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WAGENINGEN UNIVERSITY
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CLIMATE CHANGE ADAPTATION IN GRONINGEN

Master Atelier regional scale
January-April 2008

This publication is written as a final master atelier report in landscape architecture by order of the chair group of landscape architecture at Wageningen University.
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Master Atelier Regional Scale
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CLIMATE CHANGE
ADAPTATION
IN GRONINGEN

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00.1 Working in the atelier format

Rudi van Etteger

Working in the atelier format

Introduction
Before you lies the result of a masters-student atelier in landscape architecture. The atelier started on the 7th of January and ended on 25th of April 2008. Before we dig deeper into the results of the atelier, it is good to comprehend the context in which these results were produced. So this text will deal with the participants in the atelier, the procedure that was followed the pedagogic aspects and some issues pertaining the subject of climate change in relation to regional landscape architecture.

Participants, lecturers and tutors
In an atelier such as this, three groups of people are involved: Students, lecturers and tutors. The students are an international group of students that have a completed bachelors degree in landscape architecture. In the first year of the masters-level training they are participating in this atelier. In the atelier different lecturers are invited for scientific contributions on the topics at hand. Tutors were Rudi van Etteger for the chair of landscape architecture and Rob Roggema for the province of Groningen.

Procedural aspects
The students worked in three phases on this subject, following a more or less classic order of inventory and analysis, envisioning and conceptualizing, designing and detailing.
In the first phase the students worked in groups of three analyzing matterscape, powerscape and mindscape of the plan area and the aspects of mitigation and adaptation to climate change .
These three terms refer to different aspects of the landscape. In matterscape the material aspects of the landscape are analyzed. What are sizes, numbers of inhabitants and here specifically how much energy is being used and produced in the area, what are the foreseen changes in climate. In powerscape, we look at political aspects of landscape. Who is in control, what are agreed policies for this landscape at which level. Where are administrative boundaries etc. In mindscape we look at landscape as the matter of imagination and appreciation on the basis of perception. What do we think about the landscape? What is the difference of opinion on this landscape with regards to insiders and outsiders? Out of these inventories and analyses three presentation posters and presentations were distilled. Added to this classical model was an experiment on analyzing the art of, in and about the plan area. This was done to get away from the strict scientific interpretation of the landscape and to add some cultural flavour to the designs. The results were shared with the all groups and commented on by the tutors. The group-members then split evenly over three new groups with each a subregional area. The subregional areas cover the whole of Groningen, dividing the North, the Middle and the South. Renewing their analysis on a more detailed level the students worked out a subregional proposal. After this phase the students worked out a detailed design of part of the subregional proposal individually.

Pedagogic aspects
The students have worked in groups for a large part of the atelier thus facilitating inter-student learning. This is important in the masters-phase as we then have a mixed group of students of Wageningen bachelors, professional bachelors from the Larenstein education and international students from diverse backgrounds.
As they have expressed their preference for working in a regional scale in subsequent practice all these students will have to work in design-teams. So learning to cooperate in a team, evaluating and compositing plans from different origins is part of the learning experience.
The knowledge-base with regards to the climate change side of the project is broadened by lectures of experts in this field and by professional landscape architects specialized in this field. Different lectures were given by specialists on the climate change and impact, on the specific problems regarding the watermanagement and on ecological principles to be used in regional design. Also the students were given lectures in argumentation theory and policy debate, this knowledge was trained during a debate. This debate also meant a sharpening of the proposals through inter-student learning.
The knowledge of the regional circumstances is provided by literature study, a fieldtrip and lectures from the landscape department staff. The students have enriched this by interviewing contact-persons in the region and by repeat-visits to their design-sites.

Why is this landscape architecture?
Why do we run a landscape architecture atelier on the impact of climate change on a regional landscape? We, as the staff of the landscape architecture department,

do not believe in landscape architecture in terms of mere beautification. Working on relevant themes for society as a whole and local communities in particular has our specific attention. Fitting new societal needs in the landscape and researching the capacity of the landscape to deal with new functions eg. Studying the impact of climate change is part of our desire to make our research matter.
Within the field of climate change of course we then focus on the impact on the landscape. That means that we research the potential of the landscape to adapt to climate change but also evaluate this capacity against the landscape with regards to ecological and experiential values.

Landscape architecture on a regional scale
Landscape architecture on a regional scale is always closely related to spatial planning but where landscape planning focuses on the “what goes where?” and on the “how to arrange this?”, landscape architecture looks at the “how?” of fitting functions in the landscape, with an equal eye for functional, ecological, political and aesthetic aspects. Of course the latter is impossible without some thoughts on the former. These projects try to balance the needs of a scientific approach towards landscape grounded in geology, ecology and geography and the everyday experience of these landscapes. But where an experiential approach would not allow us to deal with a site of this size, the scientific approach would not allow us to design for people. A theory seminar focusing on these two conflicting demands on regional design was held parallel to the atelier.

The use of the atelier in research
If 12 students spend 20 hours for 16 weeks that is 3840 hours of work. To spend this much time on one subject, a university-researcher needs to work almost two year on four days a week full-time research. The chairgroup of landscape architecture therefore thinks it is wise to extend current topics of research into atelier-subjects. The advantage for the students is that they get even more dedicated tutoring, as what they do matters to the tutors. The students also benefit by being included in cutting edge research rather than rehearsing the same old exercises done a thousand times before. The advantage to the tutors is of course the fresh thinking power to be used for their research-topic. The preparation for such ateliers takes a little longer as there are new subjects every atelier, but this then does fit again with the research-work. In times of increasing pressure on university staff to produce publishable research as well as provide intensive teaching these advantages are direly sought after. I hope this end result lying before you now gives a good impression of the interesting work done in the atelier.

00.2 Reflections on the regional atelier

Jo Groven

Landscape architecture and climate change The world is changing and new challenges are emerging. Climate change is now a generally accepted fact with predictions that temperatures may increase by 1.4°C to 5.8°C by 2100 if greenhouse emissions are not controlled. These changes will have a range of effects for ecosystems and human settlements, depending on their degree of vulnerability. Due to global climate change the coastal safety of the Netherlands has become an issue again for the Netherlands and has been put high on the Dutch political agenda. The Dutch Water Board, the Delta Commission 2008, the Dutch Innovation Platform; all are currently working on ideas that can provide a solution for the Dutch Delta.

But what is it actually about? The actual future challenge is about reconnecting the relationship between man, his land(scape), nature and culture. Groningen is facing urgent water problems, salt intrusion, lacking coastal defence and many more. Therefore research needs to be done, but first action needs to be taken now. The outcome of the research in the form of innovative knowledge can be exported to other countries and create employment. 12 international students researched the capacity of the landscape to deal with new multi -functional use like the production of sustainable energy, water storage, new ways of living, new habitats,… This landscape research highlights the potential of the vast Groningen landscape, the society, the different habitats and different dreams of a new polder. The following student research projects each take a landscape approach to the design of the changing landscape of Groningen. The diversity of concept ideas and design solutions show the richness of potential spatial implementations and development strategies. But more relevant, they show a hopeful view on the changes in the landscape of Groningen. We are able to cope with social issues, ecology, energy, community, politics and sustainability. Site specific concepts and solutions are given to global issues. Ecosystem based strategies are offered often combined with energy issues.
Two types of strategies to climate change can be distinguished, but are often combined in reality. First of all adaptation strategies need to be carefully developed, which respond to the impacts of climate change and prepare for changes, in order to limit their impact on ecosystems and human settlements. This can be done for example by the planting of resilient species to cope with changing temperatures and salty habitats. Secondly mitigation strategies are needed, which aim to reduce the amount of greenhouse gases released into the atmosphere.

Examples of mitigation strategies include using alternative fuel technologies or using natural or technical systems which trap carbon, for example within plant material. Essential in all of this is the landscape approach to not only solving issues like climate change but in doing so also creating a sustainable and self sufficient landscape that is also liveable and worthwhile. Next to that and maybe even more important, a paradigm change is needed to create a solid social acceptance for a more resilient and diverse landscape with new possibilities for multi - functional use in the Netherlands for example depoldering land, introducing new agricultural activities, new ways of living or changing land use due to salt intrusion is controversial, especially within older generations that have grown up with land reclamations as the way forward. Allowing the influences of the sea and the altering climate might seem like throwing away a good piece of agricultural land, but it will be the hard truth in the end. Interaction with the inhabitants is necessary to create this solid base to connect people to their surroundings and make them feel responsible, but did not fit within the boundaries of this academic exercise. Future research can show to farmers, inhabitants and politicians that changes in land use or activities can have surplus value and does not mean a degradation. In this way the polder can again be a community, a habitat and a living landscape to work, to live, to love and to learn. There is a need for pilot projects to test current ideas and to make politicians and inhabitants aware of the upcoming required adaptations.
Unfortunately paradigm changes take time, but in the meantime Landscape Architects can develop new ideas and should begin researching a range of adaptation methods specific to regional areas. An ecological landscape approach for regional areas needs to be developed and their strategies need to be tested. The following projects show a landscape design approach that combines spatial thinking with process thinking. Society, politicians need to be aware of the change in thought, a need to change from technical solutions to more ecological, from power defence to smart and intelligent defence, from rigid to resilient and from spatial solution to space process solution. If we appreciate our living environment as a living system of which we are part of, the landscape of Groningen can work.

Climate change

Jo Groven

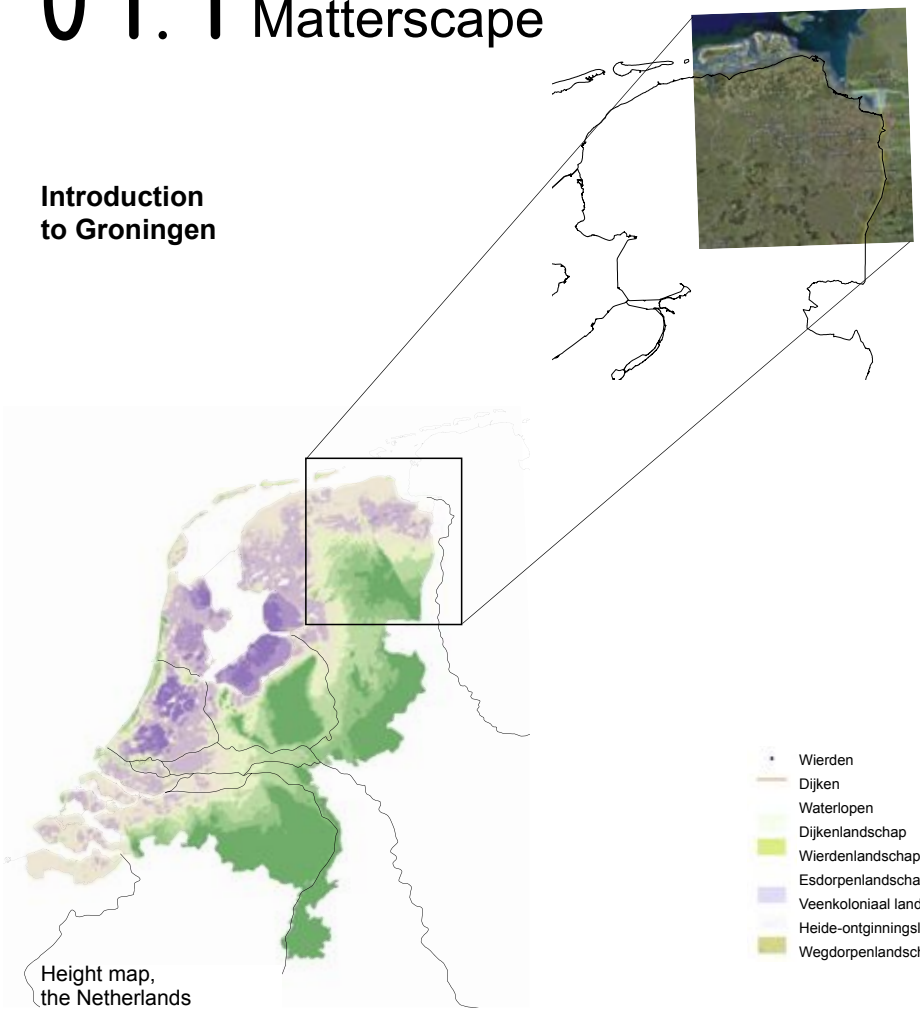
Wadden, Rise wood dams

01 Regional analysis

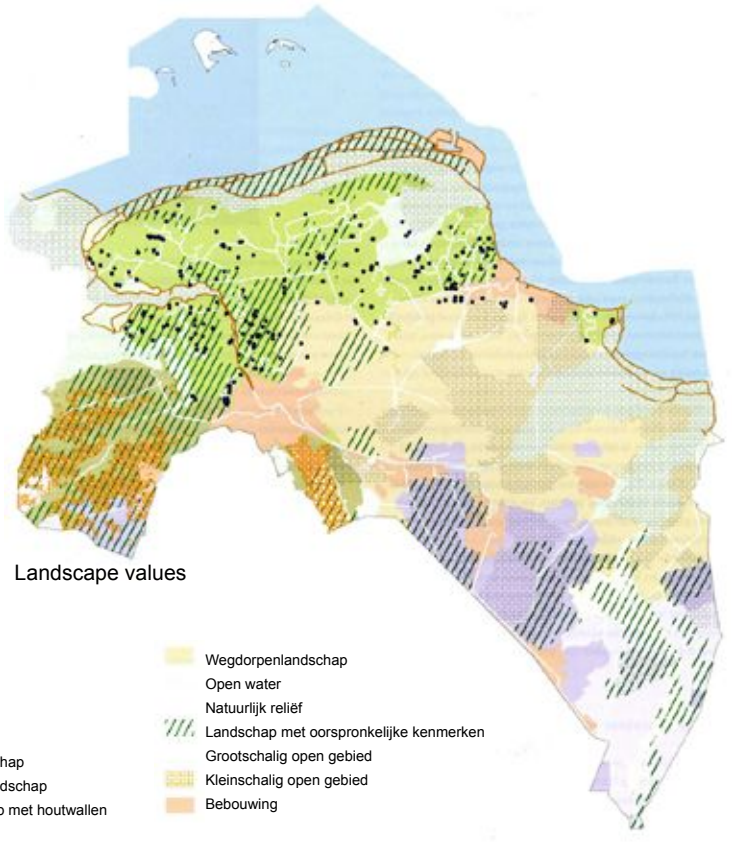
12 01.1 Matterscape
16 01.2 Powerscape
18 01.3 Mindscape
22 01.4 Artscape

