

# BSc Thesis

## The Implementation of Climate Adaptation Policies in Municipalities

*A review on how local governments implement national climate change adaptation policies in the region of Nijmegen (NL)*



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Juli 2017



## Front page images

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## Preface

There it is. My last work as a Bachelor student. When I started in September 2014 the Bachelor Landscape Architecture & Spatial Planning I didn't expect the time would fly that fast. After the first couple of months I was sure: I could not make a better study choice. The perfect combination of theory translated to the practical physical landscape made me enthusiastic. Especially the field of Spatial Planning started to interest me more and more and this interest is still growing. After a lot of excursions, lectures, fieldwork, half a year of Erasmus at the Technical University Munich, and new friends is the field of Spatial Planning still interesting me. Still there is a lot to learn, but the nicest part of this study is that the learning process is never finished. Always new challenges emerge and the landscape with the context wherein it lies never stands still.

So also the topic of climate change: a relative new topic with an uncertain future. I really found out during writing this thesis that the amount of literature and studies about climate change is enormous. So many different aspects of climate change can be researched, which made it sometimes hard to frame the thesis to do a manageable study in eight weeks. I also found out another thing. A badly written report or policy document concerning climate change is comparable with an iPhone or a Samsung: when a new version comes out, it's actually already dated after a couple of months. The future of climate change is so uncertain and complex that when a new report is published you have to re-write it six months later. There I see the challenge: how can we, as Spatial Planners, contribute to the extent of flexibility and sustainability of policies and designs, so, that they remain climate-proof in the uncertain future? That challenge makes for me the topic of climate change interesting. As Spatial Planners we have to ensure the sustainability of the landscape within the uncertainty ranges of climate change. That is why climate change adaptation is needed and why I want to contribute to this research topic.

But, I could not do this research on my own. Therefore I want to thank some people. Firstly, I want to thank my supervisor **David Ismangil** and examiner **Gerrit-Jan Carsjens**. David, thank you for your help when I was struggling with framing my research or formulating my research questions. The feedback moments were very helpful and had a very positive effect on the end-result. Thereby I am happy that I followed your advice to write this BSc Thesis in English. I learned a lot by doing so, and English writing is a very important skill for my master study next year. Gerrit-Jan, thank you for reading and rating my BSc Thesis. In my opinion it is very important that somebody, who did not follow the whole process, gives a less biased rating. This is very valuable. Secondly, I want to thank the three experts I interviewed from the **municipality of Nijmegen**, the **municipality of Wijchen**, and **Waterboard Rivierenland**. Without you all this study was impossible. Thank you all for the interesting and helpful conversations. I hope I paid your effort back by giving some new insights by connecting your experiences to a theoretical framework. Thirdly, I want to thank my colleagues **Stan Los** and **Emma Smits** who were also writing their BSc Thesis about the topic of climate change. Thank you both for the regular feedback moments and the exchange of thoughts. Last but not least I want to thank **my parents** for their never fading support and cheering me up when I was struggling. Not only during this thesis, but during my whole Bachelor!

I hope you enjoy reading this BSc Thesis.

Kay van Hulst  
Wageningen, 2017

## Abstract

Climate change does not consider administrative borders. Only climate change adaptation measures on a national scale are not enough. During the last decade the shift is made towards a rising importance for local climate change adaptation. Local governments need to act to fulfill the need of sufficient adaptation measures. This BSc Thesis reviews if the Dutch national policies and strategies reach the local governments and if the governments know how to deal with them. The term mainstreaming is introduced in the main research question: *How are national climate change adaptation policies mainstreamed in local governments?* To review the vertical mainstreaming path from national to a local scale, two perspectives are introduced namely The Learning Cycle and possible emerging barriers. These two perspectives are applied on two cases, namely the municipalities of Wijchen and Nijmegen. While reviewing the vertical mainstreaming process is found out that both municipalities face the problem of too high abstractness on a national scale. This evokes for both municipalities a lot of barriers in the mainstreaming process. Especially the relatively smaller municipality of Wijchen faces a lot of problems with implementing climate change adaptation. The bigger municipality of Nijmegen can better deal with the national abstractness, because of more resources and capabilities. Nevertheless, Nijmegen also faces problems to implement climate change adaptation. To tackle this problem, and to help Wijchen and the even smaller municipalities in the region, a regional collaboration is set-up by Waterboard Rivierenland. Time will tell if this regional collaboration is the forerunner of a new shift: from climate change adaptation perceived as a local concern towards climate change adaptation perceived as a regional concern.

Keywords:

*Climate change adaptation - Mainstreaming - The Learning Cycle - Barriers - Local governments - The Netherlands.*

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# 1 Introduction

## 1.1 Project Framework

Climate change does not consider administrative borders. As the consequences of human activities on the climate become more visible, it is of common interest to take adaptation measures. The common good and overall responsibility of society across scales to adapt to climate change evokes a dilemma which is described by a lot of literature: who has to take responsibility? (e.g. Adger et al. 2005; Granberg & Elander 2007; Lundqvist 2016; Nilsson et al. 2012).

National governments can play a key role in the governance of adaptation to climate change (IPCC 2014; Measham et al. 2011). On a national scale a lot of instruments are available which can help to facilitate climate change adaptation. Examples are the provision of information, the creation of policy- and legal frameworks, actions to protect vulnerable groups, and the possibility to financially support other levels of governments (IPCC 2014, chap.15; Biesbroek et al. 2013).

Despite that on national level a lot of instruments are available, adaptation to climate change is increasingly perceived as a local concern (Nilsson et al. 2012; Measham et al. 2011). Only adaptation measures on a national level are namely not enough (Granberg & Elander 2007; Adger et al. 2005; Lundqvist 2016). Adaptation measures are made up of actions throughout different scales of society (Adger et al. 2005). Thereby governance has become a more important subject, which involves more actors than only the national state actor (Juhola & Westerhoff 2011). As a consequence other actors and local governments have to deal with knowledge and politics from an (inter)national scale (Nilsson et al. 2012). A problem arises: adaptation instruments are presented on the national scale, while adaptation is perceived as a local concern.

The sketched problem puts more pressure on the coordinating key role and available instruments of the national government. Lack of policy guidance, limited coordination between levels, and lack of available governmental resources are all examples of how national governments could cause adaptation constrains at all administrative levels (Biesbroek et al. 2013). The possible consequences on a local scale manifest itself in barriers as different mutual interests, lack of economic resources, and lack of available knowledge, with possibly lack of policy implementation at the local level as a result (Juhola & Westerhoff 2011).

The possible consequence of impossible or non-sufficient implementation of high scale policies on local scales stresses the social importance of more research to this topic. All societal and governmental layers have to deal with the topic of climate change and that needs coordination (Adger et al. 2005; Granberg & Elander 2007). Next to this social importance the research on this topic also has scientific relevance. The topic of climate change is relatively new in local governments and also at national scale new policies are still developed, as for example the Dutch National Climate Adaptation Strategy 2016 (Ministry of Infrastructure and the Environment 2016) and Delta Programme 2018 (Deltacommissaris n.d.). Such national strategies and policies need monitoring how they find their way through lower scales. Progress reports are needed, which can result in adjustments, revisions or updates (Ministry of Infrastructure and the Environment 2016). It is important to constantly gain insight into the perceptions actors have regarding adaptation and if these perceptions stimulate the performance of climate change policies (Uittenbroek et al. 2013). An increased understanding in possible barriers within the context nowadays is needed, because it may lead to new strategies for implementing climate change adaptation and can form new policy documents as the Delta Plan Spatial Adaptation 2018 (Uittenbroek et al. 2013; Ministry of Infrastructure and the Environment 2016).



## 1.2 Goals and Research Questions

To get more insight in how the sketched problem manifests itself in the Netherlands, the national-local adaptation policy path is analyzed. This thesis describes the current situation how national adaptation policies and strategies reach the local governments and how the local scale deals with them. Climate change is affecting a wide range of different fields (e.g. biodiversity, heat waves, extreme weather events). This BSc Thesis does not focus on measures taken in one specific policy field, but more on the process of bringing climate change adaptation into the city hall. The focus is on the process of converting agenda into action at local scale. In this process barriers that emerge at local scale play an important role.

The goal of this BSc Thesis is to get an in-depth understanding of the national-local climate change adaptation policy path. Therefore two case studies are done, namely the municipality of Nijmegen and the municipality of Wijchen. In this BSc Thesis is described how these two municipalities implement and react to new climate change adaptation policies and strategies. Therefore the vertical path of national climate change adaptation policies to the local governments in these two municipalities is followed. Thereby the goal is to find out which barriers emerge and if these could be overcome. For describing the path from agenda to action, the term ‘mainstreaming’ will be introduced. The main research question is:

*How are national climate change adaptation policies mainstreamed in local governments?*

To measure the degree of mainstreaming climate change adaptation policies and strategies at local governments two theory topics are introduced, namely The Learning Cycle and barriers. These two perspectives form the sub-questions and help to answer the main research question. The three sub-questions are:

- SQ 1: What national scale climate change adaptation policies are currently available in the Netherlands?
- SQ 2: How are national scale adaptation policies implemented in the municipality of Wijchen and the municipality of Nijmegen following The Learning Cycle?
- SQ 3: Which barriers do the municipality of Wijchen and the municipality of Nijmegen face and what is the origin of the barriers?

## 1.3 Reading Guide

This chapter, where the topic is introduced and sub- and main research questions are given, is followed by chapter 2 Theoretical Framework. This Theoretical Framework offers descriptions and explanations of the term ‘mainstreaming’, The Learning Cycle concept, and barriers. The third chapter describes the research design and used methods among which the literature study, the in-depth interviews, and the case studies. Chapter 4 describes the development of the Dutch national scale policies and how they deal with local climate change adaptation (SQ 1). Chapter 5 focusses on the two cases of Nijmegen and Wijchen and answers SQ 2 and SQ 3 per case. In this chapter also a comparison is made between the two different cases. Chapter 6 describes the shift to a more regional approach and sketches a new Learning Cycle for the regional collaboration. After the results the discussion and conclusion follow. At last the reference list is given and the annexes.

## 2 Theoretical Framework

In this chapter the Theoretical Framework is described. The Theoretical Framework starts with describing the main term of this report, namely 'mainstreaming'. After this, the term 'mainstreaming' is operationalized by two concepts: The Learning Cycle and barriers. These two concepts are used to review the mainstreaming of climate change adaptation in local governments.

### 2.1 Mainstreaming and Climate Change Adaptation

To review the implementation of climate change adaptation policies on lower scales the term 'mainstreaming' is introduced. Mainstreaming in the context of climate change means that the potential consequences of climate change systematically are taken into consideration in planning and decision-making processes (Crabbé 2011, p.40). Actors estimate and consider if the consequences of climate change have influence on their policy field and if necessary adaptation measures have to be taken (Uittenbroek et al. 2013). The goal of mainstreaming climate change adaptation is to *"ensure the long-term sustainability of investments and reduces the sensitivity of development activities to today's and future climate."* (Uittenbroek et al. 2013, p.400).

Because of geographical and administrative local differences and because adaptation is perceived increasingly as a local concern, mainstreaming has to take place at the local level (Rauken et al. 2015; Nilsson et al. 2012; Measham et al. 2011). Mainstreaming stimulates the effectiveness of policy-making because it combines objectives, increases the efficient use of human and financial resources and ensures long-term sustainable investments (Uittenbroek et al. 2013; Ahmad 2009). Thereby it reduces the sensitivity of measures with a view to uncertain future climate conditions (Ahmad 2009).

Mainstreaming has both vertical and horizontal components (Rauken et al. 2015). The difference is that the vertical component focusses on how delegations from higher governments find its way to local scales (Figure 1). Certain responsibilities in the context of climate change adaptation can be delegated from a higher level of government to lower scales (Rauken et al. 2015). Horizontal mainstreaming is about cooperation and coordination across sectors (Rauken et al. 2015). In my opinion the vertical component is first needed to reach the horizontal component at a local scale. Without good vertical mainstreaming across scales the national adaptation policies and strategies do not reach the local scale. Because of this horizontal mainstreaming at local scale would be difficult without vertical mainstreaming across scales. Therefore this report focusses more on the vertical component and discusses horizontal mainstreaming only superficially. This means that in this report the *process* of implementing climate change adaptation at lower scales is more important than specific *results* or *measures* taken in different policy fields.

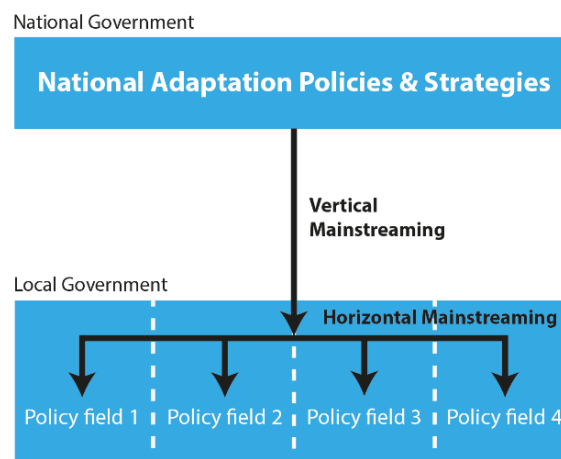


Figure 1 Vertical and Horizontal Mainstreaming

To review if and to what extent mainstreaming is reached on a local scale two theories are introduced (Figure 2). These two perspectives to review mainstreaming complement each other. The first perspective is the concept of the 'The Learning Cycle'. This organization-centered concept offers a framework for analyzing how organizations adapt to the direct and indirect impacts of climate change (Berkhout et al. 2006). Next to The Learning Cycle a framework to analyze barriers is introduced as second perspective. By identifying barriers and examining the nature of barriers it becomes clear where there is place for improvement.

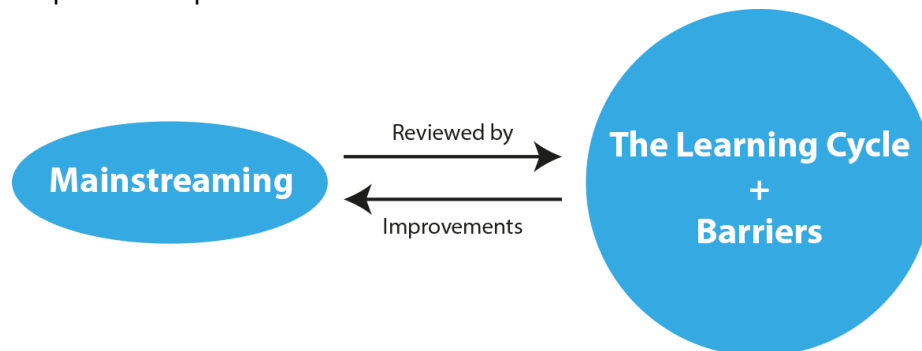


Figure 2 Theoretical Framework Overview

## 2.2 The Learning Cycle

When a new problem arises on the (inter)national policy agenda, policy makers at different scales have to estimate what these problems mean for their policy field (Crabbé 2011). Policy makers have to take responsibility and to find out how they, within the context of their policy field, could convert agenda points into action. To review if the vertical mainstreaming reached the local governments and how they deal with the delegated tasks 'The Learning Cycle' concept from Berkhout et al. (2006) is introduced. Also other studies, as for example Nilsson et al (2012), use this cycle to examine how climate change adaptation finds its way through different scales. The concept focusses on the organizational routines (e.g. rules, procedures, and strategies). Routines are *"stable patterns of behavior that characterize organizational reactions to variegated, internal or external stimuli."* (Zollo & G. Winter 2002, p.340). The Learning Cycle helps by reviewing if the contemporary organizational routines at local scale are sufficient to mainstream climate change adaptation policies. Berkhout et al. (2006) describes the five steps where the cycle consists of (figure 3):

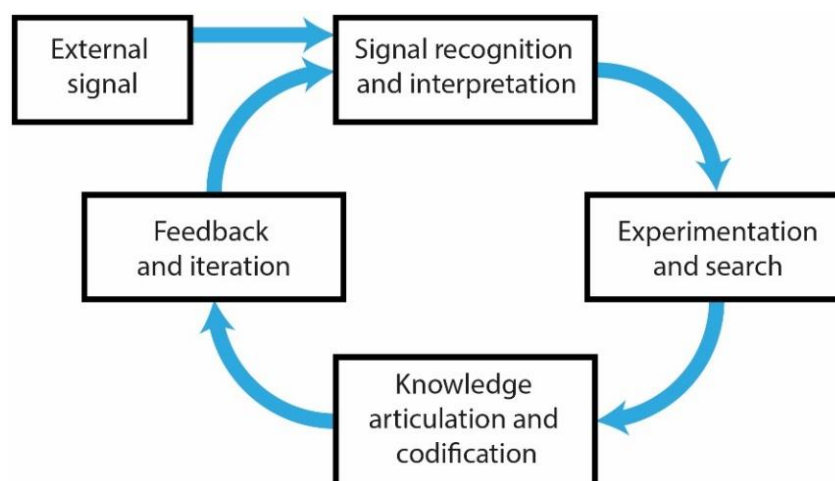


Figure 3 Scheme of The Learning Cycle (Berkhout et al. 2006)

### **1. External signal**

The cycle starts with an 'external signal'. On a local scale this could be a national policy document or certain (inter)national legislation. Next to this a more physical signal can evoke action, for example nuisance on a street level or an environmental disaster as a flood.

