



# EXPERIENCING CLIMATE PROOF DIKES

An exploratory study of the experiences of dikes  
within climate adaptation designs in the river landscape

Master Thesis Landscape Architecture  
Wageningen University

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Chairgroup Landscape Architecture Wageningen University  
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# Preface

In the process of finding a suitable and interesting subject and direction for my thesis I started to read and talk to a few people from companies like Grontmij and Rijkswaterstaat. I already thought in the directing of the river area and dikes. It was interesting and helpful to hear what was going on in practice. Soon the topic of climate dikes came forward, and I decided to focus on this new concept of dikes.

During my study I did not only follow landscape architectural courses, but also as much as possible courses within Social Spatial Analysis (now Cultural Geography). It has always fascinated me how these two link together, having different focus points and methods, but dealing both with the outside world and the changes happening there.

I would like to thank my supervisors, Rudi van Etteger and Martijn Duineveld, for their guidance in the process, their advice, the sharing of experiences of the location and research methods, and the challenge in creative, critical and reflective thinking; and Adriaan van Haaften for his time and enthusiastic advice for the drawings used within the interviews. The goal of using knowledge of both chairs in one research was sometimes challenging, but also very interesting. Especially in the end the analysing of the results and the way it can interact with design felt a bit like putting pieces of a puzzle together and seeing the image emerge.

Secondly I would like to thank all the interviewees for their time, curiosity, critical questions and remarks, nice conversations and sometimes funny quotes. Also the information and sharing of experiences with all landscape architects was very valuable.

Last but not least, special thanks to my family and friends for their positive and encouraging conversations during the whole process.

# Abstract

The main topic of this thesis is dikes, especially climate dikes, and their experiences. The purpose of this study is to explore and discover the effect of (drastic) changes to dikes on the experience and experience value ) of people. Also the application towards design principles and the use of experience in the design process is studied. The experience is looked at from different angles and is also describes as the perception. Meaning, values and opinions about dikes and climate dikes is the main focus. This 'so called subjective' starting point is meant to be an addition to the present (mainly) visual and technical approach to dikes.

As a case location the south side of the Neder-Rijn is chosen. Here lies a winter dike along the river, of which I choose the part between Opheusden and Rijswijk. The main questions are :

*What will be the impact a climate dike has on the experiences of dikes and river areas in the Netherlands?*

*In what way can different views and backgrounds of experts and non-experts effect the design principles related to climate adaptation dike designs?*

A climate dike is described as “a collective term for design components that result in flood defences so robust that they are virtually impossible to breach, and thus offer lasting protection, even in the face of on-going climate change. The Climate DiKe concerns a type of dike that allows some wave overflow and even a limited amount of flooding, but which prevents the uncontrolled catastrophic dike breaks associated with devastating flooding of the hinterland. The risk, calculated as a product of the probability of occurrence and the resulting damage, is therefore drastically reduced. Another feature of the Climate DiKe is its integrated multi-functional character (Hartog, 2009).”

The study is done from the constructivist paradigm, using also the phenomenology perspective. Mixed methods are used like literature study, conversations, semi-structured interviews and the application of climate dike principles and design to the case location. The main part

consist of research by design. The design is used to research, instead of the use of research for design.

Three topics are used within the theoretical framework. Perception theories and experiences, space and place; and aesthetics form the core of the theory background. Within the perception theories the constructed image, and the use of both mind and feelings are most important. The outside world within this theory provides no objective, neutral or direct knowledge. Views on 'landscape' and 'space' also turn out to be perceived different by people as well. When a location or area is perceived as (very) positive it has a high experience value.

When a space is experienced positively and meaning and value has been given to the location it is called place. Mostly inhabitants or regular visitors have a strong sense of place and they are attached to the place. A well-known concept in landscape architecture is the Genius Loci. In this study it is used in the sense of the character of the location and the possibilities of linkages this provides.

A field that deals with beauty is the field of aesthetics. Although clear changes in history can be seen, and the Western world was (and for a large part still is) more mind-oriented. But aesthetic appreciation is only achieved by an active engagement and interaction between cognitive and emotional. Within this appreciation there is a strong influence of words and language. Places can also vary in their capacity for aesthetic potential.

To get a first understanding of the case location, the area is described from a landscape architectural viewpoint, using the layer model. This contain the abiotic, biotic and occupation patterns. Looking at the visual character and the historical processes in the area variation along the route can be found. This variation can be a good starting point for location specific designs. Also the way people see these differences is seen in the answers in the interviews. The floodplains are especially important for the biodiversity in the area, mainly for birds. But also on a smaller scale, the scale of a dike, the biodiversity can be higher by using

different steepness in the slopes.

Due to climate change, the present norms of the dikes would not be sufficient in the future. Higher rain peaks due to heavy rainfalls and changing weather patterns cause a higher risk for floods. To prevent heightening the dikes regularly, the concept of climate dikes is meant to alter the dikes in such way that it only has to be changed once. There are many options in the application of climate dikes, depending on the location. Until now, not many of such dikes are yet made.

To explore the experiences of the location and future dikes I used conversations and semi-structured interviews. I interviewed 18 people of which 8 landscape architects and 10 lay-people. The interview is divided into a general part, location specific questions and questions about future dikes using design drawings. Three locations (categorized in land use function that is mostly present) were used that are most present along this dike; agricultural, recreational and village. Each present situation was accompanied with three climate dike alternatives.

There were differences between the landscape architects and other people, but also much similarities could be seen. The main difference lie in the way of describing and communication about the area, and the way a dike is seen as an object (versus context, that was much more valuable for lay-people). Also background (origin), educational background, individual, social and other factors. Comparing and analysing all answers mechanism could be found in the interviews that play an important role in the perception of the location and the preference for design alternatives. These are: interpretation of scale, focus, object and context, influence of knowledge and memory, physical and emotional proximity. Together with the general view on 'landscape' and 'space' they all influenced the opinions, values and meanings about the present and the preference of future climate dike alternative.

In the application I proposed to use these keywords and outcomes of the interviews (in order to take experiences of people more into account), together with the analysis of the location (from the landscape architect point of view) to combine this into one map called the characterization

map. This map is then used for the application of different climate dike solution along the route. Three details are worked out from these principles, of which one detail has three options. Again the interviewees were asked to react on these options. Two options were seen as the most suitable solution.

The exploration of perception of dikes and future developments shed an interesting light on the background of choices and opinions people have. It gives more insight in not only how people experience the outside world, but also the reasons why they prefer certain things above others. Also for a broad perspective on the subject and critical reflection of (unconscious) choices that are made (as a landscape architect) the input of lay people is valuable. Communication between designers and lay-people can cause for misinterpretation, but when easy-to-read materials and broad questions are used the input, of both groups can be valuable to use for implementing more experience value into the design process and design of dikes.





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# 1 Introduction

## Fascination

During my study I have always been very interested in the combination or relation between Landscape Architecture, with the focus on design (strongly visually directed), and Cultural Geography, focusing on research of people-environment interactions. It becomes more visible, also in practical works of landscape architecture, that people are getting involved in the processes of designs. Opinions, values, spatial quality, and other so called 'subjective' and personal themes are heard in the field. I am interested in what knowledge about experience, value and opinions can mean for designs or concepts that are presently developed. One of such innovative ideas is the climate dike, a robust, broad dike, or other alternative and innovative solutions that are climate proof and can carry multiple functions. The perceptions, multiple meanings, values and opinions of climate dikes will be the subject of my research.

Reading about dikes and the designing of dikes I came across some interesting views on the way dikes are being perceived

**Perception** is the process of experiencing organized and interpreted information extracted from sensations. It is one of the modes of experience; the other modes include dreaming, imagining and thinking in natural language (Jacobs, 2006).

There are two different kinds of **meaning**. Connotative and denotative. The first reflect all the personal associations things call up, and the emotionally toned inferences that are drawn. The last is the explicit, "dictionary" meaning. In this research I will use the first, the connotative meaning. It also involves the meaning of the object (or landscape) for the people. If they understand it and what meanings they see. Meanings are influenced by perception and relates strongly with value and opinion.

**Values** are commitments to larger abstract ideals, which is rendered useful or desirable. It is strongly relates to meaning and it influences the opinion.

**Opinions** are conscious verbal expressions of the sum of all their feelings and values about particular places, objects, persons, or events. Opinion is strongly influenced by perception, meaning and values.

or experienced. Landscape Architect Yttje Feddes writes in her book "Een Scherpe Grens – Ontwerpstudie naar de ruimtelijke kwaliteit van verzwaarde rivierdijken (freely translated as: A sharp boundary – Design study at spatial quality of enlarged River dikes)" several times about the relation between the dike and the experience of people. In the Spatial Analysis chapter she writes:

*"The experience of the route on the dike becomes more exiting through the high position. One gets the sensation of floating above the landscape; an effect enhanced by the steep slopes of old dikes, whereby behind the top of the dike, mainly in the outside bend a void seem to be present. You must be careful, not to fall off the dike!"* (own translation, p. 47)

Reading this passage at first, this expression seems logical. Maybe because, generally speaking, landscape architects are educated to think like this, maybe because most of the psychological processes are logical. It is not uncommon that the reaction of profound psychological research is "I already knew this" or "that seems logical". However, questions also rise. First of all it is striking that the words that are used and the assumptions that are made are not (visible or clearly) backed up with research. Secondly, these (and other) assumptions form an important starting point for the design of dikes in general. When these assumptions turn out not to be correct, this has also consequences for the designs made from these assumptions.

When an example is shown of a straight dike (p. 50), she writes about the image people have about dikes. A river dike is seldom straight. The image of a straight dike is not the same image people have in their minds about a river dike. The conclusion that is drawn: a curved dike is more 'natural' and 'historically correct', and therefore it will be more positively perceived. Where does this image of the people comes from? Most dikes are indeed curved, but does this mean that people have a fixed image of how a dike must look like? Maybe more important: does this 'one image' among people exists? And if they do have such image, what formed this image?

Somewhat further an example of a 'spatial visual experience' is



mentioned. It refers to the curved dike, that will cause an “ ‘optical illusion’ of the perspective”. In this case the English landscape style is given as a reference. So in this case there is a reference used to (partially) explain why it is a special experience. Also ‘readability’ is used to explain the experience of dikes. This is a well known and often used concept in (landscape) architecture. For this moment ignoring whether or not all the assumptions are correct (and disregarding the question whether or not it is necessary to know this through psychological research) they do have consequences for the whole design process. Assumptions about people’s perceptions can strongly influence the starting views in the design process, influence the (literal) shape of the design or even used as an argument afterwards to justify (partially) the choices that are made.

I found it interesting to see what assumptions are made and how they are dealt with. To know if there is such image about dikes, one has to talk to people about it. In this thesis I therefore would like to know more about the reasons why people see dikes the way they see them. Do reasons or values change when context change? Both groups (experts and non-experts) ascribe values and meaning to their environment, both

#### Climate Dike

A climate dike is a collective term for design components that result in flood defences so robust that they are virtually impossible to break, and thus offer lasting protection, even in the face of on-going climate change. The Climate Dike concerns a type of dike that allows some wave overflow and even a limited amount of flooding, but which prevents the uncontrolled catastrophic dike breaks associated with devastating flooding of the hinterland. The risk, calculated as a product of the probability of occurrence and the resulting damage, is therefore drastically reduced. Another feature of the Climate Dike is its integrated multi-functional character. (Hartog, 2009). Another word used for climate dike is ‘Multi-dike’.

groups have their opinions and views. Do designers base their image or view on the same things as the non-experts for example? And how can this be used and implemented in the design process?

The way ‘experts’ deal with the question of dike reinforcement in relation to the human aspect is not only visible with landscape architects. In the report *Klimaatdijk – een verkenning* (Hartog, 2009) the concept of climate dikes is explored by different group of experts. Most is written from a more technical viewpoint. The concept of a climate dike is relatively new (and not yet realized in the Netherlands), and a lot must be

researched in the near future. At the end of the report the authors conclude with the remaining knowledge gap and a list of knowledge questions. All the questions are organized in four subdivisions. First technical questions are being asked, then there are questions about the integration in the landscape, norms, testing, management and maintenance and finally community/society questions.

Many of the social or community questions regarding the realisation of the Climate Dike that are mentioned concern different aspects. There are some questions about the actors, durability, the build-up area’s, laws and the possible leading actor. But interestingly enough most of the questions deal with financial aspects. Six out of thirteen questions directly speak about financial consequences of these dikes and two indirectly speak about financial issues, like expropriating. Only the last question deals directly with the wishes of people. But even this question is vaguely expressed and it only speaks in terms of living next to a dike. It says nothing about the consequences a dike may have on the experiences of the people that live or come there. What is also striking is the fact that the term human aspects is between quotation marks. Apparently not much attention is paid to the experience and the human side of the concept, although it is a quite radical change, and thereby altering the living places of many people (especially considering that next to dikes and in river areas a lot of (old) villages and cities are situated).

#### Purpose of study

The purpose of this study will be to explore and discover the effect of (drastic) changes to dikes on the experience and experience value ) of people. Experience does not only include the visual aspect. In my research the term experience means “how something is experienced, how it befalls on the viewer and what emotions it evokes” (De Vries, 2009). The experience is directed through attention. Without this selective interest, experience would be an utter chaos (William James, 1890, p. 402.) It is also based on individual differences (adaptation level and knowledge), situational factors (time of stay, purpose of staying and position reviewer), social factors (influence from other people’s opinion, status and expertise) and cultural factors (e.g. perceived symbolic



meaning) (Karmanov, 2009). It can be positive or negative. When the overall judgement concerning the nature of experiences is pleasurable (pleasurable meaning the pleasure that is given by the senses) it concerns the experience value (De Vries, 2009).



## Case location

For my research I choose the area south of the River Nederrijn as case location. This is the continuation of the river Rhine, flowing from Switzerland into the North Sea. It is called de Nederrijn from het Pannerdensch Kanaal until Wijk bij Duurstede. From Wijk bij Duurstede the river is called the Lek. Just before Arnhem the river Rhine, splits into the Nederrijn and the IJssel, which is flowing north. The north side is interesting because of the differentiation and occupation. Cities and villages are located very closely to the river and near Wageningen and Rhenen there are two ice pushed ridges. The south side it called the Betuwe, where the villages are less directly connected with the river. On top of the sandy ridges a long line of smaller villages follow the line of the river. Because of the good soil a lot of fruit farmers are situated here. The Rhine is a middle size river, ca 200 m broad and it drains 22% of the water into the sea. The river is mainly used for recreation and pleasure boating. The dike I choose is a the winter dike, the main dike for protection against flooding.

Choosing this area has different reasons. Most of the projects around climate dikes concern the urban area (figure 1). Secondly for a more practical reason: the location is close to visiting the area and interviewing people there.

In the next chapter I will explain more about the relevance of my research, the problem definition, objective, research questions and methodology.

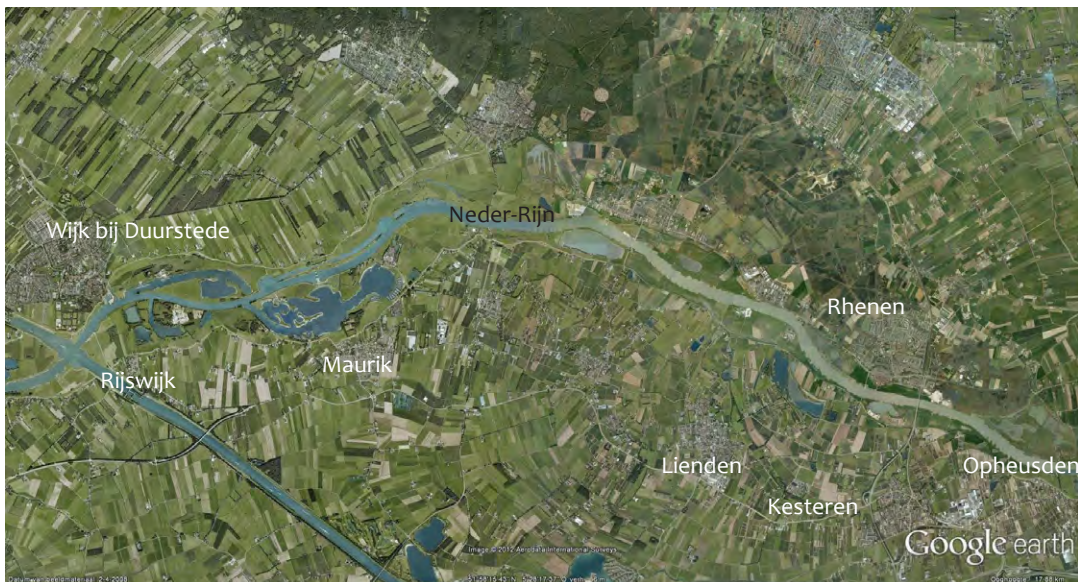


Figure 1 Current projects around Climate Dikes

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# 2 Problem definition and research structure

**In the introduction I already started to explain the direction of my research. This chapter will explain the (further) relevance and goals of the study, and which methods will be used to achieve this goals.**

## 2.1 Relevance

There are a lot of studies and exploratory research on adaptation to climate change. But a lot of these findings focus on technical aspects of the measures that must be taken. There is a lack of attention to the experiences and knowledge of people regarding this subject. Designs and concepts, also of the Climate Dike, focus mainly on safety norms, multifunctional use, ecology, economy etc. Plans are made with the knowledge of the experts, like hydrologists, ecologist and technical people. The government pays attention to the importance of integral spatial planning and spatial quality in the Nota Ruimte. Projects like 'Mooi Nederland', also imply the importance of beauty and feeling. Not only policies pay attention to these themes, but also companies are becoming more and more interested in the experience and opinion of people. But in most cases it is seen as an 'extra subject', something that has to be looked at next to the 'objective scientific knowledge', seen from the experts view. Secondly it is not always directly clear what the reasons are for the government or companies to pay more attention to the spatial quality. Input from lay people may be used, but the focus lie on scientific knowledge and that is seen as more important and more useful than the experience, knowledge and values of other people. The question remains if this method and strategy will benefit the design and process. A clear difference between the so called facts of science and the so called values of the non-experts is usually made (Duineveld.M, Beunen, R., 2006). But is this justified?

## 2.2 Problem definition

- failure mechanisms dikes
- climate change
- no, or little attention to experience in dike designs (and difficulty of implementation)
- strong technical approach to dike adjustments

## 2.3 Objective

As stated in the introduction the purpose of this study will be to examine and discover the effect of (drastic) changes to dikes on the experience and experience value ) of people. I would like to focus on perception, meaning, value and opinions. This is a part of the way people can respond to the environment (see figure 3). Zeisel (2006) states in his book that "the better designers understand this process, the better they are able to understand the side effects of environmental design decisions they make." and "the better researchers understand what sense people make of their surroundings and how they do so, the better researchers can interpret other people's behaviour."

My goal is to explore the different perception, meanings, values and opinions of different groups of people related to climate dikes. I would use both expert and non-experts groups: landscape architects and lay people. I would like to know if the (possible) differences between these groups result in different design principles that can be applied in dike altering measures due to climate change.

It is important to explore how people perceive dikes, what their preferences and ideas are and what possible designs or appearance they prefer. Furthermore it is important that the landscape implementation of robust climate dike can be possible in the river area, since the area next to the river hold a rich history, both ecological and cultural.



In my research I would like to focus the general gathering of knowledge of experience and dikes, especially climate dikes. In this part I would like to use the research by design approach. These alternative dikes are presented to the different groups and they are interviewed to know their views about the specific area (and more general the river area), aesthetics, values, opinions and perception (see figure 3). These findings can be used in the second part in which a case study location is used to show if these results have different consequences for design (principles). This is more specific and location bound. A strip of land or location that varies in density and occupation can be useful.

People's Responses to Environments
What they see (experience) in environments <b>Perception</b> <b>Meaning</b>
What they feel about environments <b>Opinion</b> <b>Value</b>
What they do in environments Place Path Relation
What they do to environments Adaptations Displays Messages
What they know about environments Knowledge Data

Figure 2 People's responses to environments (green bold and "(experience)" added)

## 2.4 Research questions

### Main question(s)

*What will be the **impact** of a climate dike on the **experiences** of **dikes** and river areas in the Netherlands?*

&

*In what way can different views and backgrounds of **experts** and **non-experts** effect the design principles related to climate adaptation **dike** designs?*

### Subquestions

- What will be the impact of climate change in the river area?
- How do different groups of people see beauty, aesthetic and experience? How do they experience and value dikes?
  - o Experts (landscape architects)
  - o Citizens living and not living close to the river, but familiar with the environment
- What will be the impact of climate dikes developments on the area itself and on the experiences of that area within the different groups?
- How and to what extend differ the perception, experiences, values and opinion of climate dikes of the different people?
- What does this mean for the design process and design principles?



## 2.5 Methodology

### Paradigm

Every research is done from a certain view point and discipline. To reveal and explore the multiple meanings and values of climate dikes a view is needed in which the different perceptions and experiences of people are recognized. Working from e.g. a positivistic paradigm will not be suitable in this case. From this view the world is seen too much as a mechanical world where regularities of cause and effects play an important role. The subjective side of the human mind and processes of behaviour is not enough recognized or acknowledged. Therefore I would use the (social) constructivism paradigm.

The ontological starting point of the constructivism is the (sub)conscious forming of the own world by acting (together) and giving meaning to these actions (Oosten, 2005). The knowledge is intersubjective and the value of empirical information depends on the way this information is acknowledged and used by people. The paradigm focuses within research on motives and meaning in social interactions (Oosten, 2005). In the most extreme form there is a relativizing of the truth of the world where people live in a new idealism. This relativizing goes too, but the idea of the paradigm is useful for the aim of my thesis. I will also not so much focus on the social this view and research. The social part in the sense of the group will be of less importance.

The pragmatic knowledge claim is consistent with the constructivist paradigm. In this approach the problem is the most important and researchers use all approaches to understand the problem. Mixed methods are used to get a grip on the problem as a whole, using the most suitable methods. In this view there is not a strict dualism between the mind and a reality completely independent of the mind (Creswell, 2003). Researching experiences and values is not easily measurable, so this view is suitable in this case. Within this knowledge claim systematic thinking is commonly used by designers. This systematic thinking means integrative thinking and with cognizance of systems dynamics. By a systemic design intervention, “multiple influences are integrated into

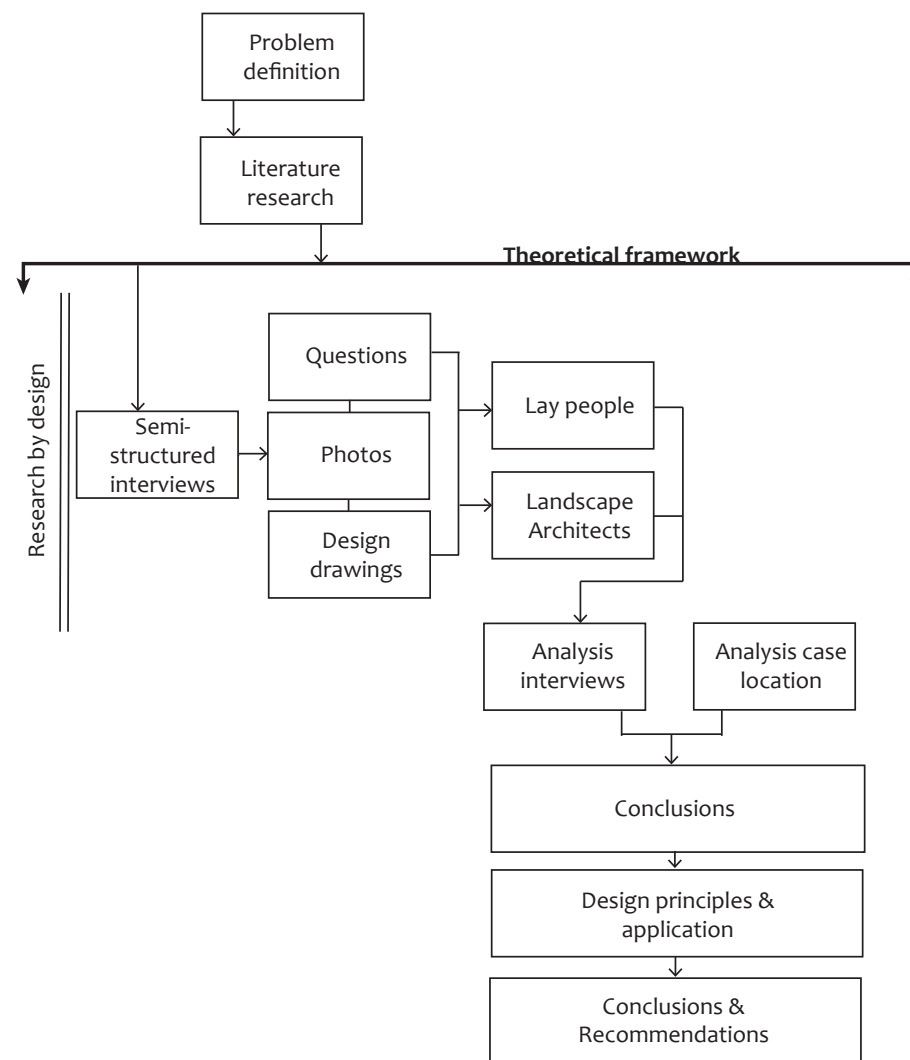


Figure 3 Research scheme

wholes with enriched experience and intensified meaning, and the landscape becomes richer, and the place (mental construct experienced in the mind's eye of the beholder) more alive (Motloch, 2001).”

To discover experiences through perceptions, meaning, opinions and values I choose not to look as a first observer from my landscape architectural background directly to the subject of dikes and river areas (except using a model in chapter 4, see also explanation chapter 5). Instead I focus on the different groups and how they are observing and perceiving the environment as a ‘second observer’.

### **Theoretical framework and analysis**

An important base of my thesis is the theoretical framework. It forms the theoretical background with an quantitative search in literature for several themes. Different models can be used to understand and analyse a certain area. Next to the explanation of these models, the terms perception, landscape experience and use, and aesthetics are explored. The landscape models I will use to explore in what way this theoretical base influence the way landscape architects talk about ‘landscape’, how it influence their perception and in what way this differs from non-designers. The terms perception, landscape experience and aesthetics are approach by the phenomenological view. Within the interviews I will explore how this will relate to the location and design sketch perception and what this can mean for further designs of dikes.

Another quantitative part is the general description and analysis of the developments and present form of the so called river landscape. This is necessary to understand the object of a dike in broader context. This part is from a landscape architectural view.

### **Research by design**

Research by design is a useful way to generate knowledge for improving designs. The knowledge gathered resulting in the theoretical framework can be placed under ‘research for design’, but this is not the main part of my research process. By observing and interviews I can compare the outcomes of both groups and explore the consequences of using a

design this way and to see whether or not design principles may vary by using different groups as knowledge sources.

### **Interviews**

Qualitative interviews are useful to discover the perception, experience, values and opinions of the experts and non-experts. To find out why people perceive and experience the way they do is a semi-structured open interview most suitable (Zeisel, 2006). According to Hendrikx (1999) especially the attention to the knowledge and connection have with the landscape is important. This can be tested through asking the people.

The interviews contain several themes that provide a direction, but because it is not a questionnaire there is still room for asking further. To understand the way of looking it is important to know about the view on beauty, aesthetics, space and place, the river area and dikes. Within these themes this I would try to search for the behind laying ideas and values. The method of selecting themes and compare the answers with each other is a method also used by Karmanov (2009) in his PhD thesis *Feeling the landscape – 6 psychological studies into landscape experience*. The aim of this report is to clarify the relation between the formal properties of the landscape and the related experience properties.

An important challenge is to make the comparison between the ‘old’ dike and new, possible dike(s), visible. Knowing or seeing the old situation has an important effect on seeing and validating the new situation. In this case the size of the change and the content of change (from what to what) influence the perception. If the change is already realized, then the speed of change and the process of changing is relevant (De Vries, 2009).

Experience does not only include the visual aspect. I would use both expert and non-experts groups: landscape architects (overall strongly visual oriented) and lay people. I would like to know if the (possible) differences between these groups result in different design principles that can be applied in dike altering measures due to climate change. But I will not use these groups as a strict separation. I use themes that explore

the individual and social related differences.

**Design recommendations**

The last chapter of this study will contain the possible combination of theoretical background, analysis of the case location and finding of the interviews. Together they will be the starting point of design principles and application in the specific area.

3





# 3 Theoretical framework

**The theoretical framework is meant to provide useful information and concepts for the chosen subject and methods used. It gives direction to the research. The research questions stated in chapter four determined the starting point of the literature search. Also the constructivist paradigm influenced the search for useful literature. In this chapter three main themes are described related to experiences of different groups or people regarding a certain environment, what is present outside the door. The themes are: environment perception and experience; space and place; and aesthetics. All are related and explain in their own concepts how these environment experiences can be understood and explored. And they do not form a specific landscape architectural viewpoint, but a broader starting point, less focused on just the visual aspects.**

## 3.1 Environment perception & experience

### Perception theories

Perception is the way we see things, the way we observe and perceive. But how simple the word might sound, the process and exact definition is much more complicated. Some authors that write about (landscape) architecture focus strongly on the visual aspect of perception (Bell, 1993), while others focus on the more holistic view of perception (Pallasmaa, 2005). Behind this focus lies a certain (philosophical) theory.

When this concept of perception is seen from a phenomenological approach, two extremes can be distinguished. The phenomenological approach is a manner in which people experience and understand the world. On one hand perception is seen as an event in nature. Perception is the causal physical or chemical action of a thing on an organ which sensation registers. This is called empiricist objectivism. On the other hand perception is seen as “an absolute subjectivity involving a transcendental Ego who is the subject of experience. In relation of pure interiority the objective world exists only in relation to a consciousness

which projects that world before itself (Tilley, 1994).” This is the cognitive idealism view.

Perception gives no direct knowledge of the world outside, according to Coren (1999). In the book *Sensation and perception* four theories about perception are described. An important note is that the authors of this book are all psychologists. The first theory mentioned is the biological reductionism, in which for any given aspect of the observer’s sensation there is a corresponding physiological event. The direct perception theory states that all the information that is needed to form the conscious perception is available in the stimuli that reach our receptors. Developments in the artificial intelligence systems have influenced the computational theory. The interpretation of information is believed to require a number of calculations and stages of analysis that can be specified as mathematical equations or steps in a computer program. Within the intelligent perception theory there is attention to more information than visual information perceived by our senses at one moment. The representation of the world is much richer and more accurate than might be expected based on the senses and one moment in time. Also experiences from the past of non visual information play a role. This theory is also called a constructive theory since it involves a combining of different factors that ‘construct’ the final perception (Coren et.al., 1999; p. 10-11). According to Tuan (1979) “landscape is construct of the mind and feeling”. Within this thesis I will therefore use this last theory.

The attention to more than the visual system of human beings within perception is not belonging to the new insights of science. It depends on the scientific era and discipline which element forms the starting point for the definition. Centuries ago the Greek philosopher Parmenides (500 B.C.) stated that “the eyes and ears are bad witnesses when they are at the service of minds that do not understand their languages.” The Gestalt Psychology from the 20th century subscribes the idea that the whole is more than the sum of the different parts.

In the past 20 years there has been an hegemonic and nihilistic eye in

architecture (Pallasmaa, 2005). The hegemonic eye seems to weaken our capacity for empathy, compassion and participation with the world. And the nihilistic side tends to alienate vision from emotional involvement and identification. Although landscape architecture is different from architecture, the same tendency is visible. When one compares the more traditional cultures with the modern western world there is a clear difference visible. The traditional cultures is “guided by the body in the same way that a bird shapes its nest by movements of its body (Pallasmaa, 2005).” In the modern western world dominates the visual paradigm. Work of Mies van de Rohe is a good example of this visual paradigm (see figure 4). There is a weakened sense of materiality. Natural materials (stone, brick and wood) which represents a veracity of matter, express age and history, origins and history of human use are hardly used. Although work of Van de Rohe is world-famous, according to Pallasmaa we have a mental need to grasp that we are rooted in the continuity of time. At the moment the west is beginning to discover the neglect of senses. It is more and more acknowledged that “the over-emphasis on the intellectual and conceptual dimensions of architecture contributes to the disappearance of its physical, sensual and embodied essence.”



Figure 4 Barcelona pavilion, Mies Van der Rohe

One of the most important phenomenological thinkers of the post-war era was Maurice Merleau-Ponty. Central to this thought on perceiving the world was the idea that human understanding comes from our bodily experience of the world. In his book *The world of perception* (2008), originally written in 1948, he starts with the world of perception and the world of science. Science and the intellect, he states, do not allow us to gain access to an object free of all human traces, just as God would see it. A few chapters later he explains that “the things of the world are not simply neutral objects which stand before us for our contemplation (...)” “They are clothed in human characteristics (whether docile, soft, hostile or resistant) and conversely they do well within us as emblems of forms of life we either love or hate.” Not only the objects, the world is not neutral, but also the observer cannot be an absolute observer. “... Space is no longer a medium of simultaneous objects capable of being apprehended by an absolute observer who is equally close to them all, a medium without point of view, without body and without spatial position - in sum, the medium of pure intellect.” Each person perceives different, although it can overlap with the perception of others through their influence on each other, “as a matter of principle, humanity is precarious: each person can only believe what he recognises to be true internally and, at the same time, nobody thinks or makes up his mind without already been caught up in certain relationships with others, which leads him to opt for particular set of opinions.”

### Influences on perception

Perception is influenced by many different factors. The most mentioned factor of perception is the involvement of the senses, especially the visual element. Karmanov (2009) distinguishes not only the visual but other influences on

experience, perception and appreciation of the landscape. There are individual differences which cause other adaptation levels. This is the most ideal amount of stimuli, whereby an individual can achieve the

“It is evident, that the eye is educated by the things it sees from childhood on, and therefore Venetian painters must see everything clearer and with more joy than other people.”

Goethe, 1786

maximum and feels comfortable, and knowledge. Situational factors which differ in time of stay, purpose of staying and the position of reviewer. Influences from other people (their opinion, status and expertise) form the social conditions. And cultural factors which result in e.g. the perceived symbolic meaning.

Focus is also an important element in perceiving. This focus on a specific object is directed by present desires or needs, expectations, interest and knowledge. We try to order what we see, hear and feel and we look for conformity, coherence, order and similarities. Large part of the process is unconscious, abstract schemes, categories and hierarchies, concepts and laws. In this process what is perceived also receives meaning (Hendriks, 1999). William James (1890, p.402) wrote about this attention: "My experience is what I agree to attend to. Only those items which I notice, shape my mind - without selective interest, experience is an utter chaos." We immediately feel, literally, the difference between seeing a landscape on screen or being in the landscape. The wind, sounds, the ground under our feet, all is part of perceiving the landscape. This is called the haptic perception: the experience of the world is based on a combination of tactile and kinaesthetic sensation (Coren et.al. 1999). Other influences that he mentioned are brightness and spatial frequency, colour, sounds and hearing, taste, smell, touch, light and shade, form, constancies, time, motion, attention, development, learning and experience, and individual differences.

Perception depends also on the way the landscape is seen. In a research of this phenomenon (Meinig, 1979) people were asked to describe the landscape, and to identify its elements, composition, and meaning. The answers resulted in ten different landscape interpretations that people are prone to perceive:

Landscape as *Nature, habitat, artefact, system, problem, wealth, ideology,*

"if we believe that the object of architecture is to provide a framework for people's lives, then the rooms in our houses, and the relation between them, must be determined by the way we will live in them and move through them."