01.1 Matterscape

Introduction to Groningen



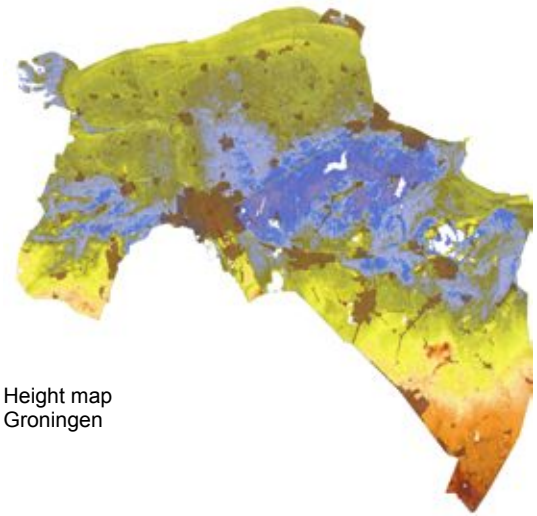
Height map,
the Netherlands



[Above]
-Situation Groningen
-Map landscape values
-View, natural waterways determine irregural shape
-View linear building construction

[Below from left to right]
-View Streekdorpenlandschap
-Wierdedorp
-View small scale parcelling

Climate change



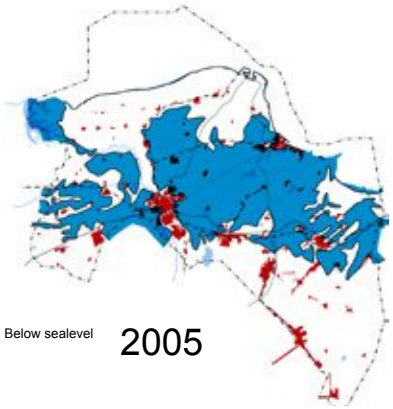
Height map
Groningen

Map Groningen

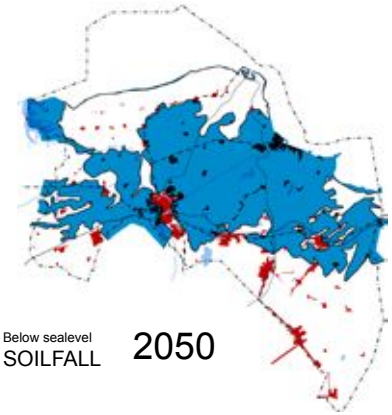
[Above from left to right]
-Height map
-Due to soilfall more land below sealevel
-Dike breach
-Storm surge

[Middle from left to right]
-Below Sealevel, 2005
-Below Sealevel, 2050
-Below Sealevel, 2100

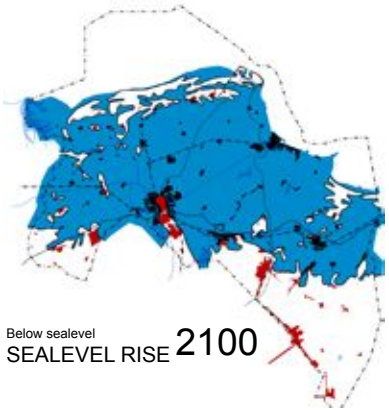
[Below from left to right]
-View Streekdorpenlandschap
-View Wierdedorp



Below sealevel 2005



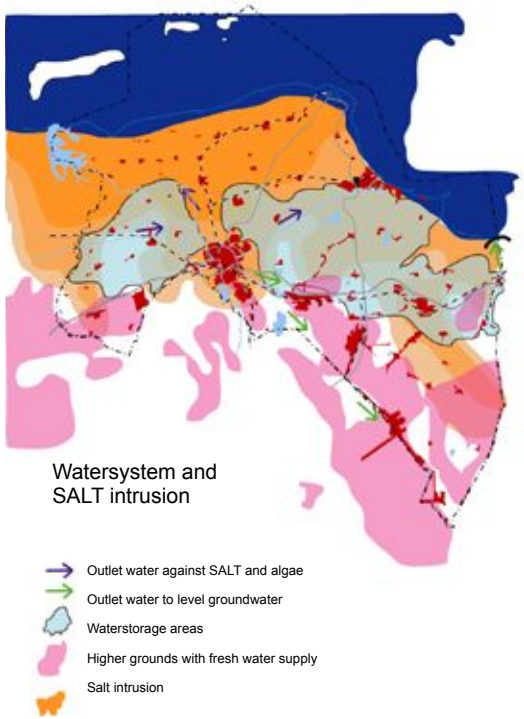
Below sealevel
SOILFALL 2050



Below sealevel
SEALEVEL RISE 2100

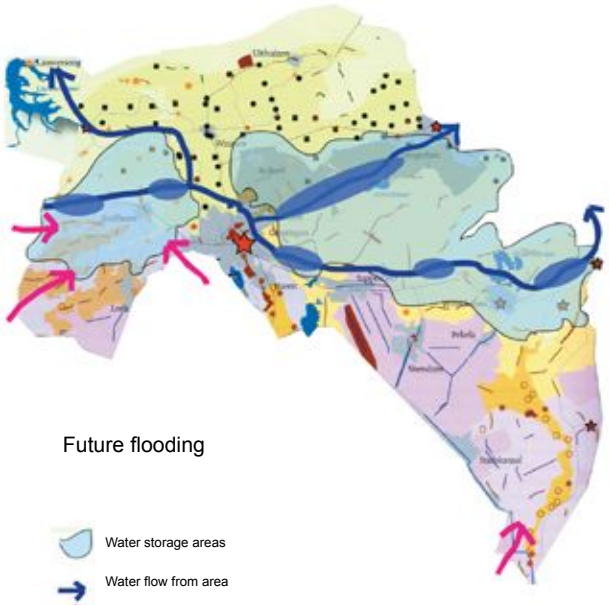
01.1 Matterscape

Adaptation to climate change



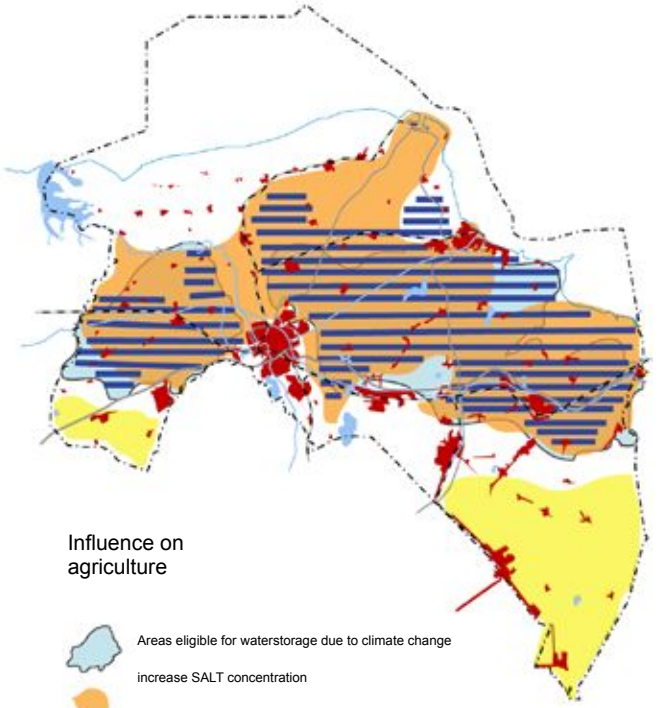
Watersystem and SALT intrusion

- Outlet water against SALT and algae
- Outlet water to level groundwater
- Waterstorage areas
- Higher grounds with fresh water supply
- Salt intrusion



Future flooding

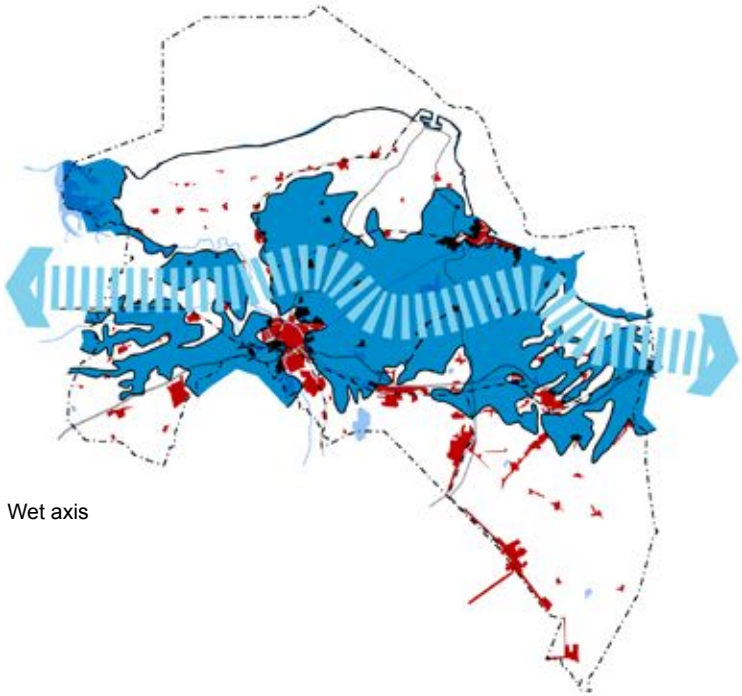
- Water storage areas
- Water flow from area
- Water flow to area
- Inundation areas



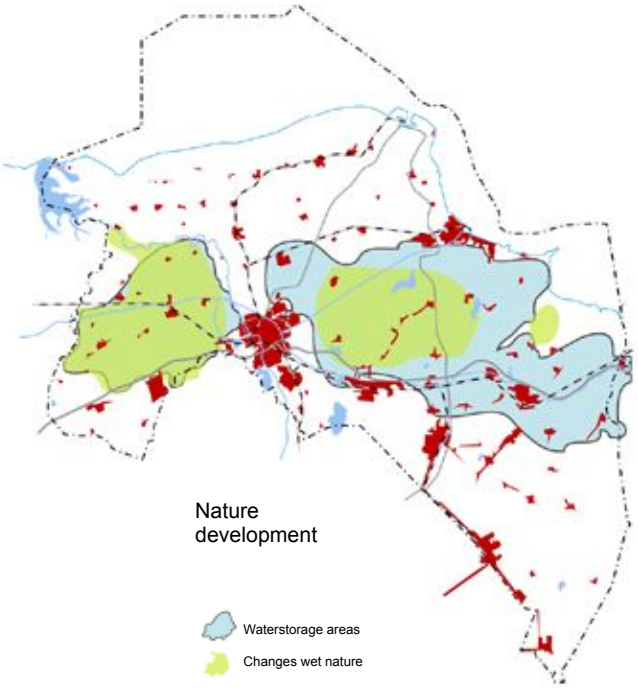
Influence on agriculture

- Areas eligible for waterstorage due to climate change
- increase SALT concentration
- chances of flooding
- increase drought

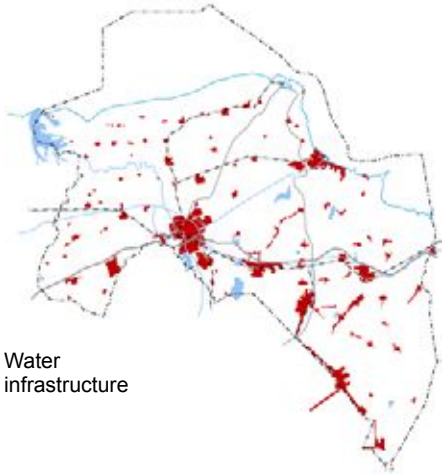
Future perspective
Wet nature



Wet axis



Nature
development



Water
infrastructure

-What is the influence of changes in weather on land use?
-How strong is the coastal defence in Groningen?
-What influence has climate change on animal population and migration?

01.2 Powerscape

Two Water Boards in Groningen, one Frisian.

Cooperation of province, municipalities and Water boards

25 municipalities: implementation of plans

[Above from left to right]
-Water boards
-Regions
-Municipalities
-Humsterland 8th-10th century
-Archeologic map

[Below from left to right]
-Retention areas 2015 Hunze en Aa's

Water

Hunze en Aa`s

2015: 1300 ha. Water retention
2025: 3000 ha. Extra 'emergency retention area'

Dikes: Sea dikes 1:4000, secondary dikes 1:100

Agriculture

EU policy: Common Agriculture Policy (CAP)
•EU-budget for agriculture has dropped from 70% of the total budget in 1970 to 34% in 2007-2013. Farmers income will be lower than average.
• More emphasize on farmer as rural developer, incl. biodiversity and forestry (other activities than agriculture)
• EU-Organic label more important: more difficult for the farmers
• More importance: growing crops to convert to fuel (biomass)
• Stimulation of trade and concurrency between the different countries. (free-marked!)

Energy & Climate

On worldwide scale, in 1997 in the Kyoto protocol international agreements have been made about reducing the emissions of greenhouse gasses.