External signals could be mentioned in policy documents, for example the reason why a certain policy document is written. Furthermore, external signals can be mentioned by experts. The external signal can be the reason why the municipality started to mainstream climate change adaptation.

### **2. Signal recognition and interpretation**

The second step contains the 'signal recognition and interpretation'. This means that the actor has to recognize the external signal and that the actor has to interpret the signal as significant to take action. The signal needs to be recognized as evidence for a novel situation, wherein existing routines are inappropriate or insufficient to deal with this situation. There has to be enhanced recognition of the need for fundamental changes in existing routines. Reasons why this step could be weak are scarcity of evidence, blindness to evidence, and uncertainty in assessing the relevance of evidence.

### **3. Experimentation and search**

The third step 'experimentation and search' is a creative process. This involves internal and external scanning for possible relevant knowledge and experiences that can be used in an effort to generate a variety of adaptation options. Possible experimentations can be trail-and-error experiments or research to a specific topic.

### **4. Knowledge articulation and codification**

Fourthly, the relevant adaptation options are selected and filtered during the step 'knowledge articulation and codification'. In the organization internal selection takes place about which adaptation options and actions seem appropriate, suitable, and legitimate for the organization. This means that an evaluation process through discussion, and internal or external assessments is needed.

Knowledge articulation focusses on the level of understanding of causal links between actions required to execute a certain task and the performance of outcomes produced. The question is which actions really are necessary and needed to reach the goal. Articulation efforts, as for example sharing individual experiences or comparing opinions, can improve the understanding of new and changing action-performance links. When employees or members of an organization become more aware of the consequences their actions have, this can improve the organizational competence. (Zollo & G. Winter 2002)

Knowledge codification is about codifying results in decision-support tools, blueprints, manuals, targets, software and so on. These tools aim at uncovering linkages between action and performance outcomes or intent to provide guidelines for the execution of future tasks. Hence, adequate knowledge articulation is a prerequisite for good knowledge codification. Codification supports transmission of existing routines. It gives insight in which transmissions in adapted or new routines have to take place. Thereby it can also help by identifying strengths and weaknesses in proposed changes of current routines. (Zollo & G. Winter 2002)

### **5. Feedback and iteration**

The fifth and last phase consists of 'feedback and iteration'. In this phase it is checked if the relevant adaptation options are implemented in the right way and if The Learning Cycle has to start again because of new external signals. Feedback and iteration checks if the changes in routines are an effective way of responding to the experienced situations. This phase closes The Learning Cycle and also starts a new one.

The advantage of The Learning Cycle is that it can be applied on different scales, because it reviews institutions. Institutions are defined *“constellations of rules, decision-making procedures, and programs that define social practices, assign roles to the participants in such practices, and govern the interactions among the occupants of those roles.”* (Young 1998, p.5). This means that The Learning Cycle can review internal organizational decision making processes, as well the decision making process within a collaboration between different organizations.

The cycle is applied on the municipality of Nijmegen and Wijchen to review how the two municipalities implement national climate change adaptation policies and strategies. The Learning Cycle is used to compare the two different cases. The concept helps to find out if local governments have the capability to adapt to changes in high scale policies and how local governments react on new tasks imposed by national policies. Furthermore, The Learning Cycle identifies where in the organizational implementation process is place for improvement. To examine possible barriers that hinder the implementation process of climate change adaptation policies, the next section introduces theories about barriers to implement climate change adaptation. Also a framework is introduced, which shows the origin of the barriers.

### 2.3 Barriers to Climate Change Adaptation

Whether high scale adaptation policies find their way to local governments highly depends on possible barriers and limitations. The literature about barriers and limitations is numerous (Adger et al. 2009; Biesbroek et al. 2014; Biesbroek et al. 2013; Lehmann et al. 2015; Uittenbroek et al. 2013). Limitations and barriers can both be obstacles to implement climate change adaptation policies on lower scales, but they differ fundamentally.

Limits are *“obstacles that tend to be absolute in a real sense: they constitute thresholds beyond which existing activities, land uses, ecosystems, species, sustenance, or system states cannot be maintained, not even in a modified fashion.”* (Moser et al. 2010, p.22026). The influence on limits is restricted. They are common for ecological and physical systems in their natural state.

On the other hand barriers are *“obstacles that can be overcome with concerted effort, creative management, change of thinking, prioritization, and related shifts in resources, land uses, institutions, etc.”* (Moser et al. 2010, p.22027). This means barriers can be erased or their influence can be reduced. Barriers delay the implementation of adaptation measures or even exclude the issue from the policy process, but they can be overcome (Uittenbroek et al. 2013). Learning from earlier mistakes and enough effort can help to erase the barriers and therefore stimulate mainstreaming.

Because the possible influence on limits is very restricted the focus in this report will be on barriers. Moser et al. (2010) mentions several possible barriers in the phases of understanding the problem, planning, and managing. Examples of possible barriers are listed in the tables in Annex A Barriers. This Annex A forms the basis to identify the barriers emerging at the municipalities. The first phase of ‘understanding’ the problem consists of the steps ‘problem detection’, ‘gather/use info’ and ‘(re)define problem’. Barriers in this ‘understanding’ phase are mostly social, cognitive and institutional in nature. The second phase, called ‘planning’, consists of the steps ‘develop options’, ‘assess options’ and ‘select options’. The barriers that emerge here are mainly financial, technological and institutional. The last phase of ‘managing’ consists of the steps ‘implement options’, ‘monitor option and environment’ and ‘evaluation’. Barriers that arise here are mostly financial and organizational/institutional (Uittenbroek et al. 2013; Moser et al. 2010).

After identifying the barriers, the next question emerges: where do these barriers have their origin and can the barriers be overcome? Therefore a matrix is offered in figure 4. In this matrix barriers can be placed to determine the origin of the barriers and therewith how easy they can be overcome.

		Temporal	
		Contemporary	Legacy
Spatial/Jurisdictional	Proximate	A	C
	Remote	B	D

Figure 4 Opportunities for influence and intervention to overcome barriers (Moser et al. 2010)

A barrier that is caused by for example national legislation in the past can be seen as a remote-legacy barrier (D in figure 4). Such a barrier is not easy to overcome by local governments because they don't have the possibilities to directly address it at its source. On the other hand, a barrier that is contemporary and proximate (A in figure 4) can be directly influenced by the responsible at local governments. Proximate-legacy barriers (C in figure 4) mainly consists of local agreements, laws, or regulations from the past which hinder the implementation of adaptation nowadays. Despite changing such agreements, laws, or regulations can be challenging, local governments can have direct influence on them. Remote-contemporary barriers occur now, but are beyond the local governments possibilities of direct control (B in figure 4). An example is a budget crisis that changes the possibilities or urgency of a co-actor which is needed for implementing climate change adaptation policies.

By filling in this matrix with barriers that are faced by municipalities an overview is given which barriers can be overcome with relatively little effort or which barriers need more attention to erase them.

## 3 Research Methods

### 3.1 Research Design

This BSc thesis has followed a qualitative study approach. This approach was more suitable for the describing and empirical nature of the research questions and theoretical framework. To answer the sub-questions, and finally the main question, three main methods are used: literature study, case study, and in-depth interviews. Sub-question one focusses on the existing national climate change adaptation policies. Sub-question two (SQ 2) reviews how these climate change adaptation policies are mainstreamed in local governments by means of The Learning Cycle. Sub-question three (SQ 3) focusses on the emerging barriers. The Research Design is shown in figure 5.

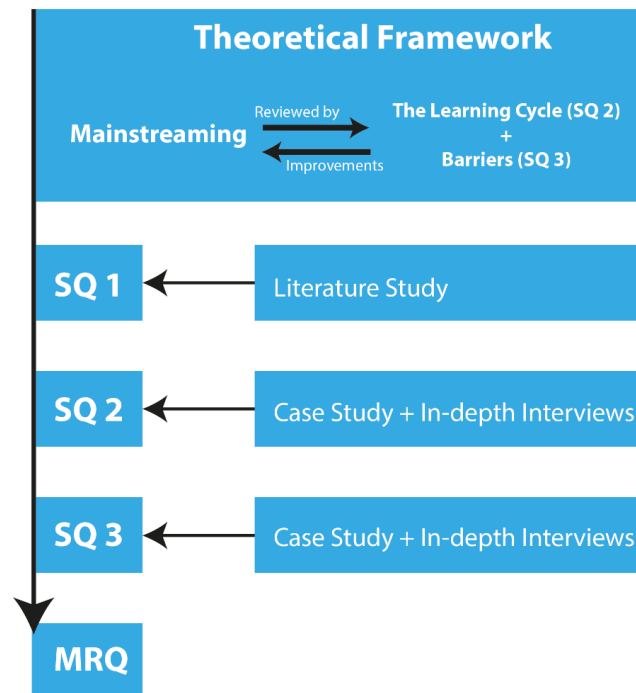


Figure 5 Research Design

### 3.2 Research Methods

#### 3.2.1 Literature Study

The literature study provided background knowledge and provided the theoretical foundation of this thesis. Important scientific literature which mostly formed the Theoretical Framework were Uittenbroek et al. (2013), Berkhout et al. (2006) and Moser et al. (2010). Important search terms for scientific literature were 'climate change adaptation', 'local adaptation', 'mainstreaming', 'local scale', 'barriers to adaptation', and 'adaptation policy'.

Next to the theoretical foundation, the literature study helped me to find answers on my sub-questions and in special sub-question 1 in Chapter 4. Firstly, scientific literature helped me to examine the genesis of the importance of local climate adaptation. Secondly, Dutch national strategy plans as the National Adaptation Strategy and the Delta Programmes helped me to examine the contemporary national adaptation policies.

As last the literature study helped with preparing the in-depth interviews. Literature that was helpful hereby were documents on the site of the Delta programme (Deltacommissaris n.d.), Kennisportaal Ruimtelijke Adaptatie (Climate Adaptation Services n.d.), and the European Climate Adaptation Platform (European Commission & European Environment Agency 2017). The municipalities did not publish a lot of literature regarding climate change adaptation yet.

### 3.2.2 Case Study

The two case studies in the municipality of Wijchen and Nijmegen answer sub-question two and three. The goal of the case studies is to find out how municipalities mainstream national scale climate change adaptation policies. As it is impossible to give a detailed overview of how all municipalities in the Netherlands implement climate change adaptation, it was decided that the study would be a case study. This added some focus to the BSc Thesis and framed my research more. Furthermore the case study approach is chosen to obtain an in-depth understanding of the implementation of climate change adaptation at lower scales. To gain insight in differences between municipalities of different sizes and dealing with different challenges the two municipalities of Nijmegen and Wijchen were chosen. These cases were chosen because they can be compared nicely: two municipalities of different sizes with Nijmegen in an urban context and Wijchen in a more rural context. This leads to an in-depth understanding of two municipalities of different sizes and with different climate adaptation challenges.

Next to this I found out while I was carrying out this research that both municipalities are together involved in a new regional collaboration since 2016. In this regional collaboration seven municipalities, Province Gelderland and Waterboard Rivierenland aim at a regional approach to implement climate change adaptation. Therefore this thesis also gives insight of which barriers exist and which can be overcome by collaborating. The barriers that are present nowadays and how they can be overcome by working together, can be taken into consideration when forming a Regional Adaptation Strategy.

To get insight in how these two municipalities implement climate change adaptation, policy documents and scientific literature were read and additional in-depth interviews are done with responsible experts from both municipalities and Waterboard Rivierenland. To answer the sub-questions the cases are combined with the Theoretical Framework as can be seen in the Case Study Design of figure 6.

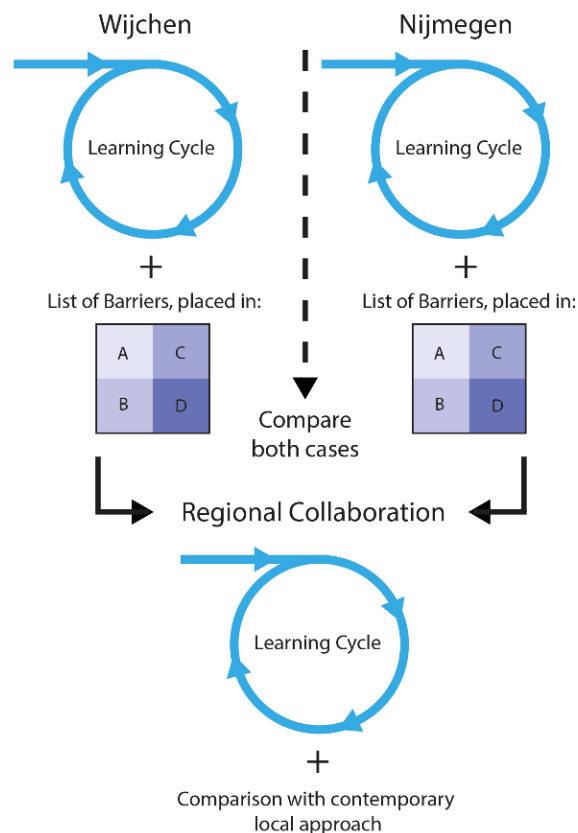


Figure 6 Case Study Design



### 3.2.3 In-depth Interviews

Because climate change adaptation is a relatively new topic for local governments not a lot of literature is published yet by the municipalities. Additional sources were needed. To fulfill this need for more data three in-depth face-to-face interviews were done. With these interviews empirical information is obtained which can be related to the Theoretical Framework. The interviews were semi-structured: a couple of open questions were prepared. These prepared open questions aimed to obtain information which was needed in the context of the theoretical framework. Sometimes new questions came up during the interview, which I added during writing-out the interview at a later moment. The interviews are done in Dutch and recorded with permission of the interviewees. This made it possible to translate the interviews later to English. All interviews took around an hour. When an expert needed explanation for a certain concept or term this was given. After working out the interviews all experts checked the interviews and gave permission to use them.