Rasmussen, 1962

*history, place or as aesthetic.* Each description is socially constructed by the viewer (see figure 5).

Landscape as...	Tendency of the viewer
Nature	Nostalgic romantic view; nature dominant and humans subordinate; nature as pristine (wilderness); separates people and nature
Habitat	Landscape is a home for humankind; nature is benign provider; managed nature; interrelating people and environment
Artefact	Anthropomorphic view; nature no longer exists; human created
System	Holistic view; people and nature are expressions of a systemic oneness
Problem	A situation needing correction; mindset can include an appreciation for the preceding four views
Wealth	Abstract geographic view; people 'own' land; primary value of land is its economic worth
Ideology	Landscape as symbol of the values, ideals, aspirations, hopes, and dreams of a culture; maximizes cultural meaning
History	Landscape as a complex documentation of the history of natural and human activities in a particular location
Place	Phenomenological view; sensual experience; immense variety, uniqueness, and individuality of places; focus on gestalt rather than elements
Aesthetics	Detached, abstract approach; primary emphasis on the artistic quality of landscape features; landscape as visual scene; aesthetical ideal

Figure 5 Ten versions of the same scene (Meinig, 1979) described by Motloch (2001)

Environment is what is perceived, it is not the physical world (Gibson, 1986). Changes in this environment that are perceived (those on which acts of behaviour depends on) are neither extremely slow nor extremely rapid. Even changes that can be seen visually, can be explained differently because of a different mindset. Gibson uses the example of an ice cube to illustrate this. When an ice cube is melted, science claims that it has changed form. But our perception will say that it has 'disappeared'.

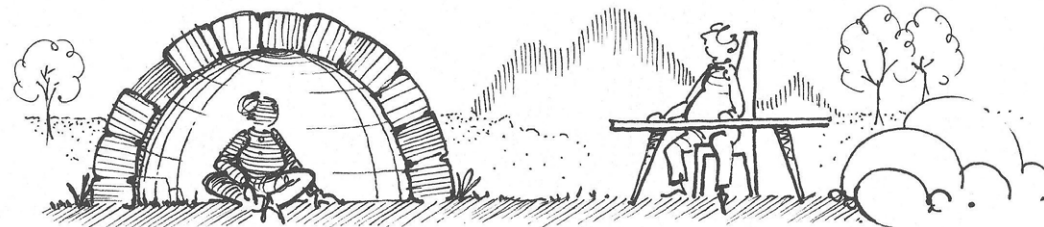
A unique human ability is imagination. This has also influence on how an environment is perceived. Not only the moment of perception is

important but also the ability to imagine one self in the past, present and future. If we cannot imagine, we can not foresee. It augments the values of reality (Hendrikx, 1999; Bachelard, 1994).

### Experience

Perception and experience are closely related to each other. Perceiving has an effect on how things are experienced. In the process of perception physical and non-physical elements create images, feelings and meanings. But experience is influenced by many factors. Physically materials in the landscape have an effect on feeling. A venetian building for example can show how an appearance of weight or lightness can be created in architecture. Colour (mostly highly symbolical), scale and proportion, rhythm, textural effects (surface appearance and heat-conducting ability), light, sounds or hearing provide a certain experience, positive or negative (Hendrikx, 1999). When a landscape pleases the senses it has a high experience value. The interpretation of the senses is dependent on knowledge, past experiences, memories, needs and preferences (De Vries, 2009).

The landscape hosts rich forms and meanings that can be inspirational because of it's differentiation. The appearance of the landscape is a results of a long complicated history of developments, which may be without special purpose. This complexity and differences with a certain order creates harmony, and this can increase the experience. This is possible because experiences from the past are combined with experiences in the presence. Knowledge is part of this experience. According to Hendrikx (1999) one can not emotionally value historical objects without knowledge.



As mentioned above visual images have become commodities. Vision and hearing are privileged sociable senses in our western culture. But every touching experience of architecture is multi-sensory. Significant architecture makes us experience ourselves as complete embodied and spiritual beings. There is even medical evidence that peripheral vision has a higher priority in our perceptual and mental system (Pallasmaa, 2005). Pallasmaa and other philosophical writers focus on this 'embodied space'. The experiential world becomes organised and articulated around the centre of the body. The entire body beholds, touches, listens and measure the world. He shows the importance of shadow, acoustic intimacy, tranquillity, scent and texture in a building. A good example of embodied human condition is the work of Frank Lloyd Wright an Alvar Aalto (see figure 8) Although a designed new building can be altered and build according to the ideas of the architect, these elements do play a role in the landscape too.

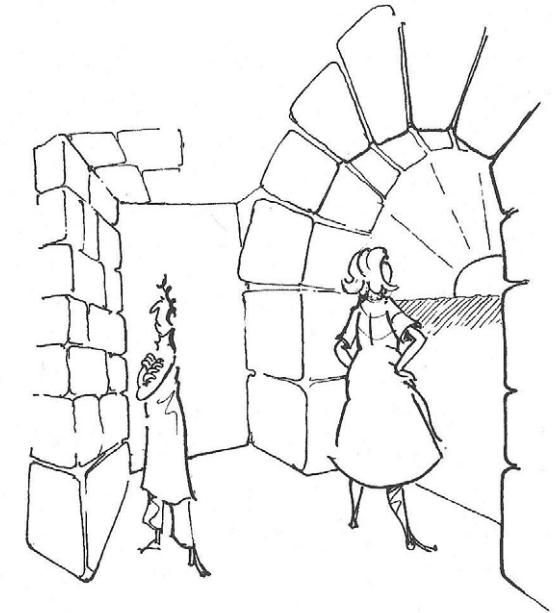


Figure 6 An opaque body boundary gathers stimuli at the surface while a transparent one stimulates fusion with external events.

Figure 7 If landmarks are very close to us, our body seems to shrink, whereas a vista makes us feel our body has expanded





“We have said that space is existential; we might just as well have said that existence is spatial.”

Merleau-Ponty, 1962, p. 293

Figure 8 Mount Angel Abbey Library, 1964-70 St. Benedict, Oregon, Architect: Alvar Aalto; Embodied space. (Photograph by David Roy)

According to Gibson (Bloomer, 1977) “The feeling of buildings and our sense of dwelling within them are more fundamental to our architectural experience than the information they give us (see figure 9).” He divides the experiences into basic-orienting and haptic systems. Basic-orienting refers “to our postural sense of up and down which because of its dependence on gravity, establishes our knowledge of the ground plane.” Within the haptic system the entire body is included, not just the instruments of touch, such as the hands. These haptic experiences give fundamental meanings to visual experiences, while visual experiences serve to communicate those meanings back to the body.

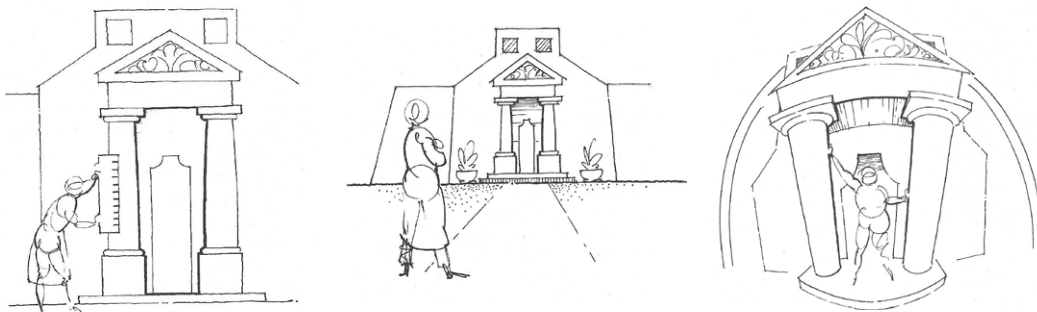


Figure 9 The bigness which the building actually has (1); the bigness which it appears to have (2) and the feeling of bigness which it gives (3).

### 3.2 Space & place

When space become meaningful to people they become places. Place can be seen as the physical environment, where different elements relate to each other and which has meaning. This can be natural or man-made places. They are made by the interaction between settlements and soil or bases of the landscape. “Place is the point of departure as well as the goal of our structural investigation; at the outset place is presented as a given, spontaneously experienced totality, at the end it appears as a structured world, illuminated by the analysis of the aspects of space and character.” (Norberg-Schulz, 2003). Tilley (1994) describes place as the “existential or lived consciousness.” Y.F.Tuan (1975) highlighting the influence of experiences on place-making by stating that “Place is a centre of meaning constructed by experience.”

In the process where a space becomes a place to people they will proceed to defend it against the threatening outside. The place is connected with a particular identity, which needs to be protected from other different identities (Creswell, 2009). And a place is perceived in five hierarchical levels (Motloch, 2001):

- 1) Basic information is processed
- 2) Setting is interpreted as legible and offering opportunity for exploration (Lynch: imageability)
- 3) Perceptual meaning is conveyed as the individual relates what is perceived to previous experience, at both preconscious and conscious level
- 4) Setting is decoded for its ability to support desired behaviour.
- 5) Associational meaning is imbued. (by recalling patterns of previous experience from the mind)

As a contrast to places, there are the so called non-places (non-lieu). This places are only experienced by passers-by and which have no binding with the people. There is also a more distinguished view on space where it is divided into different kind of spaces. Tilley (1994) describes these five spaces:

Space	Focus
Somatic space	Sensory, bodily movement
Perceptual space	Egocentric, daily practice, relative and qualitative
Existential space	Socialized within group, social meanings
Architectural space	Create and bound space, deliberate tangible, visible and sensible
Cognitive space	Basis for reflection and the theorization, discussion and analysis

Figure 10 Different kind of spaces

As mentioned the Western world approach to perception and experience is different from the non-western world. In the Western world space created by market forces must above all be a useful and rational place (Tilley, 1994).

Genius Loci is a term often used to explain that places have their own identity or character. It is a Roman concept based on the thought of a 'good' relationship to the place in a physical as well as a psychic sense (Norberg-Schulz, 2003). In the western world this concept is used for referring to a specific identity or atmosphere of the place (De Vries, 2009). The origin of the concept means that there is a 'spirit' in that specific place. It is not attributed to the place by the people. Although this thought is less present, the idea of places having their specific character which can be destroyed or strengthened is still remaining when designers refer to the Genius Loci. When one sees the landscape, including different places, as constructed entities by people, this (original) concept of Genius Loci differs from this point of view. It depends on the used words and the idea behind it. For instance, saying that all places have character (expressed by Norberg-Schulz(2005)) in this case means that this character is depending on the how things are

made. It depends on the function of time, like change of seasons, but also on the material and formal constitution.

Ian Thompson discussed the use of Genius Loci in landscape architecture (Menin, 2003) He stated that "the fact that an idea has a long pedigree does not make it true or useful, as can easily be seen from the persistence of astrology. The question is really whether the genius loci is just a poetic piece of animism or whether it can be given some more definite and useful sense (...) It is possible to say that design which attempts to optimize social, ecological and aesthetic values is thereby richer than that which only attempts to maximize one sort of value. If the idea of the genius loci can help us to identify such design, and – better still, if it can help us to create it – it will justify our attention." He accepted 'character' as the central idea of Genius Loci. "Paying attention to the existing character of a site offers a means to consider the aesthetic, ecological and social aspects of a place simultaneously."

The meaning of a place is influenced by fantasy, symbolism, mystic and the range of values we attach varies with our closeness to or use of it (Bell, 1993; Hendriks, 1999). The emotionally band with a place is called 'place attachment'. By being longer in one place this band is created, especially when there is personal interaction with the place. Norberg-Schulz (2005) shares the same opinion concerning this qualitative complexity of places. They cannot be described by means of analytic, 'scientific' concepts. From the scientific principle places become abstract spaces with 'objective' knowledge. What is lost is the everyday life-world. This "ought to be the real concern of man in general and planners and architects in particular." It is important because people do not gather objective knowledge, but gather experience meanings to create for himself an 'imago mundi' or micro cosmos by which he concretizes the world. According to Seamon (1993) a sketch can be the important bridge between the knowledge and experience, or 'lived space'. Within the design cycle (problem, design program, proposals sketch, presented client, accept or not accept, working drawings, new environment occupied, new experience of place, evaluation) a sketch is a form of communication between geometric and lived space.



### 3.3 Aesthetics

Probably the most famous sentence in the world about beauty is “beauty is in the eye of the beholder”. What is usually meant by this is that beauty is subjective, not an attribute of the ‘object’ but it is depending on the viewer. In history aesthetics in relation to architecture, design and environment developed into a form of science. The word aesthetics finds its origin in the Greek word ‘aesthetikos’, which means ‘sense of perception’. From the time of Galileo the body stood central in aesthetics. The body as the ‘divine’ organization principle in architecture. During the time of Louis XIV architecture existed around the importance of functions. Especially during the Enlightenment (18th century) there was a move from the divine to mechanical organization, laws and mathematics. Debates where about ornament, proportions and functional criteria. It was not until 1750-1758 aesthetics or ‘Aesthetika’ was acknowledged as science. During this time aesthetics become an independent body of knowledge, real knowledge. And architecture was seen as art (Bloomer, 1977).

German philosophical thinkers during the 18th and beginning 19th century had there own ideas about beauty and aesthetic. Diderot saw aesthetic experience as being dependent on a wealth of associations. In the approach of Burke the bodily senses and the sense of beauty are closely allied: “beauty acts by relaxing the solids of the whole system... Bodies which are rough and angular rouse and vellicate the organs of feeling.” Although at the end of the century Kant acknowledged the forces of feeling, a response to theses forces would not give people pleasure unless there is a mental judgement of them. Feelings where intellectualized by this judgemental activity. Hegel emphasized the mental aspect of art. More then the philosophers before him. He defined the beautiful as “the sensuous semblance of the Idea.” He also limited the senses which give aesthetic pleasure to sight and hearing. Touch, taste and smell were excluded (Bloomer, 1977) (see figure 11-13). Where the body was incorporated into the experience of objects during the 19th century, by the end of the century body and mind were clearly separated.

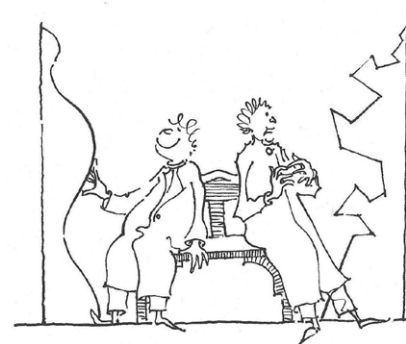


Figure 11 Burke: Beauty acts by relaxing the solids of the whole system... Bodies which are rough and angular rouse and vellicate the organs of feeling.

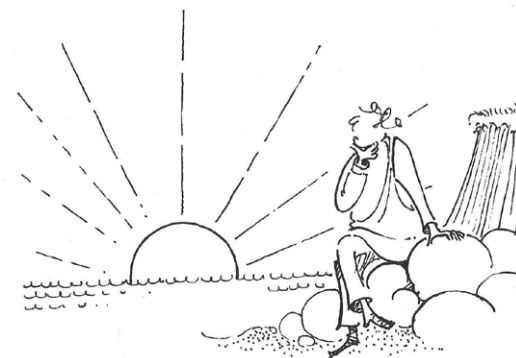


Figure 12 Kant: Recognizing the force of feeling but demanding the intervention of a purely mental activity.

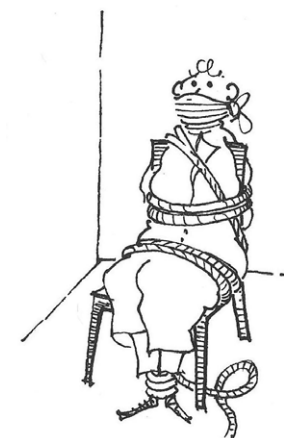


Figure 13 Hegel: Limiting the organs of aesthetic pleasure to sight and hearing

In the 20th century aesthetic, defined by Carlson (2000), is the “area of philosophy that concerns our appreciation of things as they affect our senses, and especially as they affect them in a pleasing way.” The appreciation is initially intimate, total and engulfing. It is not ‘framed’ as traditional works of art, in time (like dramatically works or musical compositions) or in space (like paintings or sculptures). There is a debate about appreciation and how it relates to aesthetics and the environment.

Most essential to appreciation is active engagement and it is an interaction between the cognitive and emotional. The experience value can be stimulated through aesthetical designing (Hendrickx, 1999). Meaning the whole body is involved, as well as the secondary emotions, such as the experience of beauty. Our construction of order and purpose effects the understanding of nature and its beauty (Kemal, 1993). According to Hepburn (Kemal, 1993) (in the essay ‘Trivial and serious in aesthetic appreciation of nature’) beauty contains a sensuous and a thought component. The thought component is illustrated by a falling leaf, which is also symbolizing all ‘falling’. Beauty in a narrow sense is when one is responding with delight. More widely it may cover the aesthetically arresting the rewarding-to-contemplation, a great range of emotional qualities, without necessarily being pleasurable or loveable or suggestive of some ideal.” Saito (1998) places the sensuous and thought component in a certain order by saying “I believe that the aesthetic appreciation has the beginning and end with the sensuous, through the sensuous can be, and often is, modified or adjusted by the conceptual.”

Tuan adds to the debate the influence of language and ordinary geographical term on seeing. For example the word river means different things and will be different associated in Europe then in Australia. Proportion, harmony and integrity are important for the ‘classical beauty’ writes Crawford when discussing the comparison between natural and artistic beauty. Classical beauty is “based on a conception of natural beauty in which nature exhibits perfection of form in regularity and due to proportion (...) the sensuous embodiment of seemingly intelligent design (Kemal, 1993).”

The enjoyment of the landscape depends on the behaviour relationship of the observer and the visible environment. Places vary in their capacity for stimulating aesthetic response and therefore there is an aesthetic potential of place (Appleton, 1996). It is influenced by the shape of the land surface, the character of vegetation and even climate. Climate does not only influence vegetation, but the sky is an integral part of landscape. The sky and its visual properties are no less subject to the laws of nature than are those of the land. A landscape is in balance when proportions in which the symbolism of prospect, refuge and hazard are combined.

### **3.4 Concepts used in my research**

Literature gives a lot of useful concepts to work with when experiences of dikes are explored. In this last paragraph I will sum up which concepts will be used and how they will be used in the following chapters.

Within perception the holistic approach is used to find out about the meanings, values and opinions of people regarding a certain environment. Not only the visual system, which is very much present in the discipline of (landscape) architecture, is important, but also the haptic system. This is also found in view of constructivism. Not only the mind, but also feelings and senses are important. When interviewing people attention will be paid to the visual, by images, but in the conversation the background of the perception, the stories behind the answers are equal as important. Focus plays a role in perception too. In the interviews this will be used to find out how, and if there is a difference in focus within the different groups. But it is also useful for finding out how focus changes the perception and what the consequences will be. This is not only a focus on the moment itself, but also the influence of backgrounds, education and knowledge, values and more. It is the starting points in views of the people. Therefore the landscape interpretation research of Menig is used to explore the differences among people when talking about the environment in general, basic views that may influence later choices.

The concepts of space and place will be used to explore the meanings given to the specific location. The meanings attributed to the space can turn space into place. How do the different groups and people view dikes in general and the specific location. Not only the values will be interested, but especially the reasons behind them. What influences the process of value and meaning given to the location. The concept of climate dikes can change the area a lot. Differences among groups, but also between individuals that for instance live in the area can shed some light of the experiences of the present dike and possible future changes.

Not getting lost in the discussion of what is beautiful or not, aesthetics provides some views to work with. Although there is a discussion about aesthetic appreciation, I will use the explanation of the use of both cognitive and emotional within appreciation. How will both elements used by the people? Can this be seen in their answers? Again, not only the places people like to visit, what they find beautiful to look at outside the door, and the preference for certain climate dikes (shape wise) matters. Therefore I will try to find out what, both visually and non-visually, influences the aesthetic potential of dikes and my case location.

All interview themes and questions relate to these three themes. Also the chosen methods are derived or related on these point of views.

4





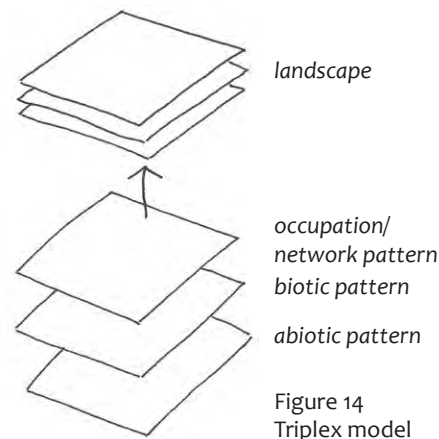
# 4

## Developments of the river landscape

Analyzing a certain environment can be done from different viewpoints. And every viewpoint comes along with a certain set of terms and common language. In this chapter I will use a method of landscape architects and use the first observer position (for further explanation of the used method see chapter five). This means for a large part a (strongly) visual way of looking at the physical world. In the first part of the chapter I will explain what this methods includes. It already shows a lot of how the word 'landscape' is seen and used by many landscape architects. This explanation of landscape is therefor also used in this chapter. Using this method the river landscape, and specifically my case location of the North of the Betuwe, is analyzed. How is the landscape formed through geological and hydrological processes? And how did humans influence this area? Zooming in on dikes, the (general) history of dikes is described, followed by a short paragraph on climate change and the influence on the river landscape and the dikes. In the last paragraph the concept of Climate Dikes is explained and several examples of possible dike solutions reacting on climate change will pass by.

### 4.1 Unraveling the landscape

Every model has its own way to look at landscape and it depends on the used model what is taken into account and what is underexposed. Kerkstra developed a layer model called Triplex-model (Kerkstra en Vrijlandt, 1988) in which the landscape is divided into three different layers (see figure 14). Each layer has its own landscape forming factors. There is a occupation pattern (e.g. villages, networks, infrastructure), a biotic pattern



(flora and fauna) and a abiotic pattern (e.g. geomorphology, water system, soil). The focus of the Triplex model lay on the physical presence of the landscape.

The above model is useful to understand processes in the landscape. A tool to analyse not only what we see, but also to understand why the landscape has its present forms and what the influences are of human interventions.

#### 4.1.1 Abiotic pattern

The abiotic patterns of the river landscape concern all the non-living factors that shape the land. Soil, geomorphology and the water system are an important part of it. Especially in a river area, water plays the most important role in how the landscape is being formed.

#### Geomorphology and soil

240.000 years ago land ice from the North came to a halt in the middle part of the Netherlands. During that time the Rhine was a strongly fluctuating braided river. With the water a lot of sand was deposited. This became an important source for industrial sand extraction. 12.000 years ago the climate became mild. The river changed from a braided to a meandering river (see figure 15). Floods resulted in the sandy higher areas near to the river and the lower clay areas further away (see figure 16 & 17). On this higher sandy soils occupation began (see figure 18 soil map light blue). Surrounding soils were fertile and very suitable for

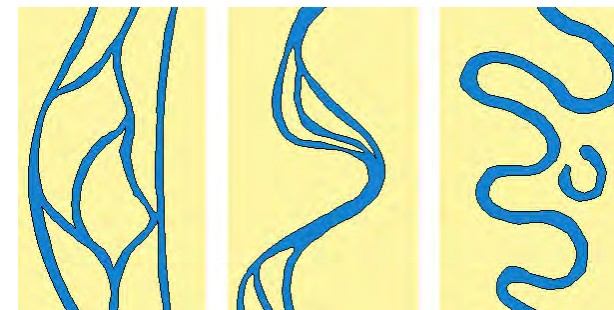


Figure 15 Changes in the river landscape: from a braided to a meandering river.

agricultural activities. The lower soils were less suitable for agriculture and became grassland for cattle (see figure 18 soil map dark blue).

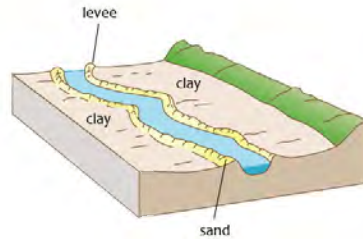


Figure 16 & 17 Higher levees and the lower 'basins'

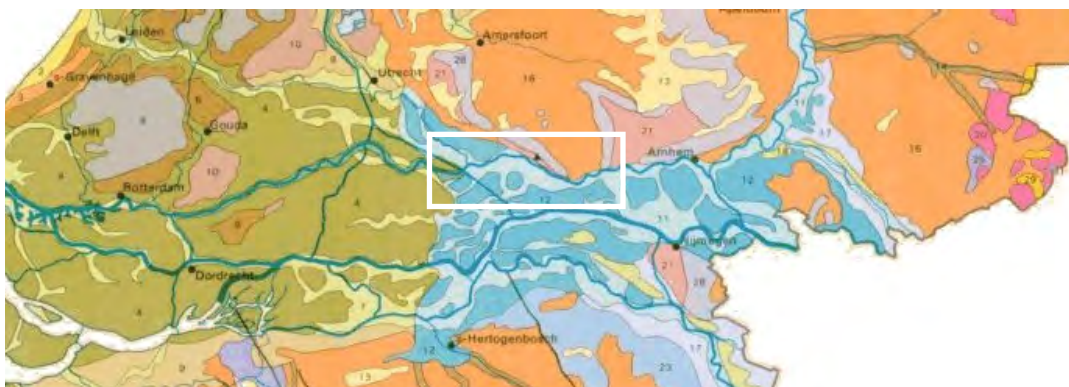
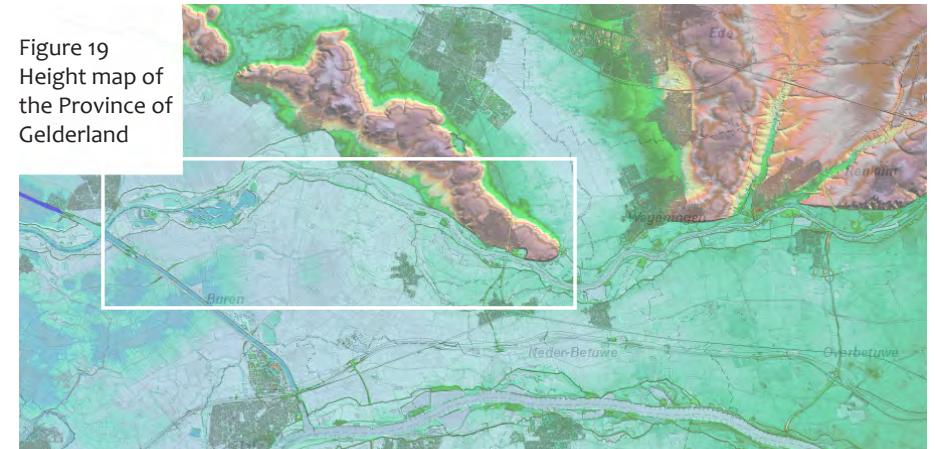


Figure 18 Soil types of the Netherlands

At the south side of the Neder-Rijn, between Rijswijk and Opheusden, three higher sandy levees were created by the influence of the water. These levees are called the levees of Maurik-Rijswijk, Lienden-Ingen and Opheusden-Kesteren. The low part of the Neder-Betuwe is called 'kom Zoelen-Ommereen'.

Figure 19  
Height map of  
the Province of  
Gelderland



### Water system

Throughout history the shape of the river Rhine has changed a lot. The river changed from a natural to a highly controlled and more straight course. With the rise of more (technical) knowledge, more was done to prevent flooding. And the river could be used more safely by the ships. In the 17th century new river courses were dug and small groynes were made. Rivers were strongly shortened.



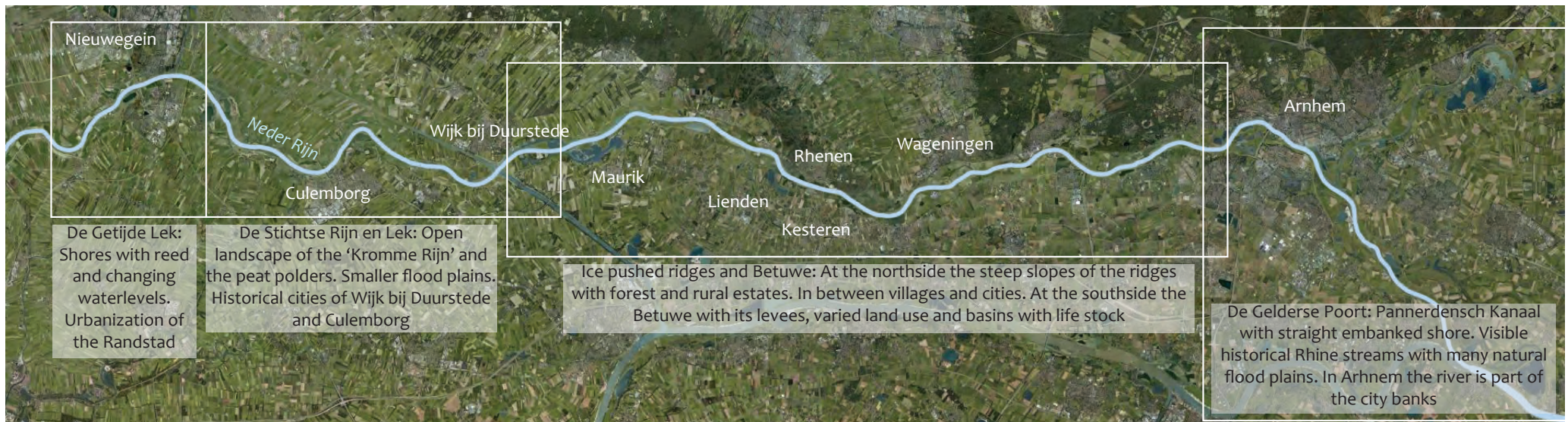


Figure 20 Meandering Rhine at Amerongen, Conrad 1792 – 1795 (RA-Utrecht)

In the 19th century the monitoring of dikes became systematic. At a regular distance dike storage buildings were built in which materials were stored that were needed when high water was a threat to the people. Next to Lienden a nice 19th century dike can be found. At Maurik meanders and intersections from the 20th century are present. Around these dikes many traces of dike breakthroughs ('wielen'), quays, dike storage houses, dams and other changes can be found (see figure 20). Winter dikes divided the flood planes from the area within the dike. This last mentioned land is kept dry through a complicated system of ditches, quays and locks. Because of the construction of dikes the dynamic

increased in the flood plains. Water raised higher, the flow increased and the mobility of the riverbed increased. In the 1970's weirs were built into the river. The consequence was a decrease in the river dynamics. Per year the weirs are open for 60 days. The dammed river runs off an average of 25 m<sup>3</sup> water per sec. Comparing this to the river IJssel, which is 285 m<sup>3</sup> water per sec., this is much less. The peak discharge of the Neder Rijn is a fixed part of the Boven Rijn. This 3.376 m<sup>3</sup> per sec. is 2/9th of the total discharge of the Rhine. The IJssel discharges 1/9 part and the Waal discharges the largest part, 2/3 (Takke, 2009). Not only the discharges between the rivers differs. The river Rhine can also be categorized into 4 routes: De getijde Lek, de Stichtse Rijn en Lek, Ice pushed ridges and Betuwe and de Gelderse Poort. These areas differ in their position relative to the ice pushed ridges, the route of the river and age of existing routes, the presence of three weirs (with consequences for the dynamics), and because of the urban junction around Arnhem and the separation of the Rhine and IJssel (see figure 21)(Takke, 2009). Again, this division is strongly spatial and visual oriented, but it can also give some useful insides of the area about variation and origin.

Figure 21 Four categories along the river Neder-Rijn





Besides the river itself, water is also present in three other ways in the flood plains (see figure 22). The so called ‘flowing secondary channels’ are at both sides connected to the river. At all water level they discharge a small amount of water. This type of water channel is not present in the chosen case location. Secondly there are ‘flood channels’ which are connected downstream with the river. Only if the water rises high this water starts streaming. Most of the time the water is calm.

At the south side of the river Rhine other water areas are present, but these are related to human interaction, sand excavation activities and stone making factories. A water channel can also be disconnected from the river (‘strangen’). Usually this water lies further away from the river.

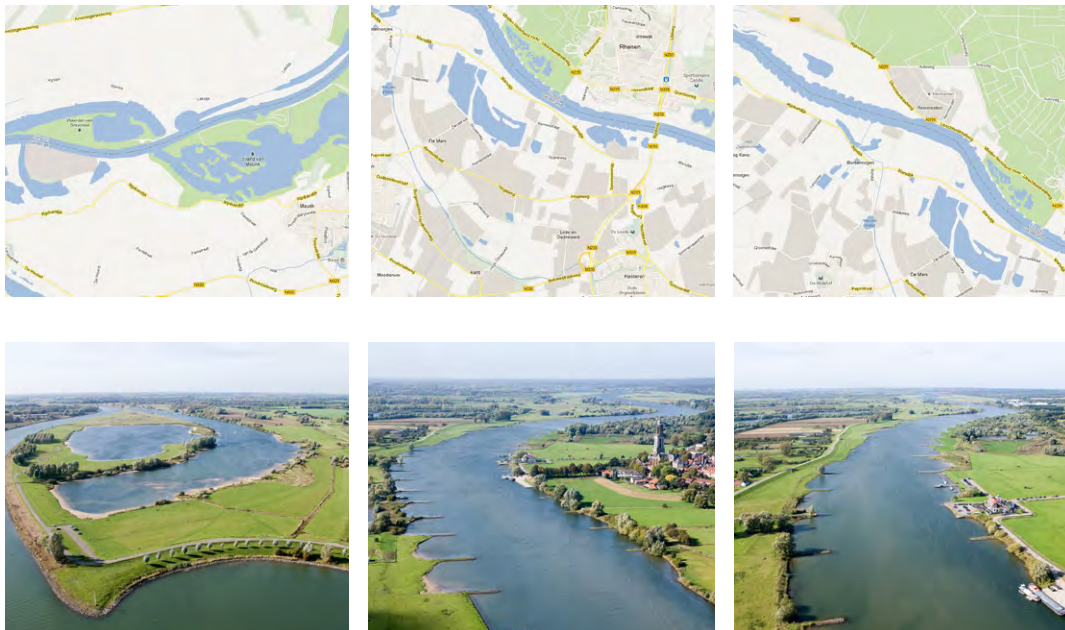


Figure 22 High water channels near Rijswijk and Maurik  
Human made lake due to sand excavation near Rhenen  
‘Strang’ near Lienden

#### 4.1.2 Biotic pattern

The biotic patterns of the river landscape concern all living elements that are present. Flora, fauna and ecology (relation between living organisms and their surrounding) differ in each area. The river landscape and in this case the Betuwe has its own unique living habitat. The Rhine together with the ice pushed ridges form one of the largest ecosystems of the country (Takke, 2009).

In the last decades more nature development areas are being created, that is to say agricultural land is transformed or directed into wet areas with shrubs, trees and sometimes introduced grazing animals (like De Blauwe Kamer, near Rhenen). A river bounded ecosystem arises.

Both north and southside of the Neder-Rijn is designated as European protected nature areas (see figure 23). A small part near Amerongen falls (also) under the Habitats Directive. All other flood plains fall under the





Birds Directive.

The floodplains are an important breeding area for birds of rough grasslands, like the Corncrake and the Spotted crane. Locally we find colonies of Sand martins in the steep wall of sand excavation lakes. Larger ponds are used as a resting place by geese and ducks. White-fronted goose, Gray goose and Widgeon are the most common birds. Populations of Crested newts can be found in areas where high floodplains alternate with water areas (Kiwa Water Research & EGG, 2007). For the fish special fish passages are placed at the weirs in the river.