For the Netherlands, compared to 1990 a reduction of 6% of CO^2-equivalents was determined
Taking the Kyoto protocol into account, the Dutch government strives for a 10% share of the total energy supply to be sustainable in 2020, from which 42% will be realized out of energy from biomass.

Groningen's contribution would mean a reduction of 1.1 to 2.4 Mton CO^2-equivalents up to 2010.
In order to realize this potential, Uit-voeringsplan Klimaatbeleid Groningen has been set up in 2004

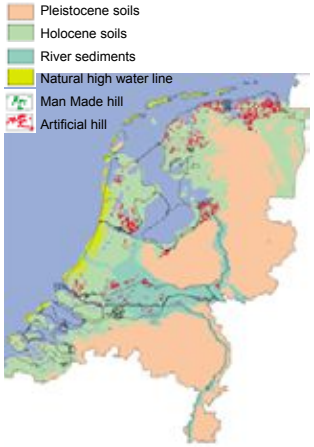
Cultural heritage

The Wadden Sea on the list of World Heritage of Unesco and represents an area of 20 by 500 kilometers and is an important breeding area for seals and a living area for birds and mollusks.

Middag-Humsterland
One part of the Groninger Wierdengebied, called Middag-Humsterland, represents one of the oldest constantly inhabited cultural landscapes of North-West Europe, showing archeological interesting and still intact 'wierden' and a very original pattern of ditches. The area is now considered a National Landscape.

In 'Nota Belvedere' a number of cultural and historical valuable areas are being described. The province of Groningen contributes financially to projects restoring landscape elements:

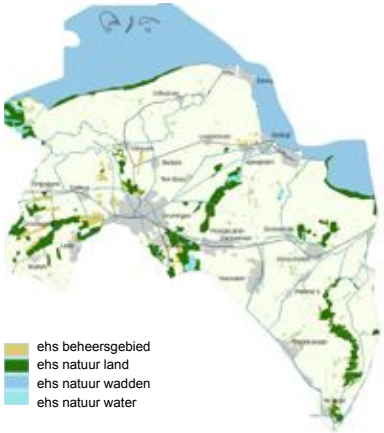
- het Groninger wierdengebied;
- het zuidelijk Westerkwartier;
- de oude Veenkoloniën;
- Westerwolde



Nature

• **Natura 2000** is the general name for the European Bird- and Habitat directive and is a extensive European network of areas that are protected by the Bird- and Habitat directive.
The EU is committed to the protection of biodiversity and there is a political commitment to halt biodiversity-loss within the EU by 2010.
• Birds Directive + Habitat Directive: Protection and management of all wild birds and their environment.

National Ecological Network (EHS)
• The government wants to enlarge nature areas, and connect them with each other through the National Ecological Netwerk (EHS).
• Private landowners also have the possibility to arrange and manage their grounds as nature area. They can receive a subsidy for this.
• the nature area should not only be enlarged, but also connected.



Ecological Network Groningen

• More than 2200 ha of nature area will be managed by private owners in the future in Groningen.
• The province of Groningen has pointed out nineteen ‘green connections’.
• EHS (the robust connections ca. 6000 ha included) will be realized and will be ¾ part private nature management and ¼ part agricultural nature management. Groningen should have realized 2238 ha of new nature though private nature management in the year 2018. This means every year 180 hectare of new nature.

Protected area	Hectare	Provinces	Authority
Noordzeekustzone	272.026	Groningen, Friesland, Noord-Holland	Friesland
Waddenzee	250.000	Groningen, Friesland, Noord-Holland	Friesland
Lauwersmeer	5.790	Groningen, Friesland	Friesland
Leekstermeer	1.449	Groningen, Drenthe	Drenthe
Zuidlaardermeer	2.096	Groningen, Drenthe	Groningen
Lieftinghsbroek	20	Groningen	Groningen
Drentsche Aa	3.966	Groningen, Drenthe	Drenthe

Political parties

When looking at the map of election statistics of the Netherlands, a large preference for the ‘left oriented’ parties PvdA (literally translated, the party of labour) and Christenunie (which is a protestant party) is noticeable.

According to most popular PvdA, in the discussion three main purposes concerning the landscape are being quoted:
-a raise in consciousness among people about the uniqueness of the landscape of Groningen
-concentrating new residential areas in so-called ‘economical core areas’

Of all political parties, not one is calling a reaction to climate change explicitly, for they seem to be merely concerned about preservation of the landscape as it is, than the idea of sustainability and producing energy.

[Above from left to right]
-Nature 2000
-EHS
-Political areas

[Middle]
-EHS areas in Groningen

[Below from left to right]
-Protected areas

01.3 Mindscape

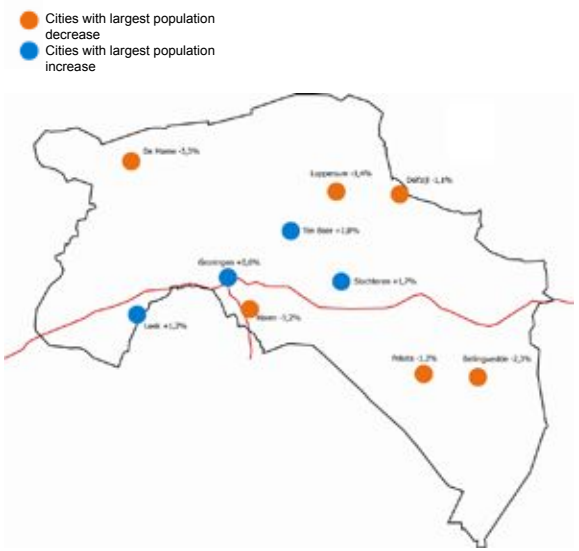



History of the occupation Groningen

The earliest habitation in the province of Groningen dates from 13.000 before Christ, people were living like hunter/gatherers traveling through the sand landscape to fulfill their needs.
At the end of the stone age, when the peat bogs started to develop people were only living in the south east part of Groningen because other area's became to wet.
Around Christ the peat grew so rapidly that the sandy area's became inaccessible and people started moving away from the sandy area's. In the coastal area the kwelders became higher and higher and people started to settle on these kwelder ridges. But there was still tidal influence in these area's so in order to stay dry people started to create artificial hills to live on.

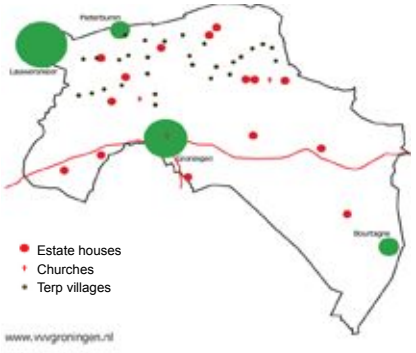
Due to the cultivation of peat the land was sinking so the water problems became larger, to solve this problems dikes and polders were created so that they could keep the land dry. And these new techniques also made it possible to claim land from the sea.
During the middle ages the city of Groningen became an important trading city.
In the 15th century the power of the city reached it's maximum as it then even influenced parts of the province of Friesland.
During the war with the Spanish, Groningen joined 'De republiek der 7 verenigde Nederlanden'in 1594.

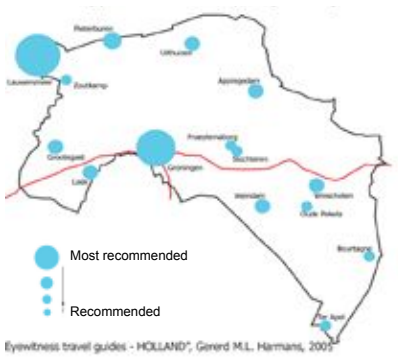
In the 20th century a lot of things changed due to the industrialization, a lot of the rich soil from the wierden was used to enrich the sandy and poor soils in the south east part of Groningen en Drenthe. People also started exploiting the gas fields which is still going on.

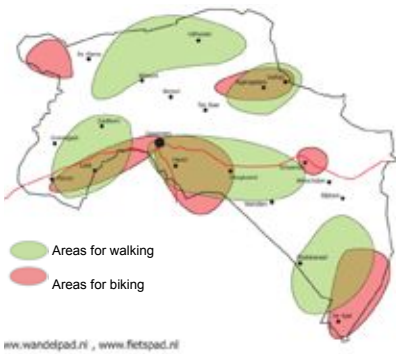


[Above from left to right]
-Church Groningen
-View Lauwersmeer
-View Lauwersmeer
-Wadden Sea

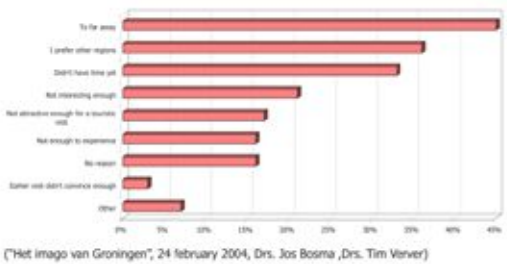
[Below from left to right]
-Population figures in different municipalities in 2007



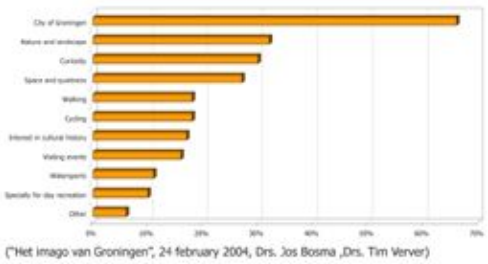




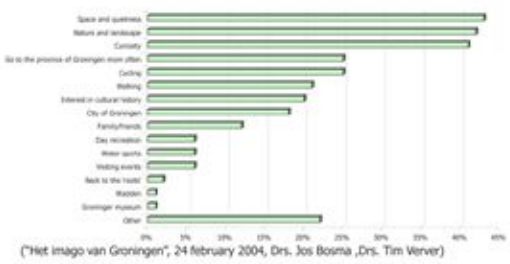
Areas to visit in Groningen



Reasons for not visiting Groningen



Reasons for possibly visiting Groningen



Reasons for visiting Groningen

[Above from left to right]
-View small harbour Groningen
-Reasons for visiting Groningen
-Places recommended by foreign tourist guides
-Most recommended areas for biking and walking
-Best reasons for visiting Groningen

[Below from left to right]
-Reasons for not visiting Groningen
-Reasons for possibly visiting Groningen
-Reasons for visiting Groningen

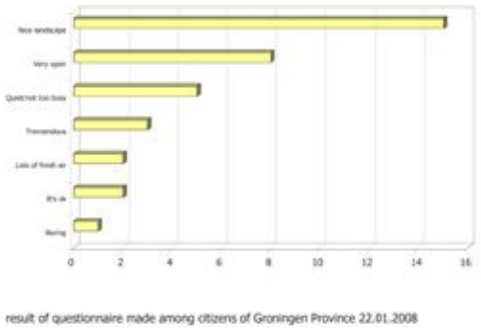
01.3 Mindscape





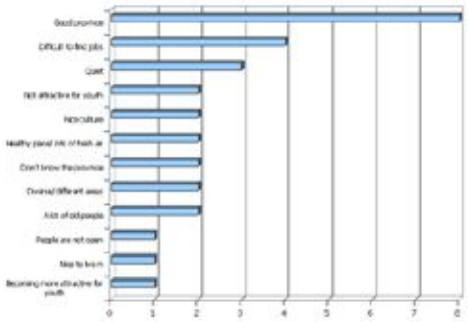
[Above from left to right]
-View peat cultivation
-View artificial hill
-View rise wood dams, salt marsh
-View peat
-View elevated village

Views from the people of Groningen

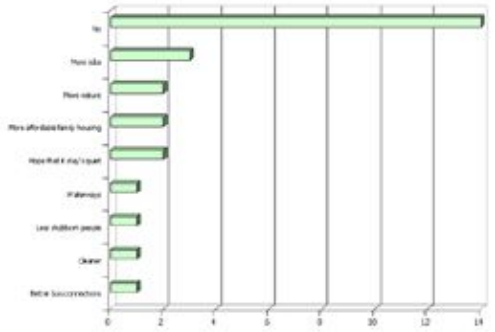


result of questionnaire made among citizens of Groningen Province 22.01.2008

What do you think of the landscape you are living in?

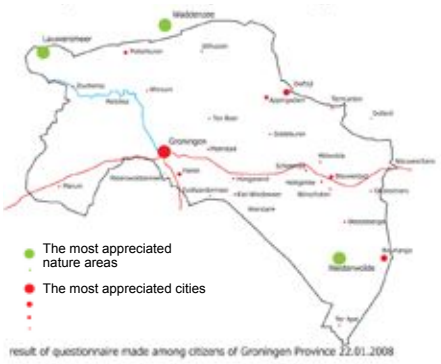


What do you think of the Province Groningen?

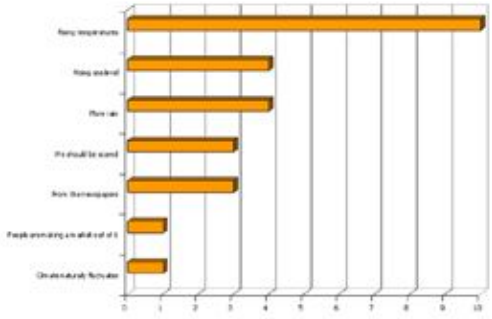


Are there things you would like to change in your environment?

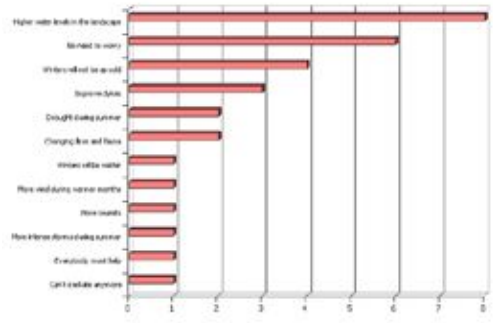
[Below from left to right]
-Figure,What do you think of the landscape you are living in?
-Figure,What do you think of the Province Groningen?
-Figure,Are there things you would like to change in your environment?