Two of the three in-depth interviews are done with experts from the municipality of Nijmegen and Wijchen. From the municipality of Nijmegen the interview is done with an expert who works at the department spatial planning and who is responsible for the topics water and climate adaptation. The other interview is done with an expert who works as environmental policy adviser at the municipality of Wijchen. Next to their work within the municipalities, both are involved in the regional collaboration leaded by Waterboard Rivierenland. The goal of the interviews with the two municipal experts was to collect more information about what is currently done regarding climate change adaptation within both municipalities. The interview topics were based on the five steps of The Learning Cycle and on the theory about barriers. Thereby questions were asked about what they expect from the regional collaboration and what they hope to achieve.

To get more insight in the regional collaboration a third interview is done with an expert who works at Waterboard Rivierenland. The expert is responsible for the regional cooperation between municipalities around Nijmegen and in 'Het Land van Maas en Waal'. The goal of the interview was to get insight in the goals and implementation process of the regional collaboration. Thereby an interesting discussion was if climate adaptation on local scale is possible or if it needs a more regional approach.

### 3.2.4 Case Study Area

As said, the two cases consist of the municipality of Nijmegen and the municipality of Wijchen. Climate change adaptation is, especially in the field of water management, a big topic in the region wherein the municipalities are located (figure 7). The maximum distance between the rivers Maas and Waal is around 17 kilometers in the east. In the west the rivers Maas and Waal almost touch each other with a distance of 1.5 kilometers. The region has a big history regarding water management, with as main incident the evacuation of 250.000 people in 1995 (NOS 1995). To prevent such disasters in the future still new measures are developed regarding water management as for example *Room for the River* (Ruimte voor de Rivier 2007).

The municipality and city of Nijmegen has around 175.000 inhabitants and is located at the riverbank of the Waal. The city of Nijmegen expanded fast during the last decades and the municipality borders were reached in the south. Because the city continued to expand, Nijmegen had to make the 'Waal Jump' to the other side of the river. Thereby the river Waal is part of the 'Room for the River' policy which means that the dikes were placed landward. This dike movement made it possible to dig a new channel which gave the river even more space. Because Nijmegen jumped over the Waal, the river is nowadays actually floating through the city.

The smaller municipality of Wijchen counts 40.000 inhabitants, diffused over the villages of Wijchen, Alverna, Batenburg, Niftrik, Balgoij, Bergharen, and Hernen. The municipality of Wijchen is located in a more rural context than the municipality of Nijmegen and therefore faces different challenges. Already in 2012 a ‘climate atelier’ took place in the municipality of Wijchen organized by the Province Gelderland (Stein et al. 2012). Such climate ateliers consist of workshops where different actors and interested people are brought together to talk about how to fulfill climate adaptation in the municipality. Also in the budget estimations of the last years climate adaptation is mentioned, especially in the field of water management (Gemeente Wijchen 2016).

During my research I found out that both municipalities are involved in a collaboration with seven municipalities, Province Gelderland and Waterboard Rivierenland since June 2016 (Kennisportaal Ruimtelijke Adaptatie n.d.). This collaboration started since the signing of the Delta Agreement Spatial Adaptation in 2015, which called for an additional Delta Plan Spatial Adaptation in 2018. This collaboration formed a very important trigger for the municipalities in the region of figure 7 to start implementing climate change adaptation in their policies and action. The waterboard and other participants are still developing results and searching for a precise filling-in of the collaboration. Two main tracks form the basis of the collaboration, namely one track that focusses on developing a Regional Adaptation Strategy (RAS) and one track that focusses on the exchange of experiences and information.



Figure 7 Collaboration area, which consists of seven municipalities (Edited from: Google Maps 2017)

## 4 Dutch National Adaptation Policies

In this chapter the first sub-question is answered: What national scale climate change adaptation policies are currently available in the Netherlands?

Before this sub-question is answered the genesis of climate change policies is described in section 4.1. This is done to examine since when, and how long, local climate change adaptation is important. Did municipalities already have enough time to respond to the rising importance of local climate change adaptation, or is this topic really something of the last years? Section 4.1 therefore forms the context of the upcoming results. After this, section 4.2 describes if the global shift of a rising importance of local climate change adaptation also took place in the Netherlands.

### 4.1 Genesis and Development of Climate Change Policies

The United Nations Conference on Environment and Development (UNCED) in 1992 is the beginning point of international collaboration to mitigate anthropogenic climate change. During this conference the United Nations Framework Convention on Climate Change (UNFCCC) got signed, which can be seen as the leading international treaty to negotiate stabilization of greenhouse gas concentrations in the Earth's atmosphere (Heidrich et al. 2016). The framework led to legally binding greenhouse gas reduction targets, as for example in the Kyoto Protocol (Heidrich et al. 2016). Early international goals in such protocols focused in particular on mitigation. Experts doubted if explicit adaptation policies were really needed and if they were needed, then how much, and when? (Khan & Roberts 2013) Mitigation was the main goal, adaptation would only distract from that goal.

Over the years, it became clearer that the goals of the legally binding mitigation agreements could only be fulfilled partly and that the measures taken were not sufficient to stop the consequences of climate change (Conti et al. 2012; Khan & Roberts 2013; Füssel 2007). The withdrawal in 2001 of the Kyoto Protocol by the United States, which was the biggest emitter at that moment, casted a further negative shadow over the effectiveness of mitigation measures (Khan & Roberts 2013). Because of the failure of the world to agree on a sufficient measures to bring down anthropogenic greenhouse gas emissions, the attention for adaptation to climate change has risen rapidly (Measham et al. 2011; Khan & Roberts 2013; Füssel 2007). Just after the turn of the century this shift took place in Europe (Biesbroek et al. 2010).

Next to this shift to more attention for adaptation, another shift took place. Despite numerous conferences on an international scale, adaptation to climate change was, and still is, increasingly perceived as a local concern (Nilsson et al. 2012; Measham et al. 2011). Researchers gain insight that only adaptation measures on a national level are not enough (Granberg & Elander 2007; Adger et al. 2005; Lundqvist 2016). Adaptation measures are namely made up of actions throughout different scales of society and they have to find their way from higher scales to lower scales to get converted from agenda to action (Adger et al. 2005). Nowadays, this path does not always go fluently and does not always have the desirable result, for example because of lack of (inter)national guidance (Heidrich et al. 2016). Mitigation on lower scales seems to be more advanced than adaptation (Heidrich et al. 2016). Tang et al. (2010) shows these problems regarding local adaptation policies by examining 40 local climate change action plans in the US. The results of the study show that the local climate plans have a high level of awareness, moderate analysis capabilities for climate change, and relatively limited action approaches. Also Zimmerman & Faris (2011) stress the need for increased attention to adaptation at a local level by studying the availability of practices in mitigation and adaptation in North American cities.

Not only on other continents this national-local implementation pathway looks fragile. The problem emerges in Europe as well. Where over the years, since around 2005, a lot of studies focused on climate change adaptation at local scale (e.g. Adger et al. 2005; Urwin & Jordan 2008; Granberg & Elander 2007; Nilsson et al. 2012; Lundqvist 2016), still not all municipalities do take climate change adaptation into consideration. A study last year from Heidrich et al. (2016) investigated 200 cities spread over Europe and found out that only 56 cities have an adaptation strategy or plan. Specifically, in the Netherlands the adaptation topic is hardly practiced by municipalities. Only the city of Rotterdam has an explicit and detailed climate change adaptation plan (Heidrich et al. 2016). Nevertheless, this does not mean that other municipalities in the Netherlands do not pay attention to the topic of climate change adaptation. Despite it is good to pay explicitly attention to raise awareness, climate change adaptation cannot be reached by an isolated approach (Biesbroek et al. 2010). The topic has to be vertically and horizontally mainstreamed as told in the theoretical framework, which means that it has to be an integral part of all relevant policies (Biesbroek et al. 2010). We will see if this is encouraged by the Dutch national government in section 4.2.

Now the origin of - and challenges for - local climate change adaptation are clear, we have a more specific look at documents present on a Dutch national scale. Do they also embed the shift to a local climate change adaptation approach or does it mainly consist of national agenda points?

#### 4.2 National Climate Change Adaptation Policies

To guide and encourage climate change adaptation and mitigation several policies are developed by the Dutch government. Most of them find their basis in the National Adaptation Strategy 2007 “Make Space for Climate” (Ministeries & Unie van Waterschappen 2007), which sets out a general framework to tackle the effect of climate change (European Commission & European Environment Agency 2017). In the goal of this National Adaptation Strategy 2007 (hereafter: NAS 2007) the term ‘mainstreaming’ is already mentioned. If this goal is reached we will see in the case studies:

*“The aim is to make adjustments to climate change an integral part (“mainstream”) of policies in 2015.”* (Ministeries & Unie van Waterschappen 2007, p.3)

Another important point is that the NAS 2007 connects climate change effects with spatial planning. This can be seen as a strong and unique aspect. The field of spatial planning is generally regarded to be capable to reduce vulnerability and to develop measures and policies regarding climate change adaptation and mitigation (Greiving & Fleischhauer 2012). In a study from Greiving & Fleischhauer (2012) NASs from nine European countries are compared and the Netherlands came out as the only country which makes the connection between spatial planning and climate change. Therewith the Netherlands can be seen as a forerunner. The Dutch NAS 2007 describes the particular role of planning and also asks for implementing adaptation and mitigation measures in planning law and practice. Also specifically in the river area (Dutch: rivierengebied), where our case study area is located, measures are proposed and even visualized (figure 8). Nevertheless, the NAS 2007 does not offer a specific description how climate change adaptation find its way to lower scales. It just offers a framework for new policies and strategies and sums-up future challenges.

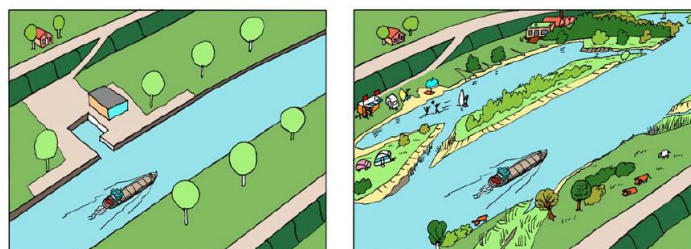


Figure 8 Not good (left) versus good (right) climate-proof river area (Ministeries & Unie van Waterschappen 2007)

From the orienting and challenge-describing framework of NAS 2007 new policies got developed in different policy fields and with different purposes (table 1). Documents which focus on impacts, vulnerability and adaptation assessments and monitoring will be needed constantly in the uncertain future of climate change. These form the basis of new national scale policies and decision-making processes. One policy field that is highly concerned with climate change adaptation in the Netherlands is the field of water management (Greiving & Fleischhauer 2012). Since the first Delta Programme in 2011 every year a new Delta Programma is published wherein climate change adaptation plays an important role.

Table 1 Dutch Climate Change Policy Documents (Edited from: European Commission & European Environment Agency 2017)

Type of document	Examples
Impacts, vulnerability and adaptation assessments and monitoring	<ul style="list-style-type: none"> <li>- KNMI Climate Scenarios (Klein Tank et al. 2015)</li> <li>- Research projects to form basis for NAS 2016 (Kennis voor Klimaat 2014)</li> <li>- Effect reports (PBL 2013)</li> <li>- Policy studies in specific policy fields (e.g. Vonk et al. 2010; PBL 2011)</li> <li>- Climate change monitoring (Monna et al. 2009)</li> </ul>
Delta Programmes	<ul style="list-style-type: none"> <li>- Yearly climate change adaptation strategies in the field of water management (Deltacommissaris n.d.)</li> </ul>
Web Portals and training and education resources	<ul style="list-style-type: none"> <li>- Knowledge portal Spatial Adaptation (Climate Adaptation Services n.d.)</li> <li>- Delta Programme information (Deltacommissaris n.d.)</li> <li>- Knowledge for Climate Change Programme (Driessen et al. 2015)</li> </ul>
National Adaptation Strategies	<ul style="list-style-type: none"> <li>- NAS 2007 (Ministeries &amp; Unie van Waterschappen 2007)</li> <li>- NAS 2016 (Ministry of Infrastructure and the Environment 2016)</li> </ul>

After all those different publications and studies the successor and an updated version of NAS 2007 was developed, namely NAS 2016 (Ministry of Infrastructure and the Environment 2016). NAS 2016 sets out, in combination with the Delta Programmes, the Netherlands' response to climate change (Ministry of Infrastructure and the Environment 2016). The Delta Programmes form an intrinsic component of the overall Dutch climate adaptation strategy (Ministry of Infrastructure and the Environment 2016). This makes the National Adaptation Strategy, together with the Delta Programmes, the main national documents concerning climate change adaptation.

In the NAS 2016 new initiatives are introduced and the progress of ongoing activities is accelerated. The NAS 2016 forms the new framework wherein new documents can be formed. So is NAS 2016 the precursor for a new Climate Adaptation Implementation Programme which will be developed by the Ministry of Infrastructure and the Environment and relevant knowledge institutes. The Climate Adaptation Implementation Programme will offer a system which enables governments on all scales and other stakeholders to monitor the progress of the overall implementation program and their own contribution to this (Ministry of Infrastructure and the Environment 2016).

Where NAS 2007 mentions the term 'mainstreaming', NAS 2016 does not mention it anymore. Nevertheless, the focus in NAS 2016 is on 'integrating' climate change adaptation across different sectors and policy fields, which can be seen as horizontal mainstreaming. Despite the term mainstreaming is not mentioned explicitly anymore, the call for a Climate Adaptation Implementation Programme suggests that the vertical mainstreaming across scales is not reached yet. Thereby NAS 2016 calls several times for a promotion of participation and cooperation between parties. Even instruments to reach this are mentioned as for example governmental financial support for those parties which currently have insufficient capacity.

The same developments are perceptible in the Delta Programmes. Already since the first Delta Programme in 2011 the focus is on adaptation to climate change: *“The Delta Programme is not about mitigation. The Delta Programme is about adaptation measures.”* (Ministeries van V&W LNV VROM 2010, p.70). Despite the term ‘mainstreaming’ is not being mentioned here, already in the Delta Programme of 2011 the importance of collaboration between different governmental layers is stressed: *“United collaboration between national government, provinces, waterboards and municipalities is a prerequisite for the success of the Delta Programme. Because of this quality and feasibility increase significantly.”*(Ministeries van V&W LNV VROM 2010, p.46).

Nevertheless, seven years and seven Delta Programmes later, there is still a call for improving local climate change adaptation. In the next Delta Programme 2018 a new part will be added, namely Delta Plan Spatial Adaptation. The Delta Plan Spatial Adaptation explains how actors can reach the goals and transition challenges which are set out in the Delta Programmes. Furthermore the mix of instruments and measures that can be used are set out in the document (Deltacommissaris n.d.; Ministry of Infrastructure and the Environment & Ministry of Economic Affairs 2017). This means that also in this case, comparable with NAS 2016, the call for a Delta Plan Spatial Adaptation suggests that mainstreaming across scales is not reached yet and needs to be improved.

To conclude the answer on sub-question 1 is given: what national scale climate change adaptation policies are currently available in the Netherlands? The NAS 2016 and the Delta Programmes can be seen as the main national adaptation policy documents. These documents form the national scale framework wherein challenges and roles are described. Thereby the documents describe where more research, monitoring or assessments are needed. Despite the fact that the term ‘mainstreaming’ is not mentioned in the new developed documents of last years, NAS 2016 and the Delta Programmes mention the urgency of climate change adaptation at local scales. This means that the global shift to a rising importance of local climate change adaptation also have taken place in the Netherlands.