The levees of the Betuwe belong to the highest quality habitat for fruit cultivation (Takke, 2009). Insects and birds are attracted by the blossom, but also grassland birds (like the Stork, Lapwing and Godwit) feel at home on the grasslands of the Betuwe.

Figure 23 Natura 2000 - Flood plains Neder-Rijn

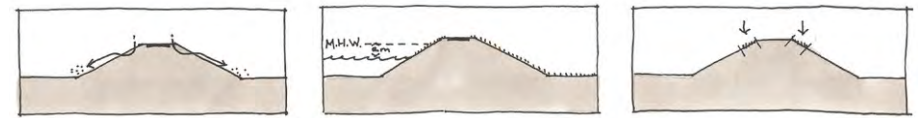


Figure 24 Nutrition transport - Inundation - Highest potential biodiversity

Looking at a smaller scale, the scale of a river dike, different vegetation zones can be distinguished (see figure 24).

Because of its form different environmental conditions are present. One hectare of dike slope can host a larger biodiversity than a hectare of flat grassland with the same soil compositions. These zones exist because of the difference in dynamics of the slope. Factors that determine this dynamics are:

- rainwater runoff. This causes major changes in nutrients and moisture content
- transport of soil- and organic materials down the slope under influence of rainwater. The result is an impoverished top of the slope and an enriched bottom of the slope. Riverine species prefer dry, poor circumstances and therefore thrive on impoverished areas.
- inundation through river water. The frequencies of inundation lowers to the top of the slope. Floods lead to a stagnation in growth, but also the river water also functions as a fertilizer. The riverine grass lands are not resistant to these floods.

Potentially, the largest biodiversity can be found on the top of the slope. Different plant communities prefer different soil conditions regarding slopes. Some avoid slopes, some prefer a slight slope (1:6 to 1:3) and others prefer a steep slope (steeper than 1:1.5). Combination of slopes can be promising for biodiversity on dikes. The way a dike is maintained is in this a very important factor. When the soil is fertilized and there is overgrazing biodiversity declines. No maintenance at all will result in a species poor rough area. Mowing without removing the grass will provide conditions for (a larger) biodiversity (Feddes en Halenbeek, 1988).

### 4.1.3 Occupation pattern

A third layer that can be analyzed is the most human influenced one. Villages, infrastructure, cultural and military history are all leaving their traces and elements in the landscape.

#### Cultural history

The present landscape of the Betuwe was formed through historical events and processes. The way land and water can be used by men has influence on the physical appearance of the landscape. At the end of the Ice Age people in this river area were deer hunters. It was in the Stone Age that farmers would settle on the higher lying levees. Settlements were chosen on the basis of safety (high) and suitable soils. Small villages arose in the Iron Age, German tribes populated the area and farmers settled down at the base of the ice pushed ridges.

The Rhine became the most important river of the Netherlands during the Roman Age. The northern border of the empire stretched from the German border until Wijk bij Duurstede, along Utrecht and Katwijk (see paragraph Military history).

During the Middle Ages the river Waal became more important. Little erosion, a lot of sedimentation and a fixed course characterized the Rhine. Villages like Huissen, Arnhem, Wageningen, Rhenen, Culemborg, Vianen en Vreeswijk were established. Villages at the north side of the river had a strong connection with the river, in contrast with the southern side. These villages lie further away from the river, behind the dike.

Deforestation and flooding became a serious problem during the 12th and 13th century. This formed the start of constructing of dikes on a large scale. Many winter dikes were built to keep the water out. But it was not until around 1400 before all dikes were made. Ice drifting in the river could also form a major threat to the area, especially from 1500-1800. Dikes broke and the water made big holes at the other side of the dike. To stabilize the water flows the Pannerdensche channel was made in 1707.

Although the Betuwe presently is famous for its fruit and trees cultivation other agricultural activities preceded. Around 1900 the area sugar beets and grains were cultivated (see figure 25). Further away from the Rhine, but still in the Betuwe, Tiel was world-famous for its metal (tin).



Figure 25 Economy and traffic (1870-1914) topography 1914



Figure 26 Economy and traffic (1919-1940)

Around 1900 the view from the dike was strongly hindered by the planted banks of the river and the stone factories. From 1919 until 1940 the production of brick was the largest economic activity (see figure 26). Yellow and brass colored bricks were made from the clay, and red bricks were made from the old clay from the lower parts of the Betuwe (Takke, 2009). Only a few factories can be found in the present floodplains along the river. At the end of this century the flood plains became more open, with natural vegetation, more water and more variation.

The railroad through the area, of which a part led to Rhenen is no longer there. In WWII the bridge was destroyed by bombs. One highway crossed the Betuwe, constructed in the lowest part where soils are less useful for agriculture and where the least villages lie. The river has lost most of its transport function. The Waal is the busiest transport river now. The Rhine can be seen as a recreation river where industrial transport plays a minor role.

#### Military history

The oldest military line that left visible and invisible trace along the Rhine is the Roman Line, called the Limes (see figure 27). This was the border of the Roman Empire in the Netherlands. Above this line there was no



Roman occupation. The Romans build castellums to defend the line, (in the Betuwe) one near Rijswijk in the flood plains and one near Maurik in 'Eiland van Maurik'. The dynamics of the river erase many traces, but it was likely that Maurik and Kesteren were Roman villages (see figure 28).



Figure 27 The Limes, border of the Roman Empire



Figure 28 Reconstruction of the topography and most important Roman sites in the area of Kesteren

In the 16th century, when the Republic of the Seven United Netherlands took shape, another military defense line was created under French supervision. In contrast to the Limes, the Grebbelinie stretched from north to south, with the Utrechtse Heuvelrug at one side and the wet marshy area of the Gelderse Vallei at the other side (see figure 29). When the Northern army easily passed the defense line in 1794 -'95 through the Betuwe the Grebbelinie was prolonged in 1799. The fortification 'de Spees' near Kesteren was an important element in the defense. Remains of this fort (together with old batteries) are still present in the landscape. This part of the defense line, together with the Grebbelinie played also an important role in the Second World War. It was then called the 'Betuwestelling' (see figure 30).

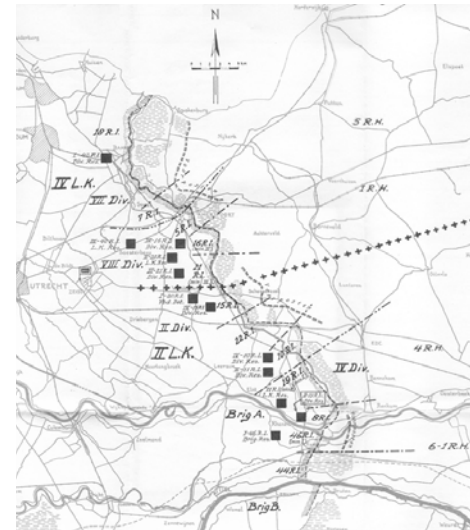


Figure 29 Grebbelinie (1946)



Figure 30 Betuwestelling 1940-1952

## 4.2 History of dikes

### General history

The relation between water and land has changed throughout history (as described in paragraph 4.1.1). Were centuries ago the river flowed based on natural laws, human slowly changed the course and flow of the main rivers in the Netherlands. For two reasons: protection against floods, and to make the river navigable.

Figure 31 shows the three main phases of this process of change through human intervention. Constructing dikes in the 14th century protected the land against the water. Making the river suitable for shipping transverses dams bundled the main stream. A large part of the flood plains stayed dry during normal water levels. Summer dikes between the dams

made the land suitable for agriculture, the so called ‘outside polders’. The river was being regulated. At the end of the 19th, beginning 20th century, the width and curves of the river was being fixed through longitudinal dikes and groynes. This process is called normalization. The depth and width of the main stream is kept constant as much as possible (Feddes en Halenbeek, 1988).

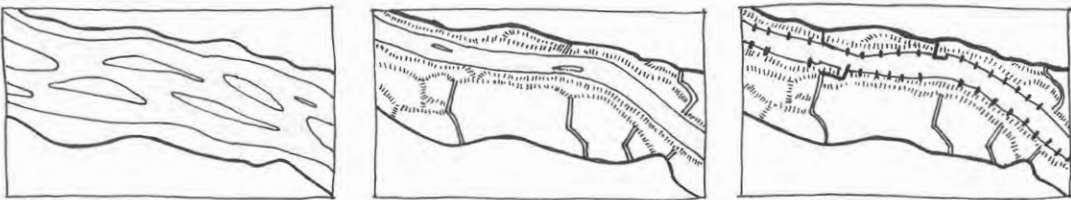


Figure 31 Construction of dikes – Regulation – Normalization

There are four types of weirs: dunes, ground constructions (dikes and dams); special weirs (i.a. safety coffer-dam, retaining wall and dam-wall); and damming civil engineering works (i.a. locks, cuttings, storm surge barriers and pumping stations) (De Koning, 2002) .To place the river dike, or more specific the dikes around the Rhine, in a wider perspective, I will describe different kinds of dikes that are present in the Netherlands. The biggest difference can be found between a sea dike and a river dike. A sea dike has to resist the water for only a few hours a day, but a river dike has to be able to resist the water for a couple of weeks. Therefore the shape of dikes differ (see figure 32). Furthermore, dikes are adapted to the area in which they function. Upstream differs from downstream, and sea dikes differ from dikes around lakes (see figure 33). Along the upper rivers the total kilometers of dike is the highest (see figure 34).

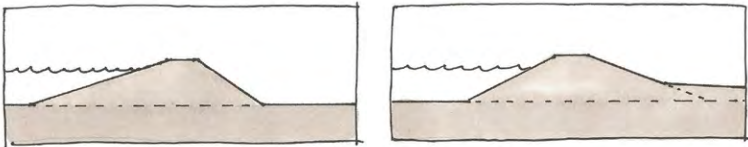


Figure 32 The different shapes of a sea and a river dike

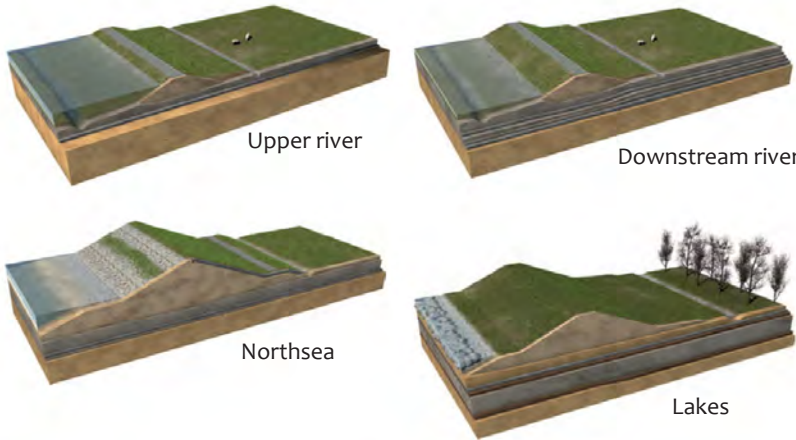


Figure 33 Representative dike profiles

Watersystem	Dike lenght (km)
Northsea, Waddensea	330
Estuaries	310
Lakes	460
Downstream river area	590
Upper river area	810
Total	2500

Figure 34 Water systems and dike length in the Netherlands

Originally a dike was no more than an earthen wall. Experiences and technical insights changed the form and shape of a dike over time. The base of a dike is still the same. The top of the dike has to be higher than the highest expected water level and the weirs has to be strong enough. Until the 12th century Romans set the standard of the Dutch dike building with this principle. From this period of time on I will describe several dikes that are created and used (according to an inventory of Lola landscape architects and WUR-Alterra (2011)).



### 1st century – Limes

This Northern line of the Roman Empire functioned as a defense line, also in the Betuwe, and as an important trade route. To keep the roads suitable for transports the Romans were forced to construct some roads on higher ground, as a dam. Sometimes even a sort of coffer-dam was made out of wooden poles, with debris inside. This large-scaled, precise method of operation was ahead of its time, although this dams were not for the protection against water. Dikes were not made yet and people still lived on mounds.

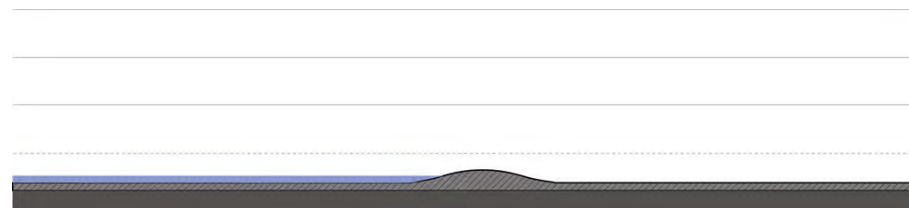


### 2nd to 12th century – Mounds and Inlay Dikes

For a long time the construction of dikes meant building small walls, sometimes even made of peat, between the mounds. The mounds were connected with each other, and on several places a system of dikes was created. But these dikes were not strong enough against the beating of the waves of water. An inlay dike was made further inland when a dike was almost breaking.

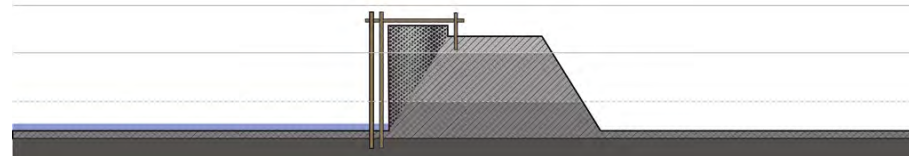
### 13th century – Encircling dikes

For the first time systematically encircling dikes were made in the 13th century after a series of storm surges in Zeeland and Holland. Owners, the nobility and the church worked together. This unique cooperative initiative led for example to the famous 'West-Friese omringdijk' in Noord-Holland. Led by count Floris the Fifth a series of peat walls were replaced by dikes of clay and connected together.



### 17th century – Weed dikes and reclamation polders

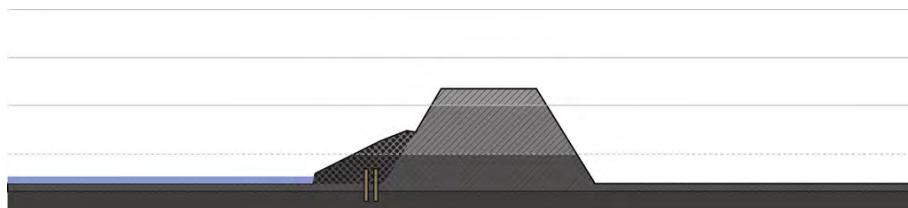
During the Golden Century new polders were reclaimed and lakes were drained. Dikes and water ways were used in a systematic way to drain and keep the lakes dry. A large encircling dike and a system of mills were used in this method. Another new method was used for the profile of the dike. The weed dike was made by a double row of wooden poles, between which sea weed was compressed. This could be five meters high. The sea weed was better resistant against leakages, because the water seeps through the dike instead of taking away part of the dike at once, like clay.



### 18th century – Pile-worms and basalt

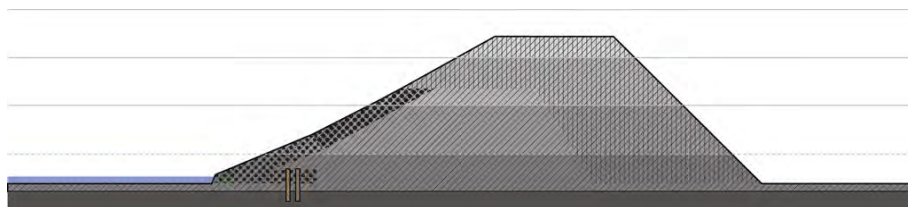
In the 18th century wooden timbering of the dikes were affected by the pile-worms. Comprehensive floods were the result of this wood eating animal. A new dike had to be reinvented. Norwegian basalt blocks were imported to reinforce the dikes. A new, modern dike profile was created when one discovered that a sloping dike was much more resistant to the beating of the waves. In the 18th and 19th century many polders were made and dikes needed to be heightened. Water could no longer spread

out over a wide surface, which caused rising water levels, frequent dike breaking and floods. But this Industrial Era was an innovative age in dike construction. An example is the drainage of the Haarlemmermeer.



#### 1920 – 1940 – Zuiderzee-dike

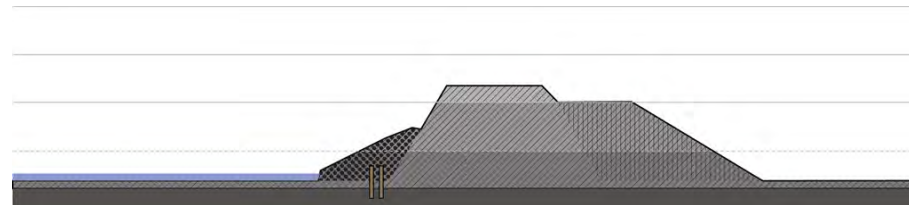
Were for the main part hundreds of workmen still built dikes and dams to create the Wieringenmeerpolder, this era was more and more characterized by an industrial way of working. The extensive Zuiderzee-works were constructed and profiles become complex. A typically dike for the Wieringemeerpolder contained for example a base of brushwood with a layer of rubble; above that boulder clay, covered with a matras pegged to the ground (krammat), a foundation layer (vlijlaag) of rubble and upholstery materials.



#### 1950-1990 – Delta-dike

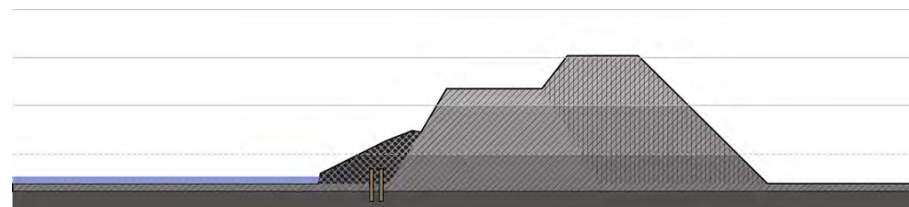
A major turning point in the thinking of safety was the flood of 1953. Large part of Zeeland, West-Brabant and Zuid-Holland was flooded, over 1800 people lost their live and ten thousand lost their homes. From this year until 2005 the Delta-law was made and the term Delta-height appeared. For every dike this height is different, because also the wave run-up had to be counted in with the flood water level. Besides this a certain flooding frequency for the flood water level became leading (for

instance once every 10.000 years). Another things that was learned from the disaster was the following: when the inside of the dike is broader and less steep, chances of undermining trough waves is smaller. Since then, modern dikes have a less steep and broader slope at the side of the land. At last weirs were placed in the tidal outlets, like the 'Afsluitdijk' (although strictly speaking this is a dam).



#### 1990-2000 – River dike

In the years of 1993 and 1995 new disasters were close because of the high water, standing just below the top of the dikes. A new norm for large rivers was made through the Delta-law of the Big Rivers (1995-2005). Now also river dikes had to be heightened until Delta-height. This meant a large operation, with great impact on the river landscape. On and next to these dikes houses and infrastructure were built. Many dike houses and small cities lost their view on the river.



#### 2000-2009 – Calibration dike

Stichting IJkdijk is now working on a smart dike. The dike can register weaknesses, because of its monitoring system. The IJkdijk is a test locations where every innovation can be tested one on one. An example

of such dike is the Live Dike in the Eemshaven. This is a pilot study in an existing dike.

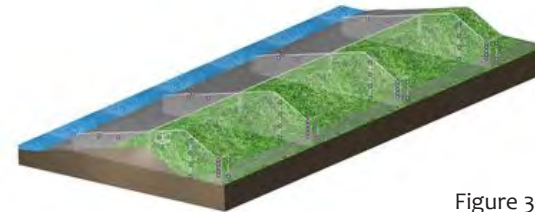
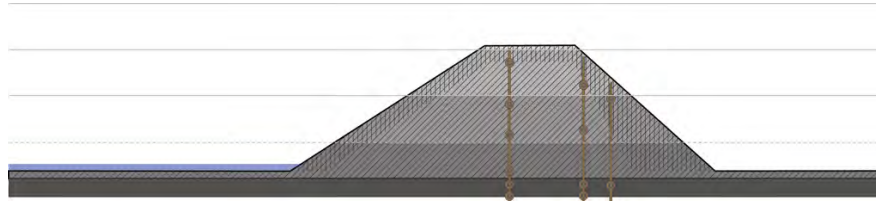
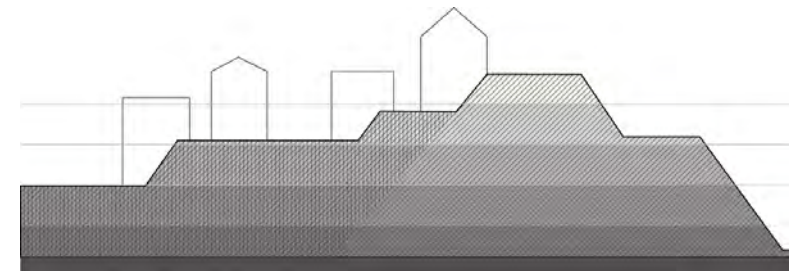


Figure 35 Live dike in the 'Eemshaven'

2009- ? - The 'Teibo'

In 2008 the committee Veerman concludes that the safety level of dikes must be heightened with factor of 10 due to climate change. Coastal protection must for instance have a norm of once every 100.000 years, instead of once every 10.000 years. Therefore many dikes should be heightened. The committee suggest the concept of broad unbreakable dikes, to the example of Japan (Teibo's). Preferably new urban developments can be place on the dikes. Further they like to raise the water level of the IJsselmeer with 1 until 1,5 meters, with large consequences for the cities and dikes at the lake.



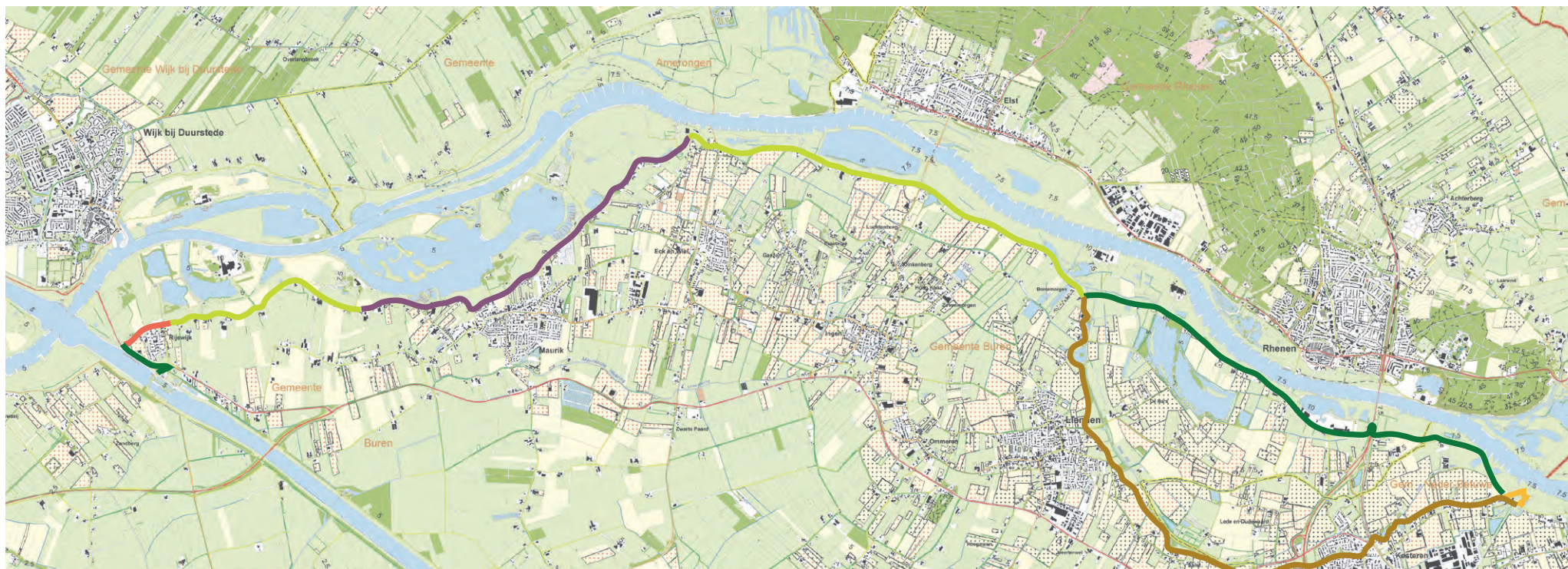
### Present dike along the Rhine

The case location that I choose lies in the upper stream area of the river Rhine. The dikes that protect the land here are river dikes. Most of the slope have a steepness of 1:3, but some parts are steeper. Here old houses stand so close to the dike that with the new safety measures after 1995 the dike could not be made as broad as other parts. At Rijswijk the dike is very small, clamped in between historical houses. Here the dike is strengthened inside.







Small variation in profiles are present, but also on the whole route the dike can be categorized (see next page). According to De Koning

(2002) several interaction between theme's (14 themes from route/length profile, view distance, trees to traffic and sound and weather circumstances) form the characteristics of a dike. Figure 36 shows the different sections of the dike compared to the dikes mentioned by De Koning in the downstream river area. The themes logically play a role in this, but are not worked out in the same detail for this dike route. Some elements therefore slightly differ from the examples in the downstream area, together with the fact that this is another location.





### Dike categories

- |   |                   |   |
|---|-------------------|---|
|  | Concealed dike    | Smaller and less visible through the densely build strip of houses and green in between.  |
|  | Dry utilized dike | Mix of culture, nature and infrastructure and water management. Stronger focus on the use by inhabitants and tourists.                                |
|  | Panoramic dike    | Many panoramic views and great openness to both sides of the dike.  |
|  | 'New world' dike  | Relatively new dike, opening up a new piece of land. Polder on one side, and the river very close to the other side.                                  |
|  | Hidden dike       | Small old dike (former primary dike). Most parts closely clamped in between houses, trees and green. Large part not accessible for motorized traffic. |
|  | Rampart           | Remains of the fort De Spees function as a primary dike. Sharp star shaped curves.  |



### 4.3 Climate change

Our climate is changing faster than ever before. This has a lot of different consequences for all parts of the world and it impacts life and the world of man. Temperature rises, glaciers are melting faster, the search for alternative renewable resources is becoming more important, the sea level is rising, more extreme weather patterns and the danger of floods is increasing. Very hot and dry summers will occur more often. More and heavier rainfall with the danger of flood is expected. Also the river's peak discharge will increase. Damage due to water is therefore more likely in the future (Bresser, 2005). Along rivers the chance of floods is higher in comparison with the sea and lakes. The river Rhine will not rise because of melting glacier, but because of (heavier) rainfall (Deltares, 2008). The Netherlands is not yet prepared for a higher sea level, extreme high river flows and precarious weather (Deltares, 2008). The concept of climate dikes recognizes this problem by introducing a broad and/or alternatively designed multifunctional dike which results in a higher safety for the river landscape (see paragraph 4.4).

We can see direct, but also indirect effects. There are two ways to react to climate change: through mitigation and/or adaptation. Mitigation means the "Technological change and substitution that reduce resource inputs and emissions per unit of output. Although several social, economic and technological policies would produce an emission reduction, with respect to climate change, mitigation means implementing policies to reduce GHG emissions and enhance sinks (IPCC, 2007)." On the other hand we can adapt to climate change: "Initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change effects. Various types of adaptation exist, e.g. anticipatory and reactive, private and public, and autonomous and planned. Examples are raising river or coastal dikes, the substitution of more temperature shock resistant plants for sensitive ones, etc (IPCC, 2007)."

The KNMI, the Royal Dutch Meteorological Institute developed four climate scenario's (see figure 36) These are consistent and plausible

pictures of possible future climates. Air flow patterns and the rising of temperature are the most important variables.

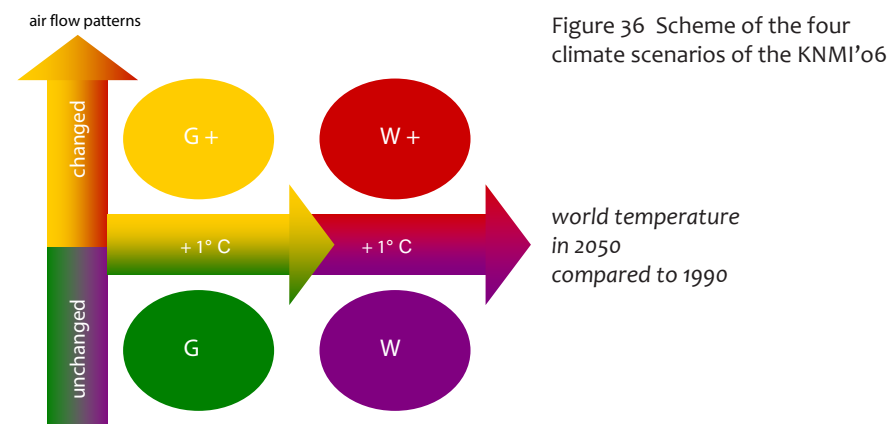


Figure 36 Scheme of the four climate scenarios of the KNMI'o6

G	Moderate*	1°C temperature rise on earth in 2050 compared to 1990 no change in air circulation patterns in Western Europe
G+	Moderate +	1°C temperature rise on earth in 2050 compared to 1990 + milder and wetter winters due to more westerly winds + warmer and drier summers due to more easterly winds
W	Warm	2°C temperature rise on earth in 2050 compared to 1990 no change in air circulation patterns in Western Europe
W+	Warm +	2°C temperature rise on earth in 2050 compared to 1990 + milder and wetter winters due to more westerly winds + warmer and drier summers due to more easterly winds

Legend for the KNMI'o6 climate scenarios. \* 'G' is derived from 'Gematigd' = Dutch for 'Moderate'

For the Netherlands, water management and safety, has always been of great importance since large parts of the country lies beneath sea level. Although the Netherlands is one of the most safe countries in the world, the attention to the water system remains important (PCCC, 2010). The lower parts of the country and the coastal area of the North Sea are the most vulnerable, but all river area's will have to deal with higher peak in water flows in the future. Present dikes are protecting the land behind, but on many locations this will not be sufficient for the future.

Therefore a lot of research is done on the effects of climate change in the Netherlands. Two third of the Netherlands is protected by dikes. Along rivers the chance of floods is higher in comparison with the sea and lakes. The river Rhine will not rise because of melting glacier, but because of (heavier) rainfall (Deltares, 2008). In figure 37 is shown where the dikes are situated (red lines are the primary dikes; blue is primary outside the Netherlands) and where the higher grounds lie.



Figure 37 Dikes in the Netherlands with higher soils (orange)



Figure 38 Dikes in the Netherlands with the safety norms according to the Water Law (2009)

The safety norm for River dikes is set based upon the threats from the past. Statistically they may break once every 1.250 years (the present safety norms range from 1/1250 to 1/10 000 (Silva en Van Velzen, 2008) (see figure 38). That is the equivalent of a change of 8% in an average human life span. At this moment not every dike meets this standard. The government and the Water Board are working to solve this problem. The Netherlands is not yet prepared for a higher sea level, extreme high river flows and precarious weather (Deltares, 2008). It is safe enough for the present and near future, but not for the far future. Then the norms

must be adapted to the new developments. Next to the rich history of water management and the profound knowledge within the discipline of hydrology, new alternative measures and solutions are sought. Climate change does not only effect water management or hydrology. The impact stretches much farther. It effects the weather, nature, agriculture, recreation, economy (companies) and health (Bresser, 2005).



Not related to climate change, but effecting the flooding risk is the rise or subside of the ground levels. Parts of the Netherlands will rise, large parts will subside and a small part will remains the same. Figure 39 shows that the river Rhine and surrounding land will subside. A factor that will add negatively to the climate changes.

Figure 39 The expected subsidence and rise of ground level up to 2050

#### 4.4 Climate proof dikes

##### A Climate Dike defined

As mentioned before committee Veerman recommends a new type of dike, the Delta-dike: “Dikes, which through their width, height or internal construction are so strong, that a sudden uncontrollable flood is virtually eliminated. (...) Delta-dikes can be, depending their shape, combined with other functions (Van den Reek et.al., 2008).” Platform Klimaatdijk and COMCOAST are preparing and experimenting in practice. A Delta-dike is a climate dike, but climate proof dikes have different

names in the different literature and reports. Sometimes only the name changes, but this concept contains also a wide variety of dike shapes. Nevertheless, the principles are more or less the same.

According to the knowledge bureau Kennis voor Klimaat “a climate dike is a collective term for design components that result in flood defences so robust that they are virtually impossible to breach, and thus offer lasting protection, even in the face of on-going climate change. The Climate Dike concerns a type of dike that allows some wave overflow and even a limited amount of flooding, but which prevents the uncontrolled catastrophic dike breaks associated with devastating flooding of the hinterland. The risk, calculated as a product of the probability of occurrence and the resulting damage, is therefore drastically reduced. Another feature of the Climate Dike is its integrated multi-functional character (Hartog, 2009).” The innovation program of the Water Board (WINN) described this climate dike in the same way, adding that the dike has to fit in its environment (Loon, 2011).

An unbreakable dike is another term used for a climate dike. This dike “is as high, broad and strong that under extreme circumstances the chance of breaking because of overflow, waves passing over, erosion of slopes, piping or inward macro instability (see figure 40) is hundred times smaller than present safety norms (Loon, 2011). A river dike has a norm of 1/1250 years. A new dike will have a chance of breaking once every 125.000 (0,0008%) year (Silva en Van Velzen, 2008).

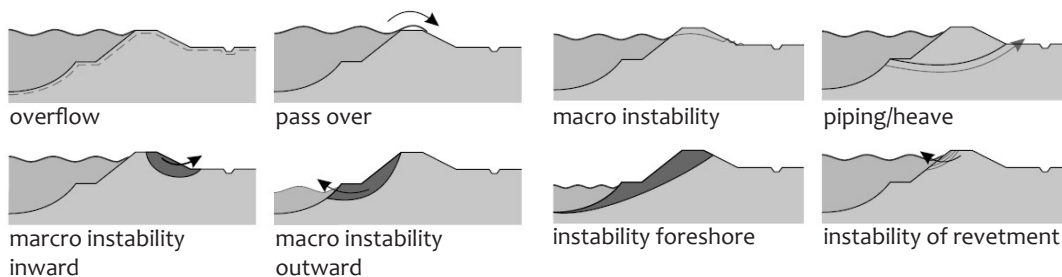


Figure 40 Failure mechanisms of dikes

Other names that can be found in publications and media are: submersible dike and overflow permanency dike.

A climate proof dike is custom made, adapted to the specific locations. It leads to a substantial reduction of influent water. Figure 41 shows the excess amount of water with normal dikes (left), and with climate proof (or Delta) dikes at Walcheren. This would be the result of extreme water levels. Traditional dikes will succumb with above normative conditions and large parts of the area will flood in a small amount of time. Damage will be great and there will be casualties. The new dikes will not break. Some damage is caused by overflowing water, but the water flow will be slow, which gives the people the opportunity to evacuate (Silva en Van Velzen, 2008).