Conclusion



What have you heard about Climate change?



How do you think climate change will influence the Province Groningen?

Ideas

- People from Groningen like the province as it is now, but for people from outside it is not very attractive
- People know about climate change from newspapers and TV, but they do not think it can be dangerous for their province

Considerations

- Sense of place, different meaning for different individuals
- While exploring how to grow and change remember the roots
- Existing views of Groningen. How much change is desired/necessary?

[Above from left to right]
-View artificial hill
-Mental map of citizens of Groningen with appreciated areas

[Below from left to right]
-Figure; what have you heard about climate change
-Figure; How do you think climate change will influence Groningen

01.4 Artscape







Schildmeer

‘t Schild beraidt zich veur op de winter.
’t Blauw van de kolle,
taikent zich al oaf in de lucht
De aanlegstaigers d’er aanzoam en
verloaten bie.

De gezellighaid van de zummer gliedt
langzoam vot en
maokt ploats veur de stilte van de
winter.

Binnenkort scheuveln ze weer op
gladde iezers over ’t schild
en kin men zich weer waarmen aan ’n
kop haite chocoloademelk.

‘t Laand

‘t Laand van doezend kleuren
‘t Laand van storm en wind,
‘t Laand van mooie laidjes
‘t Laand as n laang lint

‘t Laand van boer en boetenlu
‘t Laand van swoare klaai
‘t Laand van moi, hou gaait mit die,
‘t Laand in de moand maai.

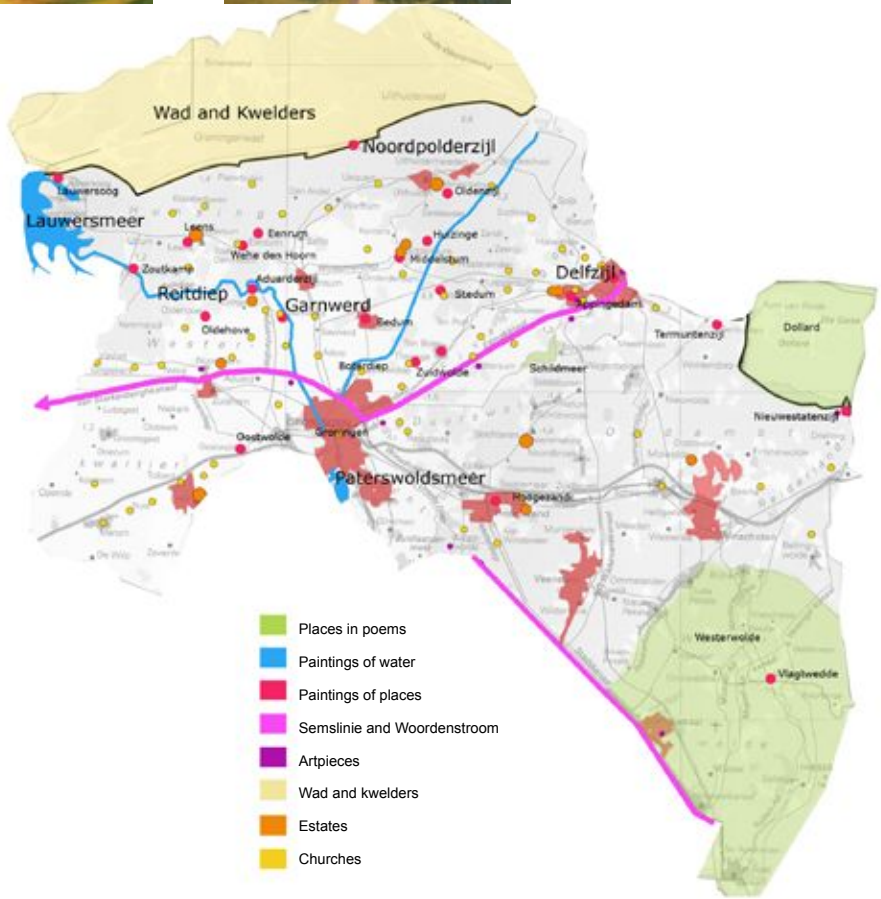
‘t Laand van koolzoad in de blui,
‘t Laand van wotter kaant
‘t Laand van boerderij en groot
‘t Laand mit n golden raand.

Grunnegerlaand

Geboren oet t wotter
joaren leden.
Nou is t klaai
deur de mins nomen,
de zee geven.

Vruchtboare grond
veul beschreven.
Pittoreske dorpkes,
Deur historie verweven.
Op wieren.

Perels in t noorden,
zien geboortegronden.
n Borstbeeld as herinnern
hier stond tied even stil
Roppen miet Jan Boer verbonden






places

[from left to right]
-Sluis farmsum, Delfzijl
-Tussen winsum en garnwerd, Bé Kracht
-Reitsdiep, Jan van der Zee
-Reitdiep, Johann Faber
-Het Reitdiep bij Groningen, Jan Altink
-Paterswoldsemeer, Jan Altink
-Garnwerd vanuit noorden op dijk, Johan Dijkstra
-Nieuwe werken Delfzijl Sluis Farmsum, Gerrit Jordens
-Veerpont bij Garnwerd, Jan van der Zee





water

[from left to right]
-Wad, Schreuder
-Noordpolderzijl bij hoog water, van der Stelt
-Baadsters aan het Pater woldsmeer, Johan Dijkstra
-Peizerdiepje, Bé Kracht
-Lauwersoog, Josefien Alkema
-Noordpolderzijl, Aly van der Wal
-Wad, Hollander
-Wad, Ron Beumer

poems

[from left to right]
-Schildmeer
-t Laand, Alberta van Dijk
-Grunnegengerlaand, Anja Atten
-Westerwolde, Doede Bruinsma
-Rust, stilte en duusternis
-De polder, Prugel

Westerwolde
Raand van veen, haart van zaand.
Dat is ons Westerwolde.
‘t Mooiste stok van Grunnegerlaand,
‘t Laand woar wie zoveul van hollen.

Woar wind in zunne ‘t korenstoefmeel struit
En ‘t eerappellaand sangen en wit bliede bluit.
Machtege ekkelbomen ‘t gruinlaand omzeumen.
Glaanzende koien in schaar stoan te dreumen.
Woaterns, dij kronkelnd heur weg mouten vinnen.
Kenoalen, dij liekoet deur ‘t laand hentrokken binnen.
Dat is ons mooi Westerwolde.

‘t Volk is d’r vrundelk, luu helpen mekoar.
Elk is geliek, wat of wel hai ook is.
‘t Is naargens zo mooi en zo goud as doar:
in ons mooie Westerwolde.

‘t Klooster, Boertang, Wedderbörg, Juvverstoorn,
dij dorpen, dij buurtschoppen, wel kent ze nait?
Ze mouten aalmoal nuimd worren in ‘t laid,
In ons laid over mooi Westerwolde.

Antje Herrman, Joeri Meliefste, Milan Belicky

Rust, stilte en duusternis…

Doar woar de Eems en de Dollerd soamenkommen,
Verkrekt de moan met zien flauw schiensel het nachtelijk duuster.

k Sloet mien ogen en luuster noar de geluuden van de nacht.
n Schoap dei hoast, n grutto dei roupt….

Het steurt mie nait, t binnen de geluuden dei heuren bie de diek en het wotter.

DE POLDER
‘… zwoare luchten hangen boven het polderlaand en veurzichtige zuikt een zunnestroal zien weg tussen hemel en oarde… ’

01.4 Artscape

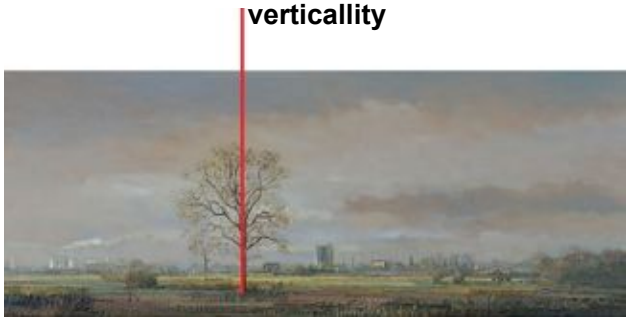









horizon

verticallity




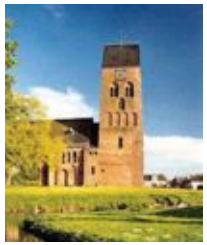





photographs

[from left to right]
-4 b/w photographs, Martijn Heemstra
-5 photographs, Marianne Krizkowski




architecture

[from left to right]
-Waaiboei
-Woordenstroom, Appingedam
-Borg Verhildersum, De Marne
-Menkemaborg, Uithuizen
-Frayelemaborg, Slochteren
-Meervogel, Hoeksmeer
-Stelpboerderije
-Farm, Usquert
-Church, Stedum
-Church, Mars

farmhouses

weather

aspects of landscape

[first row,from left to right]
-Avondlucht, Schreuder
-Leeg landschap, Schreuder
-Gezicht op Groningen met Gasunie gebouw, Rein Pol
-Deltheem(Stedum)in de sneeuw, Rein Pol
-Noordpolderzijl bij hoog water, Huib van der stelt





[second row,from left to right]
-Zomerlandschap, Dinie Boogaart
-Wad nieuwstatenzijl,Schreuder
-Wad, Schreuder
-Schreuder
-Josrodeweg, josefien alkema
-Populierenakker, Schreuder
-Langs de weg Leens(Zuurdijk), Bé Kracht
-Tussen winsum en garnwerd, Bé Kracht
-Koeien, Schreuder

Dynamic North Sea

02 Groningen North

28 __ 02.1 Groningen North: Building on structures

36 __ 02.2 The Riches of forest

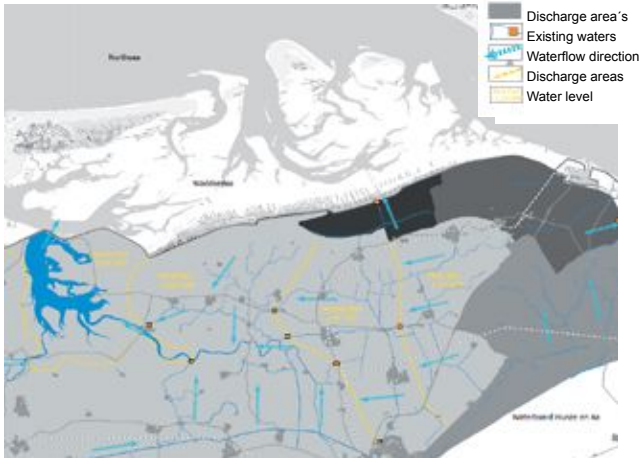
40 __ 02.3 Minds meandering through time

44 __ 02.4 Lauwerszee

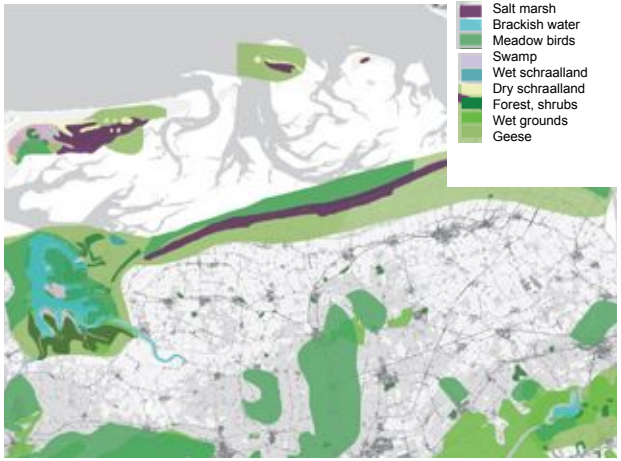
48 __ 02.5 Designing towards the future

02.1 Groningen North

Building on structures

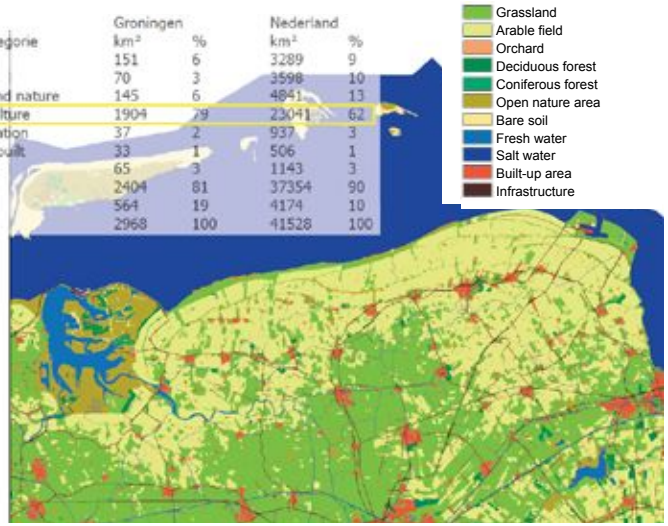


Present Waterstructure

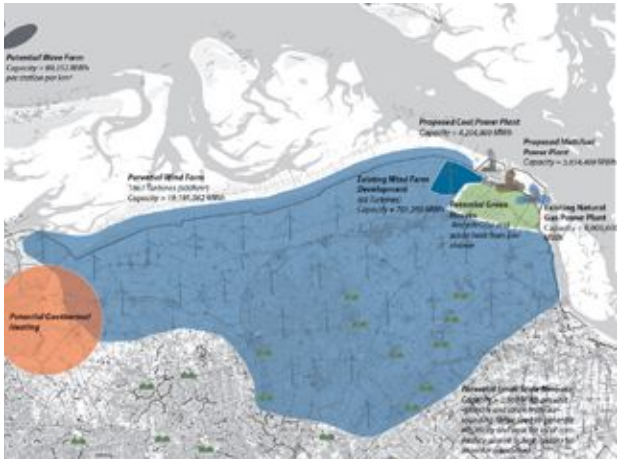


Present Nature

Categegorie	Groningen km²	%	Nederland km²	%
Built	151	6	3289	9
Water	70	3	3598	10
Bos and nature	145	6	4841	13
Agriculture	1904	79	23041	62
Recreation	37	2	937	3
Semi-built	33	1	506	1
Traffic	65	3	1143	3
Total	2404	81	37354	90
Sea	564	19	4174	10
Total	2968	100	41528	100