That the term ‘mainstreaming’ is not mentioned, does not mean that mainstreaming is already reached. The need for new documents as the Climate Adaptation Implementation Programme and Delta Plan Spatial Adaptation suggest that local climate change adaptation still has to improve. On the other hand, this does not mean that local governments did not have the opportunity or signals to mainstream climate change adaptation already. Already in the NAS 2007 mainstreaming is mentioned as a goal. Thereby the announcement of such plans as Delta Plan Spatial Adaptation and the Climate Adaptation Implementation Programme could encourage municipalities already to start thinking about how to fill in the need of local climate change adaptation implementation. To what extent the case studies of Nijmegen and Wijchen already mainstreamed climate change adaptation during the last years, is shown in the next chapter.

## 5 The Implementation of Adaptation Policies at Local Governments

In this chapter the two case studies of the municipality of Wijchen and the municipality of Nijmegen are worked out. In section 5.1 is started with the case of Wijchen, continued by the case of Nijmegen in section 5.2. In both sections are sub-question 2 and sub-question 3 answered in succession:

- SQ 2: How are national scale adaptation policies implemented in the municipality of Wijchen and the municipality of Nijmegen following The Learning Cycle?
- SQ 3: Which barriers do the municipality of Wijchen and the municipality of Nijmegen face and what is the origin of the barriers?

In section 5.3 the results are summarized and the differences are pointed out between the two municipalities.

### 5.1 The Municipality of Wijchen

This section answers the sub-questions two and three for the municipality of Wijchen. One of the results is the interview with the expert of the municipality of Wijchen which can be found in Annex B. In 5.1.1 *The Learning Cycle: Wijchen* sub-question two is answered regarding the municipality of Wijchen. After that, in 5.1.2 *Barriers: Wijchen*, the answer on sub-question three is given.

#### 5.1.1 The Learning Cycle: Wijchen

##### 1. External signal

The external signal to mainstream climate change adaptation in the municipality of Wijchen is twofold. Firstly, the Delta Programme River Maas let the municipality of Wijchen start thinking about climate change adaptation. This mainly focused on the outside-dike area (Dutch: buitendijksgebied). Secondly, the Delta Plan Spatial Adaptation formed a trigger to start mainstreaming climate change adaptation in policy and action. Herein the focus is more on the inside-dike area (Dutch: binnendijksgebied).

The development and implementation of Delta Plan Spatial Adaptation took longer than Delta Programme River Maas. The reason for this difference is that the urgency for climate change adaptation in the context of rivers was more urgent. As said by the expert from the municipality of Wijchen:

*“When a dike breaks the social and economic consequences are bigger than when a ditch floods or when people have wet feet in a street. The Province as a regional organization took responsibility and started to develop specific measures for the outside-dike area.”*

In the beginning no regional actor, as for example the Province Gelderland, took responsibility to develop and facilitate Delta Plan Spatial Adaptation at a local scale. The consequence was that the implementation of Delta Plan Spatial Adaptation stagnated, until the Waterboard Rivierenland took responsibility. Thereby the municipality of Wijchen does not face really big practical problems caused by climate change. Therefore the municipality decided to focus on other topics. Hence, the start of the regional collaboration can be seen as an extra trigger to start mainstreaming climate change adaptation.

##### 2. Signal recognition and interpretation

On an administrative level the step of ‘signal recognition and interpretation’ is fulfilled. The administrative layer of the municipality agreed that a regional collaboration is needed to adapt to climate change. As said by the expert of the municipality of Wijchen:

*“The administrative necessity to implement climate change adaptation is already a couple of years there. Especially after the vulnerability assessment done by Waterboard Rivierenland in the context of the regional collaboration the feeling of urgency grew. The administrative layer agreed that climate change adaptation is a problem of us all and that collaboration is needed to tackle it.”*

To interpret and to recognize what the Delta Plan Spatial Adaptation means for municipalities, help was and still is needed from a regional actor. Therefore the initiative by Waterboard Rivierenland to start the regional collaboration was very important:

*“When regional organizations as the Province or Waterboard Rivierenland do not take responsibility and do not show leadership in such regional topics as climate change adaptation, nothing happens on a local scale. A single municipality does not take responsibility on its own in the context of such topics.”*

Where the step of ‘signal recognition and interpretation’ at the administrative layer is present, the executive layer still faces problems. The people who have to execute climate change adaptation only see the urgency to take action when a practical problem arises or a norm is not reached. Climate change adaptation needs to be implemented in such norms and practical examples as the municipal Environmental Policy Plan to improve the phase of ‘signal recognition and interpretation’ at the executive layer. As said by the expert of the municipality of Wijchen:

*“When I focus on the practical level, less than the administrative level, the necessity to take action is only noticeable when a problem becomes practical. Practical examples are the municipal Strategic Water Policy Plan (Strategische Waternota) and the municipal Environmental Policy Plan (Milieubeleidsplan) wherein both climate change adaptation is taken into consideration. Next to this climate change adaptation has to be embedded in for example the Municipal Zoning Plan (Bestemmingsplan), in the Sewerage Plan (Rioleringsplan), in the Management and Maintenance Plan for Public Space (onderhoudsplan openbare ruimte- en voorzieningen), in the Residential Vision (Woonvisie) and as last in our Strategic Environmental Communication Plan (Strategisch milieu communicatieplan).”*

### **3. Experimentation and search**

In the municipality of Wijchen innovative research studies are barely done. Pilot projects are absent. Activities mainly focus on monitoring the current situation. So are a lot of investments done to improve the measurement facilities for sewerage systems. This resulted in improved computer models. Thereby the municipality did studies to map the places where action is needed, for example with a Water System Analysis in 2013.

Next to this, the municipality of Wijchen faces problems with exchanging information with other municipalities. Nowadays this is barely done because municipalities use different software to measure climate change adaptation. Thereby information and data is not collected at one central place. As said by the expert of the municipality of Wijchen, a regional approach could fulfill an important role here:

*“A possibility for the regional collaboration concerning spatial adaptation is to make a jointly online portal where we can exchange information with other municipalities involved. Calling and E-mailing the municipalities separately if they have information available, does not work. Therefore I think it is important to make one central accessible pigeonhole, facilitated by Waterboard Rivierenland, where information, inspiration, and examples can be easily and clearly found.”*

This means that the step of ‘experimentation and search’ can be improved a lot, but that the municipality of Wijchen tries to fulfill this step within their possibilities.



#### 4. Knowledge articulation and codification

Firstly, the step of ‘knowledge articulation’ is in development. As said, the executive layer needs norms and practical assignments to carry out climate change adaptation. The stricter norms are still discussed and in development. Therefore it is not always clear yet which actions are appropriate, suitable, and legitimate for the municipalities. The available man-power, time, and money at the municipalities plays herein a role, because the municipality of Wijchen cannot take action on their own to overcome the national abstractness. Currently it is not clear what tasks the municipality has to carry out. As said by the expert from the municipality of Wijchen, the development of a Regional Adaptation Strategy (RAS) within the regional collaboration can play an important role to divide the task:

*“An important point for us is the respect for action at the local municipality scale: local action when it is possible, collaboration when it is needed. The development of the RAS can give insight in which topics need collaborative effort, and which not.”*

Secondly, the step of ‘knowledge codification’ is not completed yet. Decision-support tools, blueprints, manuals, targets, and software are still in development. A step that is already made by Wijchen is the improvement of sewerage system models. Furthermore a webpage will be launched soon to communicate with citizens what they can do to make their environment more climate-friendly. Of course the development of the RAS will be a codification instrument for the whole region. Next to this the mentioned online portal to exchange knowledge, developed within the regional collaboration, could improve the step of knowledge codification. Before this is possible agreements have to be made about how and which measurements have to be done.

#### 5. Feedback and iteration

At the moment the step of ‘feedback and iteration’ is almost absent. One of the reasons that feedback is hard is because no real performance indicators are defined yet. The consequence is that the municipality of Wijchen does not know where to talk about: did a certain policy or measure package have the desired result or are additional measures needed? The expert from the municipality of Wijchen makes a proposal:

*“Nowadays the performance indicators of policy documents mainly focus on the products: is the policy document published and what is the amount of sections in that document concerning climate change adaptation? We have a wish to use more criteria regarding social effects. By focusing more on social effects it becomes more clear where the society experiences problems. Possible nuisance situations found by means of modelling of theories, does not have to be experienced as nuisance situation in practice by the society. Possible criteria for social effects are the amount of complaints or how often a street stands underwater.”*

Figure 9 summarizes the answer on sub-question two regarding the municipality of Wijchen.

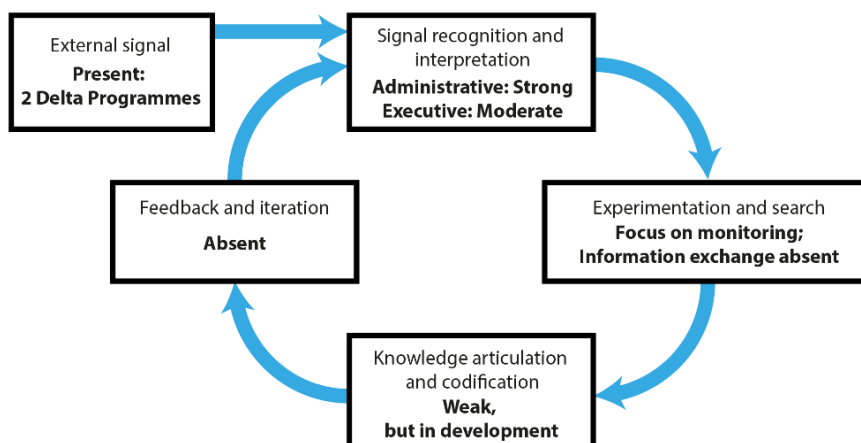


Figure 9 Learning Cycle Wijchen

### 5.1.2 Barriers: Wijchen

During the interview the expert of the municipality of Wijchen mentioned several barriers which hinder the mainstreaming of climate change adaptation at local scales. In this part the mentioned problems are translated to the listed barriers in *Annex A Barriers*. After that, the barriers are placed into the matrix showed in the Theoretical Framework in figure 4.

#### Understanding Phase

As said in the learning cycle the existence of a signal in the ‘understanding phase’ is present with two Delta Plans. Thereby the problem is perceived as a problem of regional scale, wherein an agreement is made to collaborate regionally. Nevertheless, the expert at the municipality of Wijchen said that the description of the problem is too abstract to convert it into real action:

*“In the phase of understanding the problem I would say that the abstraction level for the municipalities is too high to convert policy into action.”*

This could have the consequence that municipalities act differently to tackle the problem. The national government tries to overcome this barrier by developing policies as the Climate Adaptation Implementation Programme and Delta Plan Spatial Adaptation. Despite this, this contemporary problem cannot be directly influenced by one signal municipality. Therefore the ‘different perception of a signal’ is placed in the remote-contemporary quarter in table 2.

Another barrier emerges when gathering and using info to understand the problem in combination with defining the problem to take action. The municipality of Wijchen tries to take their own measurements where possible to determine if action is needed, for example regarding sewerage systems by means of a Water System Analysis in 2013. By doing such tests the municipality is dependent on norms which are developed by other actors as for example the Waterboard or Rijkswaterstaat. As said by the expert of the municipality of Wijchen:

*“Without exceeding a norm there is no real task to take action. For us norms, formed by the Waterboard or Rijkswaterstaat, are the leading criteria to review if action is needed.”*

Some of the currently available norms have to be redeveloped to embed climate change adaptation, and therefore the municipality of Wijchen does not know yet where action has to be taken. Without updated ‘thresholds of concern and response need’ the municipality does not act and the development to a climate-proof municipality stagnates. Next to this, climate change adaptation can also be embedded by means of other instruments than only norms, as the expert of the municipality of Wijchen said:

*“Climate change adaptation needs to be intertwined in a policy framework, as for example in an Environmental Policy Plan or a Water Policy Plan (Water Nota). Only then climate adaptation is appointed as important on lower scales. Without this, climate change adaptation will not be concretized and implemented on lower scales.”*

Concluding, this problem of an absent or vague ‘threshold of concern and response need’ is placed in the remote-contemporary quadrant in table 2.

#### Planning Phase

With the start of the regional collaboration by Waterboard Rivierenland the leadership to motivate action is present. Nevertheless, also in the municipality itself leadership is needed to mainstream climate change adaptation in policy and action. The expert I spoke was dealing with a lot more topics than only climate change adaptation. She had to make choices where her priority lies. Because of this

the mainstreaming of climate change adaptation in the organization can be delayed. This absence of enough man-power to embed enough leadership into the municipal organization to reach mainstreaming, is a contemporary problem which the municipality has influence on. As the expert of the municipality of Wijchen said:

*“In this phase I would say that a barrier can be the structure of the organization. Within the organization somebody is needed who facilitates and motivates climate change adaptation. When this is not the case possible consequences could be fragmented measures across policy fields or climate adaptation will even not get into the city hall. Such a structure is also important for a feedback phase to reach a learning cycle within the organization.”*

Next to this leadership problem within the organization itself the planning phase faces another problem in the municipality of Wijchen. Until the RAS is not finished, the municipality does not exactly know what the goals are. The municipality does not have the ‘ability to identify and agree on goals’ regarding a problem which is of regional concern. For that purpose the municipality of Wijchen needs the other municipalities within the collaboration, which means that the ‘lack of ability to identify and agree on goals’ is placed in the remote-contemporary quarter in table 2.

Furthermore, the municipality of Wijchen faces barriers regarding the ‘availability of data/information to assess options’, the ‘accessibility/usability of data’ and the ‘availability of methods to assess and compare options’. As already told in The Learning Cycle no information exchange takes place and all municipalities monitor differently. Despite the municipality of Wijchen would like to gather more info and inspiration, it is simply impossible to facilitate this as signal municipality. Therefore these barriers are placed in the remote-contemporary quarter.

### **Managing Phase**

The expert of the municipality of Wijchen indicates that in the managing phase, as well the planning phase still a lot of barriers have to be discovered. The implementation is still going on and results in practice are not present yet. Nevertheless, the expert points out two possible barriers in the managing phase:

*“In this phase the most important barrier is that the expected measures and action on a municipal level need to fit within the available resources in terms of manpower, time and money. Thereby, as said, the evaluation phase is not carried out well.”*

Firstly, the possible barrier of too much tasks for the municipality with too little resources can be defined as a remote-contemporary barrier. On the other hand there are also arguments to place it in the proximate-contemporary barrier because it is just a fact of prioritizing climate change adaptation above other topics. But, when assuming that the municipalities have the willingness to adapt to climate change by means of corresponding resources, the barrier is placed in the remote-contemporary quadrant in table 2.

Secondly, the possible barrier of ‘lack of willingness to evaluate, learn and to revisit previous decisions’ can be caused by both regional and local scale. Nevertheless, as a municipality in a regional collaboration you have the possibility to participate actively and to point out the fact that evaluation is needed. Thereby this step is nowadays barely taking place within the municipal organization of Wijchen. Because of that, this barrier is placed in the proximate-contemporary quadrant.

The answer on sub-question three regarding the municipality of Wijchen is summarized in Table 2.