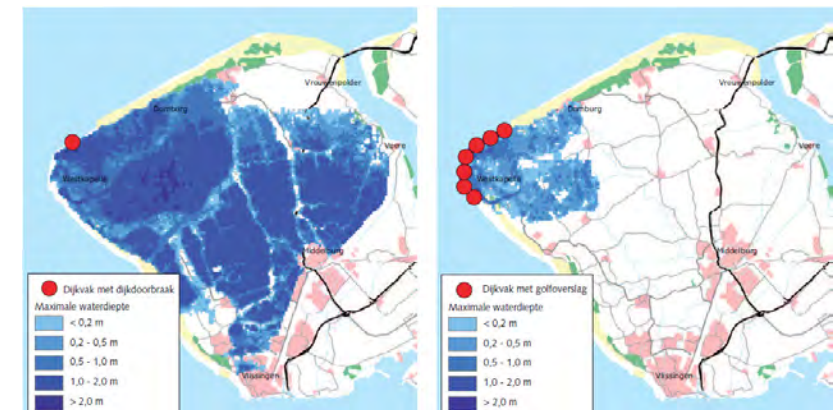


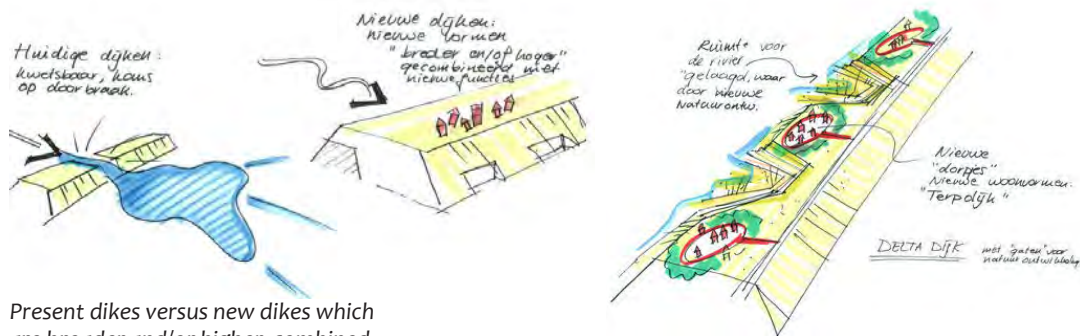
Figure 41 Dike breach without and with a climate dike

Platform Klimaatdijk includes strongly the multifunctional opportunities of such new dikes. Houses, trees, industrial buildings or other functions do not longer stand next to the dike, but they are part of it. On this moment the feasibility of such plans in technical terms are not fully investigated yet. It depends on the demand and on the location. But there are some examples that implement this multi-functionality in new or adjusted dikes. In the next paragraph I will describe present ideas, sketches, and plans in practice.



## Climate Dikes in practice

Although not many cases of climate dikes are constructed yet, there are several ideas and plans that use this concept. Some of the first sketches that can be found in publications or reports are made by a company called Grontmij. They developed some possible climate dikes together with the Wageningen University (see figure 42). But also other companies and bureaus work with the same concept. Form and specific area's change, but the principle is the same. First I will describe some other ideas that has been developed, ending with a view plans that have been made specifically for river landscape areas.



Present dikes versus new dikes which are broader and/or higher, combined with new functions

A delta dike with 'holes' for nature development, space for the river, new villages and new forms of housing: "Terp dikes"

(from left to right) Present dike – Elevator to low-traffic ground – Storage, garage, stores – New forms of dike-housing (layered)

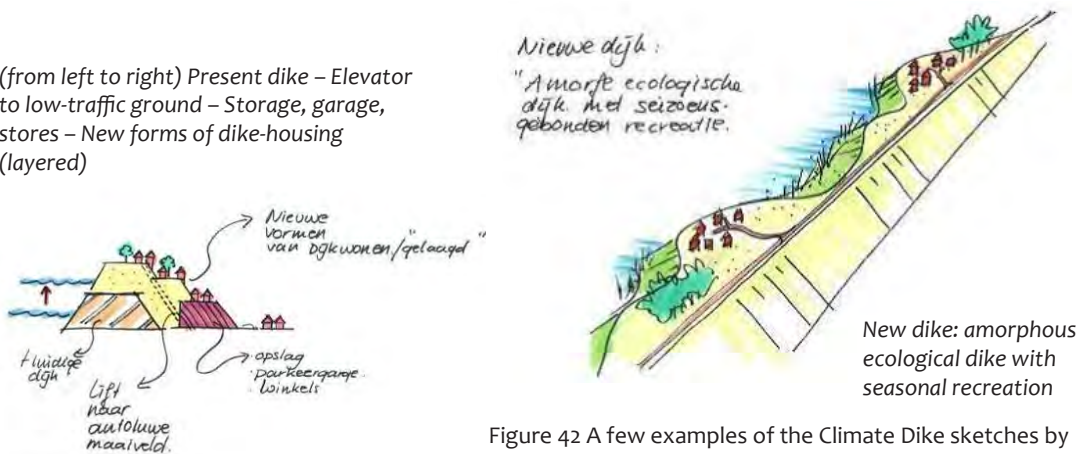
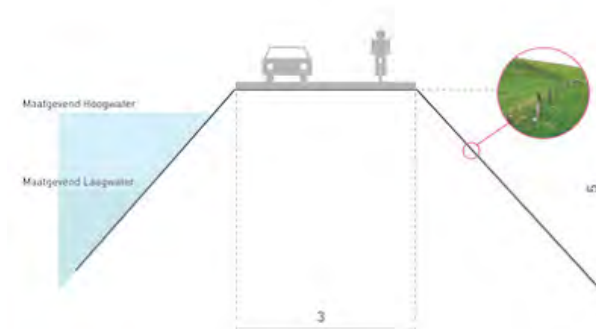
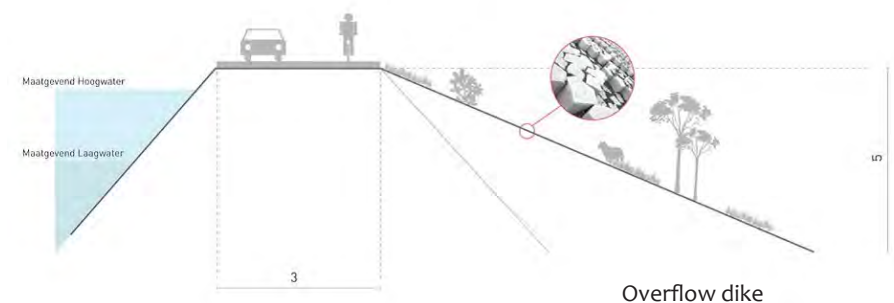


Figure 42 A few examples of the Climate Dike sketches by Grontmij (2007)

Platform Klimaatdijk (with people with different professional backgrounds) describe three different kinds of climate dike that can be thought of: "overloofdijk", "terpdijk" and the "triple dijk" (see figure 42) (Van den Reek, 2008). The first, the overflow-dike is a dike that will not break, but there is an possibility of overflowing when the water comes too high. Near Eibergen is an example of such dike. The terp (or mound) dike makes use of an historical example of villages. Houses are placed on the dike, creating a mound that protects them from the water. The last dike is a third dike (next to the summer and winter dike that already exist), which can be implemented in phases. The dike can 'grow'. It can lie 0-50 km from the original winter dike, giving also the opportunity for multifunctional use (see figure 43).



A primary weir or 'original dike'



Overflow dike



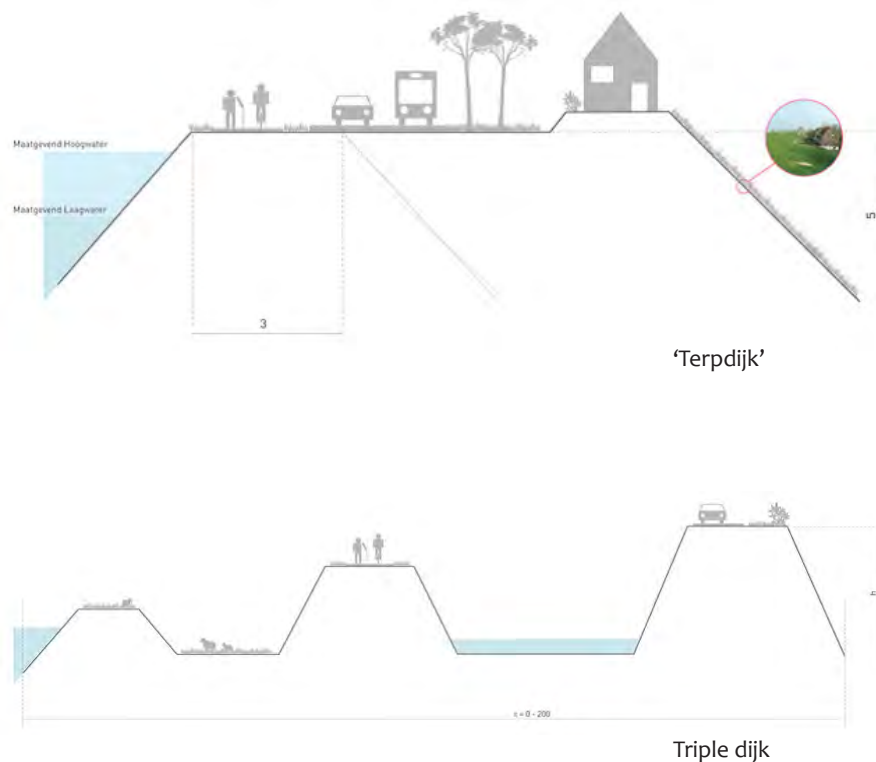


Figure 43 Different kind of climate dikes (! note: slopes are not realistically drawn)

The concept of climate dikes is also present abroad. In Germany (Nordrhein-Westfalen), the United States (New Orleans) and Japan such dikes are build (see figure 44) (Silva en Van Velzen, 2008).

In the Netherlands only a few examples can be found that use the term climate dike or delta dike for new or altered dike constructions. Nevertheless, there are examples and initiatives that can be considered a climate dike. The Nieuw Mathenessedijk, Stadionpark in Rotterdam, Pettemer Zeewering and the Hondsbossche Zeewering are examples

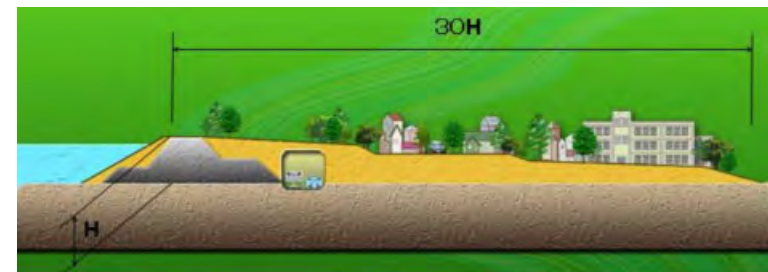


Figure 44 A multifunctional Japanese climate dike

of a broadened inside of the dike. Reinforcements on the outside can be found in Tiel (see figure 45 ) and in Hoorn-Edam. Reinforcements at both sides can be found at Corlijsplaat, Yerseke, and near Den Helder (Dijkstad).

In some areas there are two or more parallel dikes, or a low embankment in front of a winter dike, or an artificial/natural wave breaker next to a dike. This can for example be seen at Perkpolder, Hondsbossche and Pettemer Zeewering. Some dikes are not really visible, they are called the camouflaged dikes. Different functions are combined with the dike, so that the height difference is not noticeable (see figure 46).

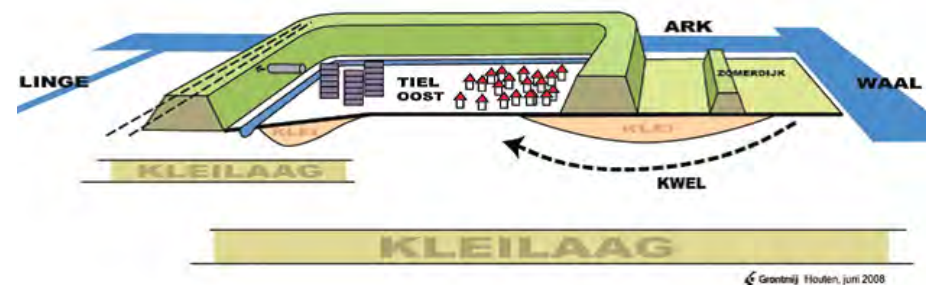


Figure 45 Proposal climate dike Tiel

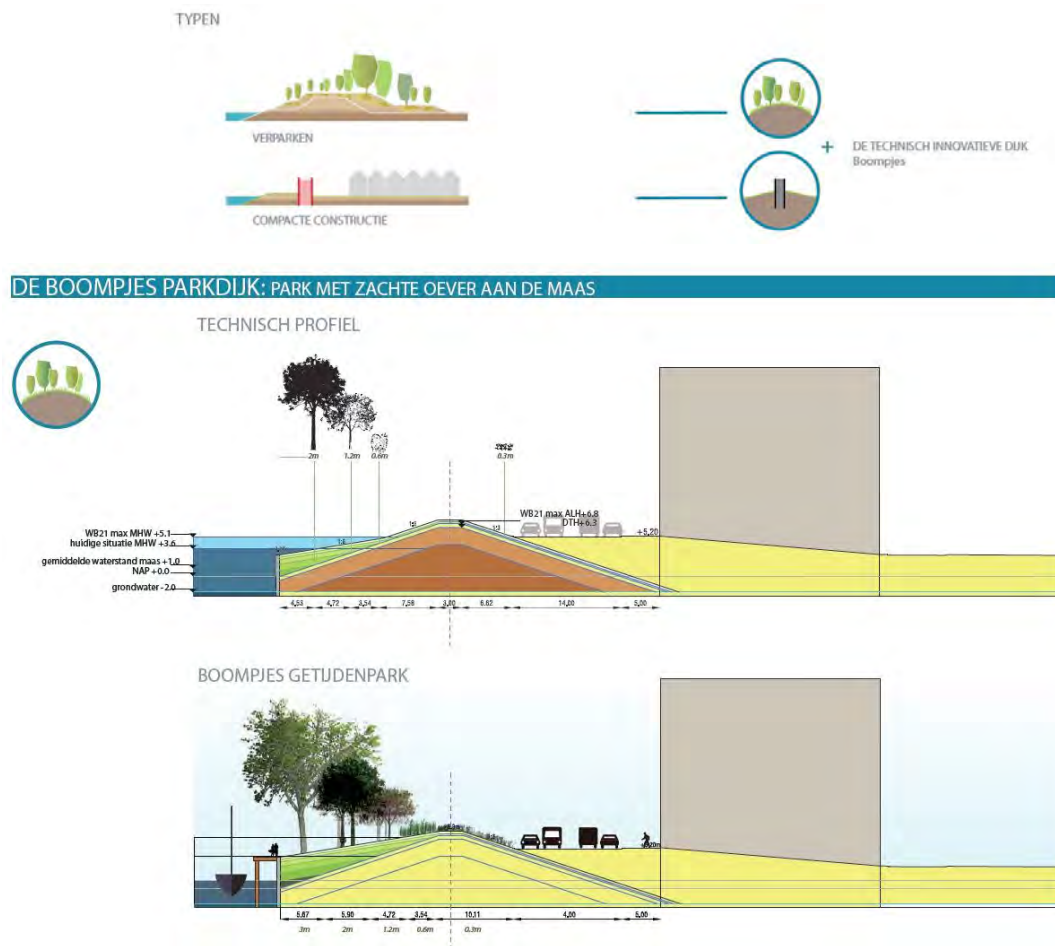


Figure 46 An example of a design for De Boompjes, variation Parkdijk (Innovative dike concepts for four study locations in Rotterdam, De Urbanisten)

Near Kampen a whole new river bypass is being created. At one side of this bypass a climate dike is planned with housing(see figure 47 ).

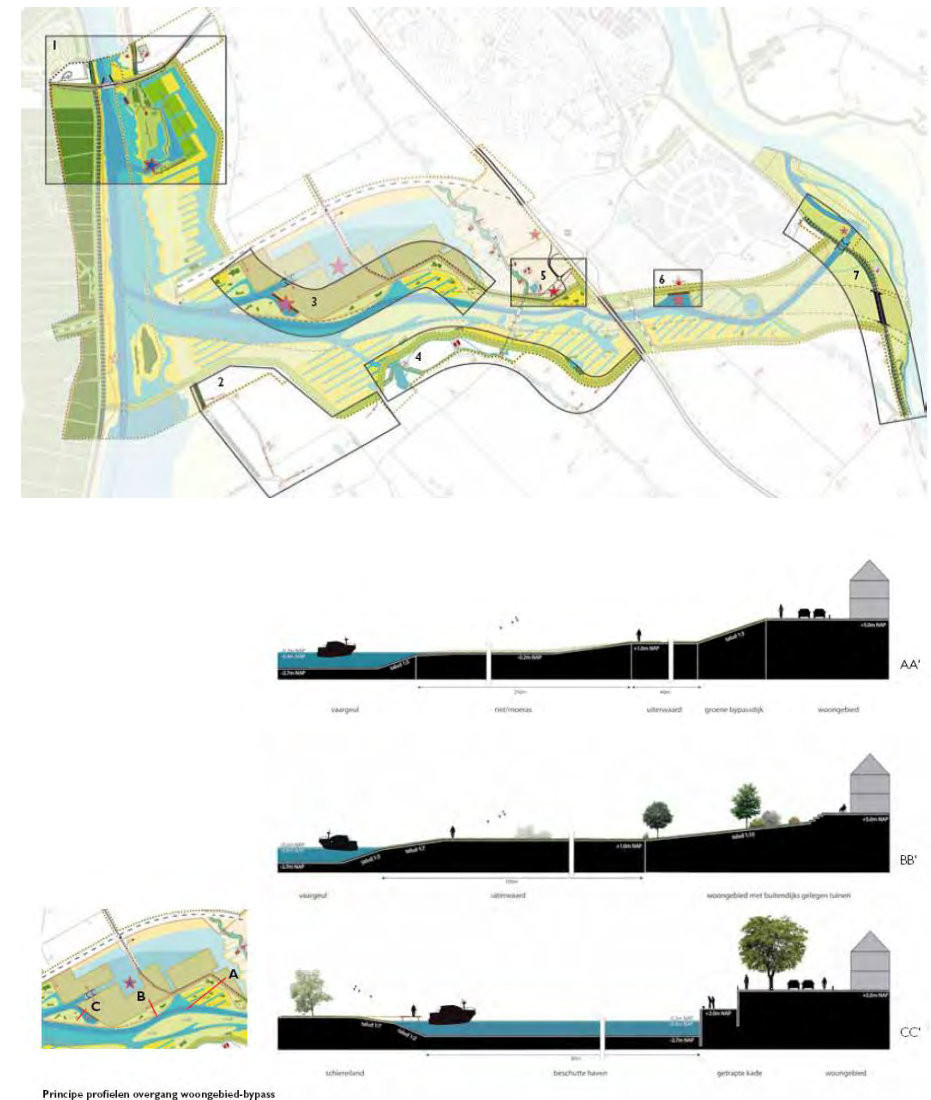


Figure 47 Route design of the Preference alternative for the bypass Kampen (location 3 is the climate dike with housing)

In the Overdiepse Polder near Den Bosch eight new mounds are made. On every mound (6 meters high) a farm will be build. Once every 25 years the polder may flood, and the farm will stay dry. This plan is part of the project Ruimte voor de Rivier (see figure 48).



Figure 48 Impression of the new farms on mounds near the river Maas

#### 4.5 Conclusions

The present shape of the Betuwe together with the surrounding land is strongly influenced by the dynamic of the river Rhine. Were once the land was not suitable to live or to work on, the river was slowly changed from a natural system to a ‘manageable’ river. A river that was suitable for ships and that was less a threat for the people that came to live on the highest parts of the area. A lot of possibilities opened up, but also a lot was lost in this process. The land became dryer through the building of dikes and weirs. It became safer, useful for agriculture, building infrastructure, and the transportation over the river. But it also

has a downside. The dynamics of the river resulted in less nature or biodiversity. When high water became a threat, the danger was larger, because there was not enough space for the river to deal with the high levels. Nowadays the inside and outside of the dikes are much more similar, agricultural or grasslands. Dikes must be higher and higher to keep up with the rising water levels.

Although a lot of the elements caused by river dynamics, cultural and military history has been lost, some of them are still there. Water pond caused by break-troughs, an old fortification, old meanders can be seen in the landscape. To the east, near Opheusden, history is most present visually by the Grebbelinie and Betuwestelling, old villages and many water ponds caused by floods. The floodplains are still an important habitat for birds and also a technical element such as dikes have potential for creating a higher biodiversity. A unique feature (in comparison to other Dutch river areas) of the area is the big contrast between the lower more open southern side of the river and the less open, high northern side.

Looking at the changes dikes went through, it is clear how the dike became higher and broader through technical innovations. Still for many centuries, the shape and principle stayed virtually the same. A big (conceptual) step was taken from around 2009, when through the influence of climate change discussions, a dike was no longer an element for protection against water, but also for multi-functional purposes. The dike is broader and, at least visually, the most radical change in the thought about dikes and their function. This radical change does not only change the way of thinking about dikes among experts, but it will have a bigger impact on the environment as well. The question of how and to what extend is an important question in the dike discussions.



5



# 5 Research by design

**The most important method I used in my research is the research by design. In this chapter I will explain the steps taken, from the analysis of the case location and its place in the general structure, to the methods and materials used within the semi-structured interviews. The analysis of these interviews will then be described in the next chapter.**

## 5.1 General structure

Different methods can be used to explore how people experience a space, objects or environment. I used three information gathering methods from Thwaites and Simkins (2007), who described reading the experiential landscape in different levels (see figure 49). Having a landscape architecture background I use the professional reading of the site (see chapter 4), which is also the least clear in finding how the landscape is experienced. Therefore I secondly and thirdly use 'conversation', and 'semi-structured interviewing' (see chapter 6). The conversations are meant to give a more defined direction to the content

Semi-structured interviewing

Conversation

Role-play

Anthropological tracking

Non-participant observation

Professional reading of site



Figure 49 The experiential landscape increases in clarity and resolution by gathering information in a range of different ways

of the interviews. They are more general and not linked to the case location. But the questions are about the river landscape and dikes.

## 5.2 Hearing and smelling

The first small experimental study was about asking a group of international students their opinion about a flood plain area (along the Waal). The students were divided into two groups, one group would focus on sounds, the other on smelling. All students were studying landscape architecture. How would the area be experienced by giving them a specific task? All were given general questions too. Questions about background, beauty, character of the landscape and they were asked what the design intervention would be if they could change anything (see attachment A).



The answers indicated two useful directions for further conversations and interviews. First of all, the division in groups made people In asking questions that are more general, the theme or direction of the research can better be made known later. Secondly knowing, or being familiar with the landscape has great influence on the perception of the place. Students that were raised in a wilderness area, saw this place more as human-made, 'my previous experience was mainly based on walking through rain forests in Brasil, so, to me it was absolutely different now'. The more urban the background was, the more positive the area was experienced, 'the first impression is 'wild''. Contrast with what is known stands out.

All focussed strongly on their own theme, also in answering the general questions. It made them aware of things. One student's first impression was described as 'I am very sensitive to sound and light. I imagine what I see from the sound and I always look for the light'.

### 5.3 Conversations about dikes

On the dike in Wageningen (car-free part) I talked with the people walking there. Why did they choose this place to walk, how did they experience the dike and how would they see possible alterations etc. (see attachment B)? I also talked to people that were not on the dike, but who were familiar with dikes. These conversations were useful to see what kind of questions could be useful for the interviews. Some questions gave some interesting answers, others were less useful. The first thing that I noticed was the selection people made when they answered. They looked only to the 'nice' side, the flood plains explaining it was a beautiful area. Only a man that lived next to the dike included both sides of the dike. Also in other answers, the dike per se, was not seen as an element, but the context, what lies next to it really mattered. The height was important to have an overview, to see the surroundings. And a dike was meant to protect the houses.

The questions about making the dike (much) broader made clear how important it is to talk about this with means that help imagining. I showed an image of a climate dike. First the answers were quite positive. When it is necessary for the safety it is possible, 'that is fine, safety is very important, for the people that live here. That is most important.' Showing and pointing out how broad the dike could be, 'until that bush', people changes their views. The same person that was positive reacted with 'no, that's impossible', followed by an example of Limburg where building on flood plains went wrong. They became more negative. It became more real for them, literally seeing what would disappear, and not being able to see what will be there instead. Overall the people that live close to the dike were more critical than visitors or people that were not at the place. It meant more to them.

Safety was experienced differently by the people. Some feel very safe, because of a great trust in the government, 'if it is necessary they will take care of the safety', others felt safe because of comparing with the past experiences. An elderly man that lived next to the dike told 'in the past it was much worse with the flooding. When the two weirs came, flooding happened much less. People drowned back then, that does not happen anymore. There were those vortices. I used to play with the son of the stone factory. He could swim really well, but he still drowned.' Feeling safe is a relative term, and past memories play a big role. Using open questions, letting people describe first and using materials to help them to see the present situation comparing to what certain measures would mean are thus very important. Personal stories can tell a lot about their perception and asking further will help to find the real reasons why people see what they see and how they will form their image about dikes.

### 5.4 Semi-structured interviews with design principle drawings

#### 5.4.1 Interview questions

Experiencing a dike can be seen from different perspectives, literally. In this research the experience of a dike means how people perceive a dike in general and interpret a possible future dike in terms of value, meaning and opinion. The literal perspective is the view from a dike, not next to a dike. The materials used in the semi-structured interviews, photographs and drawings, all have this 'on top view'.

Starting point was the two target groups, landscape architects and non-designers. In total I interviewed eighteen people, of which eight landscape architects, three inhabitants that live next to the dike, one regularly user of a similar dike and six people less familiar with the area. Three interviews were double interviews. Although the people are divided into groups at the start, not only educational aspect form perception (De Vries, 2007; Merleau-Ponty, 2008; Karmanov, 2009). Inhabitants differ from 'outsiders' in their use and memory of the place.



Designers may know a lot, but may not use the area in a practical way. And people that have been on other dikes, will see this dike in the Betuwe perhaps differently, etc. Therefore the analysis of the interviews is not by expertise background (only), but on the basis of several themes. This will not result in exhaustive findings about the experiences of (climate) dikes, but will show certain useful findings, which may be theoretically and practically useful for the designs of future dikes.

The table below contains the questions that are being used in the semi-structured interviews. The first column shows the academic questions based on the literature. The second column contains the thought and the aim of the question. The third column is used for the interview itself. Professional terminology and conceptual words are left out as much as possible to prevent showing the aim of the question or influencing the direction of the answer.

Before the interview I did explain in short the structure of the questions. General questions, the showing of pictures of the area at the south side of the river Rijn and questions about possible future design of dikes. Before showing the picture I shortly explained (when necessary) what the reason and idea behind this dike design concept is. Every interview had the same aim, but the order and exact set of questioning was not the same. The order could change or the focus could be on a certain topic, depending on the stories, explanations and questions of the people. But in most interviews the general structure of general questions, site specific and future design questions was maintained.

Academic themes and questions	Underlying thought and direction (analysis)	Questions for interviewee
<b>General</b>		
What does the term landscape and river landscape mean?	Identify interpretation of landscape *; with designers: use of landscape models	What do you think about when I say the word 'landscape'?
What does beauty and aesthetics mean?	In general, but also in relation with the landscape	Where do you like to come? Which places outside do you find beautiful?
<b>Experience present landscape and dike</b>		
How can this environment be described?	Description of what one sees and experiences, without use of terms and concept at the start; what is mentioned, what not (focus); description, identifications of elements, composition and meaning*	How would you describe this place to someone that does not know it? What stands out, positive or negative? What is characteristic about this place?
How would you describe a dike?	What is it, where does it begin and stop, characteristics, function, meaning etc.	(Idem)
What is your attachment with this place?	Space **and place; place attachment; narration; identify the meaning and use of the place	Where do you come from originally? Do you know this place? Where do you live? How often do you come here? In what way do you use this place?
How do you value this area?	Identify the values and opinions	What does this place mean to you? Why?
What is your knowledge about this place?	Identify the knowledge, kind of knowledge, reason or cause of knowing. Past experiences and memories. Interaction cognitive & emotional	How long do you know this place? What do you know about this place and what are your memories relating to this place or similar places?

<i>Experience possible future climate dike</i>		
How do you perceive the new design solutions?	Identify 'image' and perception of the new dike.	How would you describe the drawings? What do you see?
Which design principle is preferred and why?	Identify preferences for designs; which priorities (safety, green, practical, financial, etc.) are made and for what reasons	Which alternative has your preference and why?
How will this new situation influence your experience?	Identifying the influence on perception and experience and why	Do you like to be in the new situation? How would you experience the new situation?
What other design possibilities would you like to mention?	Identify preference; combinations and new ideas	If you could alter the dike, how would you do this? Do you have other solutions or ideas?

\* Landscape interpretation according to Meinig (1979) (see paragraph 3.2)

\*\* Five spaces according to Tilley (1994) (see paragraph 3.3)

#### 5.4.2 Materials used for interviews

The first general questions were asked without an introduction. The questions about the site specific area were asked while the interviewee viewed photographs (unless standing in the landscape itself). All were taken from the dike, some were panoramic photos. There were not labeled with location or names. There was an order in location though, ranging from the east to the west, from Opheusden until Rijswijk.





To explore the experience of climate dikes I used design sketches of several alternative dikes. Looking at the photographs or being on the dike, people described what they saw and explained how they perceived this specific 'Betuwse dike'. With the drawings an image was presented of possible dike measures.

A climate dike is not very specific in its form. Many different solutions can be possible. Therefore I choose two ways to give direction to the alternative I used for the interviews. The selection of location, as well as the selection of dike alternatives, was made from a landscape architectural point of view. It is mainly based on the spatial context and implementation possibilities. First three locations on the dike were chosen as an example starting point. Roughly the dike from Opheusden until Rijswijk can be categorized in term of land use functions that are present next to the dike (see figure 50). Agricultural land (mainly tree nurseries and arable land) recreational areas (camp sites and yacht basins) and small villages (of which Maurik and Rijswijk lie directly next to the dike). Although the dike on itself remains the same form and function on the whole route, a climate dike will have (great) impact on the adjacent spaces.

At all locations the dike has a comparable shape with 1:3 slopes. Older, steep dikes (which are present along the route) are not used. Furthermore, only the winter dike is used in the materials shown. The drawings are based on profiles of climate dikes available in literature. Not all dike profiles have a specific name and some have multiple names (or names that changed over time). In the interviews I did not label the drawings to prevent as much as possible associations with certain words. In the next paragraphs the method of choosing the alternative solutions, the combining with land use functions and the process from a photo to a drawing is described.



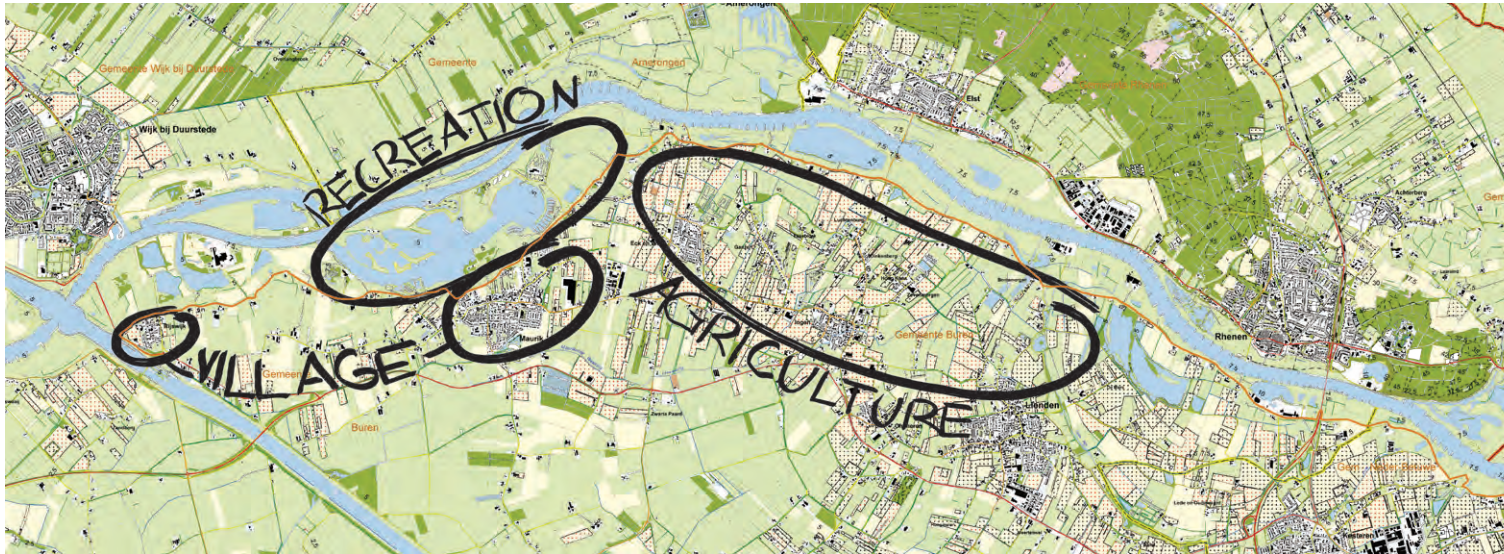


Figure 50 Three locations

### 5.4.3 Locations combined with climate dike alternatives

From the literature a few climate dike profiles are selected on the base of different spatial and form differences. The range is chosen as broad as possible, making a selection, but not eliminating options that at first seem impossible for this area (in a technical or architectural way). For every location three different alternatives are combined, so that comparing with each other is possible. With all drawings the set of drawings start with a drawing of the present situation (using a photo of the place; see paragraph 5.1.2).

Figure 51 and 52 show the schematic overview of all drawings, named and on which sketch or idea it is based on. To the people the categories are explained, but the drawings are not labelled as mentioned with a name. A few source sketches have their own specific name, but others are based on the same idea. The used drawings are altered to fit the situation, keeping the information to a minimum level. To differentiate the climate dike solutions I renamed several. These names do not occur

in the climate dike discussion or literature, but they are forming one of the possible design principles.

For each location different spatial factors are important. I chose the most important spatial element needed to benefit the land use function as much as possible. Compared to the examples in chapter four, most are less radical (in form). This because of the rural location and the less need for multifunctional use compared to dense urban regions. There are of course many factors that influence the implementation. The design principles placed under the agricultural location all take account the amount of space they will occupy. The Delta dike I will take up space at the river's side and it is strengthening the dike by heightening. The arable lands are not touched. The Triple dike will take up a lot of space, but it will take up less fertile soils in the lower parts of the Betuwe. The most fertile and useful soils remain as it is. The broadness of the last dike will take up this space, but it gives a possibility of agricultural functions on a part of the dike.