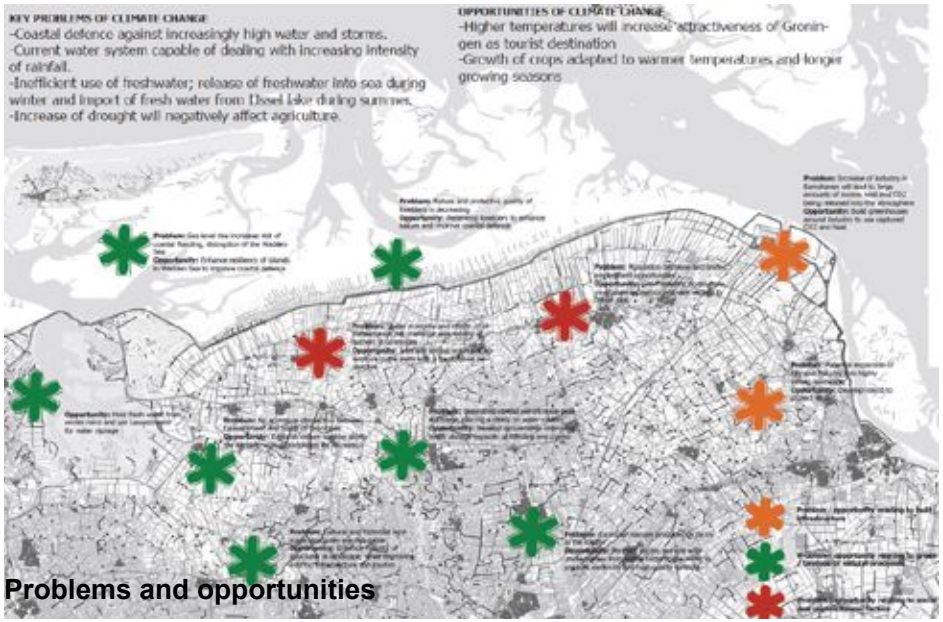
Present Landuse



Present Energy

[Above from left to right]
-Situation Groningen North
-Analysis present waterstructure
-Analysis present nature

[Below from left to right]
-Analysis present landuse
-Analysis present energy



Problems and opportunities

Desirable perspective for nature

Design Concept

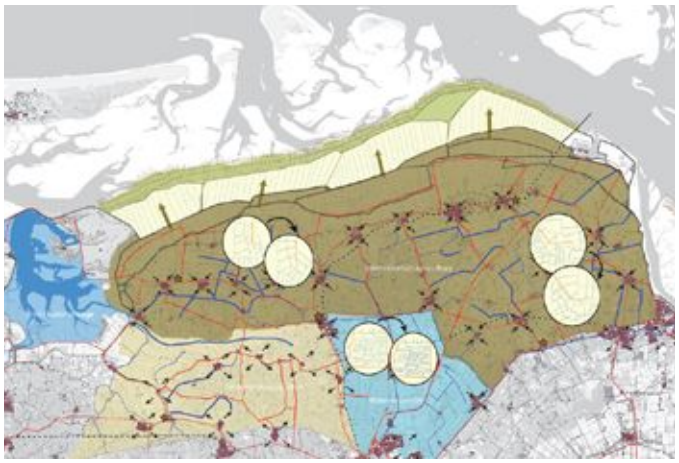
Ensure a healthy future for the northern region of Groningen by adapting the landscape for climate change in a sustainable and meaningful way.

Goals

- Adapt existing landuses and infrastructure for the predicted impacts of climate change
- Increase attractiveness for living and working
- Encourage agriculture to grow and prosper
- Unite past and future
- Increase sustainability of landscape
- Enhance nature and biodiversity
- Develop recreational opportunites

Objectives

- Provide areas for water storage in combination with nature
- Upgrade coastal defence by redeveloping Kwelders and working with the natural processes of the Waddenzee
- Establish nature corridor between Lauwersmeer and the city of Groningen
- Make visible the historical and cultural structures in the landscape and protect the existing ones
- Create opportunities for agriculture research and development
- Develop renewable energies and encourage energy savings.
- Provide opportunities for industry to the develop in the areas of Eemshaven and Delfzijl



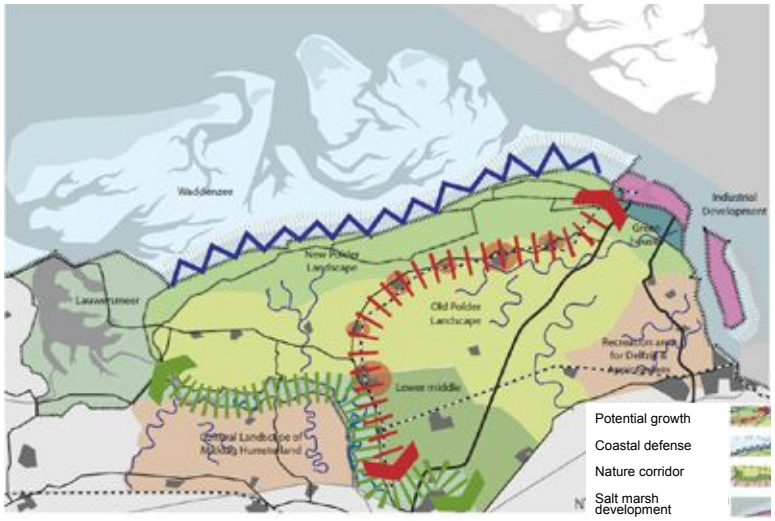
Desirable perspective for agriculture

[Above from left to right]
-Analysis problems and opportunities
-Concept; Desirable perspective for nature

[Below from left to right]
-Concept; Desirable perspective for agriculture

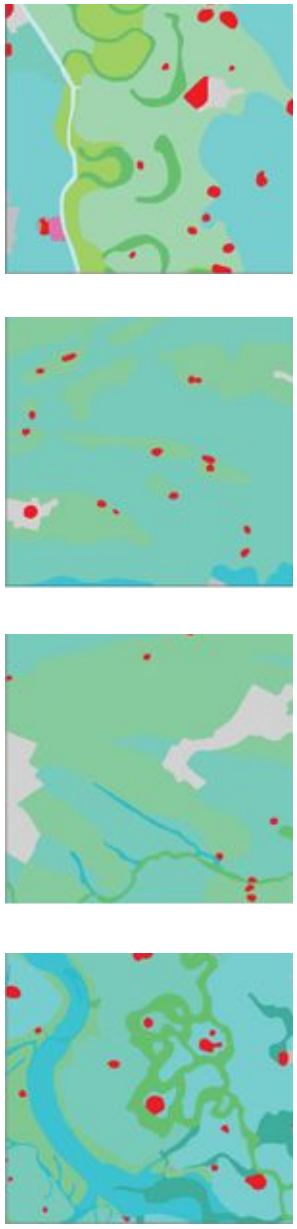
02.1 Groningen North

Building on structures

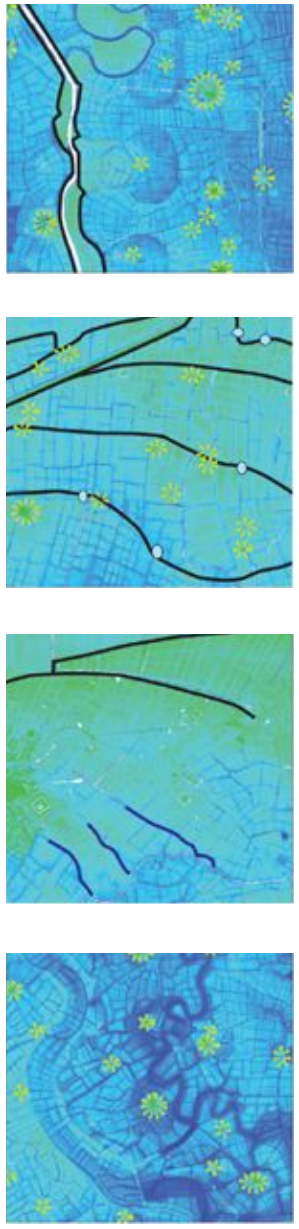


Landscape structures

Geomorphology



Altitude



[Above from left to right]
-Design concept

Aerial photo

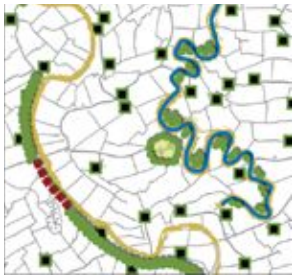
Topography

Idea-sketch

Rietdiep

New polder landscape

Salt marsh ridge

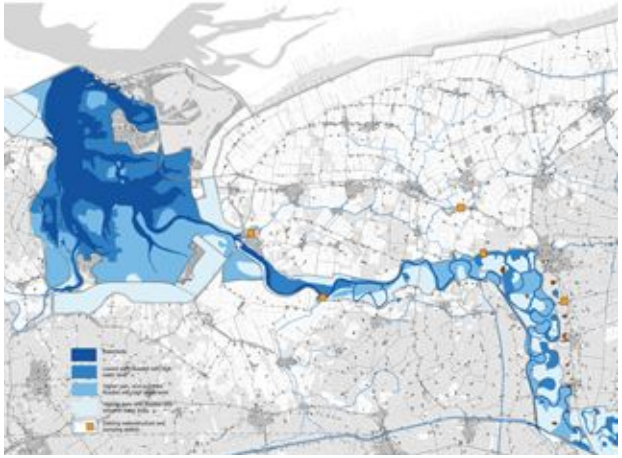


Middag-Humsterland en Delfzijl

02.1 Groningen North

Building on structures

Structure plan Nature



Structure plan Water

1.

2.

3.

[Above from left to right]
-Structure plan nature
-Increased water storage Lauwersmeer

[Middle from left to right]
-Impression Reitdiep development

[Below from left to right]
-Structure plan Waterstructure
-Impression wierden development

4.

5.

6.

1.
Increase water storage of Lauwersmeer
to provide agriculture with water during the increasingly dry summer months.
2.
Restore the natural fl ow of the Reitdiep to increase water storage, enhance nature and provide recreation opportinites.
3.
Increased visibility of wierden villages.
4.
Increase the water storage capacity of creeks, while enhanced nature along the edges to provide habitat and fi lter runoff.
5.
Tree plantings around farmhouses to reinforce structure and solar panels on the roof to provide a renewable source of energy
6.
Enhancing the structure of the landscape using tree alleys.
7.
Wind turbines in the landscape can be a symbol of sustainable development, while providing a renewable source of energy.

7.

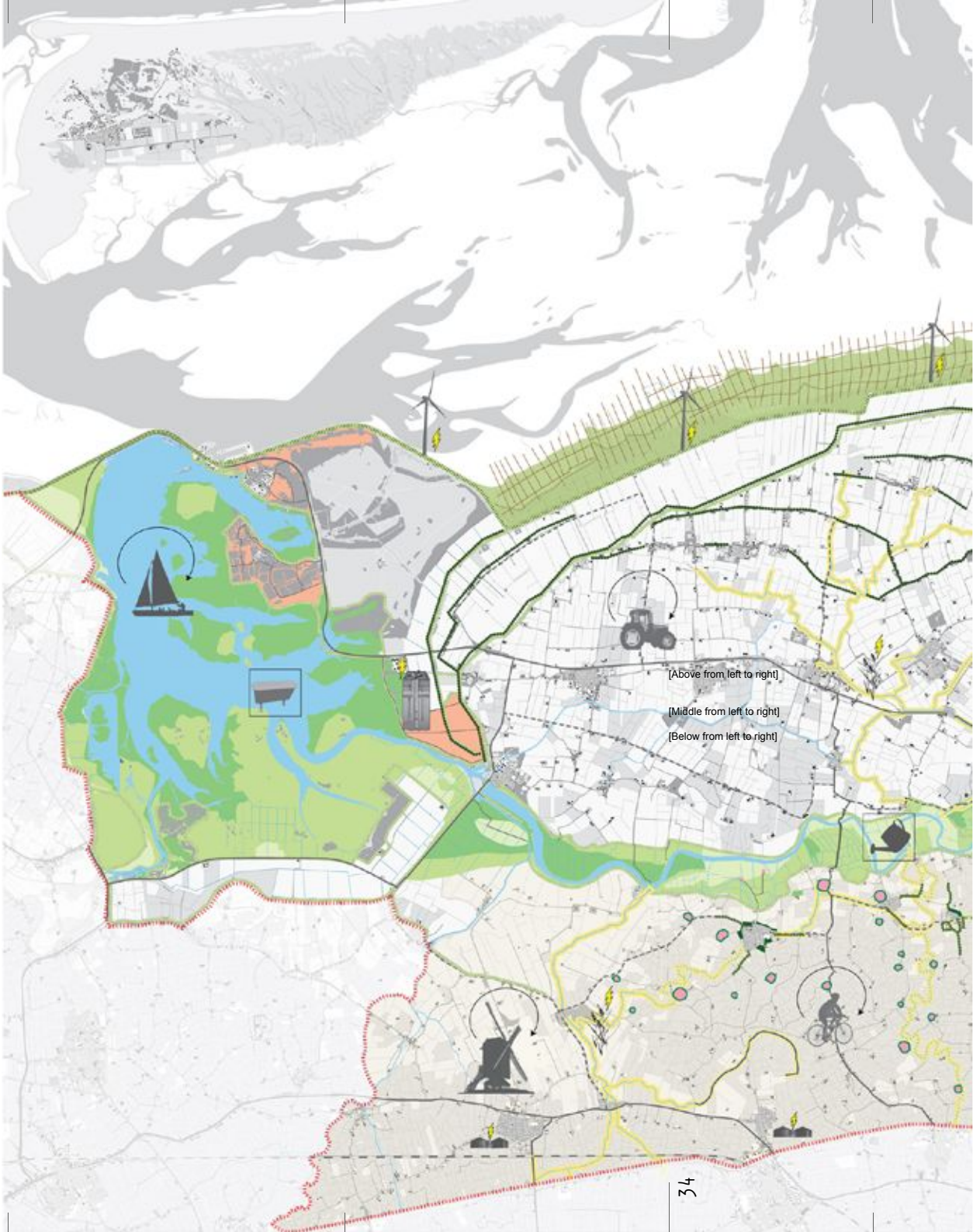
[Above from left to right]
-Impression creeks
-Impression energy