Table 2 Barrier overview Wijchen

Origin	Barriers	Temporal			
		Contemporary	Legacy		
A.	<ul style="list-style-type: none"> <li>- Absence of enough leadership to lead the mainstream process.</li> <li>- Willingness to evaluate, learn and to revisit previous decisions.</li> </ul>	Spatial/Jurisdictional	Proximate	A	C
B.	<ul style="list-style-type: none"> <li>- Different perceptions of a signal.</li> <li>- Vague or lack of threshold of concern and response need.</li> <li>- Lack of ability to identify and agree on goals.</li> <li>- Lack of availability of data/information to assess options.</li> <li>- Lack of accessibility/usability of data.</li> <li>- Lack of available methods to assess and compare options.</li> <li>- Sufficiency of resources.</li> </ul>		Remote	B	D
C.	N.A.				
D.	N.A.				

## 5.2 The Municipality of Nijmegen

This section answers the sub-questions two and three for the municipality of Nijmegen. One of the results is the interview with the expert of the municipality of Nijmegen which can be found in Annex C. In 5.2.1 *The Learning Cycle: Nijmegen* sub-question two is answered regarding the municipality of Nijmegen. After that, in section 5.2.2 *Barriers: Nijmegen*, the answer on sub-question three is given.

### 5.2.1 The Learning Cycle: Nijmegen

#### 1. External signal

The external signals to mainstream climate change adaptation in action and policy are present. Not one specific external signal can be given. The municipality of Nijmegen is involved in so many different projects and has a big network. As said by the expert of the municipality of Nijmegen:

*“We think the external signals for midsize cities as Nijmegen is more complex than the external signal for the other relative smaller municipalities in our region. We as organization are involved in many more and different initiatives and projects than the other municipalities in the region. Nijmegen is for example next year’s European Green Capital.”*

This involvement in different initiatives and projects means that the municipality of Nijmegen sends and receives a lot of different signals by means of attending symposia and workshops, reading literature, and receiving newsletters. These signals improve the vertical mainstreaming.

#### 2. Signal recognition and interpretation

The step of ‘signal recognition and interpretation’ is strong, but there is room for improvement. Although the term climate adaptation is used since 2010 at the municipality, the municipality of Nijmegen already started to implement climate adaptive measures in 2000, when a Water Plan was developed. Because of this early action the city of Nijmegen became a forerunner in the field of climate change adaptation. The municipality of Nijmegen got involved in a lot of different projects and initiatives. The administrative commitment is one of the reasons that Nijmegen started implementing climate adaptation so early. The fact that Nijmegen has a left wing political system improved this step of administrative commitment. Nevertheless, the municipality also faces some problems. As said by the expert of the municipality of Nijmegen:

*“When we are talking with other cities about climate change adaptation the biggest barrier we all face is the national abstraction level. The national layer develops, together with other actors as Provinces,*

*the Union of Waterboards and the G4 (four biggest cities of the Netherlands), the national adaptation strategies and policies. But, the gap between the four biggest cities and the 28 middle-sized cities (together G32) is too big. The G4 has the possibility to convert this abstract world into practice, midsize cities need more advice and investigations on a practical level. To facilitate this as midsize cities we are developing the Climate Adaptive Network Cities (in Dutch: KANS-Netwerk)."*

This means that measures and action to improve this step are carried out, but still in development.

### **3. Experimentation and search**

The step of 'experimentation and search' mainly consists of pilot projects, applying new techniques and conversations with residents. This step is partly outsourced to other companies. Despite this, the municipality also booked some results on their own. So did the municipality develop a complete sewerage model, based on experimentation results. The municipality also exchanges knowledge with other municipalities on both national and international scale. As told by the expert of the municipality of Nijmegen:

*"We also participated in an international information exchange network, wherein different cities in Europe helped each other with a planning question or problem. Such excursions and workshops are very helpful, because we learn the most from practical examples. This 'twinning' is also done in the Netherlands: looking to and talking about the problems of another municipality."*

### **4. Knowledge articulation and codification**

The step of "knowledge articulation and codification" is present, but can be improved to strengthen the mainstreaming. Executive layers wait for some results at higher scales, as for example a City Development Vision. Tasks are not always clear for the executive layers, despite their active attitude to call for guiding instruments from higher scales. As told by the expert of the municipality of Nijmegen:

*"A pro-active attitude is very important in this step. Out of a sectoral policy plan (for sewage systems) we need a City Development Vision, wherein perspectives on city development, on the housing transition or the energy transition are described. Without such a vision it is hard to determine how practical things as the sewerage system should develop."*

The step of 'codification' is in development. Already some results are present as for example the sewerage model, but such models and instruments can be expanded for the municipality of Nijmegen and regionally. Of course, also in the case of Nijmegen the new developed RAS is a codification instrument.

### **5. Feedback and iteration**

The step of 'feedback and iteration' is not fulfilled enough, as said by the expert of the municipality of Nijmegen:

*"Not enough calculations are done after measures are taken or projects carried out. Projects are not evaluated sufficiently. Because of this the opportunity to improve measures is not always used."*

Nevertheless, the expert points out the importance of this step. When the municipality fulfilled this step after three or four pilot projects in Nijmegen it gave a lot of new insights. These insights led to cost saving and new research initiatives. Thereby policies can be adapted when detecting and evaluating barriers, which could strengthen the mainstreaming.

Figure 10 summarizes the answer on sub-question two regarding the municipality of Nijmegen.

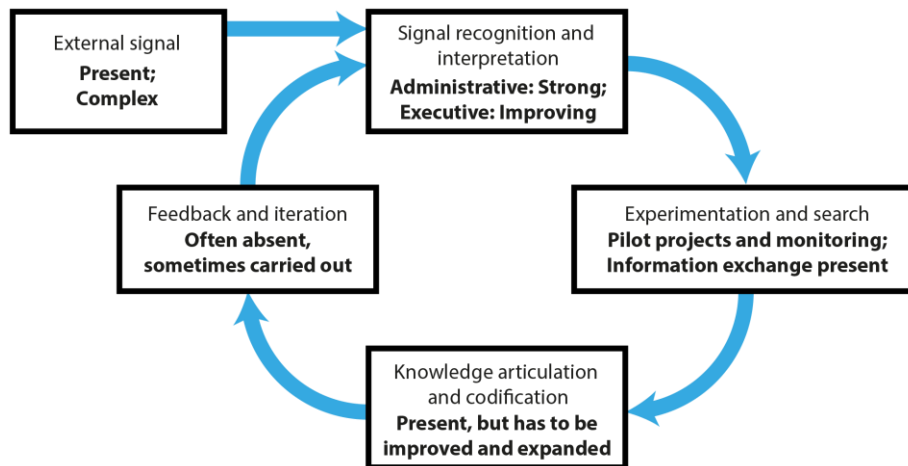


Figure 10 Learning Cycle Nijmegen

### 5.2.2 Barriers: Nijmegen

During the interview the expert of the municipality of Nijmegen mentioned several barriers which hinder the mainstreaming of climate change adaptation at local scales. In this section the mentioned problems are translated to the listed barriers in Annex A Barriers. After that the barriers are placed into the matrix showed in the Theoretical Framework in figure 4.

#### Understanding Phase

The expert of the municipality of Nijmegen pointed out some barriers in the understanding phase which could obstruct the vertical mainstream process. The existence and detection of signals is not the problem in the municipality of Nijmegen. Nijmegen is involved in a lot of different projects and initiatives. Because of this also the gathering and usage of information to understand the problem is not a barrier. The barriers focus more on the abstraction level of high scale policies, as said in the step of 'signal recognition and interpretation'. Just as the municipality of Wijchen, the municipality of Nijmegen also faces problems with the vagueness of high scale policies. Nevertheless, the municipality of Nijmegen takes action to erase this barrier of 'different perceptions of a signal' by collaborating with the G32-cities to develop the Climate Adaptive Network Cities (in Dutch: KANS-Netwerk). It is more a matter of a vague 'threshold of concern' and a vague 'threshold of response need' caused by the national government (remote-contemporary).

#### Planning Phase

In the planning phase the main barrier consist of the 'lack of ability to identify and agree on a range of criteria'. The municipality faces problems how the topic of climate adaptation can be made practical, as said by the expert of the municipality of Nijmegen:

*"To raise and protect the implementation of climate change adaptation I proposed to develop something similar as the Water Check (Watertoets) for the topic of climate change adaptation. I have to admit that when the Water Check was developed I was a bit skeptical. Nevertheless I think it turned out really well and people start to accept it. Maybe a green-norm or a certain 'Climate Check' can contribute to raise and protect climate adaptation by means of green structure development."*

The municipality needs clear criteria to ensure that climate change adaptation is taken into consideration by residents or property developers. In the field of the sewerage systems this is for example already improved by developing a model wherein norms and the current situation are taken into consideration. This results in the fact that the municipality gets fast insight in where and what

changes are needed. This means that a midsize city as Nijmegen can partly erase the barrier of ‘lack of ability to identify and agree on a range of criteria’ on their own (proximate-contemporary), but national guidance and agreements could help to take this step (remote-contemporary).

### Managing Phase

The barriers that obstruct mainstreaming in the managing phase mainly focus on the monitor and evaluation steps. The expert of the municipality of Nijmegen pointed out that projects can be monitored more. Nowadays monitoring is partly outsourced, because of lack of manpower, budget, and specialists, where bigger cities as Rotterdam and Amsterdam can do this step on their own. In the municipality of Nijmegen ‘insufficient resources and technologies’ are available to carry out this step for every project. The ‘ability to store, organize, analyze, and retrieve data’ is not always present within the municipality which makes these barriers proximate-contemporary. Next to this the expert points out that the step of evaluation is not always carried out. The ‘threshold of need and feasibility of evaluation’ is sometimes too high. Nevertheless the expert points out the importance of this step, because it can lead to improvements of measures and policy guidelines. The barrier of ‘high threshold of need and feasibility of evaluation’ is placed in the proximate-contemporary quadrant in table 3.

The answer on sub-question three regarding the municipality of Nijmegen is summarized in Table 3.

Table 3 Barrier overview Nijmegen

Origin	Barriers	Temporal		
		Contemporary	Legacy	
A.	<ul style="list-style-type: none"> <li>- Internal lack of ability to identify and agree on a range of criteria</li> <li>- Insufficient resources and technologies to monitor</li> <li>- Insufficient ability to store, organize, analyze, and retrieve data</li> <li>- High threshold of need and feasibility of evaluation</li> </ul>	Proximate	A	C
		Remote	B	D
B.	<ul style="list-style-type: none"> <li>- Threshold of concern</li> <li>- Threshold of response need</li> <li>- No national guidance to identify and agree on a range of criteria</li> </ul>			
C.	N.A.			
D.	N.A.			

### 5.3 Comparing and summarizing the Cases

When comparing the bigger municipality of Nijmegen with the more rural and smaller municipality of Wijchen several points come out. Firstly, when comparing the overall learning cycles of both municipalities, the municipality of Nijmegen is in general further. The most important places for improvement mainly start to emerge in the step of ‘knowledge articulation and codification’. The municipality of Wijchen is located in the starting phase of The Learning Cycle, where stagnation is already present in the step of ‘signal recognition and interpretation’. The step of ‘experimentation and search’ is not even carried out, despite some monitoring measurements. Secondly, when comparing the barrier overviews, both municipalities do not face remote-legacy and proximate-legacy barriers. Possibly this is because the topic of climate change adaptation is relatively new, which means that no old regulations, agreements, laws, and legislation are blocking mainstreaming. Such regulations, agreements, laws, and legislation are still in development. Next to this when comparing the barrier overviews the most important barriers at the municipality of Wijchen mainly focus on the understanding phase. Not enough resources, manpower and administrative leadership are present to improve this step. In the municipality of Nijmegen the center of gravity is more on the managing phase. More monitoring and corresponding evaluation can take place. Thirdly, both municipalities point out a high abstraction level at national scale, which makes mainstreaming difficult. This abstractness

causes a lot of barriers. The municipality of Nijmegen shows a more pro-active attitude than the municipality of Wijchen to tackle this. This difference in activeness is mainly caused because Nijmegen has more capacity and resources, but also because of the bigger signal interaction at the municipality of Nijmegen. The municipality of Nijmegen is really taking an effort to improve the mainstreaming process and to overcome barriers. Because Nijmegen is a forerunner the city is involved in many more partnerships than the municipality of Wijchen, which has the consequence that Nijmegen has more power and influence on climate change policies and strategies at different scales. The municipality of Wijchen does have less resources and manpower which stagnates mainstreaming and causes a more passive attitude. The municipality of Wijchen is more dependent on clear national or regional norms and guidelines than the municipality of Nijmegen. This is also pointed out by the expert of the municipality of Nijmegen:

*“In this step of ‘Signal Recognition and Interpretation’ there is place for improvement. Smaller municipalities also face this barrier, but do not really act to tackle it. They just wait for the finished products wherein the abstract world is converted into practice. Smaller municipalities do not need scientific literature, but practical guidelines. Midsized cities have more capacity to convert scientific literature to action for some themes, but for some other themes we also do not know.”*

Because I found out during the interviews and literature study that the regional collaboration is very important for the municipalities in this region, *Chapter 6 The Development of a Regional Approach* is added. Especially for the relative small municipalities in the region, the regional collaboration formed a trigger to start implementing climate change adaptation. Now the mainstream-differences between the municipality of Wijchen and Nijmegen are clear, we can have a look how these two municipalities can strengthen each other to overcome possible barriers by means of collaboration. Therefore chapter 6 describes and analyzes how the new regional collaboration helps the municipalities to mainstream climate change adaptation in their policy and action. This analysis is done by going through The Learning Cycle one more time.



## 6 The Development of a Regional Approach

From the results in chapter 5 can be concluded that the regional collaboration, which is described in 3.2.4 *Case Study Area*, plays a very important role in improving the vertical mainstreaming process. As found out in chapter 5 the relatively smaller municipality does face problems to start acting when no norms or guidelines are given. Wijchen is more dependent on regional initiative because they face more difficulties to act when no regional leadership is shown. Because the collaboration has just started since June 2016, Waterboard Rivierenland and the involved actors are still searching how the vertical mainstreaming could improve exactly. The goal of the collaboration is that the governments involved help each other to implement climate change adaptation in each other's policies and actions (Kennisportaal Ruimtelijke Adaptatie n.d.). To give some new insight in where the regional collaboration could play an important role, this additional chapter walks one more time through The Learning Cycle to show how The Learning Cycle could look like when the collaboration is expanded and developed. This could help to find centres of gravity where the development of a Regional Adaptation Strategy (RAS) could focus on. To get an extra in-depth insight in this new collaboration an additional interview is done with an expert at Waterboard Rivierenland (see Annex D).

### 1. External signal

The main external signal to start the regional collaboration was the signing of the Delta Agreement Spatial Adaptation in 2015. This agreement calls for the development of the new part of Delta Programme 2018, namely Delta Plan Spatial Adaptation. The agreement was very vague and no role or task distribution were given. Municipalities did not know how to deal with this vagueness as shown by the two case studies. Next to this new national policy document more practical problems emerged in the region of Nijmegen and 'Het Land van Maas en Waal' because of climate change, which also triggered the need for action.

Despite the Delta Plan Spatial Adaptation is not published yet and still in development, the Waterboard Rivierenland started thinking about how they could help by mainstreaming climate change adaptation at a local scale. As said by the expert of the Waterboard Rivierenland:

*"Because in our region there was already a lot of collaboration between municipalities and the waterboard, for example in the field of spatial planning and sewerage systems, we decided to expand this collaboration to the field of climate change adaptation."*

Next to this the regional collaboration formed a trigger to start mainstreaming climate change adaptation especially in the smaller municipalities in the region.