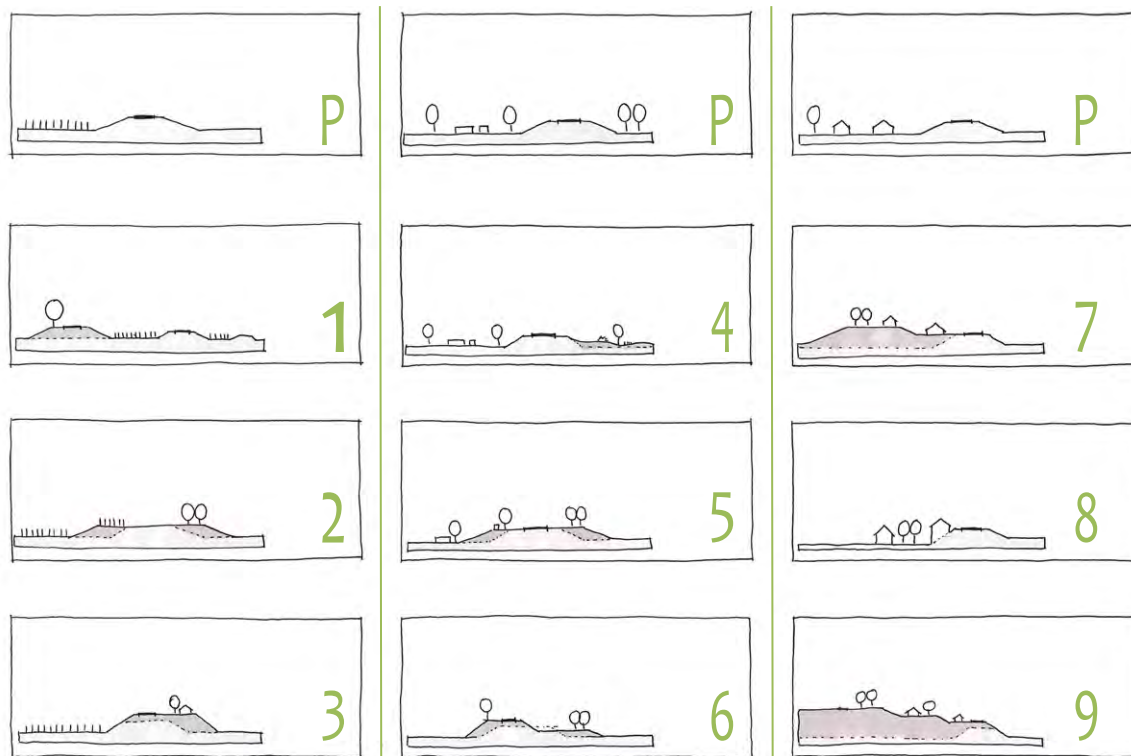


Figure 51 Schematic overview of the chosen climate dike solution per location (p=present)

Within a recreational area along the river an attractive environment, natural atmosphere and the presence of water can benefit the recreation. The amorphous ecological dike has this natural form, combined with water. The stepped dike has a more rigid shape, but it gives variation. In an already changed and modified area by recreation shifting the old dike may be a possible solution. The Multiplex dike created possibilities of placing a camp site on the dike and increases the view for the visitors.

Land use function along the dike		
Agriculture (Location 1)	Recreation (Location 2)	Village (Location 3)
Present dike; 1:3 dike <b>P</b>	Present dike; 1:3 dike <b>P</b>	Present dike; 1:3 dike <b>P</b>
Triple dike <b>1</b>	Amorphous ecological dike <b>4</b>	Terp dike II <b>7</b>
Multiplex dike <b>2</b>	Multiplex dike <b>5</b>	Construction dike <b>8</b>
Terp dike I <b>3</b>	Stepped dike <b>6</b>	Terp dike III <b>9</b>

**Based on:**

- 1 Triple dijk
- 2 Super brede dijk
- 3 Terpen dijk & dijk met verhoogde norm
- 4 Amorfe ecologische dijk
- 5 Super brede dijk
- 6 Doorbraakvrije dijk
- 7 Terpen dijk
- 8 Constructie dijk
- 9 Terpen dijk

**Source:**

- Reek, van den, B. et. al. , 2008 (Platform Klimaatdijk)
- Silva en Van Velzen, 2008
- Reek, van den, B. et. al. , 2008 (Platform Klimaatdijk); STOWA, 2011
- Grontmij, 2007
- Silva en Van Velzen, 2008
- idem
- Reek, van den, B. et. al. , 2008 (Platform Klimaatdijk)
- Deltares, 2010
- Reek, van den, B. et. al. , 2008 (Platform Klimaatdijk)

Figure 52 Climate dike names and their origin



Two out of three dike alternative for an occupational area is based on the principle of the Dutch 'terp'. All principles take safety and accessibility into account as one of the most important factors. The Terp dike will take up less space than the Delta dike II, that lifts up (large) part of the village. The construction dike uses the buildings against flooding, leaving the buildings behind as it is.

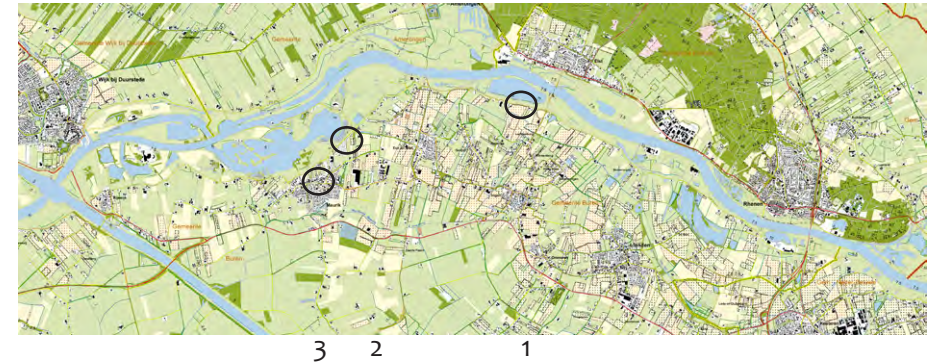
#### 5.4.4 From photo to drawing

Starting point of the drawing of the present situation dike is a photograph. Photos of the present situation are all transformed into a 'present-situation-drawing' because it gives opportunity of removing irrelevant objects, simplifying the location for a clear image understandable for everyone and it gives the opportunity to resemble the other principle drawings creating an optimal comparison between present and possible future dikes.

All drawings are made with:

- a viewer position on the road on the dike
- perspective, to create a 'walking into the landscape'
- colour because it gives depth to the drawing
- blue sky as an always clearly present element of this landscape
- the same colour of roads and structure to avoid attention to irrelevant details
- a minimum of new elements such as trees, houses, roads and other multifunctional use elements etc. By using a minimum I show a possibility without too much attention that must go mainly to the dike-profiles
- a white section with dotted lines to show clearly the difference between the visible landscape and the technical section of the (old)dike
- three different tree species: oak, poplar and willows, based on the present trees of the location and the trees that are present and suitable in this place

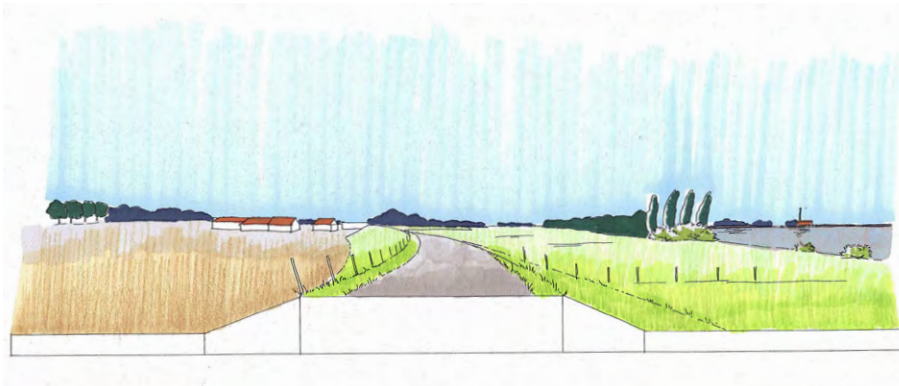
The photograph is shown to the people, but it is made clear that this photograph is used as an example location. Below the photos with location and the steps to the drawings are shown.





## Location 1

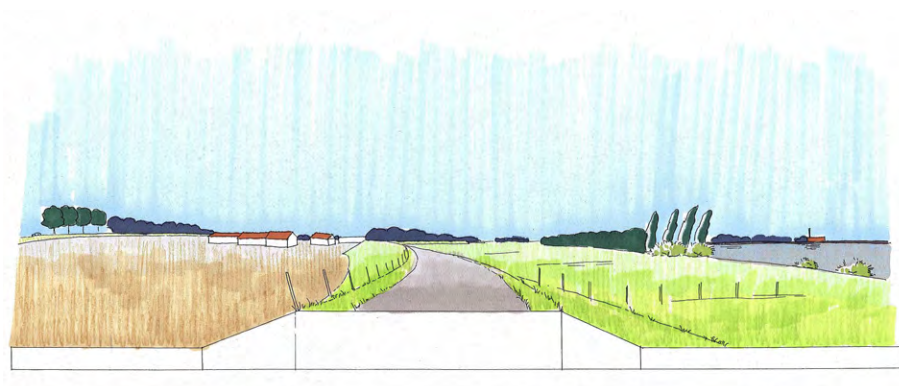
Agricultural land along the dike (in this case the cultivation of street trees).



Present situation



Multiplex dike



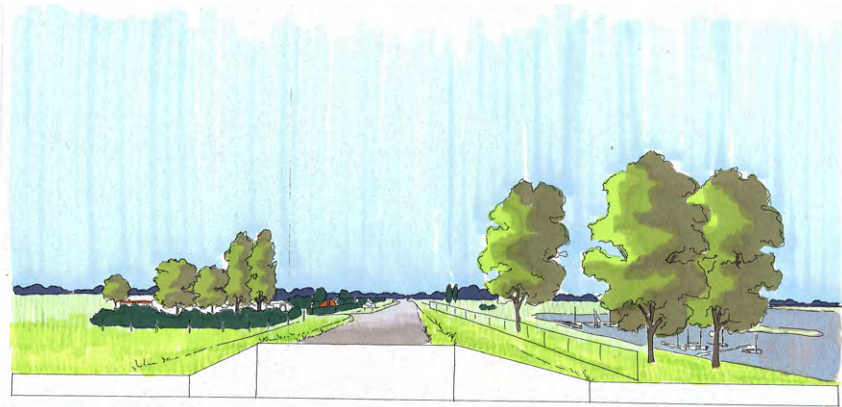
Triple dike



Terp dike I

## Location 2

Recreational area with camp sites and yacht basins



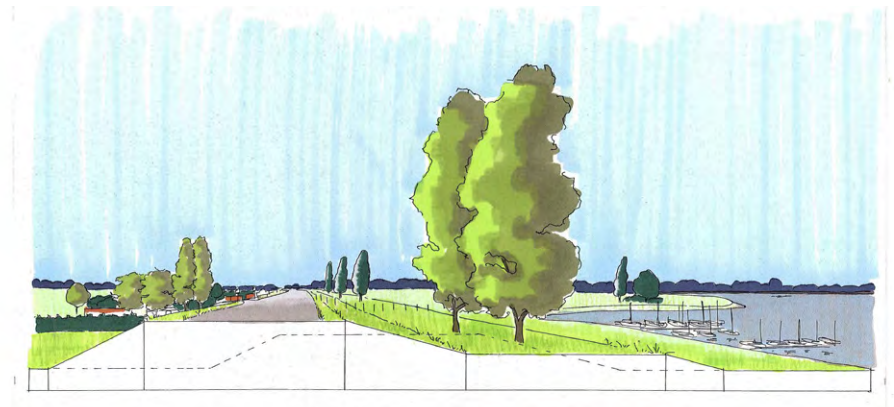
Present situation



Multiplex dike



Amorphous ecological dike

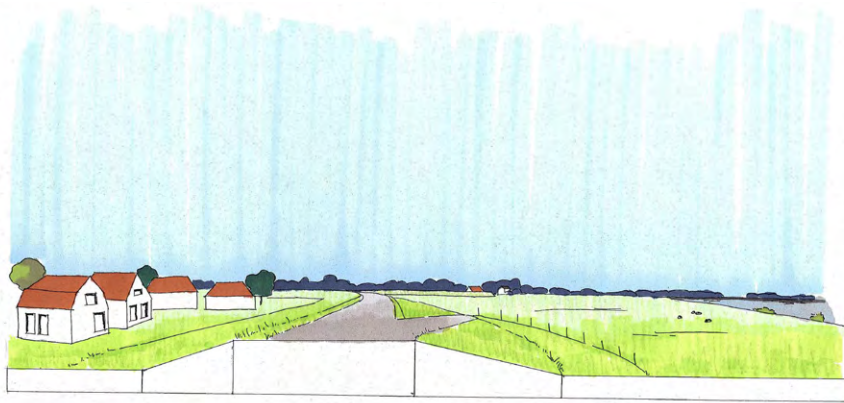


Stepped dike

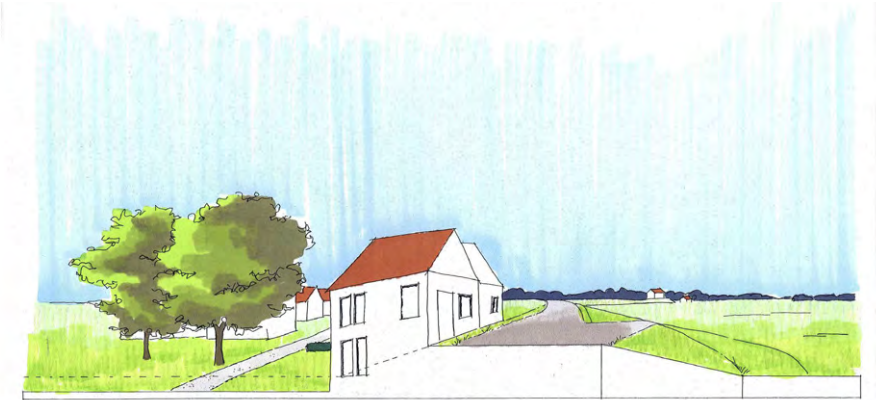


### Location 3

Village area  
close to the dike



Present situation



Construction dike



Terp II dike



Terp III dike



6



# 6 Mechanisms and design interpretation

All the questions in the interviews were aimed at discovering the meanings, opinions and values about dikes in general, and about climate dikes. The first questions were very general. Already in the beginning some clear differences were visible between the two groups, landscape architects and lay-people. Although there were many similarities about which places they liked to visit (forest, beach, places with water and other 'green' places), the difference started mainly in the way the answers were given. Lay people answered from their own perspective, more from their feelings than from their mind and they used general known words to describe for instance what they saw on photo's. Landscape architects' answers were more distant, unless specifically asked how they would experience what they saw. The language was more abstract; lines, planes and other typically learned expressions were used a lot. With the use of these words they were more often able to give more detailed answers or descriptions, although in many ways the answers were strongly visually oriented. Local people were also more able to tell details about the location, but that was often based on experiences and practical use of the area. They sometimes knew stories and details others did not know, but were important to them. What is seen as beautiful has different reasons for different people. There was not just a division between groups, but many factors determined the opinions. For one person a fruit tree was beautiful because it was less messy on the road comparing it with the tree nurseries nowadays. And for another person the same tree was valued high because of a historical image they attached to it. The following paragraphs show more about the differences and similarities between the two groups, but it is written from the findings of mechanisms in the interviews. These are like different themes and processes that explain not only the answers given, but also the background and underlying thoughts.

## 6.1 Mechanisms

### Interpretation of scale

In the first short part of the interviews people were asked to verbalize the way they see landscape, wherein feelings and the mind both construct 'landscape' (Tuan, 1979), river landscape and more indirect questions were asked about aesthetics. These were general questions not directly related to the location I choose.

The first striking difference in the description of the concepts was the variation of scale perception. Two factors played a big role in this. Landscape was mostly seen on a large scale by the people with a designer background or profession. Expressions like *'the whole world'*, *'everything outside'* were common. They viewed landscape from the birds-eye-view. The theoretical background of the designers was clearly visible in their answers. They used different words for describing concepts, but they also included and expressed the different ways of analyzing the landscape. Different layers, such as the biotic or a-biotic, were all seen as an important element. Sometimes it was a broad description because experience, time or other abstract components were added. As one of the landscape architects put it: *'Everything that you see and experience, maybe first of all everything that happens outside the city'*. The non-designers saw landscape more often on a smaller scale. *'Water', 'green', 'meadows', 'forest', 'broadness'*, were some of the most used expressions. They did not use words like the biotic or abiotic layer, but often focused on one aspect. The city was in general not part of a landscape. Some had very specific images of what landscape meant to them. One woman described landscape as *'an old fashion Dutch image with farming fields, a vast plain and in the distance a wind mill. No buildings, hills or a lot of forest.'* A first thought of a landscape architect was a geographical area, (the province of) Friesland. Although the green component of landscape was important for everybody, the biotic was seen as the most valuable aspect or the core of 'landscape' for the 'non-designers'. The same concepts were perceived differently by the variation of scales.

Notable is the way concepts of landscape could change during the interview. The explanation of landscape could be very inclusive in the beginning, but much more detailed or exclusive in the second half of the conversation. This change was most visible in the conversations wherein a very broad description was used at the start. At the beginning a landscape architect saw landscape as everything you see and experience. But in judging design alternatives he stated that the design would *'jeopardize the elements of the landscape.'* Or as another designer said *'this dike profile will radically change the landscape.'* A inhabitant of the Betuwe, who saw landscape as nature and how the landscape was *'decorated'*, reacted to a design drawing with the expression *'now it is heightened every time, this way you are not touching the landscape, but only the dike itself.'* Unconsciously people tend to change their own meaning of landscape and the way they use it. All of a sudden, the dike is no longer 'landscape' or even part of the landscape. It becomes an element standing on its own. At least it is less valued and it has another meaning then its surroundings at that moment. The more small-scaled definitions changed less in meaning.

The more specific concept of 'river landscape' showed much less difference in scale perception. Those descriptions were more or less the same. The river is most mentioned, together with flood plains, villages, dikes, polders and openness. A larger scale was mentioned in term of the Betuwe or the area that is influenced by the river. Sometimes the Dutch river landscape is compared to other river areas: *'In the Netherlands it is very impressive. Because of the openness of the landscape the rivers seem much larger and more immense'* or it is seen as *'typically Dutch'* or associated with the poem of Marsman *"Herinnering aan Holland"*. A totally different image immersed by a woman's association of the river landscape (not with the Netherlands but) with the swamp, rough and primeval environment from the Lord-of-the-Rings movies. By this comparison the river landscape gets a whole new meaning. Other more specific terms were used to describe the presented location too. Hill (or moraine) landscape, polder landscape, dike landscape.

The location of the interview also seemed to have an influence on the

perception of scale. Landscape was more often described on a smaller scale by the people who were literally in the landscape. This all points at the direction of many factors that influence our way of perceiving our environment.

Environments can be interpreted in different ways. It is perceived through identifying elements, composition and meaning. It can be seen as nature, habitat, artefact, system, problem, wealth, ideology, history, place or aesthetic (Meinig, 1979). My questions were not directly aimed at statistically finding out what the interpretation of each person was. But for analysing the conversations the categories were a useful direction with which some useful things can be said.

The question about the concept landscape was mainly aimed at the first idea's and impressions one had when they heard the word 'landscape'. Definitions and descriptions almost never fitted in just one interpretation. It was often a combination of two or three interpretations, with an accent on one of them. People with (a lot) of knowledge about landscapes and environment generally saw landscape as a system. All landscape architects saw different interactions, layers, changes in time, dynamics and historical or cultural influences. The interpretation as nature played a larger role with the non-designers. None of the spoken landscape architects saw landscape as nature. This does not mean that the 'experts' only perceived landscape through theoretical knowledge. Next to the system, habitat and ideology came forward as important. The same counts for the non-designers. And as mentioned before, this was concluded on the base of one question in the beginning of the conversation. The use and application of the term could differ depending on the subject, questions and images people saw later.

### Focus

Showing photos and drawings of design alternatives people were asked first of all what they saw. How would you describe what you see? What stands out in a positive or negative way? What do you think is characteristic? Deliberately no words were added to the presented photos or design drawings, to avoid as much as possible all kinds of associations with a word. But visual images are interpreted differently.



The focus, or ‘attention’ according to Coren (et al, 1999) was not the same with everyone. Some things stood out, some were present in the background. Especially for the people that did not know (very well) the area the shown photos directed their focus. A photo is already a selected image where a lot of the location is not visible. Sometimes this gave orientation problems, ‘*is the river on this side or the other side?*’. Being in the landscape gave the freedom for people were to look at. During the interview this could change. This is called the foreground and background switch. Some previously unnoticed characteristics of the place, hidden in the background, are focused upon, and appear as a pertinent structure, while things in the foreground disappear (Van Assche, 2004).

Not all people knew beforehand that the research was aimed at experiences. Mentioning this word before or during the conversation showed sometimes a very clear difference in the way the answers were formulated. The words perception or experience suddenly was mentioned a lot more, or the description of photos or judgment of drawings were seen from this point of view. One landscape architect favored a natural looking design alternative, for the reason that ‘*nature is adding experience*’. The focus aimed at experience and influenced the judgment.

In many descriptions not only the direct visible came forward. Non-visible elements and processes were an important part of perception. Experience, individual differences, purpose of staying, position of reviewer, influence (their opinion, status, expertise) and cultural factors play a role in this process (Karmanov, 2009). This could for instance be the question about why some elements were not there, ‘*we miss the sheep*’ or ‘*where are the animals?*’. Especially the ones that knew the area well, lived there or had experience with working on river projects saw a lot more. They saw details and knew the story behind that others did not see, ‘*high water has something special, it lowers slowly leaving things behind. Beachcombing along the dike is then possible*’, an owner of a campsite said. People that were less known with the area used the visual images to describe their experience and opinion. When a comparison

could be made with another similar area it was made. This influence positive or negative the value they contributed to the location. Driving on the dike a comparison was made with the dikes along the IJssel, ‘*here the dike is much more a dike.*’ A change in opinion was usually made after seeing more images and drawings of radical changes of the area. Once a change in value (the value of the location went up) was already visible with looking at photos knowing that I would show some other dike alternatives for this area, ‘*I’m becoming a bit nostalgic when I look at these pictures, like: this is how it still is.*’

In all answers a complex process of factors played a role in perception. The focus is directed by present desires, needs, expectations, interest and knowledge. Large part unconscious, perceived is receiving meaning (Hendrikx, 1999).

This process was not only influenced by merely individual aspects. The individual opinions could also result in another focus through the opinion of others. Merleau-Ponty (2008) states that “humanity is precarious: each person can only believe what he recognises to be true internally and, at the same time, nobody thinks or makes up his mind without already been caught up in certain relationships with others, which leads him to opt for particular set of opinions.” This was visible within the double interviews I held. There was interaction and sometimes discussion about the subject, which could result in the change of view. Ideas and opinions of others could also play a role without them being physically there, ‘*I’ve heard people say that they find this the most dramatic (in the positive way) landscape of the Netherlands, because of the contrasts.*’ Inhabitants of the Betuwe and users of the dike know the dike more in the length of the profile through their use. Through this focus many value high what is happening and standing next to the dike. The (relative small) route is what really matters, ‘*coming through different types of landscapes within one dike is typical for a dike.*’ One inhabitant of the area described his own meaning as ‘*I then think I am very conservative.*’ He liked everything the way it is, no radical changes. In the end he nuanced his opinion a bit by telling that some things will be new now, but normal in some years. The variation over the length of the dike was one of the

most important features of a dike, *'so, in that case, you should apply all alternatives.'*

### **Object and context**

Noticing the different focus of different people and the influence on perception brought another mechanism to the surface. Within the construction of an image, there was a difference in seeing objects. First of all "the things of the world are not simply neutral objects which stand before us for our contemplation (...) They are clothed in human characteristics (whether docile, soft, hostile or resistant) and conversely they do well within us as emblems of forms of life we either love or hate." (Merleau Ponty, 2008).

Secondly physical elements are not always seen as an object, standing on its own. A difference in perception can be illustrated with the role and meaning of 'the city' and its relation to the context. A few people saw a city as a type of landscape 'city landscape' or as part of landscape. There was no distinction in function, use, manmade or natural (looking). But most people did not mention a city within their description of 'landscape'. Nature, green, openness were more important, the heart of what landscape meant. Within this group the city became a separate 'object', in the sense that it stood loose from the 'landscape'. It has relation with its context, but it was no part of it, *'landscape is meadows, what you see when you leave the city.'* Interestingly it seemed that this choice was not only coming from the fact that it was build area or manmade. Asking for the reason why they excluded a city, the reason was based on size (some houses in a green environment was landscape too) or on the location of the viewer *'the city at a distance is also landscape'*. Part of this mechanism was described by Merleau-Ponty (2008) "Space is no longer a medium of simultaneous objects capable of being apprehended by an absolute observer who is equally close to them all, a medium without point of view, without body and without spatial position - in sum, the medium of pure intellect."

In this approach it also showed what a dike actually is and how people speak or did not speak about it. The ones that were practically involved in

designs of river areas including dikes, saw a dike as an important object from the beginning of the conversation, *'the dike must be in control, although it is not always possible'*. One described a dike as a boundary *'the dike functioned more and more like a boundary,'* and *'the dike connects and divides',* or as a line, *'the dike is a line which sticks out and winds its way through the landscape. Almost a sort of stage from where you can see everything.'* For them it is a clear object in the landscape. For a large part this counts for inhabitant or (frequent) users too. The word dike is mentioned early in descriptions of river landscape and photos. For them this has to do with the fact of practical use and safety. But, and certainly for the people less acquainted with the area, the surroundings are more important in the sense that they value this higher. It has more meaning for them than the actual dike. This last group do not mention the dike as an object in the beginning or their attention is not aimed at it. Sometimes the dike is seen as an object, but not a part of the landscape, *'it's as if you drive on a ridge through the landscape (...) you can oversee the landscape and the river'*. Feelings of being on a dike seeing a lot and enjoying the surrounding is most valuable. Some see the dike mainly as a mean or as a dominant object, *'a dike is predominant in the landscape (...) if you are cycling on it you somehow have a feeling of power',* while another person also as an object, but as *'a small raise, something fragile, which you should experience.'* The haptic-orientation (Bloomer, 1977), next to their basic orientation, seemed stronger present then within the first group, who seem to perceive more in objects that gives them architectural information.

### **Influence of knowledge and memory on perception**

Knowledge and memory are very important in the way people perceive. Knowledge is not objectively gathered, but people gather experience meanings to create for himself 'imago mundi' or 'micro cosmos', by which he concretizes the world (Norberg-Schulz, 2005). The meaning, opinion, value of the dike and the surroundings were in the interviews closely linked to this 'image' and interpretation process.

When there was much knowledge about the area, the answers were more cognitive and theoretical. Although more critical questions were

asked, the possibilities of realisation were discussed and, knowledge did not by definition resulted in different conclusions. In most cases it made judgements of design alternatives more nuanced. Sometimes knowledge enhanced the value of the place, through association with similar places, *'here are beautiful sunsets. I've heard it has to do with the water. Then water and sky are together, that is brilliant, breath-taking.'*

The ones that had personal experience with dike alteration measures, and the ones that worked on river projects were the most careful in their answers with the design drawings. Their experiences with the process made them more conscious on the various consequences. Especially historical knowledge lead to the choice of less radical alternatives. Without this knowledge one cannot emotionally value historical objects (Hendriks, 1999). The value of the environment and elements along the dike were valued higher.

A few landscape architects indicated that their knowledge gave them a more conscious perception. This did not directly lead to a higher value or the contribution of more meaning. One person stated that *'through knowledge you are seeing things differently. Now I have more attention, and it becomes more valuable.'* Another said *'I think that if you really have knowledge about it, the perception will be stronger and you are more conscious.'* A third person did not like the nature developments in the floodplains, because *'the striking openness of the floodplains disappear. I have to get used to it.'* But because of knowing the reason why it is done she *'could understand and appreciate it.'* Much knowledge did also not resulted in one image or judgement, although the overlap was strong. The exercise of a pure and unsituated intellect cannot gain access to an object free of all human traces (Merleau-Ponty, 2008) Memories can be positive or negative, but they all colour the perception. The senses play an important role in this, which are dependent on knowledge, past experiences, memories, needs and preferences (De Vries, 2009). People that once were on the dike or use the dike regularly talked more about the experiences gathered not only by sight *'I feel that the weather is really part of it, so visible. The mist and the enormous clouded skies'*, but also by feeling, *'on that spot I was terrible sun burned'* (a cyclist); smelling and hearing *'water exudes peacefulness, as soon as*

*you are outside you don't hear a thing'*. Most of these experiences were positive, which resulted in a higher value of the dike and especially the land next to the dike. Because you are high on a dike, having the overview it stimulates fusion with external events (Bloomer, 1977). People with a lot of memories could remember what it was like in the past. Not just by theory, but by experience. This often had a greater impact on the value and meaning of some elements than just knowing that things had changed. In the case of the often mentioned and appreciated old orchards, this has not just to do with the fact that they were nicer *'the flowers, it changes more'*, or *'typically for de Betuwe'*. All the inhabitants regretted the fact that the trees were not as present as before, and the new avenue trees had some practical consequences too, *'the trees are awful, the whole dike is muddy when they are busy.'*

### Physical and emotional proximity

The value of dikes and the river landscape is as mentioned before depending on physical and/or emotional proximity. Being near or living in a certain space will transform this into a place. When there is an emotional bond with the place it is called 'place attachment', which is "influenced by fantasy, symbolism, mystic, and range of values we attach. This varies with our closeness or use of it (Bell, 1993; Hendriks, 1999)." Feelings, or the 'embodied essence' and the influence on architectural design was underestimated for a long time in the Western world. But the sensual and embodied essence is being acknowledged more (Pallasmaa, 2005). The strong visual focus in (landscape) architecture becomes less in that case. Acknowledging this has an impact on the design process as well according to one of the landscape architects. She expressed this by saying *'when I sit down somewhere and I enjoy, I can make a better design afterwards I think, instead of thinking only from by 'baggage' and starting analysing right away.'*

Although physical and emotional proximity are closely linked, they can occur separately. An owner of a house along the dike was physically near the dike and in the landscape, but he was not as emotionally tied to the area as other inhabitants. He enjoyed riding on the dike, but comparing the environment to previous villages where he lived (like the



forests of the Utrechtse Heuvelrug) he would like *'some more liveliness, more variation'*. One can also be emotionally close to the area without being there (constantly). Again memories, knowledge, imagination and experiences keep this closeness alive. Space then becomes a place, a centre of meaning constructed by experience (Tuan, 1975). A woman who cycled on the dike regularly said she *'felt at home, I think I have a preference for openness'*. A small amount of the interviewed people were raised next to a dike. For some good memories were attached to a dike and its surroundings, and they expressed that river landscapes and dikes have special value and meaning to them, *'the most beautiful area there is; the openness with the different landscape structures and the diversity of images.'* For others the image and meaning of a dike was more unconscious, it was an obviousness, *'in the past a dike was normal and I was used to it, a dike was a dike.'* At one moment a designer felt it as a disadvantage at the start of a design process in a river landscape. When physical and emotional proximity occur at the same time, there is a stronger preference for the least radical design alternatives. "People connect place with the particular identity and proceed to defend it against the threatening outside with its different identities (Tuan, 1979)." Seeing the first four design drawings of the location the owner of a recreational area thought for a moment and concluded, *'with all the alternatives, excluding the present situation: it is less 'dike', the original image is gone and the value of the landscape goes down.'*

Spaces can be divided in different kind of spaces: somatic, perceptual, existential, architectural and cognitive space (Tilley, 1994). Designers mainly saw the location as cognitive and/or architectural space, *'the important property of a dike is a small embankment above the landscape, a line not a plane.'* Inhabitants' focus lie on the egocentric, daily practice and the relative and quality, *'a dike is important for stopping the water'* and *'it is an area where you can make a lot of different pictures, for example with high water'*. This is called the perceptual space. Talking about the flood in 1995 responses of the people that lived next to the dike where surprisingly sober, *'I did not feel unsafe, a lot of people were panicking though. For me it's just stuff.'* Another inhabitant reacted in the same way, *'a few times the water stood high, half a meter, but that*

*does not scare me. The house is higher and bigger. It can make me laugh though, we go in a rowing boat then. I like a bit of adventure.'* Safety was important to them, but they spoke about it with some relativizing. The sensory and bodily movement, which belongs to the somatic space, was the third and clearly visible aspect in the perception of space. Sometimes combined with other more mind driven approach, but all were women, *'there is not much possibility to step of (the bike) and fully enjoy'*. Explaining the difference between the dike and the Betuwe a women said *'on the dike it is 'above the Betuwe', going down it is being in it. The Betuwe is cycling through it and being able to pick an apple without going off the dike first.'* They seem to use feelings more often than men in valuing and in their opinion about the location and the judgments of the design drawings.

## 6.2 Perception and interpretation of the design principle drawings

In showing the drawings not much explanation was needed. The sketches functioned as a "form of communication between geometric and lived space (Seamon, 1993)." In which lived space refers to the pre scientific experience of our world. Most people, knowing what they were asked to do, understood (in general) the drawings and the different alternatives. The dotted line was the most unclear, so this needed the most explanation. The section was clear to most people, although many were not used to look at such sketches.

Especially people that were not used to interpret drawings took more of what they saw literally. Less questions about the realization or possibilities of for example trees on a dike, were asked. Their judgment depended much more on what they saw. This did not mean that their opinion was limited to what they saw. Although the selected alternatives directed thoughts, when more images were shown, own ideas, alternative ideas and combination of alternatives were suggested. Having visual images on the table, together with questions and conversation, helped imagining the possibilities of new dikes. It made the theoretical more real. It is a unique human ability, imagination and

it influences how environment is perceived. “It augments the values of reality (Hendriks, 1999; Bachelard, 1994).” Imagining could even bring in memory sounds that go along with the environment (looking at a picture in this case), *‘I imagine also other sounds looking at this picture, instead of looking at a panoramic photo. Closer (zoomed in) becomes more human.’* More than once comments like *‘I never thought about it this way, it makes me think’* were made by looking at the drawings. The drawings seem to make asking questions more easy, they could point to what they meant, and it made them aware (especially looking at extreme measures in dike profiles) what they really liked about dikes and why. Some landscape architects started drawing, explaining their opinion or suggesting alternative options. Being able to imagine a new situation was not easy for everybody. This became clear with the alternative of the triple dike, not easily visible, lying ‘far away’ in the picture. There was not enough information for the viewer to form an opinion, because it showed the present dike, but not what the area of the new dike was like. So often another alternative was preferred because of this lack of information or visual images.

A few dike profiles were placed at two ‘locations’, the profile was the same, but the functions on or next to the dikes differed slightly. This was not only recognized by the people quite easily, but the opinion of the dike was constructed in relation to the location. The aesthetic of the place directed also the preference of an alternative. For example the very broad dike at the recreational area was rated higher, because the landscape was already looking different or was intensively used. The aesthetic potential of the place was an important factor in this (Appleton, 1996).

The same drawing could also evoke several associations. Based on the association value was attached and an opinion was formed of the alternative. Were a house was part of a dike, some people saw a typically Dutch dike house, fitting in a river landscape, *‘dike houses, always nice’*. While others saw the same house as being (far) too urban, not fitting in the landscape, *‘very urban, it does not fit in this area.’*

Selecting and preferring a certain dike profile in the aesthetic way was many time first based on the spontaneous choice, feelings and after that on rational arguments. The sensuous is then modified or adjusted by the conceptual (Saito, 1998).



#### 6.2.1 Location 1

As mentioned before the opinion of a ‘triple dike’ as an alternative solution was hindered by the lack of information or visual

images. People wondered what the area of the third dike looked like and what the possibilities were. The influence must be taken into account. Although hesitation was present, positive and negative sides were expressed.

Some opinions were linked to the context of the new dike, as a great impact on the landscape *‘it does not add to the landscape, the others do’* or *‘difficult in the small scale landscape of the Nederrijn, you don’t just introduce a new dike.’* Another reason why it did not appeal was the fact that the new dike was so far away from the river, *‘it breaks the idea, the dike is not with the river anymore.’* The decline of the openness was the third negative aspect mentioned.