[Middle from left to right]
-Impression landscape structure

[Below from left to right]
-Impression tree alleys

02.1 Groningen North

Building on structures



[Above from left to right]

[Middle from left to right]

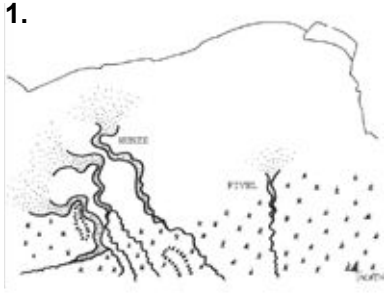
[Below from left to right]

[Above from left to right]
-Final structure plan

02.2 The riches of forest on the kwelderridge

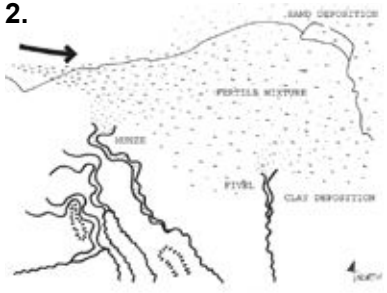
Geert Ankersmit

1.



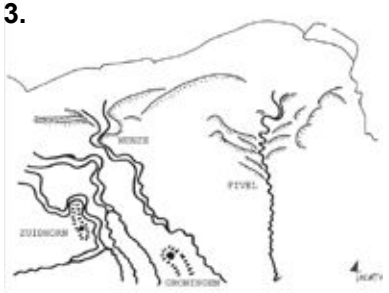
Sand deposition by rivers

2.



Clay supply by Wadden Sea

3.



Shaping kwelder ridges

Building the kwelder ridge

1. Sand deposition by rivers
The Hunze and fivel, two rivers with their source in on the ice pushed ridge, where the most important rivers for Groningen. They transported a lot of sand to the Wadden Sea.
2. Wadden Sea supplies clay
The Wadden Sea water is filled with clay particles from the North Sea. The sand of the rivers mixed with the clay of the Wadden Sea and the very fertile clay from the Dollard
3. Wierden on the Salt marsh ridge
So these high ridges were the first locations for new settlements in the Northern are of Groningen.
4. Man build dikes
But because these Salt marsh ridges were regularly flooded people build small mounts to live on(wierden) and later dikes to protect the land.
5. Rich farmers on the ridge
The rich farmers who were living on the ridge started to gain new land, so called kwelders. The became richer and richer because of a law: “If you gain land and build a dike around it, it is your property.”

Biomass forest

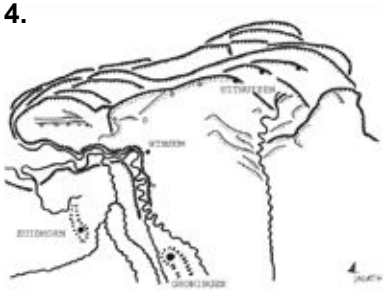
Emphasize creeks

[Above from left to right]
-Historical evolution Groningen landscape

[Middle from left to right]
-Design forest

[Below from left to right]
-Design creek development

4.



Kwelder ridges with wierden

5.

Rich farmers

Estates

Estates

Restored gardens

[Above from left to right]
-Historical evolution Groningen
-Picture estates
-Picture Restored gardens

[Middle from left to right]
-Plan estates
-Plan Restoration gardens

[Below from left to right]
-Plan dikes with trees
-Picture emphasize creeks
-Picture Biomass
-Picture older dike

Reed to emphasize former creeks

Trees along former dikes

Biomass production forest

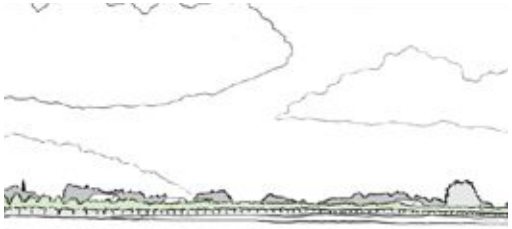
Trees along the old dikes

02.2 The riches of forest on the kwelderridge

Geert Ankersmit

Targets Regional plan:
-Emphasize on structures: dikes, former creeks and estates
-Farms can change of function to health care recreation or estate, which creates employment
-The quality of the landscape needs to be improved to attract people to these functions
-More development towards sustainable energy at the Eems harbour.
-Combine biomass production with improving the landscape
-Trees along former dike trace and reed along former creeks, reed and branches of trees and shrubs can be used

Added targets:
-Plant more biomass forests combined with permanent forests to improve the landscape quality
-Biomass forests can't be too far from the power plant, otherwise they release more CO2 than they absorb



[Above from left to right]
-View to Uithuizermeeden from an inland dike
-View to Uithuizen along a former creek
-View from the south to the church of Uithuizermeeden
-View along a former creek to the south of Uithuizen

[Below from left to right]
-Final plan

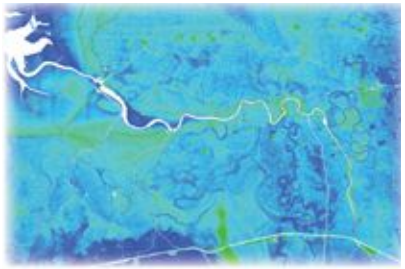
- Kwelder ridge
- Plots and water
- Reed along former creeks
- Restored and new gardens
- Estates
- Roads
- Main road
- Railroad
- Urban development
- Permanent forest
- Biomass forest
- Dike
- Tree lines along former dikes

02.3 Minds meandering through time

Mattson Meere

Inventory & analysis

Before the construction of dikes and land reclamation, Middag Humsterland was a highly dynamic landscape that was open to the sea. Numerous sea arms infiltrated inland, giving the area much different form than it has today. When settlement began around 600 BC floods were quite common. Settlements had to be built on mounds known as wierden which today are one of the reasons this landscape is so highly valued.
Today many of the sea arms have been reclaimed for agriculture land. However, they are still distinguishable by careful examination of the altitude map. These darker low lying areas are also the most suitable areas for water storage.



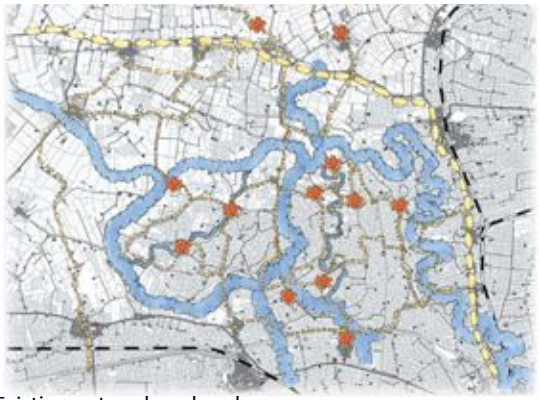
Altitude map

Northern regional plan

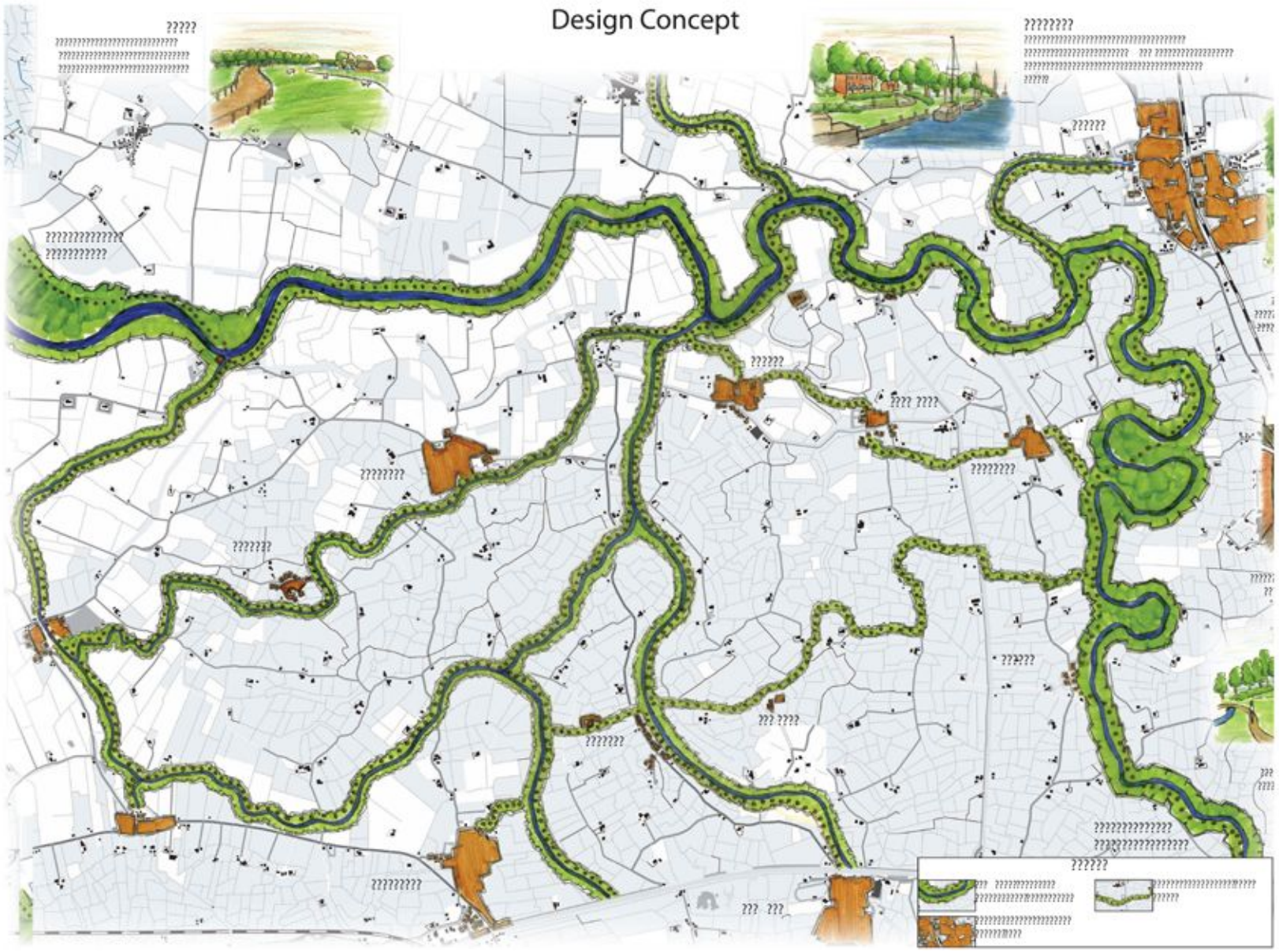
Existing plot layout

Proposed plot layout

Trail experience



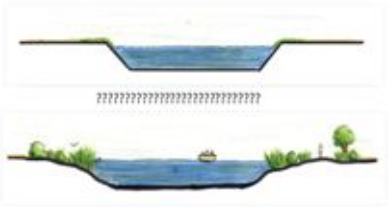
Existing network and nodes


Design Concept

02.3 Minds meandering through time

Mattson Meere

Borgen
Another unique historical feature Groningen, only two of these picturesque estates remain in the area..



Section of existing and proposed waterways

Tree Allee
Allees provide contrast to the open rural landscape and adds to the variety of spatial experiences.

Ezinge
Stop to explore and enjoy the quiet and easy going life of villages such as Ezinge.

[Above from left to right]
-Design impressions

Oostum
Oostum is one of the oldest and best preserved wierden.

Niehove
One of the most scenic and best preserved Wieden villages.

Heritage
The waterway and trail system connect a number of historical features such as this pumping station

Boating
Experience the landscape from another perspective on one the many waterways.