### 2. Signal recognition and interpretation

The regional collaboration has especially for the municipality of Wijchen improved the step of 'signal recognition and interpretation'. The municipality of Nijmegen was already dealing with the topic of climate change adaptation for longer. Before the regional collaboration the measures taken by the relatively smaller municipalities mainly focused on reaching the norms. There was no urgency of taking action because no tasks from higher governments were given. The smaller municipalities preferred handling other priorities where the task-description is clear. Nowadays new norms are developed and consultations take place about how to mainstream climate change adaptation on a local scale.

The regional collaboration also raised the urgency of climate change adaptation already under municipal civil servants. This started with finishing a climate effect report for the region. Herein was shown that the smaller municipalities in Het Land van Maas & Waal and the region of Nijmegen also have their vulnerabilities and responsibilities.

Another instrument which already improved the step of ‘signal recognition and interpretation’ is showing practical examples. The regional collaboration did this by organizing workshops, for example about heat stress, or an organized tour through the region to show measures which are already taken. A possible barrier here is that the municipalities need time and man-power to participate in these workshops or excursions and that is not always the case as shown in the case of the municipality of Wijchen.

Nevertheless, by making policies practical by showing measures and by showing the urgency of climate change adaptation by means of a climate effect report, the ‘signal recognition and interpretation’ can improve under municipal civil servants. Also the development of the RAS helps to improve this step. Without clear tasks or norms the municipalities do not exactly know how to interpret the topic of climate change adaptation, as said by the expert from Waterboard Rivierenland:

*“Municipalities need clear descriptions of tasks. Vague policies from higher scale are not converted to action or practical language. Municipalities are really implementation-oriented.”*

### **3. Experimentation and search**

The ‘experimentation and search’ step of the collaboration nowadays consists mainly of practical pilot studies. With a regional collaboration the amount of pilot studies and knowledge exchange can improve, as said by the expert of Waterboard Rivierenland:

*“In pilot projects collaboration with other actors is a very important aspect. We try to use initiatives from others as pilot projects. In some pilot projects we are the leading actor, in some not. During pilot projects we monitor what the effects are in practice. Something that happens a lot is looking to other projects: what went good, what went wrong, and what can we use in another project?”*

Not only for the Waterboard Rivierenland regional collaboration means more possibilities for pilot project, but for the municipalities this means more practical knowledge. This is pointed out by both municipal experts. As shown by the case of Wijchen they do not always have the possibilities to carry out pilot projects. Therefore the exchange of knowledge and experiences is more important. Nijmegen is already carrying out a lot of pilot projects and is also involved in other (inter)national projects. Therefore the knowledge of the municipality of Nijmegen can be valuable for the other actors involved. Unfortunately this regional knowledge exchange does not take place regularly and structured at the moment. To improve this, the expert from Waterboard Rivierenland calls for more man-power and time for pilot projects to get more experiences. She says that the urgency feeling is nowadays too low within the organization of Waterboard Rivierenland.

On the other hand, there is not only room for improvement within the regional collaboration. This step also faces problems on a national scale. Nowadays municipalities in the Netherlands monitor effects of pilot projects differently. Data is displayed differently, which makes knowledge exchange hard sometimes. Next to the expert of Waterboard Rivierenland also the expert of the municipality of Wijchen points out this problem. The expert of Waterboard Rivierenland calls for more national guidance by collecting and monitoring data in the same way across municipalities in the Netherlands:

*“We need data and knowledge about what the real problems are. Which data is helpful to tackle the real problems and how much data is sufficient? Pilot projects can fulfill a role here, but problems you face hereby is that municipalities monitor effects differently. We are calling for national guidance to collect and monitor data, instead of the fragmentation of today.”*

Possibly the new developed national Climate Adaptation Implementation Programme can help to tackle this problem.

#### 4. Knowledge articulation and codification

Nowadays the municipalities find difficulties in the step of 'knowledge articulation'. They do not exactly know which possible actions seem appropriate, suitable, and legitimate for them. As said, when no hard norms available, the municipalities do not exactly know which measures they have to take. Despite the exact filling in of the RAS is not clear yet, the expert of the municipality of Wijchen points out that the regional collaboration could play an important role in improving this step. By developing the RAS could be determined with deliberation on a regional scale what measures in which municipality have to take place.

Simultaneously, the RAS could fulfill an important role in the step of 'knowledge codification'. The step of 'knowledge codification' plays a key role in intertwining climate change adaptation more into the contemporary municipal routines. As shown by the cases, the municipalities face difficulties nowadays in this step. A clear, detailed, and visualized description of what is expected from each municipality can help to bring the topic of climate change adaptation into the city halls.

#### 5. Feedback and iteration

Because the regional collaboration is relatively new and the exact results are not clear yet, the regional collaboration does not focus on the phase of 'feedback and iteration'. As told, at the moment the regional approach mainly consists of two tracks: one track focusses on information and experience exchange, another track focusses on developing the RAS.

While the regional collaboration does not focus yet on this phase, it could play an important role. Also the municipality of Nijmegen faces problems in this step. The municipalities nowadays barely carry out this step, which is essential to learn from earlier mistakes. Possibilities are regional monitoring or review meetings. The expert from the municipality of Wijchen points out that this step can be taken into consideration by developing the RAS.

Figure 11 gives an overview of which phases of the contemporary Learning Cycles of both municipalities improve when the regional collaboration is continued and extended.

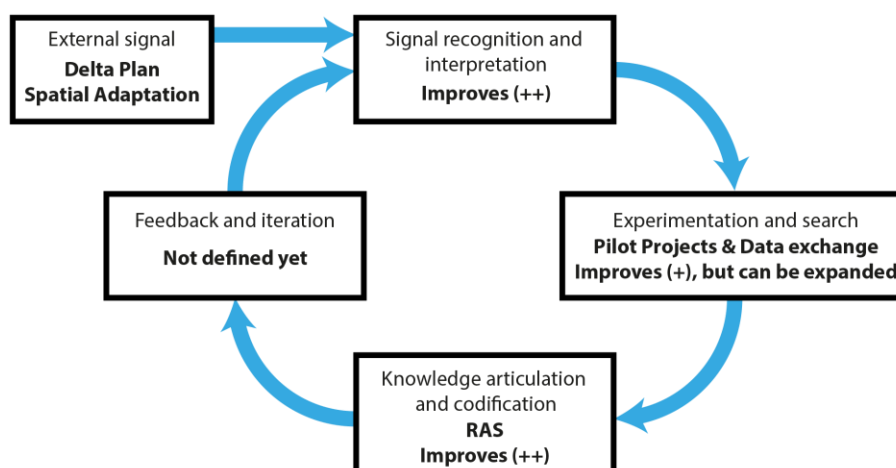


Figure 11 Learning Cycle Regional Collaboration

## 7 Discussion & Recommendations

This chapter of Discussion & Recommendations is divided in two sections. The first section focusses more on the results. The answer on the main research question is discussed: how are national climate change adaptation policies mainstreamed in local governments? Furthermore recommendations are given which specifically focus on the future development of the regional collaboration. Thereafter, in section 7.2, the research process and used methods are discussed. Next to this, section 7.2 includes recommendations and proposals for future research.

### 7.1 Discussion & Recommendations for Results

To give the answer on the main research questions we started at the genesis and development of the rising importance of climate change adaptation at a local scale. The analysis of the currently available national adaptation policies showed that globally, as well as in the Netherlands, the importance of local climate change adaptation has risen. But, despite the academic call for climate change adaptation at local scale (e.g. Adger et al. 2005; Urwin & Jordan 2008; Granberg & Elander 2007; Nilsson et al. 2012; Lundqvist 2016), still not all municipalities in the Netherlands do take climate change adaptation into consideration. The national government points out the importance of local climate adaptation already in the NAS 2007, where the term ‘mainstreaming’ is mentioned. Despite this, the term disappears in later documents as NAS 2016 and Delta Programmes. Nevertheless, this removal of the word mainstreaming does not mean that vertical mainstreaming is optimized already. National climate change adaptation policies and strategies remain focused on the importance of climate adaptation at a local scale. New policy documents are still developed to improve the implementation on a local scale as for example the Delta Plan Spatial Adaptation and a national Climate Adaptation Implementation Programme.

As additional evidence both case studies confirm that vertical mainstreaming is not optimized yet. Nevertheless, the municipality of Wijchen and Nijmegen are both dealing with the topic of climate change adaptation. This means that the vertical mainstreaming certainly reached the municipal layer. But, the vertical mainstreaming is not fluent yet and still a lot of barriers have to be overcome to reach full vertical mainstreaming where policy is converted into action. Especially the relatively smaller municipality of Wijchen faces difficulties how to deal with the topic of climate change adaptation exactly. Wijchen already faces problems in The Learning Cycle in the phase of ‘signal recognition and interpretation’. This municipality is more dependent on national and regional guidance and initiatives. On the other hand the municipality of Nijmegen reaches the step of ‘knowledge articulation and codification’. The step of ‘feedback and iteration’ is mainly absent here, so there is still room for improvement.

I think the reason for the differences between the municipalities is twofold. Firstly, the municipality of Wijchen has less resources and manpower than the municipality of Nijmegen. Secondly, during the analysis came forward that both municipalities have a complete different attitude towards climate adaptation implementation. In Nijmegen more administrative commitment is present to put effort in the topic of climate change adaptation. Therefore the municipality of Nijmegen has a very active attitude, and even became a forerunner in the field of climate adaptation. On the other hand, in the municipality of Wijchen less effort is present to implement climate change adaptation. Wijchen is more waiting for regional or national guidelines and norms, which make clear how to act. I do not think this passive attitude depends on one person in the organization, but on the complete administrative and executive layer together. Of course the municipality of Nijmegen has more resources to implement climate adaptation, but when no administrative encouragement is present to improve climate adaptation at the executive layer, it will not happen. This administrative commitment was already longer present in the municipality of Nijmegen.

A certain passive attitude is partly caused because of a problem that both municipalities face and that causes a lot of barriers to mainstream climate adaptation, namely the abstractness on a national level. Only the four biggest cities can deal with this abstractness to convert agenda points into action. The other municipalities need clear tasks and norms to make climate adaptation practical. When a midsize city with an active attitude as Nijmegen already faces problems with this vagueness, you can imagine that a smaller municipality as Wijchen cannot deal with this vagueness at all. To make it worse the region of Nijmegen consists of much smaller municipalities than Wijchen (40.000 inhabitants), as for example Druten and West Maas en Waal (both around 18.700 inhabitants). How should these municipalities know how to act? This means that the regional collaboration is a very important initiative in this region. The Waterboard Rivierenland has to stimulate, facilitate and monitor the implementation on the local scale, because without a regional trigger nothing happens at the smaller municipalities.

For the regional collaboration I want to point out three important aspects. Firstly, the stimulation and facilitation of knowledge exchange between municipalities is very important. Because the smaller municipalities do not have the capacity to carry out a lot of pilot projects, they need knowledge and experiences from others. The municipality of Wijchen can learn a lot from the experiences of Nijmegen, and vice versa. Important hereby is that municipalities monitor and process their data similar to make knowledge exchange possible. In the development of the RAS this could be taken into consideration as a focus point. Secondly, a regional collaboration creates more regional power. Nijmegen tries nowadays to stimulate the vertical mainstreaming with a pro-active attitude, for example with their involvement in different (inter)national initiatives or the G32. A similar attitude can be created by means of collaborating. When the region works together, more power towards higher scale governments as the Province Gelderland is created. This makes it possible to make clear together where facilitation or help is needed from higher scale governments, for example when new or upgraded norms are needed. This could turn the passive attitude of smaller municipalities in a more active one and improve the vertical mainstreaming process. Thirdly, it is important that there is a willingness under the municipalities to cooperate. The presence of a municipal local leader who puts a lot of effort in climate adaptation can really lead to nice practical results. The consequence could be that the municipality becomes an example for others. Not everything has to be facilitated and regulated by Waterboard Rivierenland only. The municipalities in the region need to put effort in the collaboration.

Despite a lot of challenges to reach full vertical mainstreaming still have to be overcome, progress is made. For the social problem of impossible or non-sufficient implementation of high scale policies on local scales this means that steps towards a better and more fluent process are made. The regional collaboration is still in its beginning phase and practical results are not reached yet. Nevertheless, within the context of the two cases the regional approach formed a trigger to start mainstreaming climate change adaptation more and to work together, which already is a result on its own. Such regional initiatives could be an example and necessary for other regions in the Netherlands within a similar context.

## 7.2 Discussion & Recommendations for Research Process and Methods

To discuss the research process and methods firstly is focused on the scientific relevance of this research. As said in the introduction, it is important to constantly gain insight into the perceptions actors have regarding adaptation and if these perceptions stimulate the performance of climate change policies (Uittenbroek et al. 2013). Other studies that focus on similar subjects in the field of the institutionalization of climate change adaptation at local scales are Aylett (2014; 2015) and Anguelovski & Carmin (2011). Such studies about the influence of (inter)national policies and strategies on local

scales are important to monitor the implementation progress at a local scale regularly. Similar studies may lead to new strategies for implementing climate change adaptation and can be taken into consideration when new documents as the Delta Plan Spatial Adaptation are developed. Thereby it is important that such research is done by an independent non-biased actor. This can give new insights in where improvements can be made and how national governments can contribute to the vertical mainstreaming. Summarizing, carrying out mainstreaming-monitoring studies has to go on and has to be expanded all over the Netherlands.

For expanding such monitor studies several options are present. It is impossible to describe The Learning Cycle and possible barriers for all municipalities in the Netherlands separately. The choice to carry out a comparative case study was made to get an in-depth understanding of the vertical mainstreaming in two municipalities and to compare them. Nevertheless, to test if the results of this thesis are applicable on other municipalities in the Netherlands other methods could be used, as for example a survey. A survey has a wider range and more information of different municipalities could be gathered and analyzed. In the field of climate adaptation institutionalization this method is even global applicable, as shown by Aylett (2014; 2015). By using the current method of an in-depth comparative case study within eight weeks, a lot of the results are based on three in-depth interviews. This is also because of the fact that the municipalities did not yet publish a lot of documents regarding climate change adaptation. Therefore gathering more practical experiences from more experts at different municipalities is very worthwhile.

Another option is to do a case study for climate change adaptation in one specific policy field, for example water management or nature protection. I suspect that in some policy fields vertical mainstreaming is fulfilled more than in other policy fields. It could be interesting to follow the policy path of one specific policy field to gain an in-depth insight in the vertical mainstreaming of this policy field. That makes it also possible to involve other actors as Staatsbosbeheer or Rijkswaterstaat.

To review if and to what extent climate change adaptation is implemented at local scales other theories could be suitable. An example is the study of Adger et al. (2005), wherein a framework is given of normative evaluative criteria for judging the success of adaptations at different scales. The theories used in this study to review mainstreaming, The Learning Cycle and barriers, have its advantages and disadvantages. Firstly, when looking at The Learning Cycle, this makes the reality very abstract. I found out that applying The Learning Cycle on smaller municipalities is easier than on bigger municipalities. The municipality of Nijmegen is involved in so many different projects and initiatives that the external signals are numerous. Next to this the external signals not only emerge at the beginning of The Learning Cycle, but possibly during all phases. This makes it harder to get an in-depth understanding of a bigger organization. Besides this, to review regional collaborations other choices could be made than using The Learning Cycle, as for example using literature which is focusing more on the 'collaboration aspect'. Unfortunately, this was not possible to realize within eight weeks. Nevertheless, I think that The Learning Cycle is very suitable to compare cases and to get insight in where a regional collaboration could play a role. Secondly, when looking at the method of barriers, a lot of different possibilities to analyze barriers are present. By using the framework of Moser et al. (2010) in this study, the focus is more on the place in the process where a barrier emerges. Another possibility could be to analyze barriers by categorizing them based on their nature as for example biophysical barriers, financial barriers or social barriers, as done by Uittenbroek et al. (2013) and Biesbroek et al. (2011). Furthermore, as shown by, Biesbroek et al. (2014), barriers can be reviewed from four different analytical lenses. This means that enough other possibilities are present to review barriers in a different way.