Positive aspects of this alternative was the preservation of the old dike. Two landscape architects who worked with river projects or dikes stated that it (in general) is *‘a nice and interesting option’*, *‘the nice thing about*

*a climate dike is to invent an umbrella, with multiple functions.’*



This dike profile was the least appreciated. The two persons that liked this dike, because it was *‘still bonding with the ground’*,

and liking 'the difference between the inside and outside of the dike, without the hindrance of the openness.'

A landscape architect found this dike 'confusing' because she was not used to it. In the words others use becomes clear that the broadness of this dike does not fit to the perception of what a dike look like, 'is more a terrace, not an edge', 'a broad colossus, a sort of highway'. Related to the present landscape it was not seen as appropriate for historical reasons, 'many historical elements lie close to the dike, they will disappear', or because of a context specific reason, 'Rhine dikes are slim with many curves, this is not really fitting'.



Most idea's and design solutions were suggested with this delta dike. The suggested alternative was changed by almost all people. The main reason was the fact that the dike

was broadened at the river's side and the question about the back and front side of the house. There was a strong preference for mirroring the whole dike. It would result in a 'stronger link with the river', 'preservation of the flood plains' and the house and tree is 'not related to the water' so therefore it is not fitting. For one person the preference for mirroring had to do with the feeling that 'outside the dike' is low, and 'within the dike' high.'

Two inhabitants of the area were not positive about the alternative because of the house. They would not want to live it in, 'it is so close to the road and in the wind'. And the landscape next to the river would be damaged. If this would be made, then at the other side, but 'the tree can stay'. Buildings on the dike brought the most discussion and questions. Although some saw the positive side of it, 'you can do a lot with it' or 'it adds value (financially)', other saw it as something unnatural or as a threat to the openness in the future, 'how flexible will it be in the future if you build here?'.

## 6.2.2 Location 2



On the location where recreation plays an important role, this amorphous ecological dike was seen as most beautiful and natural and therefore preferred above the other two. It was described as 'nice, with

movement', 'addition to nature', 'appealing' and 'most beautiful'. Not only the dike added more value to nature and 'represent the history', but also it contributed to recreation in the sense of efficiency, possibilities and atmosphere. The dike 'is going to be a boundary between two worlds'. One of the landscape architects, who values the combination of form and function, wondered how it will look in reality, 'is it going to be fascinating or 'sloppy?'. Aesthetically appreciated did not always mean that the form of the dike was relating to the image of a dike, 'a dike is really human, so in that sense it does not fit, but it is beautiful'. An inhabitant remarked that 'it is not nicer in terms of form, but still it is beautiful, more natural.'

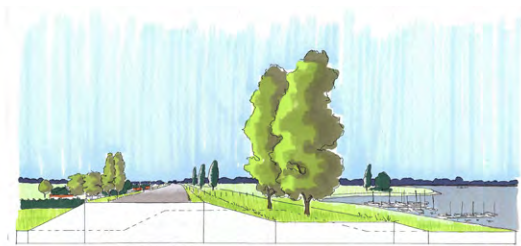


The same dike profile was shown within an agricultural area. Just as the strong (most negative) expressions were with that version, was seen here. Some of the words that were used were 'very radical', 'that super-thing'

or 'plateau'. At one hand the opinions about the dike were related to the form and the feeling you would have on the dike. The broadness would change the character or the dike was out of proportion, related to the context. This effect was nicely described by one person who called the



feeling on a dike a 'watchtower-feeling'. It would disappear, you did not have the feeling of 'standing on the dike with the fields under you.' On the other hand, the reason why it was not much appreciated had to do with the multifunctional use on the dike. Most people thought about the effect of placing the camp site on a dike, but also the trees were strange to some people 'trees on a dike...it makes me a bit uneasy.' Placing the camp site on a dike disturbed the relation with the river for one person, but it could also add value to the dike, more view for the campers. The practical consequence of this was expressed by an owner of a camp site next to the dike, 'on a dike you become part of the traffic, all those people that pass by... '.



The reaction on this dike with two different height were neither very positive nor negative. In one case this image resulted in the suggesting of a combined ecological and the very broad dike.

The form and the sharp slopes did give one person 'more the idea of a dike'.

### 6.2.3 Location 3



The house on the dike (and part of the dike also in function) gave some of the most opposite reactions, as I have mentioned before. Urban and thus not suitable, or characteristic and Dutch, fitting along this dike. For

both groups the amount of houses was important. Creating a row of

houses was not preferred at all. It would 'cut through the landscape' and it would 'detach the village with the dike and the river'. Seeing the village behind, or creating vistas were still needed for this location.



This terp-dike was strongly compared with the last, and most radical dike profile. This one was preferred above the last one. The argument that was used was especially related to the 'feeling of a dike'. Although this did

not count for everybody, for some it was too broad, comparing with the delta dike it still remained a dike; 'you still have the idea where the dike is'. It has some views to the water and you still see what is behind the new houses were other opinions. Once a slight switch was made in the judgment. Starting with a hesitation, critical approach, 'often there is no space', one designer shifted more to the positive side when I used the word terp-dike. It apparently had a more positive connotation, his opinion became more positive, because a terp-dike 'fit well to the historical feeling'.

The ones that did lost the dike feeling found this alternative 'leveling'. A landscape architect suggested the terrace form of dike also because of this reason, 'on one level it becomes a road, it's not a dike anymore'.



This alternative was by far the most radical and non-desired solution if there was a choice for other solutions. A question about whether or not the form was still following the function played not only an important role for

the landscape architect, but also for the other people.

The extreme change that people saw was not seen positive. Words were strongly negative, because this form would damage the openness, denied the past, brings to much contrast and divides the landscape. The words people used to describe what they saw or what the result would be if this alternative would be used, showed how different that image was from the present dike: *'it becomes a hill', 'messy, not fitting', 'a tribune' and 'a 'schijnoeverwal''*. A woman expressed how the position of the houses in their context would change, *'this is adding a dwelling-landscape to a river, that is weird; as if it were mountain homes.'* The negative impact will be less, according to two people who regularly use the dike, if the houses will be a bit lower than the road, so the curves would be accentuated, or depending on the length of this profile.

### 6.3 Conclusions

The mechanisms that can be found within the interviews play a big role in the way people perceive their environment. It starts with the images, opinions, meanings and values people have about 'landscapes' and the 'river landscape'. Not everyone has the same image of what 'landscape' is. Landscape architect see landscape mainly as a system, others mainly as nature. Seeing the environment as a system will overall result in attaching a lot of meaning to the so called readability and visibility of the dynamics of the environment. Whereas a natural image was stronger linked to the high valuing of the 'green' and water elements. This is important within communication about a specific area, in this case the dike and surroundings along the Rhine. The word 'landscape' can even change in meaning during a conversation. But it also directs descriptions of the area and the preferences of alteration in that area.

Focus can also change in the conversation. Things not seen before can become more prominently present. In this case, the photos, influenced the focus of perception. A selection of the what you look at is already made. And the viewers do not focus on the same elements at the same time.

Photo's influence the focus in perceiving. Through the selection of the photographer, but also within one picture through the viewer. The existing ideas and opinions about what a river landscape should look like, and the focus on certain elements brought to the surface the difference of perceiving a dike. To designers, and some inhabitants, a dike is a clear object. While for others, the context was mostly seen and highly valued. The dike was not mentioned much, what lies next to it meant a lot and was valued high.

Overall knowledge can add value to a dike, at least it gives more consciousness about it. With memories people tend to talk more in terms of feelings instead of in theory. Both influence the way people look at how dikes were, and compare with other areas. Being physical near a dike gives the place more value. The present dike is valued more in its present form. But being physical near does not have to link one on one with being emotionally connected with the present situation or dike. Inhabitants of the area do see the space more as perceptual, whereas landscape architects mainly see the space as cognitive. Choosing an alternative was influenced a lot by this viewpoint. Inhabitant looked more at the practical side of the alternative, and the designers clearly used their knowledge and experiences in projects to make a choice. In the end the same alternative could be chosen, but with (slightly) different reasons behind them.

Evaluating the reactions on the design drawings a few conclusions can be drawn. Because of the comparison people made between different options, some alternatives were accepted sooner when the others showed a radical or to them strange solution. This occurred more often with the non-designers. Some saw the solutions more as fixed and literal plans, whereas the designers more often came with alternative ideas or other solutions, like a combination of two. But will many the drawings made them think about their views and values, also about the more unconscious opinions.

Not being in the landscape, a part of the context is lost and not seen. Drawings are made from one perspective: on the dike, with the river

to the right sight. This can influence the value they give to a solution or change their perception and opinion. Sometimes a lack of information can lead to a more negative opinion about the new situation, and when there are alternatives.

Relation of dike with the river is seen as important. Sometimes knowing is enough. Openness experienced from a dike is overall seen as a very high value. And the context of a dike determine for a large part how a dike is perceived and valued. It is possible that the definitions of what a dike means will differ if another river dike is shown. In the experience, a dike never stands on its one.

Objects (houses, trees etc.) on a dike did not by definition devalued a dike. How it was placed and designed did make a big difference. A house placed on a dike was seen as strang or not fitting, unless people had historical associations with dike-houses. A drawing in that case can evoke different, opposite, associations. The result is a totally different opinion on the new situation. Green, like a tree, was more easily seen as nice or fitting.

Overall the riverside had more value than occupational side, when looking at the reactions on measures in the floodplains and the descriptions of the area, but both have a lot of meaning. Alternative solutions must be fitting, which in most cases meant: in proportion with the context, preserving or enhancing the most valuable elements (like openness and height). Within this framework and keeping in mind the specific location of the Betuwse dike, there is not a well-defined image of what a dike is. But there are factors that either contribute to the image of a dike (like height, two slopes, the link with water) or factors that cause people to say, this is not a dike anymore (like radical broadening on the same height, or straitening the dike). In between there are also options, depending on the personal views on what is, and what is not a dike.

Searching for a useful link between the interviews and design application I found a few themes that were mentioned the most. Keywords that are strongly related to the experience of the dike and its specific context,

but also giving spatially starting points for design. Two are more indirect present in the reactions: 'Context' and 'Two slopes'. Indirect in the sense that these words are not always mentioned literally, but the talking about everything next to the dike and the preferences for the two clearly visible slopes in the drawings indicates the importance of these elements. The others are more directly mentioned many times:

*Green*  
*Relation with river (or water)*  
*Variation*  
*Openness*  
*Height (of the dike)*  
*Contrast/two worlds*  
*History*  
*Curved road (dikes)*

In the next chapter I will use these conclusions to elaborate the possible spatial implications and I will explain how I used the keywords within the design application.



7



# 7 Design principles and application

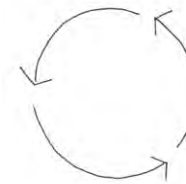
**In this last chapter the finding of previous chapters are combined to search for possible design principles and application. First of all in general, in design principles, but also specific solutions for the case location.**

## 7.1 A bridge between experience and design

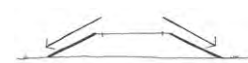
Exploring peoples' experiences of dikes and climate dikes does not give a 'statistically best solution' for the chosen location. Not all findings can be one on one translated into a spatial forms. But it can direct the choices required within the creation of a design. Also including the opinions, meanings and values of both groups creates more awareness about the non-visual.

Certain findings described in chapter 6 can be used to search for possible application of values into spatial forms. Although there is not one image of what a landscape is, if the focus lies on the system or on the nature side, similarity is also present. Green elements, next and on the dike is important to both groups. In both views the dynamic of the river area, and the relation a dike has to have with the water, comes forward. Floodplains seem to have the highest value, but both sides of the dike contain a lot of meaning. Although most designers tend to focus more on the dike itself, at the end, the context and what lies next to it makes a big difference in the choice whether or not a certain dike solution is 'fitting'. The changes of dikes must be understandable for both groups, using as much as possible the uniqueness of the area, preserving what is valued most (like historical elements, but also things like variation along the route). Sometimes the danger of a flood does not outweigh the acceptance of a radical measure, if that measure changes the present area too much (an important note is the fact that none of the interviewees actually experienced a flood where one had to leave the house.)

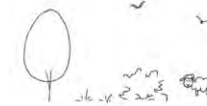
The keywords mentioned in chapter 6 can be used for this area to direct design principles. They relate strongly with the dike and experiences, and together show some uniqueness of the area. Of course these values do not only belong to this specific location. Other dikes and locations may have similar values, but maybe combined or replace with other values.



**Context:** what lies next to the dike, houses, agricultural land, flood plains, the contrast with the ice pushed ridges, historical elements like a stone factory etc.



**Two slopes:** to see the dike goes down on to sides.



**Green:** trees, shrubs, grass, but also the animals.



**Relation with river (or water):** seeing or knowing where the river lies.



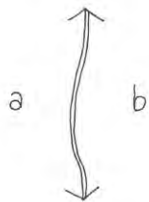
**Variation:** different elements and experiences along the route of the dike.



*Openness:* being able to see far and seeing a lot of sky.



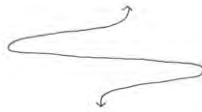
*Height (of the dike):* having a 'watch-tower' experience on the dike.



*Contrast/two worlds:* experiencing a difference between both sides of the dike.



*History:* preserving and using historical elements like small rural (dike)houses, stone factories and fruit orchards.

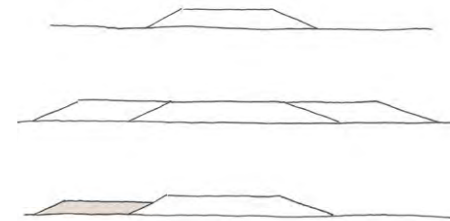


*Curved road (dike):* an appreciated pleasant feature of what a dike must look like.

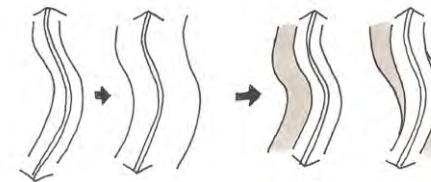
From these keywords general principles can be derived for the area:

**Context** The dike as be part of the context, not overruling in shape and character, fitting to the rural and small scaled character of the location.

**Two slopes & Curved road (dikes)**



^ Present - Not preferred - Preferred



When reinforcing the dike by broadening it, the two slope must preferably be visible on two sides. If this is not possible, one side is also an option. The new part of the dike should not be on the same height as the present dike, but on a lower level. To preserve or accentuating the curve of the dike, the new part can be added on the left and right side. In this way the curves are not diminishing but reinforced.

< Present - Not preferred - Preferred (2 options)

**Height of the dike**

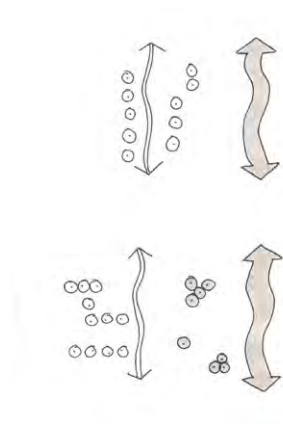
Related to the two slopes and curved roads: preserving the height of the dike. The ability to 'look down' and seeing the sky as much as possible.

**Green**

As much as possible use of a 'natural materialization'. A grass covered dike, and fitting planting along it.



## Variation & Contrast/two worlds



Keeping or creating the variation along different parts of the dike: open large scaled and more closed small scale areas. Clear planting species difference and pattern on two sides of the dike.

On the riverside species like: Willow, Poplar and Alder.

On the levees species like: Elm, Ash, Oak, Beech, Chestnut, Maple, Hawthorn, Hazel and Walnut (see figure 53).

Figure 53

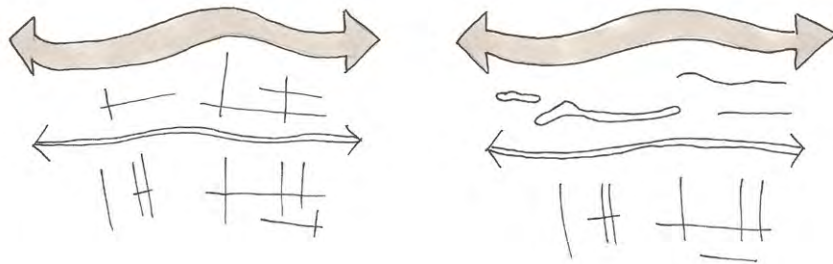
Riverside: Salix Alba, Populus X Canescens, Alnus Glutinosa



Levees: Ulmus, Fraxinus Nigra, Quercus Robur, Fagus Grandifolia, Aesculus Hippocastanum, Acer Platanoides, Crataegus Monogyna, Corylus Americana, Juglans Nigra

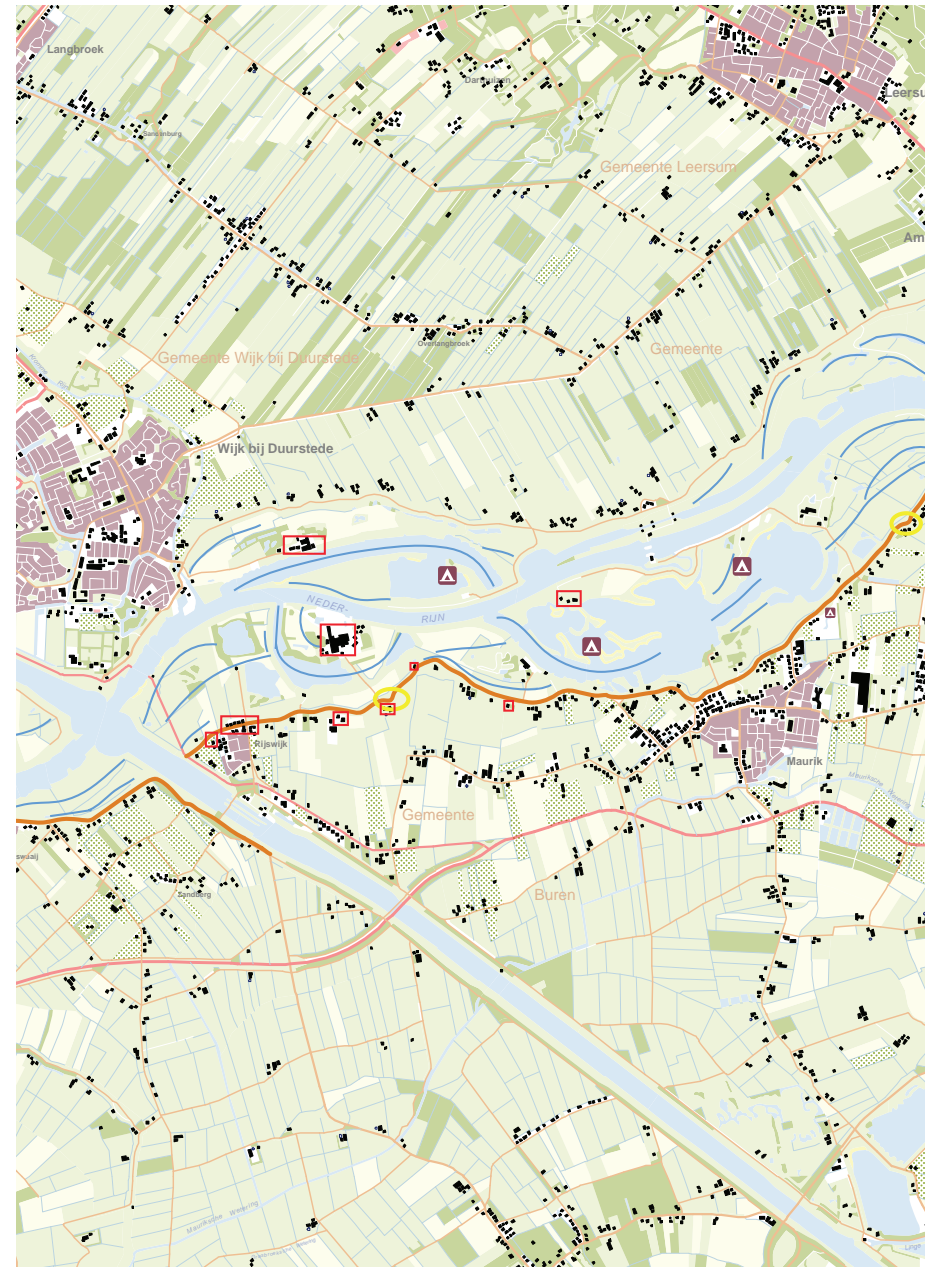
Preserving or creating a visible influence of the river in the floodplains in pattern and direction of elements.

To:



History	Preserving and/or using and visible showing historic elements like stone factories, old river streams and old houses.
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When the analysis is combined with the outcomes of the interviews a map can be made with the choices of the most important features in that area, related to experiences of the dike. In the characterization map also present projects can be found. This concerns two project of 'Ruimte voor de Rivier'. The river gets more space in the Tollewaard and the Middelwaard. For instance parts will be excavated for the storage of water, summer dikes will change and footpaths will be made (see figure 54).





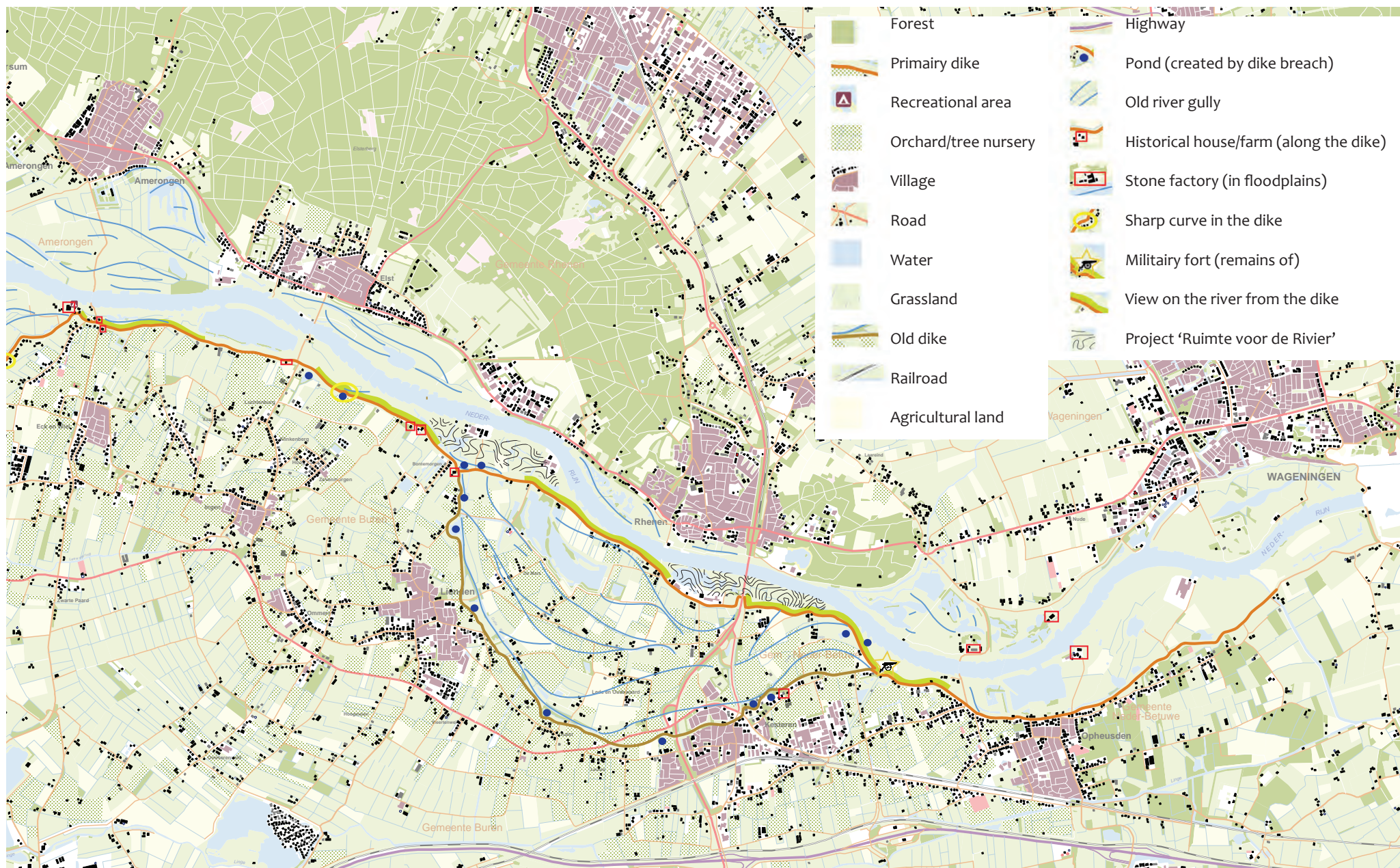






Figure 54 Project of the Tollewaard and Middelwaard (*Ruimte voor de Rivier*)

Although it is one dike, the context, what lies close to it or a bit further away shows the differences in the location. To apply one solutions to the whole areas is therefore not desirable. Also in the light of variation along the route, different solutions are an opportunity. For creating variation, and for preserving of enhancing parts of the dike. In the next paragraph I will use this map to divide and apply a certain solution to a certain part of the dike.

### 7.3 Climate dike solutions applied to the Rijnbandijk and the Marsdijk

The characterization of the area gives rise to a certain solution of the climate dike, but choosing different solutions must not lead to a chaotic chain of different forms. Therefore I choose to use a basis starting point in shape. As much as possible I used the broadening of the dike inside the dike, lower than the present dike. Because this is a rural area there are parts that have enough space for this solution, without having to move or take away buildings. But not on all places this is possible, mainly because of the lack of space of historical buildings. In that case a broadening outside the dike can be chosen. The flood plains are relatively wide in this area, and in some cases it can be combined with extra water storage by recreating old gullies or on two places combine with projects already made (as mentioned in 7.2).

This rural area does not demand so much for multifunctional use compared to some urban areas. But in some more complex cases houses can be places on the dike. The combination with natural elements is also possible, but because of the highly valued openness this is not desirable in most places.

On the map the chosen dike segments can be seen, with the principle of the dike solution.

1 On both sides of the dike segment at Rijswijk stands historical buildings very close to the (very small) dike. Broadening or heightening is not an option here. The triple dike, a climate dike in the form a new third dike, can be a solution. There are a few options for this new route (see detail 1).

2 Along this part of dike several historical houses or farms are present and many curves can be found here. To avoid as much as possible taking space from the river by expanding inside the dike, the dike can be broadened outside when possible, and inside were needed. Outside is for instance possible were an old house is standing at the flood plain side.









Expanding inside the dike can be implemented where historical buildings stand close to the dike. One very sharp curve lies on this segment, but expanding outside the dike is possible because of its shape (see detail 2).

3 The dike between Maurik and the recreational area is quite straight. Along the dike much is happening. New houses are built, yacht basins are very present and camp sites and other recreational elements can be found here. Because of the many houses not much space is available outside the dike. But the flood plain area is very broad. Here a combination between a stepped dike and an amorphous ecological dike can be made. The broadness of the dike can create a more clear line in the somewhat chaotic looking area, and the adding of natural elements can enhance the experiences for visitors. Creating different slopes (steepness) and gradients can also increase the biodiversity.

4 Outside the dike many houses stand close to the dike. Also here the flood plains are still wide. Expanding the dike inside the dike is an option here, in combination with (as a compensation for the space of the dike) digging out one of the old gullies.

5 Enough space is present here outside the dike. Broadening the dike on this side is then possible.

6 This part is a more complex situation, because of the different roads, height of the dike and the (historical) houses on both sides of the dike. The dike can be strengthened by combining broadening inside and outside and lifting up a few houses (see detail 3).

7 This segment is the most panoramic part of the dike. On many places there is a nice view from the dike on the flood plains and river. There are less houses, which are standing more away from the dike. This gives the opportunity to broaden on the outside. At the moment traffic can speed up, and cyclists and walkers do not have the space to stop and enjoy the view. On a few spots an extra viewpoint can be made where people can safely stop (see figure 55 a and b).

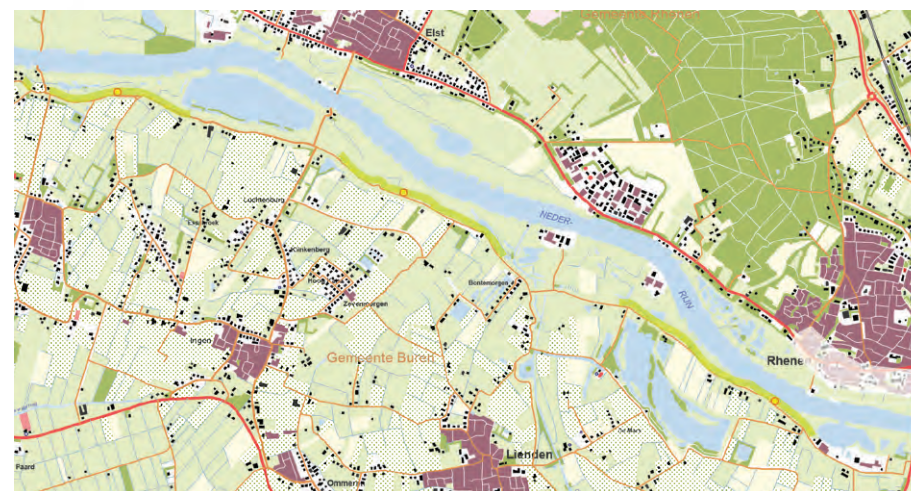
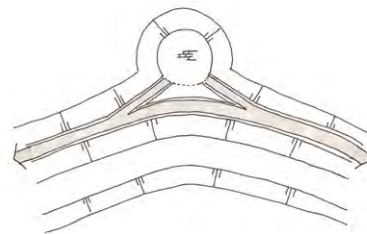


Figure 55 a) Viewpoint of grass, asphalt and brick (a reference to the stone factories)  
b) Proposed locations of viewpoints (orange circles)

8 There is one exception in segment 7. Here two old 'Betuwe' farms lie next to each other, close to the dike. For a small part the dike can be broadened on the inside of the dike.

9 This segment is the most recent part of the dike. The old dike is still present, and the created polder is used for agricultural purposes. The dike lies very close to the river. Therefore I choose to heighten the dike slightly, and adding a small part at the outside of the dike. The old dike can still function as a second security, when also the old river stream (now very small, but still present along the old dike) is made

broader to store water if necessary. The water is then gradually stored, without breaking the dike at once. The different phases will show the river dynamics more, but it limits the damage by directing the water. This can be done with a seepage quay (red arrow) in the part of the dike where the old stream begins on the outside of the dike. When a higher safety is required, there is a second face possibility of putting the farms on individual mounds (according to the example of the farms along the Maas; see chapter 4).

10 The old fort is now functioning for a small part as a primary dike. Altering this 'star shaped' dike will cause the form to decrease in clarity and change the historical form. But there is a small part of road, in between other parts of the dike, that can be heightened. The dike is then continued in a logical way, without changing the remains of the fort.

#### Detail 1

a triple dike around Rijswijk. There are more options to apply this solution here. Two (option 1 and 2) are new dikes which lie on the side of the Betuwe. The village's historical part is preserved as it is, but at the same time the village has more risk of flooding, because it lies outside the third dike. The 3rd option is situated in the flood plains. This has other consequences: the dike takes up more of the space of the river and changes the views of the most historical part of the village. This dike can be a smaller, for cyclist and walkers, whereas the other options can be made suitable for motorized traffic.

All three options with the location and some photos (see attachment E) were presented to the interviewees (after the interviews). Two questions were asked: which option do you prefer and why? The document was sent by email and the reactions were also sent back by email. Thirteen people in total gave their opinions, of whom eight were landscape architects.

First of all some general remarks can be made about the method and outcomes. Because of the limited amount of explanation(in text, but

also visually there were no drawing as people see within the interviews) it was harder to make a decision. It also led sometimes to questions or misinterpretation of especially option 1 and 2. It was not always clear that indeed Rijswijk would lie outside the (new) dike in these options.

Besides this it became clear that people use different point of views and have different priorities or values on which they base their decisions. Were history and historical element and the preservation of this is decisive for one person, another values the use of the dike higher. In general safety is seen as an overall important factor, which is of course for a dike not uncommon. Below I will point out the most striking reactions per option.

#### Option 1:

This option, together with option 3, was chosen the most. Positive sides that were mentioned:

- Opportunities for extra housing (although not preferred by everyone), multifunctional use and possible economic profit
- More view and space compared to option 2; *'loss of views towards meadows is intuitively better than the loss of sight towards the water'; 'Rijswijk keeps its landscape and open 'platter', and you make a strong new element.'*
- In term of shape, the preference of a whole new structure when the present dike could not be strengthened or when important historical values would be lost
- Logically fitting (more than option 2) in the parcelling of the area
- Closing in Rijswijk, stopping the possibility for further expansion of the village
- Issue of safety when the dikes break, the village will function as a bath tub
- Less view from the village to the Betuwe
- Less suitable dike for walking, compared to the others

The factors seen as negative in this option were also often reasons why people chose option 3 as the best option.





Detail 1

Option 1





### Option 2:

Option 2 has no preference for everyone. According to several reacting it blocks the view to the Betuwe, offers not space or possibilities for multifunctional use, lies too close to the existing village and offers no safety for the village, which should be important. For one person it reacts on the build structure whereas a new climate dike is preferred to lie *'straightforward in the landscape'*, and for another it contains the replacement of existing houses on the new dike, which is seen as *'anachronism, an insult to history.'*

-  Existing houses
-  Present dike
-  New dike (road)
-  New dike (slopes)
-  Historical houses/buildings
-  Existing house lifted up on new dike
-  New orchard
-  Stepped dike (horizontal part)





### Option 3:

Positive sides of this option that were described:

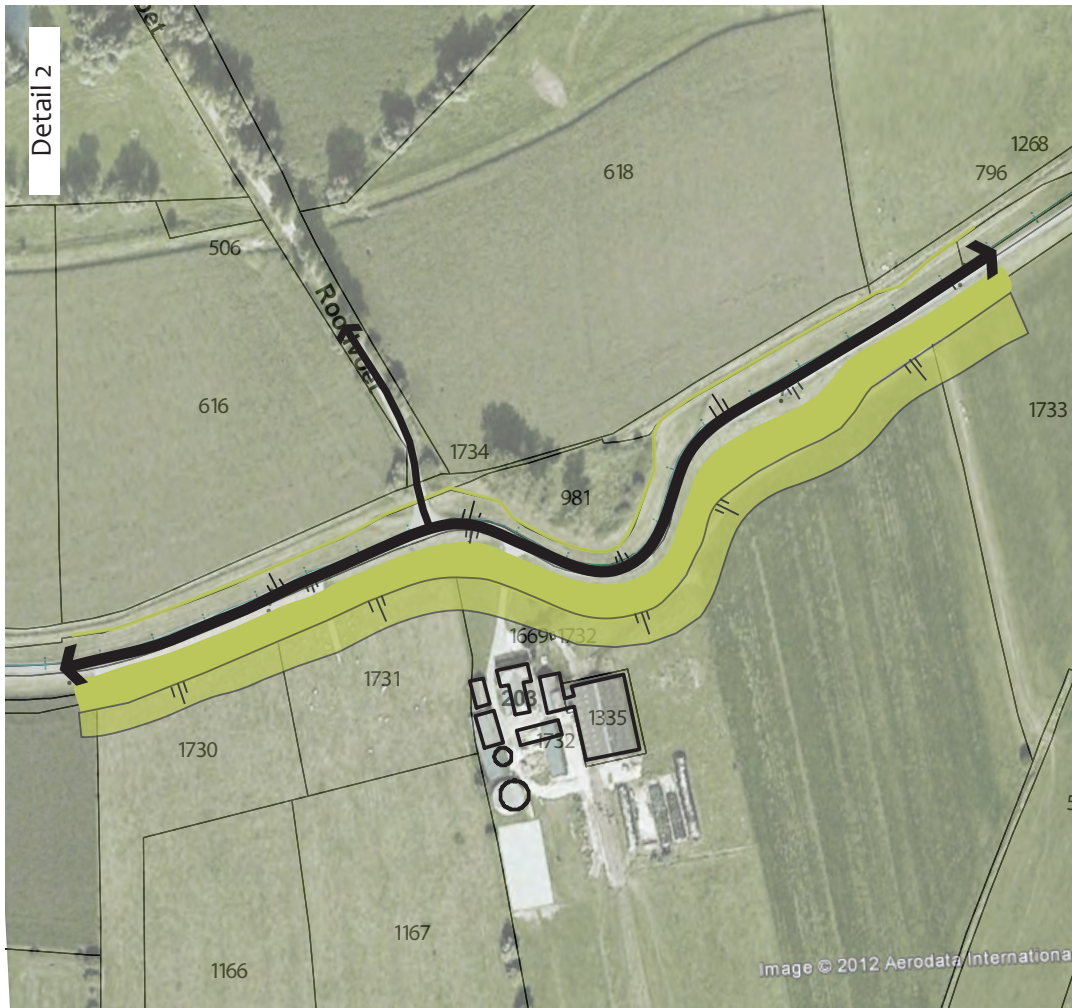
- Keeping most of the present situation;  
*'connexion with the existing has less impact on the landscape'*
- Following the line of houses
- Safety protecting between village and river  
(although for two persons this is not an *'attractive solution because of the historical core of the village'*)
- Fitting into the landscape structure of the flood plains
- Spatially an elegant solution

Negative remarks concern:

- Present image is drastically changes along with the values of the present dike
- Determines to much of the village views
- It makes the houses (*'which are small objects'*) more important than the dike

When the questions about the location of the village in option 1 and 2 is taken into account (more negative regarding the safety of the houses) the third option is overall preferred as the best option. The shape and size does matters a lot in this option, because of the high values this location has historically seen. For some this new dike is influencing this historical part too. much.