Mattson Meere

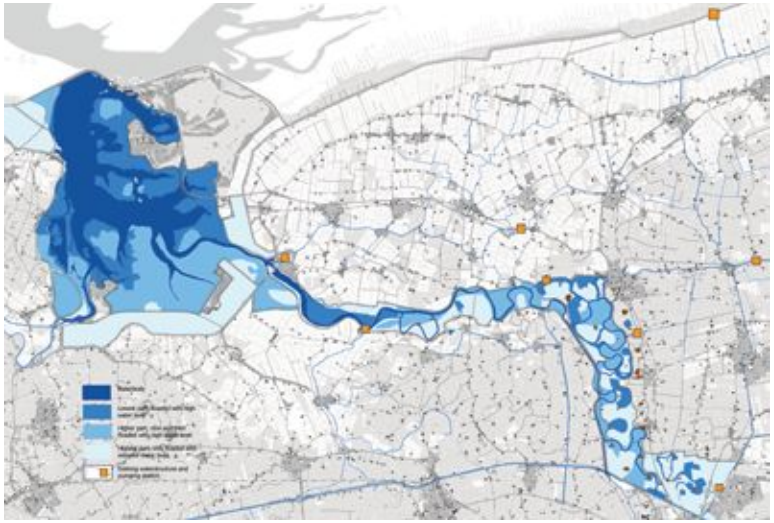
02.4 Lauwersmeer

Joeri Meliefste

Structure plan

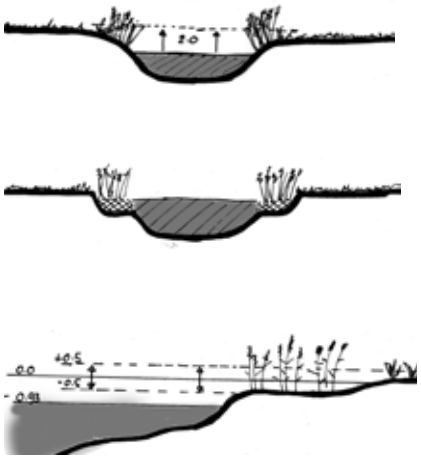
waterlevel +1m

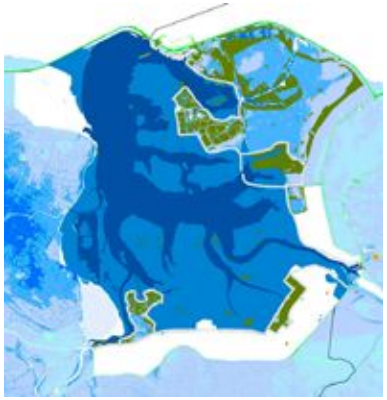
Problem of growing forests



Water storage

[Above from left to right]
Problems and ideas





waterlevel +2m

Zoning

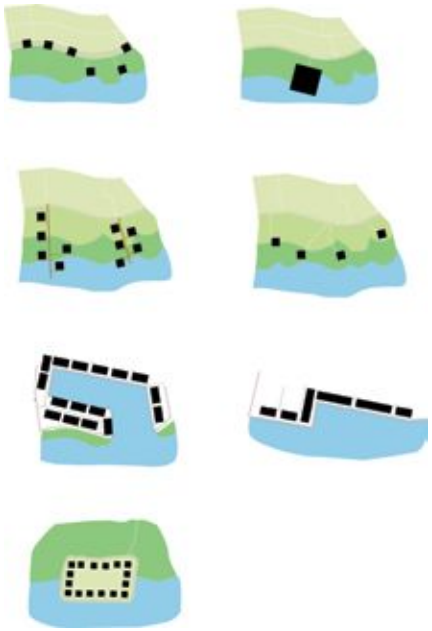
Amount of Waterstorage needed 210 milj m3
Reitdiep 25.5 milj m2
Rise the water level with 0.5 meter 6.4 milj m3
Lauwersmeer 67 milj m2

Rise the water level with 1 meter 43.5 milj m3

Total storage capacity 49.9 milj m3
Storaga capacity needed 160.1 milj m3
Extra rise of waterlevel Lauwersmeer with 2.4 m

Developments;
- New recreational bike route, round around the
Lauwersmeer, with different stops (recreational
centre points)
- New or continues walking routes, different routes, also
in nature area
- Connecting Lauwersmeer with other waterways, easy
and good connection for ships, sailboats.
- New recreational housing in larger communities
(Zoutkamp and Lauwersoog)
- New housing (residents), benefits from work and
money tourists

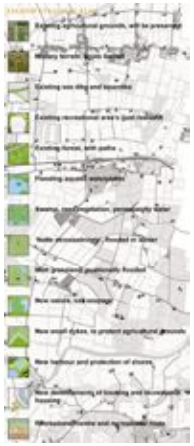
Water Storage in Reitdiep and Lauwersmeer



Opportunities for living

02.4 Lauwersmeer

Joeri Meliefste



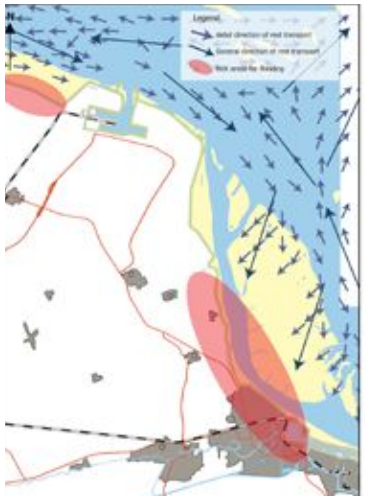
[Above from left to right]
-The design

14 Closed sea-arm of fresh water; Deep lake, partly with aquatic plants and surrounding swamp
vegetation. Important factor is regulation of waterlevel (summer low and winter high level).
This type consists of; 18 Buffered lake and 24, 25 swamp
18 Buffered lake; Otter (Lutra lutra), Smelt (Osmerus eperlanus), Water shrew (Neomys fodiens),
Pintail, (Amas acuta) Black-tailed Godwit (Limosa limosa)
24 Swamp with fluctuating water level; Burbot (Lota lota), Root Vole (Microtus oeconomus), Water
shrew (Neomys fodiens), Grass snake (Natrix natrix), Black-tailed Godwit (Limosa limosa), Purple
Heron (Ardea purpurea), Great Egret (Casmerodius albus)
25 Wet ‘strooiselruigte’; Root Vole (Microtus oeconomus), Water shrew (Neomys fodiens), Little
Egret (Egretta garzetta), Short-eared Owl (Asioflammeus), Hen Harrier (Circus cyaneus)
32 Wet, moderate nutrient rich grassland; Common Redshank (Tringa totanus), Common Snipe (Gallinago gallinago)

Scenario for Zoutkamp
Phase 1;
- New housing next to Reitdiep
- New sluice, connection Zoutkamp - Lauwersmeer
- New recreational houses, with harbours
- New recreational route around Zoutkamp
Phase 2;
- Nature development
- New housing in new nature part
Scenario Lauwersoog
Phase 1;
- New housing around existing harbour
- create new harbour
- Recreational facilities, next to harbour
Phase 2;
- New living island, mixed housing recreational and
permanent housing, new harbour.

02.5 Designing towards the future

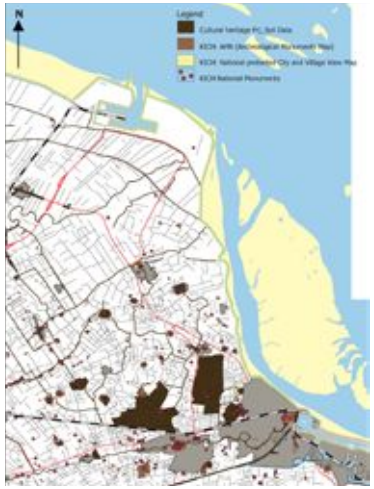
Ilse Verwer



Problems climate

Problems industry

Problems nature



Problems cultural heritage

[Above from left to right]
-Problem analysis

Concept

[Above from left to right]
-Impressions

[Middle from left to right]
-Water infiltration on Hondsrug
-Plan view Hondsrug inflitration
-Ecoduct

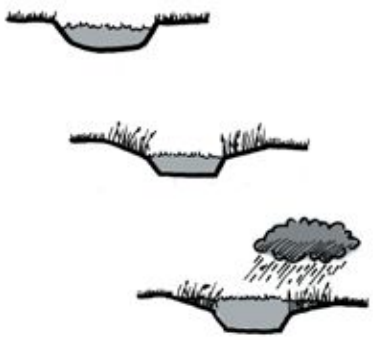
[Below from left to right]

02.5 Designing towards the future

Ilse Verwer

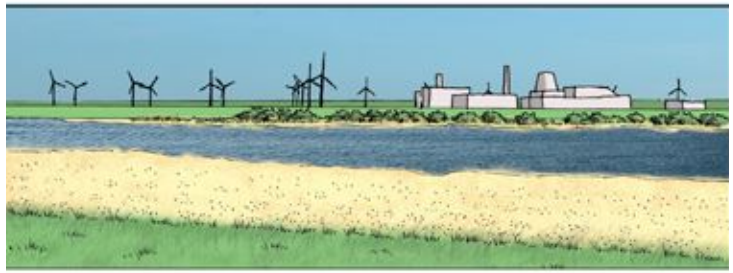
Kwelders protecting dikes

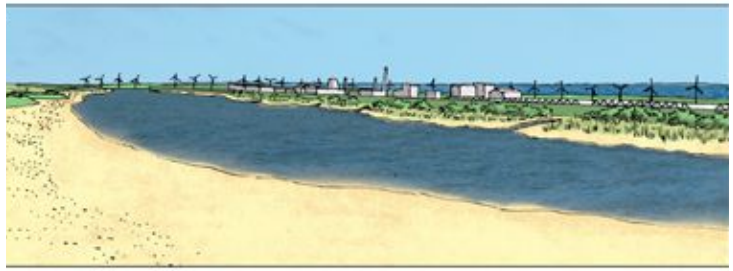
Kweldersystem to decrease wave power



Creeks with natural shores

Efficient use of energy





Final design

Continuation of the kwelder system to gain land and protect the dikes against the waves.

Eemshaven is growing very fast. It is mainly focussed on the production of energy, and produces 1/3 of the total energy for the Netherlands.

New greenhouses, using the heat and CO2 emission produced by the industry in Eemshaven.

New port for big ships to enter, making import and export possibe.

Development of lake with brackish nature on the sides.

Windmills, producing electricity for the buildings on the island. The surplus can be transported inland.

New industry, slowly expanding in time, dependent on the demand.

Greenhouses, not soil dependent. Minimum light discharge and using the heat and CO2 emission produced by the industry on the island.

Continuation of the kwelder system to capture sand and protect the dikes against waves.

Recreational sight, beach with small facilities.

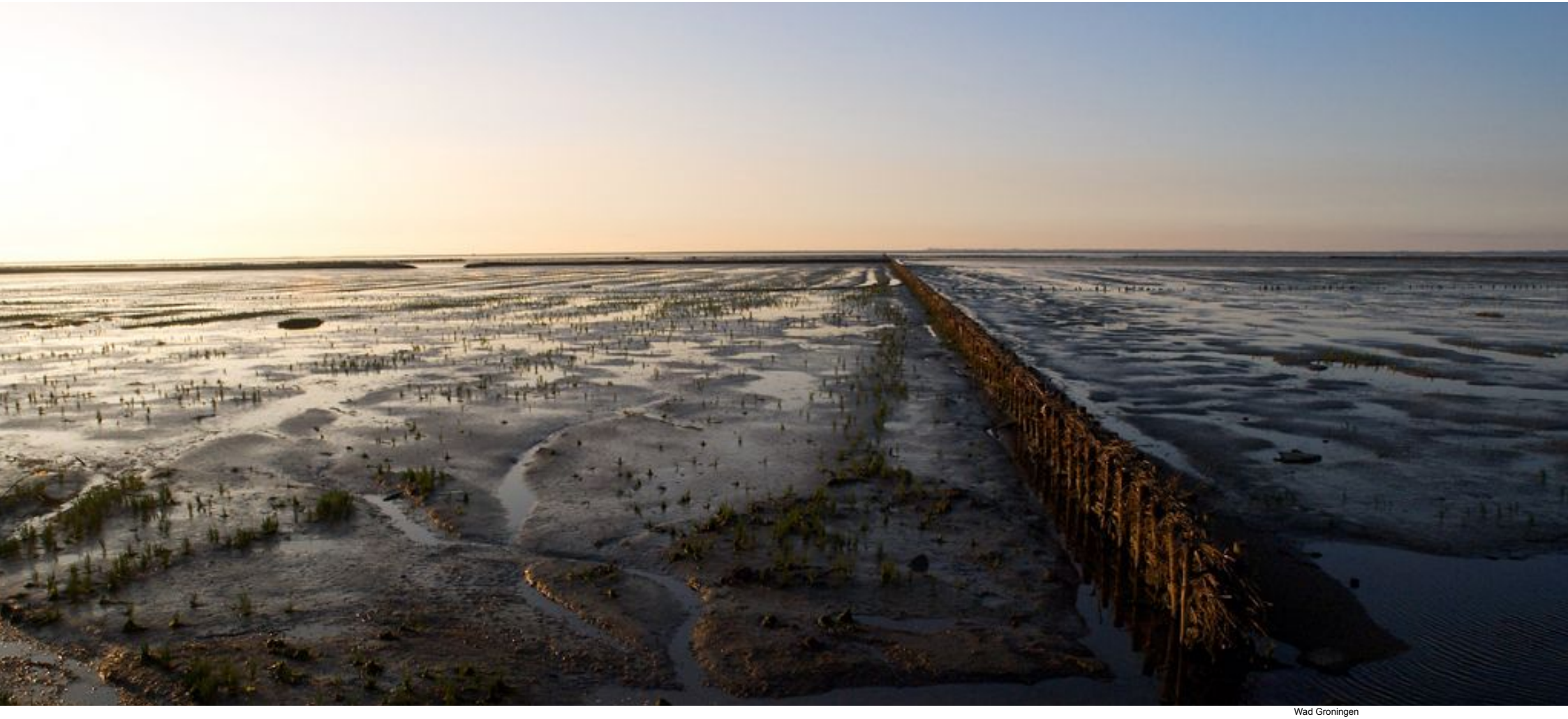
Process of sand deposition and development of salty nature.

Dike to connect the island with the mainland and to connect the infrastructure.