## 8 Conclusions

### Main Research Question:

How are national climate change adaptation policies mainstreamed in local governments?

- SQ 1: What national scale climate change adaptation policies are currently available in the Netherlands?
- SQ 2: How are national scale adaptation policies implemented in the municipality of Wijchen and the municipality of Nijmegen following The Learning Cycle?
- SQ 3: Which barriers do the municipality of Wijchen and the municipality of Nijmegen face and what is the origin of the barriers?

To answer the main research question first the Dutch national climate change adaptation policies are analyzed. What are their goals and how do they improve the vertical mainstreaming process? By reviewing literature I found out that after international agreements mainly focused on mitigation, the shift is made to a rising importance of climate adaptation measures. In Europe this shift took place just after the turn of the century. After this shift, another development started. National governments found out that only international agreements and measures were not enough. Since around 2005 the amount of studies rose which focus on adaptation measures on a local scale. Climate change adaptation got increasingly perceived as a local concern.

These two shifts also took place in the Netherlands. The national government points out the importance of local climate adaptation already in the NAS 2007, where the term 'mainstreaming' is mentioned. Despite the term is not mentioned anymore in later documents as NAS 2016 and Delta Programmes mainstreaming at local scales is not optimized yet. National climate change adaptation policies and strategies are still focusing on the importance of climate adaptation at a local scale. Thereby new policy documents are still developed to improve the implementation on a local scale. To see why this is still needed and what problems emerge at a local scale, two case studies are done. The two cases are chosen because of their differences in sizes and context. Furthermore the two cases are together involved in a regional collaboration to improve climate change adaptation at a local scale. To answer the main research question the mainstreaming process of both municipalities is described by means of The Learning Cycle and possible barriers that emerge when implementing climate change adaptation.

Both cases, the municipality of Wijchen and the municipality of Nijmegen, show that vertical mainstreaming is not optimized yet. Especially the relatively smaller municipality of Wijchen faces problems in early phases of The Learning Cycle. The midsize city of Nijmegen reaches the last phases of The Learning Cycle. The main problem that causes barriers in both cases is the abstractness of policies on a national scale. The municipality of Nijmegen comes further in The Learning Cycle than the municipality of Wijchen, because they have more capacity and resources to deal with this abstractness.

This means, as answer on the main research question, that the mainstreaming process is not fulfilled yet. Where midsize cities already face problems regarding national abstractness, the smaller municipalities face them in such a degree that vertical mainstreaming stagnates at the local administrative layer. The new regional collaboration set-up in 2016 in the region of Nijmegen and 'Het Land van Maas en Waal' surely has possibilities to overcome this abstractness. Tasks, norms and guidelines for the local governments are needed for municipalities to act and can be developed within this regional collaboration. Time will tell if this regional collaboration is the forerunner of a new shift: from climate change adaptation perceived as a local concern towards climate change adaptation perceived as a regional concern.

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## Annex

### A. Barriers

Tables are taken from Moser et al. (2010).

#### Common barriers in the stages of the Understanding phase

<i>Understanding Phase</i>	<i>Barriers</i>
<i>Detect Problem</i>	Existence of a signal Detection (and perception) of signal Threshold of concern (initial framing as problem) Threshold of response need and feasibility (initial framing of response)
<i>Gather/use of information</i>	Interest and focus (and consensus, if needed) Availability Accessibility Salience/relevance Credibility and trust Legitimacy Receptivity to information Willingness and ability to use
<i>(Re)define problem</i>	Threshold of concern (reframing of the problem) Threshold of response need Threshold of response feasibility Level of agreement or consensus, if needed

#### Common barriers in the stages of the Planning phase

<i>Planning Phase</i>	<i>Barriers</i>
<i>Develop options</i>	Leadership (authority and skill) in leading process Ability to identify and agree on goals Ability to identify and agree on a range of criteria Ability to develop and agree on a range of options that meet identified goals and criteria Control over process Control over options
<i>Assess options</i>	Availability of data/information to assess options Accessibility/usability of data Availability of methods to assess and compare options Perceived credibility, salience, and legitimacy of information and methods for option assessment Agreement on assessment approach, if needed Level of agreement on goals, criteria, and options

<i>Select option(s)</i>	Agreement on selecting option(s), if needed
	Sphere of responsibility/influence/control over option
	Threshold of concern over potential negative consequences
	Threshold of perceived option feasibility
	Clarity of authority and responsibility over selected option

### Common barriers in the stages of the Managing phase

<i>Managing Phase</i>	<i>Barriers</i>
<i>Implement option(s)</i>	Threshold of intent
	Authorization
	Sufficient resources (fiscal, technical, etc.)
	Accountability
	Clarity/specificity of option
	Legality and procedural feasibility
	Sufficient momentum to overcome institutional stickiness, path dependency, and behavioral obstacles
<i>Monitor outcomes &amp; environment</i>	Existence of a monitoring plan
	Agreement, if needed, and clarity on monitoring targets and goals
	Availability and acceptability of established methods and variables
	Availability of technology
	Availability and sustainability of economic resources
	Availability and sustainability of human capital
	Ability to store, organize, analyze, and retrieve data
<i>Evaluate effectiveness of option</i>	Threshold of need and feasibility of evaluation
	Availability of needed expertise, data, and evaluation methodology
	Willingness to learn
	Willingness to revisit previous decisions
	Legal limitations on reopening prior decisions
	Social or political feasibility of revisiting previous decisions

## B. Interview Expert Municipality of Wijchen

Oral interview at the city hall of Wijchen, with:

Environmental Policy Adviser

Date: 20th June 2017, 14.00 p.m.

Wijchen (Gelderland)

By Kay van Hulst

*This interview is done in Dutch and later translated to English*

### About the interviewee

The municipality of Wijchen is one of the municipalities involved in the regional collaboration about the topic climate change adaptation. The interviewed expert is the responsible person from the municipality of Wijchen, where she is working now for 17 years as environmental policy adviser. Climate change adaptation is one of the topics where the expert has to deal with.

### The External Signal

*Which higher scale policy documents or events triggered the municipality of Wijchen to start implementing climate change adaptation?*

Two different Delta Programmes formed the trigger to start implementing climate change adaptation in the municipality of Wijchen. The first one is the Delta Programme River Maas, the second one is the Delta Programme Spatial Adaptation.

Delta Programme River Maas is focusing on the outside-dike area (Dutch: Buitendijksgebied). Important topics here are water safety, river drainage, river widening and expansion, and dike management. I am involved in this Delta Programme since 2011, when the Delta Programme started.

Delta Programma Spatial Adaptation started more recently. This Delta Programme is focusing more on the inside-dike area (Dutch: Binnendijksgebied). For quite a long time the development of this policy stagnated.

The reason that Delta Programme River Maas is executed earlier is because the urgency for

this Delta Programme was higher. When a dike breaks the social and economic consequences are bigger than when a ditch floods or when people have wet feet in a street. The Province as a regional organization took responsibility and started to develop specific measures for outside-dike area.

The Province did not take this responsibility by developing the Delta Programme Spatial Adaptation. In 2012 several Climate Ateliers were organized by the Province, as an incentive to start collaboration about climate change adaptation. After this the Province stopped all of a sudden and did not motivate anymore. The consequence was that the implementation and development of climate change adaptation stagnated. This stagnation lasted until the Waterboard Rivierenland took responsibility and started with the regional collaboration.

*Since when and how did the municipality of Wijchen start to implement climate change adaptation?*

Besides the earlier implementation of the Delta Programme River Maas, we also started with implementing the Delta Programme Spatial Adaptation since a couple of years.

In the beginning of the regional collaboration concerning spatial adaptation, around 2015, the focus was mainly on getting insight in the vulnerabilities of this region. We did not fully participate in this phase, but only as agenda-member because of two reasons. Firstly, we had already made a water system analysis in 2013, where no big urgent problems were found. Secondly, we did not experience problems that are caused by other

municipalities. For such problems regional collaboration can be needed, but as said this was not the case. Thirdly, we had other urgent priorities with a view to available manpower in our organization.

Now the regional collaboration is carried out we mainly focus on the RAS-track (Regional Adaptation Strategy). Our priority is to find out how to implement climate change adaptation in policy and action. In the knowledge-track we only participate when we think it is necessary and when we have manpower and time available. We do not see this second track as compulsory.

### **Signal Recognition and Interpretation**

*How do you recognize a problem regarding climate change adaptation and when do you take action?*

Without exceeding a norm there is no real task to take action. For us norms, formed by the Waterboard or Rijkswaterstaat, are the leading criteria to review if action is needed. For example our Water System Analysis in 2013 is done with the norms established at that time. At that time not a lot of bottlenecks emerged. Only at two places in the municipality was action needed.

In line with the Delta Programme River Maas and Delta Programme Spatial Adaptation the Waterboard Rivierenland decided to review and to sharpen the norms. When this is finished we need to do new calculations and measurements in our municipality to see if there is a problem now. The outcome could be that we have to take action at other places in the municipality. Nevertheless, when a norm is exceeded this does not always mean nuisance in practice. It is possible that in theory a norm is exceeded, but in practice the problem is not observable. So we have to take this into consideration and to look where our priorities are.

*Do you feel the necessity in other policy fields to implement climate change adaptation in the municipality of Wijchen?*

The administrative necessity to implement climate change adaptation is already a couple of years present. Especially after the vulnerability assessment done by Waterboard Rivierenland in the context of the regional collaboration the feeling of urgency grew. The administrative layer agreed that climate change adaptation is a problem of us all and that collaboration is needed to tackle it. Nevertheless, an important point for us is the respect for action at the local municipality scale: local action when it is possible, collaboration when it is needed. The development of the RAS can give insight in which topics need collaborative effort, and which not.

When I focus on the practical level, less than the administrative level, the necessity to take action is only noticeable when a problem becomes practical. Practical examples are the municipal Strategic Water Policy Plan (Strategische Waternota) and the municipal Environmental Policy Plan (Milieubeleidsplan) wherein both climate change adaptation is taken into consideration. Next to this climate change adaptation has to be embedded in for example the Municipal Zoning Plan (Bestemmingsplan), in the Sewerage Plan (Rioleringsplan), in the Management and Maintenance Plan for public space (onderhoudsplan openbare ruimte- en voorzieningen), in the Residential Vision (Woonvisie) and as last in our Strategical Environmental Communication Plan (Strategisch milieu communicatieplan).

When regional organizations as the Province or Waterboard Rivierenland do not take responsibility and do not show leadership in such regional topics as climate change adaptation, nothing happens on a local scale. A single municipality does not take responsibility on its own in the context of such topics.

### **Experimentation and search**

*Does the municipality of Wijchen carry out research in the field of climate change?*

Mainly in the field of sewerage systems a lot of measurements are done during the last couple of years. Before these measurements started model calculations were mainly based on assumptions. The consequence was that we found out during the development of the Water System Analysis in 2013 that the results of model calculations did not always represent the practical reality. After this a lot of investments are done to improve the monitoring and measurement process. On the basis of these new measurements the models are upgraded.

*And do you carry out pilot projects?*

At the moment no pilot projects are done in our municipality. We proposed to carry out pilot projects in our municipality at the Waterboard, but other municipalities with many more problems had priority. If the RAS proposes new pilot projects we are open to participate.

*Does the municipality of Wijchen exchange knowledge with other organizations or business regarding climate change?*

Not yet. A possibility for the regional collaboration concerning spatial adaptation is to make a jointly online portal where we can exchange information with other municipalities involved. Calling and E-mailing the municipalities separately if they have information available, does not work. Therefore I think it is important to make one central accessible pigeonhole, facilitated by Waterboard Rivierenland, where information, inspiration, and examples can be easily and clearly found.

One of the reason that this is barely done is because of the possibilities to exchange information are not ideal yet. Nowadays municipalities and waterboards use different software which constraints the exchange

possibilities of measured data. A regional approach could be a solution here, also in the context of the developed RAS.

### **Knowledge articulation and codification**

*Which climate change adaptation measures are already taken to make the municipality climate proof?*

We mainly took measures at vulnerable places in the public space that are pointed out by the Water System Analysis. That were the places with high urgency. Additional measures are possible in for example new construction projects. Such measures are in development now.

*Does the municipality of Wijchen already develop or use decision-support tools, blueprints, manuals, targets or software to support the implementation of climate change adaptation?*

Next to the models used in the field of sewerage systems the Municipal Zoning Plans (Bestemmingsplannen) are important. Actually this is the only legally binding testing framework we have as a municipality. Another option is making agreements with housing corporation or businesses about measures that could improve climate change adaptation.

Next to these measures we have developed a webpage which is not online yet. On this webpage is attention for what people can do at home to make the environment more climate-friendly.

### **Feedback and iteration**

*Do you have (internal or external) consultations if the measures taken reach the desirable result or about the progress of implementing climate change adaptation?*

At the moment we do not really do this. For such consultations with other actors an important question is how you can measure if a municipality is climate proof.



Nowadays the performance indicators of policy documents mainly focus on the products: is the policy document published and what is the amount of sections in that document concerning climate change adaptation? We have a wish to use more criteria regarding social effects. By focusing more on social effects it becomes more clear where the society experiences problems. Possible nuisance situations found by means of modelling of theories, does not have to be experienced as nuisance situation in practice by the society. Possible criteria for social effects are the amount of complaints or how often a street stands underwater.

### **Barriers**

*Which barriers do you face in the 'understanding' phase?*

Firstly, in the phase of understanding the problem I would say that the abstraction level for the municipalities is too high to convert policy into action.

Secondly, climate change adaptation needs to be intertwined in a policy framework, as for example in an Environmental Policy Plan or a Water Policy Plan (Water Nota). Only then climate adaptation is appointed as important on lower scales. Without this, climate change adaptation will not be concretized and implemented on lower scales.

*Which barriers do you face in the 'planning' phase?*

In this phase I would say that a barrier can be the structure of the organization. Within the

organization somebody is needed who facilitates and motivates climate change adaptation. When this is not the case possible consequences could be fragmented measures across policy fields or climate adaptation will even not get into the city hall. Such a structure is also important for a feedback phase to reach a learning cycle within the organization.

*Which barriers do you face in the 'managing' phase?*

In this phase the most important barrier is that the expected measures and action on a municipal level need to fit within the available resources in terms of manpower, time and money. Thereby, as said, the evaluation phase is not carried out well.

Overall, In the planning and managing phase still a lot of barriers have to be discovered. We are not that far already, so the future will tell us where barriers emerge in these phases. The sense of urgency is especially on an administrative scale present. This is not a barrier at the moment. In the outside dike area we are a bit further than in the inside dike area, but now we started the climate change adaptation policies need time to get specific and practically implemented on a local scale.

## C. Interview Expert Municipality of Nijmegen

Oral interview at the city hall of Nijmegen, with:

Policy Adviser Water and Climate Adaptation

Date: 23th June 2017, 9.00 a.m.

Nijmegen (Gelderland)

By Kay van Hulst

*This interview is done in Dutch and later translated to English*

### About the interviewee

The interviewee works since 2003 as ‘policy adviser water and climate adaptation’ at the department of spatial development at the municipality of Nijmegen. The interviewee is involved in policies, strategies, programmes and projects on different scales: municipal, regional, national and European.