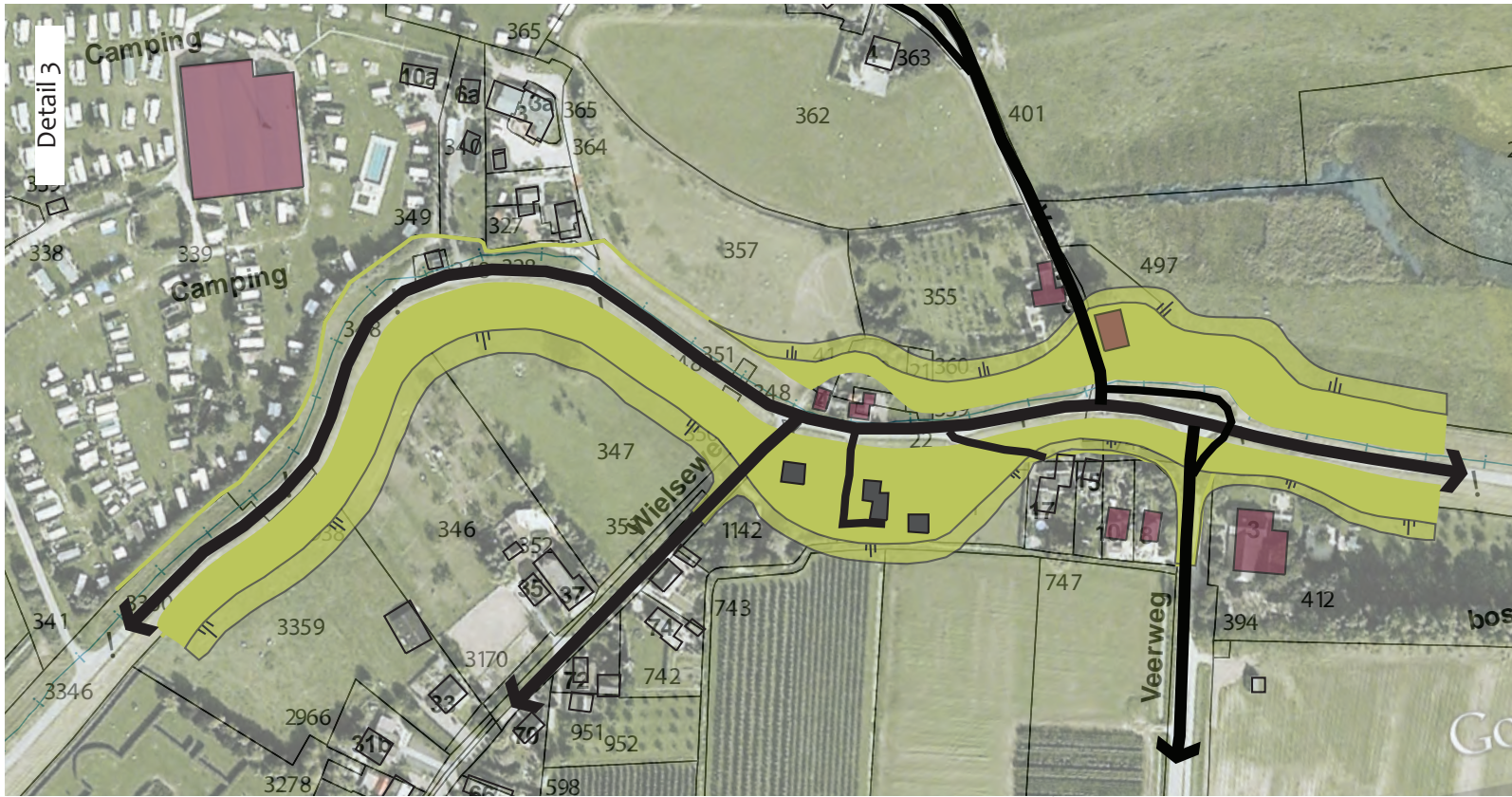
### Detail 2

Making a dike a lot broader has consequences for the curves in the dike. In this specific location there is enough space to expand on the outside of the dike. And because the curves' shape is directed to the same directing as the new part of the dike, the curve is not weakened in form, but accentuated.

### Detail 3

Were roads cross and houses are built on both sides of the dike the situation is getting more complex. One solution applied to this part is not desirable. Especially because on both sides historical houses are located. The new part is created as much as possible at the outside of the dike. Three fairly new houses are lifted up and places on the dike. Two historic houses and one farm is not placed on the dike, but the dike is here expanding on the other side. An old shed, which is already standing higher than the surrounding buildings, is also being placed on a part of the dike. On the places where the dike is broader than the part next to the campsite, the steepness of the slope can increase. The broadening on both sides follows or increases as much as possible the current curves of the dike.





8



# 8

## Conclusion and Discussion

### 8.1 Research questions

Previous chapters contain the exploratory study of experiences of climate dikes. Literature study, the theoretical framework, conversations, interviews and the link to design principles and application all give insight in the way dikes and especially climate dikes are experienced and what possibilities opens up for the design process. In this paragraph I will come back to the two main questions that formed the starting point for this study.

*What will be the impact a climate dike has on the experiences of dikes and river areas in the Netherlands?*

The most challenging in answering this question is the fact that the concept of climate dikes is quite new and therefore not known to a lot of people. To know how a not yet implemented dike would be experienced can only be found out to a certain extent. How people would experience such a dike when it is really present cannot be completely predicted. But however, it is important to use this more 'so called' subjective information next to the technical and financial side of dike constructions. After all, a dike is a human made, used and thus experienced, clearly visible feature in many places of the Netherlands.

Historically seen dikes have evolved in a logical way. Heightening and broadening when there was an increase of knowledge and danger of floods. A climate dike is different in two ways, visually speaking. First of all the concept of a more radical alteration at once, to prevent constant smaller changes. And secondly the idea of multi-functionality on the dike. From this point of view one can argue that the impact on the area where it is made will be large and therefore it will impact the experiences as well. The use of interviews and different design drawings of climate dike give a more nuanced image of what a dike is and as a consequence a climate dike changes positively and negatively. Not just the form and change of form influences the experiences. Many factors like the way

'landscape' is seen, how space is perceived, the focus of the people, the physical or emotional proximity to dikes and river areas, knowledge and past experiences all contribute to the constructed image of what the area 'must look like', what is appropriate, beautiful, valuable and worth preserving or worth changing.

Although a dike is, especially for the landscape architects (and technical professionals) visually a clear object that determines for a large part the impact on what lies next to it, this view is much less shared with the lay-people. Large part of course for the simple reason that the dike has a special function for safety and changes concern usually just the dike itself. But this different perception starting point does influence the way designs can be made, even if it is just the 'way of thinking' about the area and the priorities given to the eventual form and the impact it has on what lies next to it. Context is seen as more valuable than the dike itself for many lay-people. The changes to a dike with the goal of a higher safety norm for these people is strongly linked to what it will do with the image and meanings they have attached to the specific area. Being aware of this as a designer is therefore important.

A climate dike has many variations and can be adapted to the specific location. A positive attribution, and a good starting point for a broad view on not only the dike, but also on the whole area. Showing photographs and design sketches helped the conversation and stimulated the imagination. Visual means gave the people the opportunity to think and talk about what they saw, the character of the location they thought it has and the ability to compare different alternatives. It made them in a lot of cases more conscious not only how they ranked the solutions, but also where their opinions came from. The structure of the questions from general, to the location to the future worked well to start this process. Choosing between different options (although I made a first selection) helped them to make a choice and explain why they choose for one solution and not for another. In quite a few cases the pre-selection did not prevent for opting for a self-made combination or the invention of a slightly different option that was not present in the drawing. This last process was often more difficult for the



‘non-professionals’. It was more visible that they automatically accepted the presented ideas as the best options, or they found it just more difficult to come up with other ideas.

The location determines a lot of when a dike alternative is not seen as a dike anymore. When there is already a changed area, with in this case e.g. recreational activities, a more radical shape is sooner accepted. In all cases the proportion of the dike in relation with the context is seen as really important. When this is lost, the dike is no longer seen as a dike or it is described as not fitting. In this rural area the more radical ones are therefore valued lower, along with the ones that give an urban association. Proportion, openness, variation along the route, green character, historical sensitivity, curved roads and height are one of the most important elements. If these factors are not reckoned with in the design, the impact of the dike will be negative on the area and on the experiences of people. But again, these are the design principles that are more visually oriented. The reasons behind are still important. Knowing this gives a more complete insight in the area, and gives opportunities to alternative solutions and a more effective discussion of the possibilities of the location.

*In what way can different views and backgrounds of experts and non-experts effect the design principles related to climate adaptation dike designs?*

The effective discussion and the important factor of looking behind the visual and choices on their own that are mentioned above, is also important for another reason. It prevent early conclusions, based on own experiences (as a designer) or general thoughts only, and it gives insight to what extent the principles can be generalized for other areas. It is very well possible that visually areas look alike, but the experiences of the people (especially of the inhabitants) can make a difference in the choice for a certain climate dike alternative.

The use of design sketches early in the process, and the stepping back in the interviews and methods from my own background as much as

possible early in the process gives interesting questions and discussions. People can think along, without the idea that they should express themselves on a topic that is already thoroughly worked out.

Starting with general questions and asking a few personal questions (like origin, or places they like to visit) help to get to know what kind of background the person has. It helps to explain the answers they will give and what underlying factors may play a role. Although the knowledge and kind of education between professionals and non-designers may cause the biggest difference, this is not always causing the difference in values, opinions and meaning. A lot more plays a role. Input from both groups can be used, the critical questions as well as the new ideas. Stories can be complementary to each other and form the basis of design principles. As, a designer the experiences of both groups can be used to keep a broad view on the subject. All input can be used to prioritise, give insights in the choices that have to be made.

Coming back to the quote that is used in the introduction of these thesis, a few things can be said. First of all, a few values that are used, the high position and steep slopes, can indeed be found when people are asked for their dike experiences. But there is more than just a feeling of what is a dike. There is a wide range of what a dike is, were it lays and what the context is. Carefulness in describing the view and use of the perception of dikes is important. The making of a good story, and the direct application to the design should be consciously considered. Being aware of the choices and their origins is the starting point of this process.

## **8.2 Further research & reflection**

My thesis is exploratory. This means that the study is meant to provide useful insights, that can be deepened with for further research. Some conclusions give rise to general remarks and some can be the starting point for other studies.

In this research the method of two interview groups and one specific

location has a certain outcome described in the chapters before and in the conclusion above. Would the design application in the end differ when a design is made in the beginning, without interviewing people about experiences? Or would the conclusion and design be (very) different when other groups are involved, or when another area is used? A study which does both, a design in the beginning and a design after interviews could shed some more light on the difference when using experiences and a less visual approach or when working from a designers perspective only. Also a more thorough social research of the experiences and the constructed images about dikes in different areas can be useful to deepen the insight in areas. It would point out the differences and similarities between groups, but also between the many different areas with dikes the Netherlands has. The questions of what makes these differences and can lead to better implementation and understanding of the area and the users of the dikes.

Using photographs and drawings work in a lot of ways very good. But an interesting point would be the comparison with the same kind of research done in the area itself, outside. When visual images are used, more insights on what is the most effective within this subject can raise the understanding. It can lead to less misinterpretation. For designers especially, the way of communication with lay-people can improve.

Another question that is important, but not yet studied, is the overall possibility of implementing such big dikes in terms of soil excavation. When climate dikes must be implemented on a large scale, throughout the whole of the Netherlands, a large quantity of soil is needed. Where this must come from and how this will influence the financial possibilities is yet unknown.

Looking back at my research I especially liked the combination of two different, but closely linked disciplines. Both give a different approach to the same subject and the combination of methods were interesting to use. The opportunity to use the knowledge of both areas was not only very interesting, but also a challenge and an informative experience. This includes the knowledge and methods learned and used during my study,

but also the use of new methods (like using semi-structured interviews). Choosing the right method for achieving my goal consisted not only to take methods from my own background in landscape architecture. In this case the exploring character of my research started already with the choosing of useful methods and the search for combining results into practical use. The use of design drawing early in the process was new to me. It is good to use different methods and look at your own background in another way. Especially the theory of perception, the interviews and the not very common way of working for a landscape architect thesis showed me a lot about my own specific way of thinking. Other people with other background can point out very quickly the differences and sometimes unconscious way of thinking and working you will have after a specific study. I think this is very valuable for a designer, since is a broad field, and because of designs are meant for people to use and enjoy and with respect for nature and culture.





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# Appendices





# A Questions about a flood plain area

## Group: SOUND



### General questions

- in what kind of landscape did you grow up? (what kind of landscape is most familiar to you?)
- what is your first impression(feeling) of the landscape?
- compare this impression with the feelings after the excursion. what stayed the same, what is different and why?
- what do you find beautiful about the landscape?
- what do you find disturbing or not beautiful in the landscape?
- what is, according to you, the most characteristic about the landscape? (this can be physical or non-physical)
- if you want to improve the landscape by giving more value and a richer experience, what would your design intervention be?

### Questions about hearing

- what do you hear?
- do you find this pleasant or unpleasant?
- how does this effect the way you perceive the landscape?

## Group: SMELL



### General questions

- in what kind of landscape did you grow up? (what kind of landscape is most familiar to you?)
- what is your first impression(feeling) of the landscape?
- compare this impression with the feelings after the excursion. what stayed the same, what is different and why?
- what do you find beautiful about the landscape?
- what do you find disturbing or not beautiful in the landscape?
- what is, according to you, the most characteristic about the landscape? (this can be physical or non-physical)
- if you want to improve the landscape by giving more value and a richer experience, what would your design intervention be?

### Questions about smelling

- what do you smell?
- do you find this pleasant or unpleasant?
- how does this effect the way you perceive the landscape?

Write about your own experiences and answer these questions on one A4 paper.  
anne-margreet.niemeijer@wur.nl



## B Informal conversations

Locatie: op de dijk, Wageningen, autovrije stuk (!)

Datum: 22 maart 2011

Aantal gesprekken: 2

Aantal personen betrokken: 4

1) Echtpaar wandelend op de dijk richting Rhenen.

*Waar komt u vandaan? Komt u hier vaker?*

We komen uit Ede en lopen elke dinsdag over de dijk. We hebben meerdere plekken waar we komen, maar dit is er in ieder geval een van.

*Waarom heeft u deze plek gekozen?*

Door combinatie van hoog (wijst in richting van de Wageningse berg) en laag, voor het uitzicht (legt het uit met een toon van vanzelfprekendheid en maakt handgebaar rondom zich) en voor de vogels, de ooievaars. Zijn vrouw beaamt dit en hij verteld enthousiast of ik ze al heb gezien en waar ze zitten. Op 1 maart waren we hier ook, toen waren ze er ook al. *Stel de dijk blijkt niet veilig genoeg te zijn en het moet breder gemaakt worden. Wat vind u hiervan?*

Dat mag wel, veiligheid is toch heel belangrijk, voor de mensen die hier wonen. Dat staat voorop.

*En als de dijk zon 50 meter breed de uiterwaarden in wordt gelegd?*

Nee, dat kan niet. Er volgt een ervaringsverhaal van de plek waar hij oorspronkelijk vandaan komt, Venlo. In Limburg is ook veel overlast geweest van overstromingen. Daar werd bijvoorbeeld in een uiterwaarden jaren geleden een ziekenhuis gebouwd. Ze zeiden dat het een keer in de 1000 ongeveer zou kunnen overstromen. Maar gelijk in het eerste jaar stond het ziekenhuis al onder water. Dat kan dus gewoon niet, bouwen in de uiterwaarden.

*En als de dijk breder gemaakt wordt aan de andere kant (wijzend naar het bebouwde deel van Wageningen langs de dijk)?*

Nu kan dat niet, er staan huizen daar. Daar zouden de bewoners niet blij mee zijn. Op zich is het goed. De huizen daar zijn al oud. Als die afgebroken moeten worden mag daar wel een bredere dijk komen.

*Als de dijk breed of hoger wordt zou dat dan invloed hebben op de keren dat u hier komt?*

Nee hoor (vrouw geeft aan het ermee eens te zijn). De natuur hersteld zich ook wel weer, het gras gaat wel weer groeien enzo.

*Het groen is dus belangrijk voor u?*

Ja, het moet wel groen zijn, geen stenen wand, of veel beton. Het moet wel groen blijven. Als ze de dijk van binnen kunnen versterken moeten ze dit doen.

*Vind u dit een betere oplossing dan de dijk breder of hoger maken?*

Ja dit zou de meest ideale oplossing zijn.

2) Twee oudere vrouwen die op een bankje op de dijk zitten.

Herkomst/reden van bezoek van de dijk:

We wonen in Wageningen. Ik loop hier elke dinsdag, soms ook alleen.

*Waarom kiest u deze plek uit?*

Het is hier toch prachtig, het uitzicht is mooi. Het groen, de beesten, normaal lopen hier ook schapen maar die zijn er nog niet. Soms loop ik ook daar bij de haven en dan aan de overkant (wijst richting de Rijn) over de dijk een rondje. Dat is ook erg mooi. (het woord 'prachtig' wordt meerdere malen herhaald in het gesprek)

*Stel dat er voor de veiligheid een hele brede dijk moet komen?*

Als dat nodig is ja..Veiligheid is wel belangrijk, het moet veilig zijn.

*En stel dat het bijvoorbeeld 50 m de uiterwaarden in, wat zou u daarvan vinden?*

(heel resoluut)Nee, dat doen ze toch nooit, dat gebeurt nooit.

*Waarom denkt u dat?*

Ze wilden hier ook ooit bouwen in de uiterwaarden. De Rooseveltweg zou dan hier moeten eindigen, in de uiterwaarden. Daar hebben we heel veel geld voor betaald, dat het niet door zou gaan. Ze vraagt of ik het hoge water afgelopen winter ook heb gezien en er volgt een ervaringsverhaal over overstromingen. In 95 was er ook een grote overstroming. Het water stond hier tot aan het randje van de dijk. Er was een zwakke plek bij de Grebbeberg die ze hebben gerepareerd. Als dat niet op tijd was gebeurd stond het water bij ons in de slaapkamer, dan loopt de Eemvallei vol. Als het moet zorgen ze wel voor de veiligheid.

*Dus u voelt zich nu veilig hier in Wageningen?*

Ja hoor. Afgelopen januari stond daar (wijzend richting Wageningse berg en de Veerweg) het water ook heel hoog, maar hier niet (wijzend voor zich). Bij Lexkesveer hebben ze ook wat gedaan om de rivier ruimte te geven.



Er volgt een kort enthousiast verhaal over Ruimte voor de Rivier projecten. Hier hebben ze voor ook van die slootjes gegraven, voor ruimte voor de rivier. Ik vind dat heel mooi. Daar verderop hebben ze ook zoiets gedaan.

Van de dijk moeten ze afblijven. Ze bouwen daar toch ook hoog (wijzend naar de pas gebouwde gestapelde woningen vlak naast de dijk)?

*Bedoelt u dat de dijk niet aangepast moet worden, maar dat de oplossing in het bouwen moet liggen, dat de huizen moeten aangepast worden in plaats?*

Ja, de dijk moet zo blijven hè ... noemt naam van andere vrouw, die dit beaamt.

Locatie: op de dijk, Wageningen, autovrije stuk (!)

Datum: 7 april 2011

Tijd: s'morgens

Aantal gesprekken: 2

Aantal personen betrokken: 2

3) Bewoner van de dijk, man, 90 jaar.

*Komt u hier vaak?*

Ja, ik woon op de Veerweg (is aan de dijk)

*Kiest u bewust deze plek uit?*

Ja, hier kan ik goed lopen (loopt met stok). Vroeger ging ik in de uiterwaarden lopen. (wijst rondje aan) Maar nu kan dat niet meer.

*Heeft u in dec. ook last gehad van het hoge water (veerweg onder water)?*

Nee hoor, t kwam niet in huis en we hebben een pad achter de huizen lopen. Vroeger was het veel erger met de overstromingen. Toen de 2 stuwen er kwamen werd het veel minder. Er verdronken toen veel mensen, dat gebeurt nu niet meer. Er waren van die draaikolken in de rivier. Ik speelde vroeger met de zoon van de steenfabriekhouder. Hij kon heel goed zwemmen, maar hij is toch verdronken.

*Wat vind u mooi aan dit gebied?*

Ja, alles, de natuur.

*Is er ook iets wat u niet mooi vindt?*

Nee, eigenlijk niet.

*Voelt u zich veilig hier?*

Ja, hier rijden geen auto's. Dat was vroeger wel zo.

*En bij het hoge water?*

Ja hoor, zoals ik al zei, vroeger was het veel erger, toen waren er veel meer overstromingen.

*Er is een nieuw idee om voor veiligheid een brede dijk te gebruiken. Wat zou u daarvan vinden?*

Nee, dat vind ik niet echt wat.

*Waarom niet?*

Ik zie niet waarom dat zou moeten. wat heb je eraan om een dijk breder te maken?

*Ze willen het breder maken zodat het niet doorbreekt en niet overstroomt..*

Dan moeten ze de dijk hoger maken.

*Dat vind u een beter oplossing?*

Ja, dat is beter.

Meneer vertelt ook nog over een mooi dijkje aan de Linge, daar was de dijk heel smal met fruitbomen aan de kant en daar slingerde je dan overheen.

4) Vrouw met 2 kinderen. bewoner Wageningen (vlakbij de dijk)

*Woont u hier vlakbij?*

Ja ik woon hierachter en kom hier vaker.

*Speciaal deze plek?*

Ja, ik vind het mooi, het uitzicht en de beesten (kindje staat dichtbij de schapen achter het hek)

*Wat vind u zo mooi?*

Het hele plaatje (wijst naar de uiterwaarden), het water, de bomen en gras enzo.

*Is er ook iets lelijks?*

Ja, dat (fabriek), maar goed, ik weet dat dat er ook moet zijn.

*Stel er komt een brede dijk?*

Als het veiliger is is het goed, wat breder, twee keer deze dijk is prima.

Wel jammer van de uiterwaarden.

*En als het 50 meter de uiterwaarden in ligt?*

Moeilijk voor te stellen, wel jammer. Op sommige plekken kan het makkelijk breder.

*Hangt het ervan af wat eraan ligt?*

Ja, dit is toch authentieker (de dijk).  
*Houdt u daar meer van?*  
Ja aan het nieuwe wen je natuurlijk ook wel aan.

## II Korte gesprekken over dijken (algemeen, niet op locatie)

Locatie: via telefoon  
Datum: 3 en 5 april 2011  
Aantal gesprekken: 2  
Aantal personen betrokken: 2

1) Niet bewoner rivierengebied.  
*Waar denk je aan bij het woord landschap?*  
Marsman, Hollands, vergezicht, weiland, de wolken lucht, koeien, sloten, bomen; maar verder ook stedelijk, skyline van de stad. In eerste instantie: van afstand ernaar kijken.  
*En rivier landschap?*  
Aardrijkskundeles, het ontstaan, kribben in de rivier. Een dijkdoorbraak, maas en Waal, zomer en winterdijk.  
*Wat vind je mooi of lelijk aan dit gebied?*  
Mooi: de combinatie van land en water, handelsschepen, de diversiteit. Geschiedenis in het landschap, hoeft niet per se zichtbaar te zijn. Ook leuk, informatieborden, kennismaken van het landschap en de veranderingen is aantrekkelijk. Niet mooi: moderne steenfabriek, industrie.  
*Kom je vaker op een dijk?*  
Heel weinig, af en toe bij Wageningen en Harlingen.  
*Daarom ga je erheen?*  
Om uitwaaien, het hoge punt, uitzicht, bekijken, veel wind. Ik associeer het niet met bebouwing, maar met water natuur, beplanting en weidegrond.  
*Wat doe je er?*  
Wandelen, meestal op de dijk, daar heb je het meeste uitzicht. Meestal tussen de zomer en de winterdijk. Met het water in zicht, hiernaartoe

lopen. De dijk is echt aangelegd, tussenin is meer een wilder gevoel. Wat vind je mooier en waar ben je liever? In eerste instantie in de wildernis, dan de dijk. Pluspunt van de dijk is het hoge zicht. Afwisseling is mooi.

*Wat betekent een dijk voor jou?*

Een waterkering, bescherming van het achterland, en de rivier.

Hoogwater, functie is veiligheid.

*Stel de dijk wordt breed?*

Op zich goed als het alleen gras is, of meer lage bossages, bijvoorbeeld de weg omzoomd door bomen en het natuurlijke gedeelte meer laag.

*En bebouwing op de dijk?*

Heeft welzijn charme, de scheidslijn tussen de rivier wordt minder. Meer integratie rivier en landschap is goed.

*Beleving?*

Ervaar het minder als een waterkering.

*Is het nog een dijk?*

Ik denk het wel, het kenmerkende van een waterkering is er nog steeds.

*Ervaar je dat ook nog zo?*

Het is nog steeds weids en je loopt op de verhoging, dus ik denk het wel.

Er mist wel een stukje leegheid. Hangt ervan af hoe vaak.

*Op een plek of meer?*

Puur beleving: de dijk met leegheid en uitzicht. breed met bebouwing wel goed voor recreatie, de leegheid moet wel ergens anders opgezocht worden.

Kiezen als op oplossing ontwerp:

praktisch: voor water en veiligheid: op hogen of een grote gebied teruggeven aan de rivier. Het laatstgenoemde is beter. Door ophoging wordt de scheiding met het achterland groter en dat is minder aantrekkelijk.

Voor beleving en ervaring: teruggeven aan de rivier, de dijk zo laten.

Technisch oplossen is niet aantrekkelijk, daarvoor is de rivier te lang.

Karakteristiek van een dijk:

een strak vormgegeven ophoging in het landschap, breed onder en smal boven, een lint. Eventueel met een weg erop. Een laag achterland, het water is belangrijk om te zien. Het geeft de relatie aan waarom het er ligt.

De relatie is belangrijker dan de herkenbaarheid van de vorm van de dijk.

2) Niet bewoner rivierengebied

*Waar denk je aan bij landschap?*

weiland bomen, vlak Nederlands, ook bergen. alles eigenlijk.

*Rivierlandschap?*

topografische kaart met rivieren voor me, midden Nederland. Ik kom er niet vaak, niet een beeld over dit landschap, water.

*Kom je er wel eens?*

Ja, bijvoorbeeld afsluitdijk, strand Harlingen, Texel, Wageningen.

*Wat doe je dan?*

Wandeling maken op dijk, soms lopend ernaar toe, soms met auto. Leuk aan de ene kant zee, andere kant dorp. Beeld van gaatje dijk in het hoofd.

Maatschappelijk, veiligheid, maar is niet reden van erheen gaan.

*Wat is mooi?*

2 kanten hoog loopt. Ver uitzicht. Rollen naar beneden van de dijk.

*Lelijk?*

Zo'n haag naast de dijk waardoor je beperkt zicht hebt: benauwend en irritant. Leuk zijn de schapen. Vervelend als je de andere kant niet kan zien. Wageningse dijken zijn lager, dat is mooier, minder opgesloten gevoel. Erop is heel mooi, maar ernaast ook.

*Dijk breder?*

minder mooi, als uiterwaarden weg gaan is jammer, gaat er teveel weg.

Dijk is dan niet natuurlijk. Belachelijk als huizen weg moeten. Maar huizen op de dijk is vernieuwend. Je went eraan, dan kan het mooi worden in de toekomst.

*Wat zou dit betekenen voor beleving van een dijk?*

zie het dan meer als een woonplaats, niet echt als dijk. Zowieso hoger blijft meer interessant, ik zou er nog steeds heen gaan. Ik zou er niet naast willen wonen.

*Andere oplossing?*

eerste keus is platen voor stevigheid, aan de binnenkant als het kan.

*Waarom?*

niet hoger en breder, op een andere manier karakteristiek. Qua beleving is het wel minder mooi.

*Stel wel breder?*

Dan veiligheid op de dijk (huizen), veiligst manier is belangrijkste boven hoe het nu is, wat moet dat moet. Zoveel mogelijk groen, minder huizen.

*Schoonheid landschap?*

Bos, water, heide, strand, zee. Zo natuurlijk mogelijk ogen, gang laten gaan. Een boom in de wijk is geen natuur. Waar dieren leven.

*Hoe zie je de mens erin?*

verandering is door mens, in de gaten houden en beschermen. Regels paden, niet teveel honden, geen afval.

*Waarde dijk?*

Nederland, voor wonen, heb er een beetje mee. Zee strand, hoort erbij, is er gewoon. Functie is: omgeving bekijken en veiligheid, meer niet.





## C List of interviewees

R. van Wijk		A. Bleeker en A. Nauta	landscape architects; owners of <i>Ank Bleeker en Anneke Nauta landschapsarchitecten BNT</i>
C. Niemeijer-Vink en M. Niemeijer			
K. van Dam	landscape architect at <i>SB4</i>	D. Kuipers	
S. Pille	landscape architect	G. Hubers	
M. Tilstra	landscape architect at <i>Royal Haskoning</i>	M. Verwoert	
R. van den Brink		M. Roukens	urban planner & landscape architect at <i>Roukens + Van Gils</i>
M. Bos	landscape architect at <i>Deltares</i>	K. van der Eerden en E. van der Eerden	
J. Willemsen			
R. de Koning	landscape architect; owner of <i>Landschapsarchitect Robbert de Koning BNT</i>		





# D Original quotes/remarks interviews

## Full recorded interviews are available for peruse at the author of this thesis (DVD)

uit het NOSjournaal van ma 27 juni 2011:

Boerderijen op nieuwe terpen langs de Waal

Veehouder: men. Hooijmaijers

“Het lijkt mij een hele kick om straks zes meter boven het maaiveld om daar de gebouwen te hebben en daar te mogen werken en wonen. Het is een geweldige uitdaging.”

“Het kan ook wel een nadeel zijn om met je tractor en met je vee naar beneden te gaan naar het officiële maaiveld.”

Veehouders men. en mevr. Flerackers:

mevr.: “Ik ben vorige week er eens opgaan staan met de kinderen zo van dit is nu de echte hoogte. Het is gewoon echt een heel mooi uitzicht. Alleen het nadeel is het waait altijd in de polder en dat zal het dan nog wel meer doen, maar goed, we hebben er veel zin in.”

Men.: “Als je in de stal staat, de tegenwoordige stallen zijn vrij open, dus als je aan het werk bent heb je gigantisch uitzicht. Daar kan niemand tegenop.”

## Interviews

(Note: not all quotes mentioned below are used in the report and not all quotes are fully written out)

## Algemeen/ begrip landschap en rivierenlandschap

1 Water en grasland.

Het geheel van de omgeving waarin je bent, wat je om je heen ziet. Het is niet een stad, maar groen.

Links en rechts is het rivieren landschap. De rivier, uiterwaarden, boerderijen met boomgaarden. Af en toe een waterpartij, een wiel.

2 het uitzicht over een groene omgeving, waarin de stad niet nadrukkelijk aanwezig is.

3 alles wat je ziet en beleeft, misschien eerder wat buiten de stad gebeurt. In eerste instantie het groene landschap.

Het door de rivier beïnvloedde landschap.

4 Alles waar je in kunt zijn, alle buitenruimte, ook het stedelijk landschap.

Daar waar de rivier de kern is, de dorpjes die aan de rivier liggen, de uiterwaarden en dijken, de hoogteverschillen met het water.

5 opvallend hoe graag mensen hun verhalen willen vertellen en dat je beter inzicht krijgt in de ontwerp opgave

De oppervlakte van de aarde, alles wat daar op een instaat. Alles wat buiten is.

Alles wat onder invloed van de rivier is ontstaan. Niet alleen tussen de dijken, maar groter.

6 Een ouderwets Nederland beeld met landerijen, een uitgestrekte vlakte, en in de verte een molen. Geen bebouwing, heuvels of veel bossen.

Vreemd genoeg niet iets Nederland maar meer Lord of the Rings-achtig: moerassig, ruig, een oer landschap.

7 Landschap is voor mij het totaal van hoe het ontstaan is, dus de bodem, het levende, de mens. Als je kijkt naar de mens, hoe het gebruikt wordt, de beleving en hoe het zich in de toekomst zal gaan ontwikkelen.

Het is natuurlijk de rivier, uiterwaarden, en dijk aan beide zijden van de rivier. Dat is de minimale optie. Maar de Betuwe is naar mijn beleving ook een deel van het rivierengebied, het binnendijkse gebied met kommen, oeverwallen. Hoe het hele water systeem doorwerkt is erg belangrijk.

8 wat ik gewend ben, hoe het land aangekleed is. Weilanden, bos, rivier, dijken. In ieder geval natuur.

De rivier, beperkingen, polders en dijken.

10 in eerste instantie Friesland. De definitie van Vroom: het resultaat van biotische, a-biotische en antropogene factoren. Het is altijd een beweging, de fysieke buitenruimte. De stad is ook landschap. De definitie is afhankelijk van degene tegenover je. Het heeft ook te maken met de ontwikkelingsgeschiedenis, het is geen statisch iets.

Ik denk aan het gedicht van Marsman. Geweldig. Het slingerende rivier, vanaf de dijk te zien. Ik woon op de of Veluwe, maar de rivier is heerlijk, de schepen, de wind en het water.

11 weilanden, wat je ziet als je de stad uitgaat, bijvoorbeeld de bossen, weilanden,

duinen etc.

