all factors are questioned, you get a better overview which factors have an influence and which factors do not have an influence on the implementation of Nature-based Solutions. The N.F (not found) in the tables of the cases could be avoided then because every factor is being questioned.

Another limitation concerning the interviews is the respondent group. Choices had to be made because it was not possible to interview all people involved in the implementation of Nature-based Solutions. This resulted in a list where it has been tried to interview people from comparable organizations in each case. This resulted in the farmers' organizations not being interviewed. As this group seemed to have a lot of influence on the public awareness and property ownership complexities, it may have been useful to also interview this group. The other group of interviewees made some statements about the farmers' group, but their side of the story is not heard in this research. An additional research here would thus include interviews with the farmers so that almost every actor is heard.

The credibility of this research could be improved through an addition to the triangulation of this research. Another way to gain data is to do a survey. The factors of the conceptual model could be questioned or asked to rank them in a top 17. A survey could improve the number of respondents of this research which makes the statements made less dependent.

As this is an exploratory research, it gives an overall overview of the factors that influence the implementation of Nature-based Solutions and how the three different cases differ from each other. This study could be a starting point for additional research where you can dive deeper into the three different cases or the implementation of Nature-based Solutions in rural areas in general. This means that for each case, more respondents could be questioned to get a better view of the factors influencing the implementation of Nature-based Solutions. The found factors could be questioned again to see how different actors think about how they influence the implementation of Nature-based Solutions. Maybe some additional factors could be found more case specific.

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Appendix I: List of interviewees

Who	Date	Institution	Area
Respondent A	May 12 2021	Water authority Brabantse Delta 'Building with nature'	Boven-Mark
Respondent B	May 12 2021	Water authority Brabantse Delta	Mark Flemish side
Respondent C	May 18 2021	Water authority Brabantse Delta	Merkske
Respondent D	May 20 2021	Flemish Environmental Agency	Mark Flemish side
Respondent E	May 20 2021	Association Markdal	Boven-Mark
Respondent F	May 21 2021	Flemish Land Agency	Mark Flemish side & Merkske
Respondent G	May 26 2021	Watering	Mark Flemish side
Respondent H	June 3 2021	Staatsbosbeheer	Merkske
Respondent I	June 3 2021	Natuurpunt	Mark Flemish side & Merkske
Respondent J	June 9 2021	Province of Antwerp	Merkske
Respondent K	June 14 2021	Natuurmonumenten	Boven-Mark

Appendix II: Interview questions

General questions

Would you like to introduce yourself?

In which areas do you work?

How would you define Nature-based Solutions?

When thinking about solutions for climate problems, do we mainly talk about Nature-based Solutions or about technical solutions such as the construction of weirs?

How about the realization of Nature-based Solutions?

- Are solutions already implemented or planned?
- Is this easy or is there something complicating it?
- Which factors influence this?

Are the right people involved in the implementation of Nature-based Solutions?

- Who do you possibly miss, or are there too many people involved?
- Are there drivers/policy entrepreneurs present?
- Have there ever been conflicts between actors?
- Is power distributed in such a way that it promotes or hinders the implementation?

Is there enough support for the implementation of Nature-based Solutions?

How about finances?

- Where do they usually come from when implementing Nature-based Solutions?
- Is there enough money available?
- Does a project like Nature-based Solutions cost more than a civil engineering solution?

Is there sufficient knowledge available to solve these problems?

What about the formal and informal institutions?

- Are there laws that promote the implementation?
- Are there laws or rules that make the implementation more difficult?

Questions for people who are involved in a cross-border collaboration

Is there a difference in the definitions of Nature-based Solutions between the two countries?

What are the differences between the Netherlands and Flanders when it comes to cooperation?

Appendix III: Coding examples

Coding groups examples

- Differences Flanders-Netherlands
- Mark Property ownership complexities
- Mark Silo mentality
- Mark Risk aversion and resistance to change
- Vlaamse Mark Available financial resources
- Vlaamse Mark Counter-discourses
- Vlaamse Mark Public Awareness and support
- Merkske Supportive policy and legal framework
- Merkske Different definitions
- Merkske Counter-discourses

Coding examples

ATLAS.ti Report

Mark Risk aversion and resistance to change

2 Codes:

o Agricultural land next to the Mark

Used In Documents:

8 Transcriptie interview Marcel van Miert 20 mei.pdf

Quotations:

8:4 Bestaande meanders van voor de jaren '70 liggen nog in het Markdal en die gaan we weer aantakken, ma...

Groups:

Actors Mark, Mark Property ownership complexities, Mark Risk aversion and resistance to change, Mark Silo mentality

o Almost no arguments with residents

Used In Documents:

8 Transcriptie interview Marcel van Miert 20 mei.pdf

Quotations:

8:22 Wij hebben, op een paar mensen na, geen discussie met bewoners of eigenaren. Behalve twee of drie me...

Groups:

Actors Mark, Mark Public awareness and support, Mark Risk aversion and resistance to change