### The External Signal

*What was the external signal for the municipality of Nijmegen to start implementing climate change adaptation in their policy and action?*

We think the external signals for midsize cities as Nijmegen is more complex than the external signal for the other relative smaller municipalities in our region. We as organization are involved in many more and different initiatives and projects than the other municipalities in the region. Nijmegen is for example next year’s European Green Capital.

Our network is bigger, and within this network we send and receive a lot of signals by means of attending symposia and workshops, reading literature, and receiving newsletters. The smaller municipalities do not have the capacity to do this too. Thereby it is not only about receiving an external signal, it is also about what to do with it. The smaller municipalities receive external signals, but do not always recognize them or do not start taking action.

### Signal Recognition and Interpretation

*Since when is the municipality of Nijmegen implementing climate change adaptation in their policy and action?*

The municipality of Nijmegen already started to implement climate adaptive measures since the development of the Water Plan in 2000, although we did not use the term climate adaptation earlier than 2010. Thereafter in 2011 we developed an Integral Sustainability Policy. In this policy document, walls between sectors were ‘erased’. Our approach and experience to deal with climate change adaptation led to recognition. Such recognition leads to invitations from other actors to start thinking about new policies and strategies. Because of this approach we became a forerunner and we got even involved in two European projects about climate adaptation. This means that being a forerunner costs more time, but it is part of the job and necessary to take steps forward. Bigger municipalities as Rotterdam or Amsterdam have more people to facilitate this process of taking action than midsize cities.

The fact that we have a left wing political system helped by reaching administrative commitment to implement climate change adaptation. Hence, climate change adaptation got involved in our structural vision of 2013, which was quite an important step to encourage commitment.

When we are talking with other cities about climate change adaptation the biggest barrier we all face is the national abstraction level. The national layer develops, together with other

actors as Provinces, the Union of Waterboards and the G4 (four biggest cities of the Netherlands), the national adaptation strategies and policies. But, the gap between the four biggest cities and the 28 middle-sized cities (together G32) is too big. The G4 has the possibility to convert this abstract world into practice, midsize cities need more advice and investigations on a practical level. To facilitate this as midsize cities we are developing the Climate Adaptive Network Cities (in Dutch: KANS-Netwerk).

This means that in this step of ‘Signal Recognition and Interpretation’ there is place for improvement. Smaller municipalities also face this barrier, but do not really act to tackle it. They just wait for the finished products wherein the abstract world is converted into practice. Smaller municipalities do not need scientific literature, but practical guidelines. Midsize cities have more capacity to convert scientific literature to action for some themes, but for some other themes we also do not know.

To raise and protect the implementation of climate change adaptation I proposed to develop something similar as the Water Check (Watertoets) for the topic of climate change adaptation. I have to admit that when the Water Check was developed I was a bit skeptical. Nevertheless I think it turned out really well and people start to accept it. Maybe a green-norm or a certain ‘Climate Check’ can contribute to raise and protect climate adaptation by means of green structure development.

*Could the regional collaboration play a role to improve this step of Signal Recognition and Interpretation?*

Regional collaborations help to point out the urgency of climate adaptation in smaller municipalities. Next to our new regional collaboration, Haaglanden (Zuid-Holland) also started successfully a regional approach.

## Experimentation and search

*Does the municipality of Nijmegen carry out research in the field of climate change?*

Yes, we are doing research. Big cities have more manpower, budget and specialists to carry out this step. Middle-sized cities as Nijmegen can do less by themselves so we partly outsource this step of ‘experimentation’. Pilot projects, using new techniques, talking with the residents are some of the research instruments.

Participation is very important in our city. Regarding green structures we have around 300 initiatives, for blue structures around 100 participative initiatives. We had to learn how to approach the inhabitants when we want to carry out an idea where they are involved, for example when talking about the disconnection of a house of the sewerage system. This is a matter of experience and trial-and-error. For example in Nijmegen East, where we have quite a lot of problems with street floods when a lot of rain falls. We found out that being open and honest towards the citizens helps to tackle problems together. We admitted that we made mistakes sometimes and people accept this explanation. After that we can search together for a solution.

In the field of usable techniques we are still learning by means of pilot projects wherein monitoring, management and maintenance are important. We are searching which techniques are usable and effective. When it is possible we reserve money to tackle the mistakes that are made during pilot projects.

We achieved some results in the step of ‘experimentation and search’. One of the results is a complete sewerage model. We are not dependent on an external actor as Royal Haskoning anymore, who carried out this work for us in the past.

We also participated in an international information exchange network, wherein different cities in Europe helped each other with a planning question or problem. Such

excursions and workshops are very helpful, because we learn the most from practical examples. This 'twinning' is also done in the Netherlands: looking to and talking about the problems of another municipality.

Such processes of experimentation barely or do not happen at smaller municipalities. This is partly because of available knowledge and manpower, and partly because they outsource more.

### **Knowledge articulation and codification**

*Is it for the municipality of Nijmegen clear which tasks they have to fulfill and which goals they have to reach?*

A pro-active attitude is very important in this step. Out of a sectoral policy plan (for sewerage systems) we need a City Development Vision, wherein perspectives on city development, on the housing transition or the energy transition are described. Without such a vision it is hard to determine how practical things as the sewerage system should develop. This is the reverse direction than normally should be the case. A Spatial Development Strategy should give us instructions, not the other way around. But it seems needed to encourage this. In smaller municipalities this does not happen. They have a more passive attitude and do not prefer to carry out more tasks. When a certain municipality does not put effort in making clear their tasks, the task description remains unclear and no measures are carried out.

*Does the municipality of Nijmegen already develop or use decision-support tools, blueprints, manuals, targets or software to support the implementation of climate change adaptation?*

The development of these instruments starts with pilot projects, as for example the development of the sewerage model. After the phase of monitoring the pilot projects results got analyzed. When the pilot phase has ended we can conclude if changes have to be made or if the pilot project can be extended. Such a process leads to knowledge-building within the

organization. That is the advantage of having the possibilities of doing it on your own, rather than outsourcing the step of codification.

Without developing such models or instruments this step is mostly skipped, because outsourcing costs more money. Because of this more wrong choices are made. The bigger the municipality, the better this step can be carried out.

*How could the regional collaboration improve this step of 'knowledge articulation and codification'?*

Models and instruments can be regionally expanded. The sewerage system model can for example be important for the municipality of Berg en Dal. For expanding this step we see chances for the regional collaboration. We are available to help the other municipalities in the regional collaboration to develop and expand instruments, because we already made some steps in the right direction the past decennia.

### **Feedback and iteration**

*Do you have (internal or external) consultations if the measures taken reach the desirable result or about the progress of implementing climate change adaptation? Or if more implementation of climate change adaptation is needed?*

Not enough calculations are done after measures are taken or projects carried out. Projects are not evaluated sufficiently. Because of this the opportunity to improve measures is not always used.

Such calculations can be done after a couple, three or four, pilot projects. We did this in Nijmegen East during the project of disconnecting houses of the central sewerage system. The calculations showed us a lot of possible improvements, especially regarding saving costs, which was very helpful. Also calculations to decide the street-material had some unexpected results. So turned out that paving bricks were cheaper than asphalt regarding life-cycle-costs. Thereby paving

bricks have more advantages over asphalt: rainwater can infiltrate.

I see the usefulness of this step, because the practical measures can be used to adapt policies. So improvement is needed.

### **Regional Collaboration**

*What is the advantage for Nijmegen to participate in the regional collaboration with the smaller municipalities?*

This collaboration is very valuable and necessary in the region. As a bigger city we also

have the social duty to help the other municipalities in the region. Thereby the interaction between the more rural region and the city is necessary. The smaller municipalities also have some nice practical examples on street-scale where we can learn from.

When we work together we have more power towards other actors as for example the Province. We do not want to be the ‘big brother’ of the smaller municipalities, we want to tackle the problems together and to learn from each other.

## **D. Interview Expert Waterboard Rivierenland**

Oral interview at Waterboard Rivierenland, with:

Project leader/Adviser Climate Adaptation and Area Processes  
Team Plannen Oost  
Department Plannen

Date: 31th May 2017, 9.30 a.m.  
Tiel (Gelderland)

By Kay van Hulst

*This interview is done in Dutch and later translated to English*

### **About the interviewee**

Seven municipalities in ‘het Land van Maas en Waal’ and in ‘het Rijk van Nijmegen’ start to collaborate with the Province Gelderland and Waterboard Rivierenland to create a regional approach towards climate adaptation. The interviewee is the responsible, facilitator and contact person in this collaboration. She works at Waterboard Rivierenland as project leader in the field of climate adaptation.

### **Waterboard Rivierenland and Climate Change**

*What is the role of Waterboard Rivierenland and at which scales is the Waterboard active?*

Waterboard Rivierenland is a lower scale government. Tasks can be divided in performing, maintaining and managing. The main goal is to convert high scale policies from The Hague and provinces to a more regional context. In some fields, as for example dike

management, we are the leading actor and do all tasks of performance, maintenance and management by our self. In other fields, as for example water system management, the roles are less specific and we need other actors to cooperate.

*How is Waterboard Rivierenland at the moment dealing with climate adaptation?*

Climate adaptation is a relatively new topic in our organization, which means that we are still searching how to deal with this topic. Goals, tasks, roles and resources are not always clear defined. Nevertheless we are making progress.

When talking about climate change the questions are: what are the effects? Do the effects have negative impacts? What are the solutions? Not a lot of norms are given yet. It’s more about dealing with risks. Together with other actors we are now searching for the answers on these questions.

Nowadays we are only with two people in this organization who are dealing with this topic. I'm in this new function since the start of 2016.

*Which national scale policies are guiding for Waterboard Rivierenland in the context of climate change adaptation?*

Mainly the Delta agreement Spatial Adaptation 2015 has let us start to implement climate adaptation in our organization. Next to this relatively vague and non-committal agreement, some more direct and steering documents are important. Examples are the program sweet water and the program safety, where also strict norms are mentioned. Climate scenarios from the KNMI are important regarding risk-management.

For new documents as the National Adaptation Strategy (NAS) they are still examining what it means for the regional scale (RAS) and local scale (LAS) and how this strategy can be converted in actions. We will see later what this document means for us.

*Does the Waterboard also carry out research or experiments to climate change adaptation?*

We mainly use practical pilot projects to see what success factors are and to see where place is for improvement. In pilot projects collaboration with other actors is a very important aspect. We try to use initiatives from others as pilot projects. In some pilot projects we are the leading actor, in some not. During pilot projects we monitor what the effects are in practice. Something that happens a lot is looking to other projects: what went good, what went wrong, and what can we use in another project?

Next to these practical projects we strive to a strategical approach. The results of pilot projects helps by forming these strategies.

*What are internal barriers you face by implementing national adaptation policies at Waterboard Rivierenland?*

Nowadays we are with only two people concerned with the topic climate change adaptation. This is quite hard, because this means we have to handle within a big range of different projects. We are trying know to involve more people and make more time for pilot projects to get more experiences. But, nowadays the urgency feeling in the organization is too low.

Another big problem focusses on the collection and availability of knowledge. We need data and knowledge about what the real problems are. Which data is helpful to tackle the real problems and how much data is sufficient? Pilot projects can fulfill a role here, but problems you face hereby is that municipalities monitor effects differently. We are calling for national guidance to collect and monitor data, instead of the fragmentation of today.

**The regional cooperation regarding climate change adaptation**

*Why is this regional cooperation started?*

After the Delta agreement 'spatial adaptation' was signed in 2015 we searched for ways to deal with this agreement. The agreement was very vague: No role or task distribution and no norms. The only rule was that in 2020 all governmental organizations adopt adaptation in their policies and acting. This vagueness was very hard for municipalities because they need clear tasks and assignments. Especially in the context of the small municipalities in our region.

Because in our region there was already a lot of collaboration between municipalities and the waterboard, for example in the field of spatial planning and sewerage systems, we decided to expand this collaboration to the field of climate change adaptation. Thereby more practical problems emerged in the region because of climate change, as for example because of the extreme rainfall last year.

In the beginning we, as a waterboard, acted a bit passive. But, during the process we found out that we have a lot of regional knowledge in our organization. We can keep it practical, which municipalities like. On the other hand we also have a strategic view. Therefore we became a kind of facilitator between the lower governments.

We made a proposal for the municipalities how the collaboration could look like. The attitude to this proposal was very positive because the municipalities also didn't know how to deal with the topic of climate adaptation. In a meeting with all parties concerned in June 2016 we agreed to continue together and to develop a regional strategy. Questions hereby are: What are the climate effects for our region? What are the opportunities? What are the tasks?

*What does the regional collaboration look like?*

We started with searching together for the climate effects in this region, which gave insight and a feeling of urgency to work together. Of course smaller rural municipalities are less vulnerable than for example the city of Nijmegen. But, with this climate effect report we showed that the smaller municipalities also have their vulnerabilities and responsibilities. From there we decided to design two tracks, which are leading for the regional cooperation.

One track consists of exchanging information and experiences. A practical example for this track is organizing workshops regarding heat stress. We also did a tour through the region where already measures are taken to show examples.

The other track focusses on the Regional Adaptation Strategy (RAS). The goal of our RAS is to create a regional fundament, which can be implemented on a local scale. We want to involve also other actors in this strategy as inhabitants, farmers and Staatsbosbeheer.

*What is done in the topic of climate change adaptation in the municipalities before this regional cooperation started?*

The measures taken before this regional cooperation mainly focused on reaching the norms. Thereby in places where the urgency of action was high some measures were already taken. For example in Groesbeek, where the shopping street flooded every time. There we already took measures before this cooperation started together with the municipality. We don't want to be news topic in national newsletters and the NOS journal because of this flood again.

*What are the barriers you face within the municipalities?*

At first, municipalities didn't see the urgency of taking action. There was namely no task. Municipalities had other priorities and they are judged on their tasks. Only when problems in practice emerged, the municipalities took action.

Second, municipalities need clear descriptions of tasks. Vague policies from higher scale are not converted to action or practical language. Municipalities are really implementation-oriented.

Third, the smaller municipalities don't have a lot of policymakers to deal with this topic. Before the regional approach some smaller municipalities didn't even have one. On the other hand small municipalities can also be in advantage. When they want to implement certain policies it only needs to pass a few people. This can also be risky. The resources and knowledge depend on a small group of people.

The bigger municipalities have these resources and knowledge more available, and the manpower as well. But when for example the bigger municipality of Nijmegen wants to implement adaptation in their policy, it has to pass much more people and that will make it more syrupy.

*Which problems, which municipalities face by implementing adaptation, do you overcome by a regional approach?*

The keywords here are knowledge, experience and new insights. We want to bring the topic of climate adaptation literally into the town hall. Thereby implementing climate adaptation into the new environmental law (omgevingswet) was difficult for the municipalities. Therefore, the need to involve climate adaptation in this new environmental law forms another practical trigger for the municipalities to collaborate.

The biggest challenge is how we are going to convert problems and goals into local action. We don't want symbol politics, but real action to reach a climate resistant region. Therefore we also need to find answers on questions about financial matters and short - and long term measures. Another challenge is how we are going to involve other non-governmental actors.

*Do you think climate adaptation is more something for higher scales or local scales?*

In the context wherein we are acting I think that climate adaptation needs a more regional approach. Bigger municipalities as Amsterdam and Rotterdam can tackle such problems by their self, but the small municipalities in our region can't. The city of Nijmegen is dependent on the rural municipalities whereby it's surrounded and vice versa. Therefore a nice interaction can emerge.

I also think that the mentality of this region plays a role: The sobriety, 'no-talking-but-tackling'- mentality and the practical focus are ingredients to make this regional approach successful.