De omgeving waar de rivier doorheen stroomt. De uiterwaarden, weilanden, knotwilgen.

12 alles wat ik zie, mijn blikveld. Maar het heeft meer te maken met weidsheid, niet in de stad. De stad op afstand is ook landschap.

Hoe de rivier beweegt door het rivier landschap. De rivier is het hoofdbestanddeel.

13 waar ik op dat moment verblijf, niet in de stad. Het buitengebied, landelijk gebied. Bossen, heide, rivierengebied.

Het mooiste gebied dat er is. Het midden van het land, de Betuwe, Maas en Waal. De openheid met de verschillende landschapsstructuren. De verscheidenheid van beelden.

14 .De plek en de functie palen het ontstaan van het landschap. Daar horen tientallen beelden bij. Ook het stedelijk landschap en het bewegingslandschap. De ondergrond, bebouwd en onbebouwd en alle elementen. Daardoor krijg je een reeks typen, wat bij elkaar past. Tijd speelt ook een grote rol.

In Nederland heel indrukwekkend. Door het heel open landschap lijken de rivieren veel groter en immenser. Grootseheid, weidsheid.

15 iets met groen, weids, landelijk. geen stad. hetzelfde, natuur, overzicht kan ook stad bijzitten.

uiterwaarden; ook landelijk, stroompje, rivier. delta.  
nl veel vlakker, ook weids, veel weilanden, met slootjes. typisch nls.

### **Beschrijving ed. gebied**

1 Het is alsof je op een riggel door het landschap rijdt.  
Het bijzondere aan een hoge dijk is dat je het landschap en de rivier kan overzien, het mooiste is als er verbinding bestaat.  
Heel harmonisch geheel, ook al is het gemaakt door mensen, het is wel mooi.  
De dijk is veel meer een dijk hier. (Vergelijking met de IJssel).  
Als je dit breder maakt wordt het een stuk land dat hoger ligt. Dat kan ook wel interessant zijn maar dat zal je moeten zien.  
Een dijk hoort bij Nederland.  
Er zijn hier prachtige zonsopgangen. Ik heb gehoord dat het te maken heeft met het water. Dan heb je water en lucht bij elkaar, dat is schitterend, adembenemend.  
Er zijn weinig punten om eens af te stappen en echt te genieten.

De uiterwaarden hebben de uitstraling van: jullie hebben hier niets te zoeken.  
Je fietst er steeds langs, maar je kunt er nooit bijkomen. (De rivier). Ja, dat is ook irritant.  
Boven op de dijk zijn is mooier, Nederland is al zo vlak.

2 Nu ik hier ben vind ik dit eigenlijk ook mooi. Ik moet hier eens vaker naartoe gaan.  
Het gedeelte tot de dijk is het meest aangename.

3 De dijk is steeds meer als een grens gaan fungeren.  
Vroeger was het aaneengesloten cultuurland. Mensen voelen zich nu minder betrokken doordat het meer is geprivatiseerd en minder toegankelijk is.  
Je gaat het anders bekijken door meer kennis. Nu heb ik meer aandacht en wordt het waardevoller.

4 Als je op een dijk zit en je ziet in de verste verte geen rivier, dan denk je: waar is die dijk dan voor?  
Je ziet op een dijk wel duidelijk twee verschillende werelden.  
Ik denk dat als je er echt kennis van hebt, de beleving sterker is en dat je er meer bewust van kan zijn.  
Hier is een andere veiligheidsbeleving. In het stedelijk gebied staat het water altijd al tot de dijk, hier is een grote verschil tussen hoog en laag water.

5 Het stukje bij Rhenen: ik heb mensen horen zeggen dat ze dit het meest dramatische landschap van Nederland vinden vanwege de contrasten.  
Het is een heel groen en plat gebied, waar je soms de rivier ziet. De dijk is een lijn die door het landschap slingert en die erboven uitsteekt. Bijna een soort podium waar vanaf je alles goed kan zien.  
Vroeger was een dijk normaal en was ik eraan gewend, een dijk is een dijk.  
Wielen zijn de mooiste plekken, het zegt veel over doorbraken.  
Vergeleken met alles is dit gebied zeker heel mooi, een 8. Maar vergeleken met andere dijken een 6.  
Als ik ergens zit en ik geniet ervan, dan kan ik volgens mij daarna een beter ontwerp maken, dan wanneer ik alleen maar vanuit mijn bagage denk en meteen ga analyseerden.

6 Wat netjes allemaal, strak.  
Op die plek ben ik gigantisch verbrand.  
Op de dijk is het "boven de Betuwe", er vanaf gaan is het er in zijn. De Betuwe is: er doorheen fietsen en een appel kunnen plukken zonder dat je eerst van de dijk af moet.  
De dijk is nog echt rivierengebied, de rivier de uiterwaarden en de dijk. Daarachter is de Betuwe, dat is echt apart.  
Elke boerderij tegen de dijk, kleine tussen dijkjes, oude elementen met betekenis, af en toe een boom langs een slootje, afwisseling van oude hekjes en zandpaden.  
Een dijk is een langgerekte strook die onophoudelijk begint en eindigt. Daarnaast ligt

de natuur links en rechts. Het hoort erbij, maar meer als er tussen dijkjes of als er een karrenspoor daarnaast ligt.

7 Het zijn twee werelden: het stuwwallandschap en het rivier landschap. De dijk verbindt en scheidt. Scheidend vind ik niet zo'n punt, want het is niet de dijk die scheidt, maar het is de rivier zelf die dit doet. Als de rivier er niet was, is de dijk er ook niet.

8 De hoogste boomgaarden die de Betuwe typeren zijn veel minder aanwezig. Zulke boomgaarden hebben iets, de bloesem, het verandert meer. Het is gebied bij veel verschillende foto's kan maken, bijvoorbeeld bij hoogwater. Hoogwater 1995: ik voelde me niet onveilig, veel mensen waren wel in paniek. Voor mij zijn het maar spullen. Hoogwater heeft iets, het zakt langzaam en laat dingen achter. Dan kun je in principe strandjuten langs de dijk. Een recreant vond het te eng op de dijk, ze was bang er vanaf te vallen. Ik ben het gewend.

10 De hekjes op een dijk geven een opgesloten gevoel, hier is het heel weids. De taluds zijn flauwer geworden, het is niet zo kek meer. Het gaat meer op in het weiland. Over natuurontwikkeling: ik kan het wel begrijpen en waarderen, maar ik vind het erg jammer dat de markant openheid van de uiterwaarden verdwijnt. Ik moet eraan wennen. Hoogstamboomgaarden: een echt stroomrug beeld. Over een project: het wordt je bezit als het ware, dat heb ik altijd sterk.

11 In het donker is het prettiger om over de dijk te rijden dan door de bossen. Een dijk is ook eenzaam, maar het voelt toch anders. Typisch Betuwe: hoger de dijk, en lager de boerderijen aan de binnenkant, buiten de lege ruimte met de beesten. Een scheiding tussen bewoning en natuur. Ik voel me er wel thuis en ik denk dat ik wel een voorkeur heb voor weids. Maar hier is het mooier dan in Meppel, het is gevarieerder. Wat er voor mij gevoel heel erg bij hoort is het weer en hoe zichtbaar het is. De mist en de enorme wolkenluchten. Ik hou heel erg van boomgaarden. Alle seizoenen zijn mooi, in een vlak landschap heeft het iets lieflijks. de bomen hebben mooie vormen en breken het landschap waardoor het een knus hoekje krijgt. Aan de ene kant van de dijk is de mens en de gezelligheid, aan de andere kant is juist rust. Steenfabrieken zijn gawe overblijfselen.

12 zonde van al die boomkwekers. Ik zie liever vee en weiland. De bomen zijn een ellende: de hele tijd ligt onder de smurrie als ze bezig zijn. Verschil Utrechtse heuvelrug en gebied: er mag wel wat meer leven inzitten, meer variatie. Ik ga altijd over de dijk, dat is leuk. Gevoel van veiligheid: het water heeft een paar keer op een halve meter gestaan, maar daar schrik ik niet van. Het huis is groter en hoger. Vind ik ook wel lachen, gaan we met de

roeiboot.

13 water straalt rust uit, zodra je je hoofd buiten de deur steekt hoor je niks. Veiligheid: ik heb geen angst ervaren met hoogwater, dat is misschien ook door de bekendheid met het gebied. Wat kunnen we aan, wat niet. 1995: als de dijk doorbrak hadden wij meer speling gekregen. Dan zakt hier het water als de badkuip volloopt. Gelukkig is het niet gebeurd, want dan was de ramp niet te overzien geweest.

14 Enorme schaal. Vergis je niet hoeveel zicht en beeld je hebt vanaf de dijk. Het buitengebied is sneller rommelig. Dat kan een minder fraai en authentiek landschap opleveren. Zo min mogelijk informatie is het allermooiste van dijken. Als het zijn functie verloren heeft vraag ik me af of je het dan terug moet brengen. (terugbrengen historisch elementen.) Het fraaist zijn de silhouetten van bomen. Contrast betekent niet per se meer waardevol, maar het zorgt wel voor een karakteristieke plek die je niet snel tegenkomt. Ik stel me bij deze foto ook heel andere geluiden voor dan bij zo'n panoramische foto. Dichterbij wordt menselijker. Je ziet vaak dezelfde meningen over wat mooi en lelijk is, gepast of ongepast. Natuur zoals de Blauwe Kamer is alleen mooi op grote schaal zoals de Gelderse Poort, niet plukje of rommeltjes hier en daar. Ik hou wel van grote herkenbare eenheden. Jammer van die rode fietspaden. De dijk gaat zo overheersen en het is voor het landschap minder fraai zo. Zonder is rustiger. (bij een foto met veel leegte) Als plaatje wel leuk. Ook als de rivier niet zichtbaar is ervaar je door de weidsheid en openheid wel het rivierenlandschap. Prachtig, maar ik zou er niet willen wonen. Voor mijn gevoel is het iets te weids, te winderig. Een weidsheid waar ik me toch wat eenzaam zou voelen. Voordeel van overstromingen is dat er geen bebouwing komt te staan en dat zo de open plekken blijven bestaan.

15 Je ziet hier aan het huis dat lager ligt dat er een dijk ligt. Schitterend weer (op de foto), dan heb je mooie kleuren. Als je niet weet dat de rivier daar loopt, wij weten dat, zou ik het wel minder mooi vinden. We missen de schapen. Saai, veel groen, polders. Je hebt wel bomenrijen, maar niet echt dat bosachtige, die variatie is er niet. Schattig: molen, kerktoeren, lucht, boomgaard. Karakteristiek NL. In bloei is het weer heel ander gezicht.



**Beoordeling/ mening ed. ontwerpalternatieven  
(nr's corresponderen met geïnterviewde volgorde en persoon)**

**a) Village**

**- build dike**

als hele rij is dan niet passend, meer stedelijk en doorsnijdt het landschap. (1)  
principe is mooi, maar het is heel stedelijk en past hier niet (3)  
af en toe goed, maar lint verstopt het dorp en maakt de relatie los met de dijk en de rivier (4)  
een paar zichtlijnen overhouden (5)  
leuk voor de mensen die er wonen. met oude huisjes (6)  
heel stedelijk, past niet in gebied. of als vestingsstadje (7)  
leuk, karakteristieke dijkhuisjes. kelder moet dan wel betegeld worden (8)  
tekening geeft niet typisch dijkhuisje weer met bijvoorbeeld opstapje naar voordeur (9)  
Dijkwoningen, altijd leuk. Eigenlijk is een dijk de ideale woonplek. (10)  
kijken naar dit plaatje geeft ook het beeld weer wat nu in mijn hoofd zit. Heeft iets Nederlands. moet wel iets verder van de dijk, voor gevoel van ruimte, en privacy huis (11)  
enkel aan de rivier verbreden is er niet bij, nadeel van alternatieven: mensen zijn alles kwijt. breder aan twee kanten mag als het maar niet bij de kern is. (12)  
komt meest in de buurt (van huidige situatie), en past het meest in het landschap. (13)  
is een meerwaarde. 2 lagen is interessant. Het dijkprofiel als zichtbaar systeem blijft vrijwel intact. (14)  
willen mensen daar wonen? Ik zou daar zelf niet voor kiezen, wel leuk om te zien die huizen langs de dijk. (15)

**- terp**

is vaak geen ruimte voor. alternatief: wisselend binnen en buiten verbreden. (ik noemde het woord:) 'terpdijk' sluit goed aan bij historisch gevoel. (3)  
je hebt hier nog het idee waar de dijk is (5)  
het oude wat erachter ligt blijf je zien, dat is niet zo bij de delta (6)  
nog wel relatie houden met water door doorkijkjes (7)  
beter getrap naar beneden. "Op één hoogte wordt het een weg, dan is het geen dijk meer." (8)  
te breed, gevoel van zicht en dijkgevoel is weg. (9)  
werkt nivellerend (10)  
houd nog gevoel van dijk, omhoog en omlaag en er zijn nog doorkijkjes (11)  
je kan er heel wat moois van maken. Waarom zou je de dijk ook niet meteen een beetje verhogen, als je toch bezig bent. (combi) (15)

**- delta II**

het is een geheel, maar het is geen dijk meer. het wordt een heuvel (1)  
Openheid gaat verloren, rommelig, past niet goed. (2)  
meest waardevolle optillen, deel is ook goed (4)

je brengt bulten in het landschap die er niet waren. laten inspireren hoe het is en is geweest. (5)  
gigantisch gevaarte, er is meer contrast. (6)  
maakt een tribune, scheiding in het landschap. Dorp te aanwezig. "Dit wordt huizenlandschap toevoegen aan een rivier, dat is raar. Net bergwoningen. ze x omhoog andere functie, vorm is niet meer functie. (7)  
afvragen relatie hoogte en functie (9)  
werkt nivellerend. soort schijnoeverwal. bouwen kan ook geld generen. alt. waar huizen staan iets lager. of muur, wat bochten accentueert. (10)  
onnatuurlijk, heuvel aan een kant. hangt van doorkijkjes af en lengte van de oplossing. (11)  
kan geen keuze maken: ik denk toch dat ik heel conservatief ben. (13)  
delta en terp: hele dijsfeer is kwijt. In stedelijk gebied is het wel mogelijk, maar "niet hier waar je echt in het dijenlandschap zit." wel weer positief voor vastgoedmensen. (14)  
wel dure oplossing. veiligheid is belangrijkst, maar waar je ook stukje creativiteit kan gebruiken. (15)

**b) Agriculture**

**- tripple dike**

forse ingreep. tweede wordt overbodig (1)  
voegt niks toe aan het landschap, andere twee wel. (2)  
mooi, compartimentering past wel bij het gebied. Behoud mooie profiel oude dijk. Wel kijken wat invloed is in komgebied (3)  
veel impact verderop, minder uitgestrektheid, interessante back-up (4)  
hangt af van wat er verderop ligt. kan bij historisch dijkje, is hier niet. (5)  
doorbreekt het idee. dijk is niet meer bij de rivier. Vergezicht is weg en dat stoort. (6)  
"lastig in het kleinschalige landschap bij de Nederrijn, dan introduceer je niet zo een nieuwe dijk." idee leuk, interessante optie (9)  
hangt van de plek af om te oordelen. leuke oplossing, kan me voorstellen dat het kan. wat is het dubbelgebruik? het leuke van een klimaatdijk is om een plu te verzinnen, verschillende functies. hier kan misschien een landschappelijke fietsroute? (14)  
veel landschap weg (15)

**- delta I**

kan je veel mee doen. eigen oplossing het huis spiegelen, want meer verbinding met het water (1)  
ophogen en verbreden het mooist, want behoudt zoveel mogelijk uiterwaarden. Plus voegt waarde toe door huis te bouwen (2)  
landschappelijke elementen in gevaar. binnenkant bouwen. (3)  
aan een kant verbreden heeft voorkeur als dat genoeg is (4)  
gespiegeld, voor mijn gevoel is buitendijks laag en binnendijks hoog. (5)  
huis is onnatuurlijk, wil graag de rivier zien. (6)  
het asymmetrische is spannender. maar hoe flexibel is het in de toekomst als je bouwt? (7)

wordt wel heel breed in het fragiele gebied. berm andere kant optie. (9)  
 weg aan rivierkant leggen en huis bij water. (10)  
 stijl bebouwing erg belangrijk, openheid moet blijven dus af en toe huizen. (11)  
 ik zou er niet willen wonen, de ligging, zo vlak naast de weg, redelijk in de wind. (12)  
 ik kan geen voorkeur aangeven, het hangt af van de locatie en de instanties. Als mijn huis hier staat ben ik tegen. verbreden buitendijks is vanuit het landschap slecht, dan maar aan de binnenkant. boom mag blijven. (13)  
 meer passend voorkant naar de rivier. Water gerelateerd kan buitendijks, maar dit is niet echt water gerelateerd. (14)  
 bij deze (en multi) wordt het landschap het meest gehandhaafd. huis maakt afwisselender. (15)

#### - **'multiplex'**

er is nog binding met de begane grond. aesthetisch gezien voorkeur (1)  
 minder beleving dijk, meer een terras, geen riggel, je kijkt niet meer naar beneden.  
 Nadeel: veel historische element liggen vlak naast de dijk, die gaan verloren. (3)  
 meer in balans, meeste dijk, maar wel een breed gevaarte, een snelweg idee. (6)  
 in eerste instantie verwarrend, ben het niet gewend. Het loopt door, niet meer scheidend. fietsend is het wel geweldig om 10 cm van een lekker appeltje. (7)  
 Rijndijken zijn slank en bochten: niet zo passend. beter 1 kant dubbel zo breed. (9)  
 voorkeur door verschil binnen buiten als fietser, geen belemmering uitzicht. (11)  
 ik zie het nut niet zo van verbreden (12)  
 bij alle alternatieven excl. huidige: het is minder dijk, het oorspronkelijke beeld is weg en de waarde van het landschap gaat naar beneden. (13)  
 aan één zijde breder. meer effectief, je kan een nieuw fruitlandschap maken. (14)  
 gaat er wel een heel stuk weg. blijft meer hetzelfde, wat saaier. (15)

### c) **Recreation**

#### - **amorphe ecological dike**

leuk, niet zo strak, meer beweging en verschil met andere kant. (1)  
 past goed bij recreatie, toevoeging aan natuur. De anderen voegen niks toe, behalve dat het veilig is. (1)  
 spreekt aan, mooi. Geeft idee natuurlijk houden. Mooie combinatie natuur recreatie en veiligheid. Efficient (2)  
 natuur is extra beleving. Dijk is hier dominant, recreatie moet zich hieraan aanpassen. (3)  
 past bij natuurlijk uiterwaarden landschap, geeft geschiedenis weer (4)  
 erg sterk, dijk wordt dan grens tussen twee werelden (5)  
 spreekt aan. dijk is echt menselijk, dus dat pat niet echt, maar het is wel mooi. (6)  
 Zou het wel in het echt willen zien, lastig voor te stellen. wordt het boeiend of flodderig?  
 Mooie is als vorm en functie samenkomen. (7)  
 doel is bereikt en behoud karakter landschap in 1e oogopslag (8)  
 binnendijks brede natte gebieden als tegenhang (9)

het gevoel van natuur om je heen, de uiterwaarden, waar vee struint (11)  
 toch mooier, het is natuurlijker, niet qua vorm mooier. (12)  
 vanuit het landschap is dit het mooiste, meer natuurlijk. maar ik vind het huidige het best. (13)  
 als er al recreatie is, in dit geval de jachthaven, kan ik me een buitendijkse ingreep voorstellen. (14)  
 wel natuurlijk, maar wel minst veilig. (15)

#### - **'multiplex'**

breed veranderd karakter, is negatief (1)  
 camping op de dijk geeft minder relatie met het water (2)  
 heel ingrijpend (3)  
 "dat superding", teveel impact. verhouding tov de rest is weg. (4)  
 plateau (5)  
 geen dijk meer, een gigantisch gevaarte. (6)  
 bomen op de dijk: ik wordt er een beetje onrustig van. het is hier kunstmatiger, dus minder storend. (7)  
 dijkgevoel is weg, maar levert wel wat op waar je wat mee kan. camping op dijk goed. (10)  
 "er op staan en onder je de weilanden, het 'uitkijktorengevoel' gaat weg. (11)  
 de camping op de dijk geeft toegevoegde waarde, extra uitzicht. maar: "Boven op de dijk wordt je toch onderdeel van het verkeer, al die mensen die langskomen." (13)  
 geen waardeverbetering, want je bent eigenlijk de hele dijk kwijt. economisch misschien aantrekkelijk als de camping op de dijk ligt, maar het is niet passend. (14)  
 voor camping prettig denk ik om hoger te liggen. (15)

#### - **'twin'**

camping verlies verbinding met het water en het uitzicht. Tussenoplossing: ecol gecombineerd met multiplex (2)  
 getrapt geeft meer idee van een dijk, scherp talud. (3)  
 neemt meer ruimte van uiterwaarden, voor beheerder wel positief (4)  
 hier kan verplaatsing van oude dijk wel, er staat geen oude boerderij oid, maar een camping. (5)  
 ook mooi, strakker. Dan met schaapjes, is meteen leuker. Zonder bomen is meer dijkidee. "Je kan ook nog met de hellingshoek spelen. Het is een heel robuust ding, maar er is al meer mee gespeeld dan zo'n 'vlak' neerzetten." 1e terras, 2e: spannende dat je waterhoogte kan volgen, hoe erg is het, wat gebeurt er? (7)  
 te rigoreus. voorkeur minst ingrijpende. "nu wordt verhoogt, dan kom je niet aan het landschap, maar alleen aan de dijk zelf." (8)  
 omdraaien profiel is efficiënter, technisch werkt dit niet goed, veel waterdruk op de polder. "Het moet functioneren, anders is de ingreep niet houdbaar en doorstaat het de tand des tijds niet. Met de elementen eromheen kan je wel variëren." (9)  
 rust, strakker, past wel bij het landschap (11)  
 vorm is speelser, alt. met camping erop. (12)  
 heeft geen voordeel is niet aantrekkelijker. alleen extra groene strook. (14)

ben allergisch voor trappen, dan verzwik ik mijn voet altijd. kostenplaatje is van belang, ook als je voorkeur heb ergens voor. (15

### Dike in general

- 2 Een dijk is een dijk wanneer het een beetje slingert, het geeft een meer natuurlijk gevoel, het geeft een gevoel dat je het water volgt. Een dijk die recht is klopt voor mijn gevoel niet. Een rechte dijk is meer een opgehoogd stuk grond. De combinatie met andere dingen is belangrijk. Je moet er iets mee kunnen. In het algemeen is een dijk het mooist als de dijk (na aanpassing idg) aan één kant afloopt naar het water voor het gevoel van veiligheid. Landinwaarts maakt het niet zo veel uit.
- 3 Een dijk is smal, een verhoging, een fragiel iets, dat fragiele moet je kunnen proeven.
- 5 Belangrijke eigenschappen van een dijk: smal grondlichaam boven het landschap. Een lijn, geen vlak. Het kronkelen zegt veel. Aan beide kanten duidelijk talud. Als het aan één kant is is het voor mij een 'halve dijk'. De dijk is de baas, maar het kan niet altijd.
- 6 Een dijk is overheersend, dominant in het landschap. Iets erop zetten maakt het nog meer overheersend. Een dijk heeft altijd voorrang, ik moet wel wennen aan die multifunctionaliteit...  
Als je op een dijk fietst heb je ergens een gevoel van macht.  
Ik wordt er een beetje nostalgisch van als ik die foto's zie, zo van: zo is het nog.  
Bij een strakke dijk hoort een bepaalde landelijkheid.
- 7 Een dijk heeft als primaire functie een waterkerende functie. Als een dijk hier niet voor gemaakt is is het een heuvel.  
De lengterichting is belangrijk, lang en smal.  
Het landschap en de streek (bewoners) zouden meer het uitgangspunt moeten zijn.  
Hoe de vorm van de dijk spannend, bijv. getailleerde dijk.  
Bomen op de dijk... bijna een gewetensvraag.
- 8 Een dijk is belangrijk voor het tegenhouden van water.
- 9 Het gevoel hebben om het landschap aan twee kanten te zien. Dat kan ook door doorzichten.  
De lengte heeft een zekere uniformiteit.  
Het is leuk om bepaalde dingen op en aan een dijk te zien, niet te vlak. Vroeger was het alleen een functioneel los object. Ik vind het minder waardevol als er niks op en aan mag gebeuren.

"Beleving krijgt inderdaad minder aandacht. Techniek is te toetsen, te berekenen. Of iets moois of passend is, de meerwaarde van het gebruik van het landschap is niet te toetsen. Lastig om dit in een plek te geven in de discussie. Het is persoons en instantiegebonden of het van de grond komt en serieus wordt aangepakt.

- 10 Een dijk verheft boven het maaiveld, net als boven in een dubbeldekkertrein zitten.  
Je ziet veel meer.  
(na uitleg multifunctionaliteit) Maar daarmee verdwijnt de dijk als object behoorlijk uit beeld.
- 11 Verschillende landschappen tegenkomen binnen één dijk vind ik heel typerend voor een dijk.  
Nu is de dijk de constante factor, maar wat hem constant maakt is het hoog zijn in een laag landschap.  
Het uitkijktorengevoel.
- 12 Ik zit niet per se op een smalle dijk te wachten, het hangt ervan af wat er naast ligt. Nu zie ik de voortuin en zit ik niet tegen de dijk aan te kijken.  
Het is leuk vanwege de hoogte en het uitzicht.
- 13 Het slingerachtige (...) Je kunt er nog wel een stukje uithalen hoe het was, de bochten hebben met stroming te maken.  
(over de dijk bij Amerongen:) Ze zeiden hiervandaan, "Dat is niks, het is net een racebaan geworden, zo breed is tie. Als ik nu kijk is tie helemaal niet breed. Moderner dan deze kant, maar nog wel een aardige dijk."  
Dat je niet van Heteren naar Culemborg dezelfde dijk ziet. (Dus dan zou je alle alternatieven toe moeten passen.)  
Aan twee kanten een steil talud, dat is een echte dijk. Als het maar een kant is blijft het een dijk, maar er is minder landschapsbeleving.  
(over natuurontwikkeling:) Als het maar natuur is en goed is aangelegd. Niet in rechte vierkante stukken, dat is geen landschap.
- 14 typisch bij een dijk: een groen randje in het buitengebied. Richting bebouwd gebied staan de huizen juist dichterbij. Dit geeft mooie overgangen.
- 15 hoog, huizen lager, vaak tegen dijk aankijken (ervaring wonen tegen dijk aankijken: geen uitzicht; groene wal).  
hoog, 2 kanten naar beneden.  
"Het wordt misschien meer een met het landschap hè." (bij verbreden) "Het blijft nog wel een dijk, want je ziet en weet dat je op een hoog stuk zit. Maar het heeft wat minder dijkgevoel. Meer een terpidee."  
vb. Arnhem: afritjes van dijk: "Meer natuurlijker overgang, je rijdt spelenderwijs het dorp in."





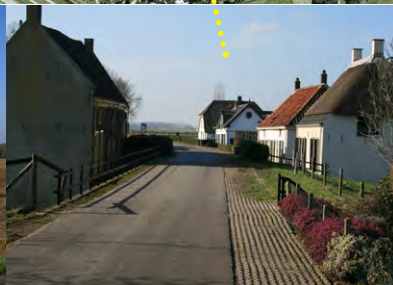
# E Rijswijk options for a triple dike

(Literal document as presented to the interviewees via email)

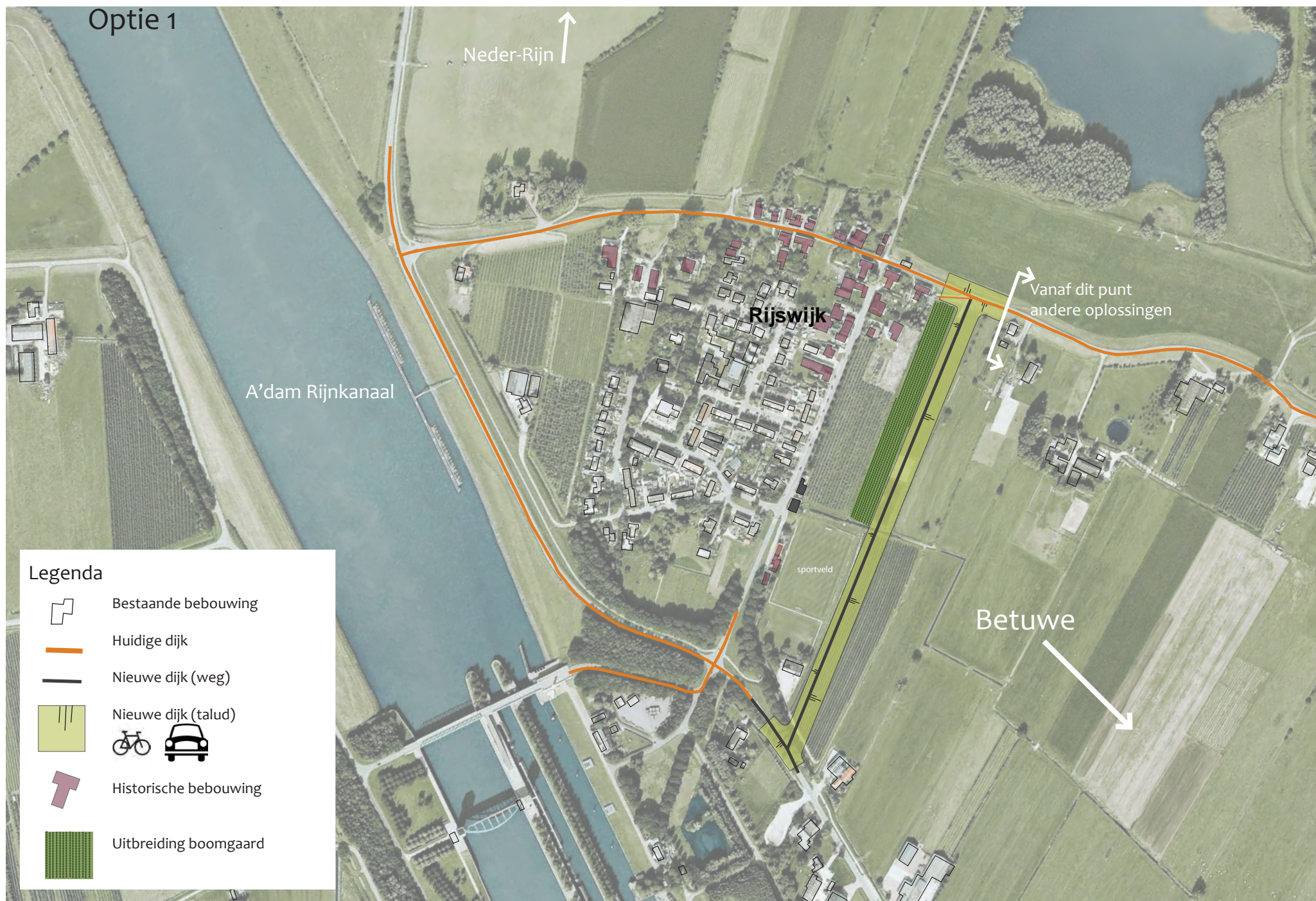




# Impressie vanaf huidige dijk Rijswijk

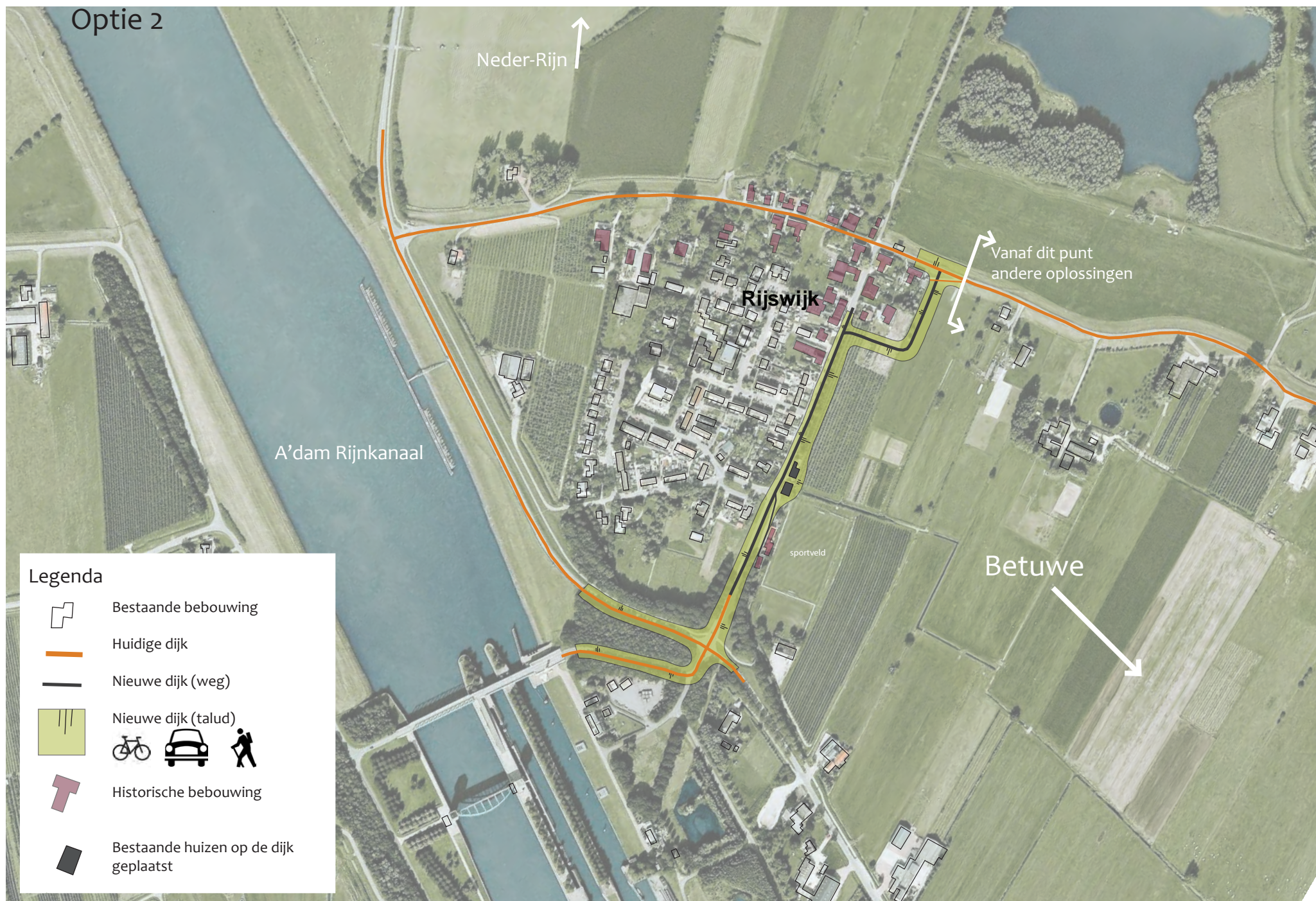








## Optie 2





## Optie 3

Neder-Rijn

A'dam Rijnkanaal

Rijswijk

sportveld

Betuwe

Vanaf dit punt  
voortzetting dijkver-  
breiding

### Legenda



Bestaande bebouwing



Huidige dijk



Nieuwe dijk (weg)



Nieuwe dijk (talud)



Historische bebouwing



Getrapt dijkgedeelte  
(zie principe =>)