Connection nature areas with creeck system, reconstructed with natural shores. The meandering structure is emphasized with willowtrees in the corners of the creecks. the infrastructure.

Boulevard in front of Delfzijl.

Residential area, uses the heat from the greenhouses to warm up the houses.



Wad Groningen

03 Groningen Central

54 __ 03.1 Groningen Central: Water for future

62 __ 03.2 Serve the servants

66 __ 03.3 Re-thinking water

70 __ 03.4 Re-connecting Delfzijl

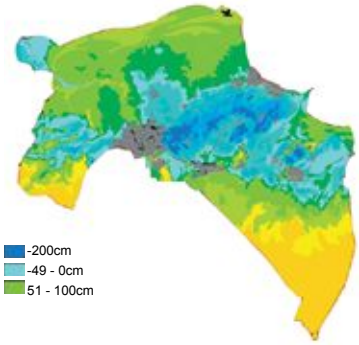
74 __ 03.5 Water for future

03.1 Groningen Central
Water for Future

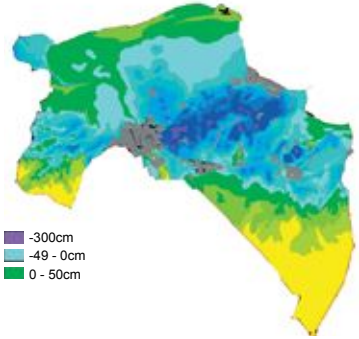
The aim of this regional project is to adapt the existing landscape to climate change, to create a safe future for living and to create a sustainable and self sufficient landscape.
We found out that this area, situated under sea level, nowadays has great amounts of water surplus and flood risks in wintertime, but a shortage of water in summertime. Declining land caused by natural gas extraction, makes the situation more difficult. Changes in climate causes great difficulties in water discharging, because of the expected bigger amounts of precipitation and sea level rise. The current main land functions, like agriculture, have to adapt to this changes and already fragmented nature will face even bigger problems.

The concept 'Water for future' is solving water problems by using the potential of the water, relating all new developments to changes in the water system. Different possibilities are developed, like the combination of (emergency) water storage with new living qualities, cleaning water systems, harvesting biomass, nature areas and new kinds of agriculture. The multifunctional use of land is the most important measure taken to create a self sufficient and sustainable landscape.
For three main cities in the region, Groningen, Winschoten and Delfzijl new urban expansions were proposed. They are combined with wetlands, emergency inundation areas and lakes for water storage, improving attractiveness and recreational values.
Great possibilities for solving the water problem in the lowest area of the region are created by a robust corridor for wet nature, with an important international function.
Needs for agriculture changes are connected with the need for water storage, by changing the land use to (wet) grasslands with cattle, biomass production with reed or willow or fish farms.
Next to the importance of energy saving, the providing of new energy sources is important. Proposed for Groningen is the use of: solar energy, geothermal energy, wind energy, biomass production and use of industrial heat.

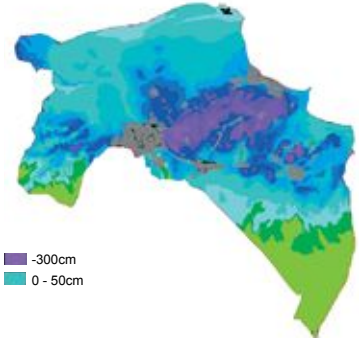
2007



2050
50cm sea level rise



2050
150cm sealevel rise



[Above from left to right]
-Study Area, Central part of Groningen
-Central area, Lowest part of Groningen
-Declining peat area due to gas extraction
-Altitude map 2007

[Middle from left to right]
-Altitude map 2050, with sea level rise of 50cm

[Below from left to right]
-Altitude map 2050, with sea level rise of 150cm

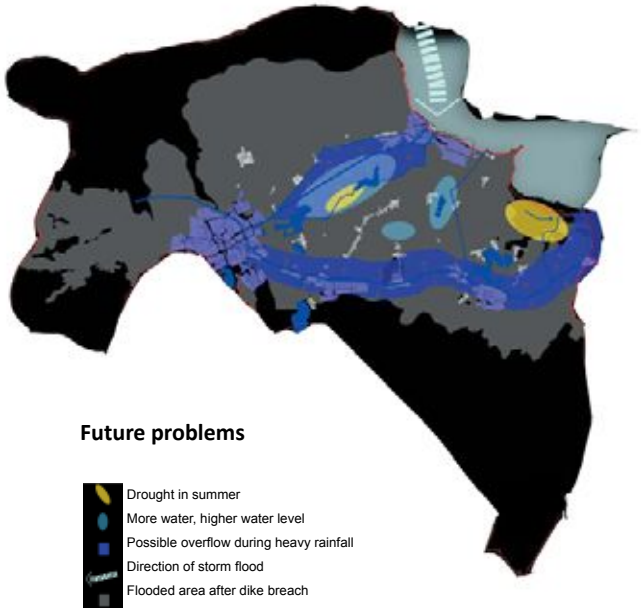


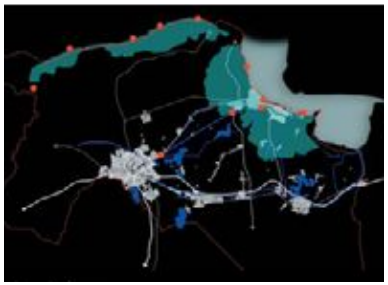



Current problems and effects of climate change

Today
Almost the whole area lies under the sea level. The land is further declining because of the gasextraction.
More than 50% of the area is used by agriculture. Agriculture needs to pump out the water, especially in winter time to keep a certain water level.
Because of this the surrounding nature areas have problems with drought. Further more the habitats are fragmented by urban development and infrastructure.

Future problems
-more water in spring, winter, autumn
-less water in summer
-heavier weather occurences (storms, heavy rainfall,..)
-higher temperatures




..in 4h


..in 12h

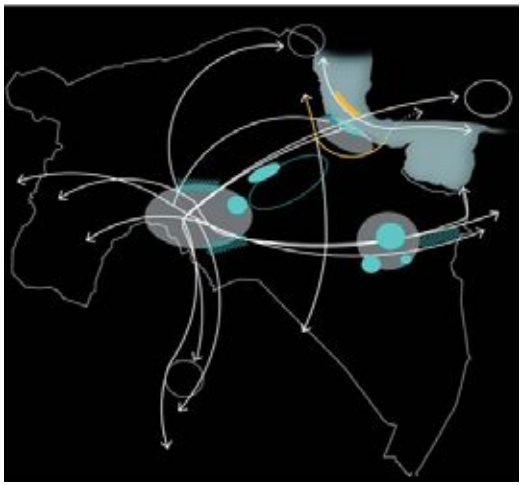

..in 24h

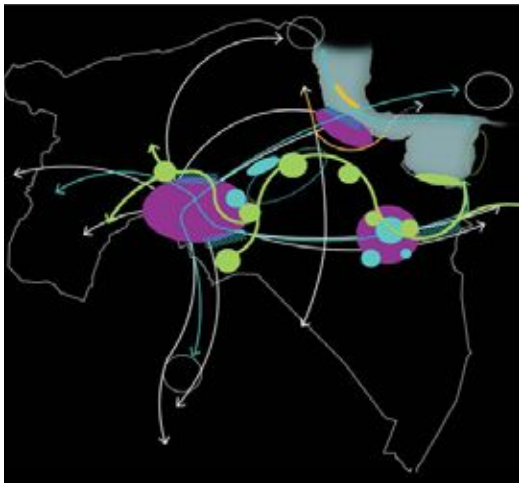
[Above from left to right]
-Dike breach After 4h

[Middle from left to right]
-Dike breach After 12h

[Below from left to right]
-Future problems
-Dike breach After 24h

03.1 Groningen Central
Water For Future





Adaptation watersystem

1. Keep More water in lowest areas (Blue circle)
2. Water storage in winter for agriculture in summer (blue area)
3. Inundation areas in case of heavy rainfall for overflow or overflowing canals (blue lines)
4. Flood protection in Eems estuary and around Delfzijl (orange)

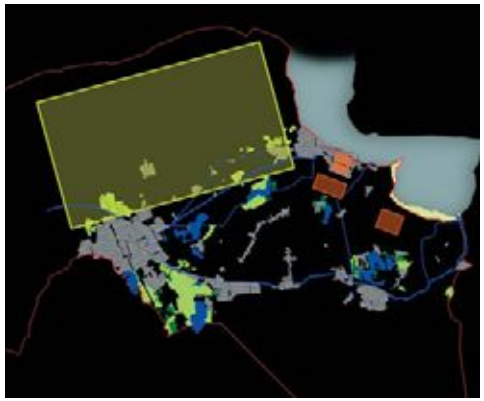
Strategy for settlement

1. Concentration of urban development on higher spots (purple spots)
2. Use Attraction of Groningen as an impulse for Delfzijl and Winschoten =new entrance area from Germany and the sea
3. Use water as urban quality and identity for the three urban centers
4. New living forms in shrinking Polderland
=Self-sufficient villages (purple circle)

Adapt nature

1. Connect existing nature areas with Eems- Germany, Lauwersmeer and Biesbosch & Zeeuws Delta
2. Connection = corridor for sea clay areas and peat areas
3. Target species:
-Roerdomp
-Otter
-Bever
-Grote Karekiet
-Noordse woelmuis
-Blauwborst
-Rietzanger
-Ringslang
-Grote vuurvlinder

[Above from left to right]
-Adaptation watersystem
-Strategy for sttlement
-Adapt nature



Adapt agriculture

According to agriculture scenarios on a European scale, the north of the Netherlands will have good future perspectives. In comparison to the south, the north is less influenced by urbanization, so that large scale agriculture can be kept. But if we have a look on the impacts of the declining land the effects of climate change in some parts, the current function of agriculture problems will increase in future. In the lowest area the current agriculture should change to keeping more water in this area (purple). The higher area is in the future still well suitable for the current agricultural types (orange), but water storage in the summer will be necessary.

Alternative energy

Possibilities for alternative energy production:

The green areas are the current agricultural used areas. It is possible to use the leftovers, for example straw and grass in combination with the manure of the cows and pigs for biogas production.
The yellow and orange spots are possibilities for good(yellow) and very good(brown) geothermal energy. The grey areas are suitable for solar energy. That can be interesting in the first stage for the new development and may be for the big roofs of stables.
The pink circles are the areas in which industrial heat can be used.

Today we have in our area 38.148 pigs and 47.148 cows. If we want to use all the manure to produce biogas, we will need this area if Stroh co/product (yellow)
4.999.208Gj= 8% of total energy demand

The orange squares show the area of windmills(120) which are needed to produce the total amount of electricity for the expected households in 2020. The calculations are based on reduced energy consumption for 2020.
1.731.460GJ= 3%of total energy demand

[Above from left to right]
-Adapt agriculture
-Alternative energy concept
-Alternative energy demand

03.1 Groningen Central

Water For Future

water

cities

nature

Concept: ‘Water for future’

- Arable land
- Grassland
- Biomass
- Fish farms
- Wetland nature
- Salt marsh
- Inundation area

[Above from left to right]
-Concept Water
-Concept Cities
-Concept Nature

[Below from left to right]
-Final Concept

Different habitats for various species

New housing on poles can cope with big fluctuations of water...

... not only for animals but also for people

[Above from left to right]
-Impressions wetlands
-Impression species habitat

[Middle from left to right]
-Impression habitat experience

[Below from left to right]
-Impression new living with fluctuating water levels
-Impression water recreation

New kind of housing

...and new safe floating houses on lakes create great recreational values

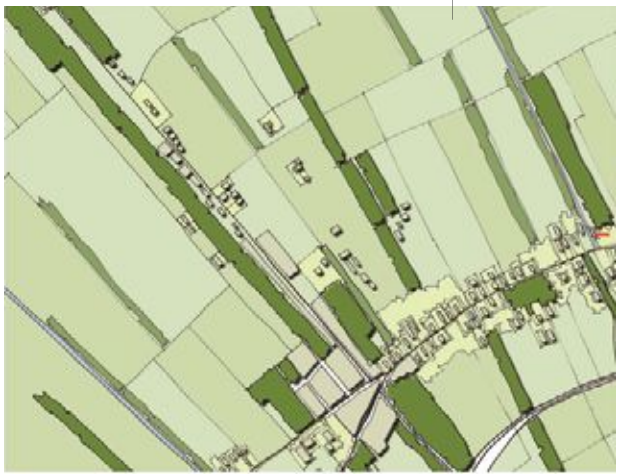
03.1 Groningen Central
Water For Future

Energy farming

-mosaid landscape of grassland, willow and reed
-next to cattle, grassland and agricultural production of the need to co-produce for biomass fermentation
- allow higher water level in the area

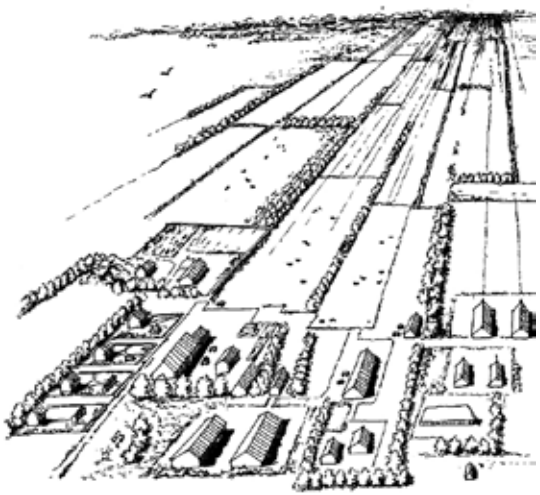
Fish farms

-possibility for new agriculture and water storage
-water from the fish farms can be used for agriculture in dry summers



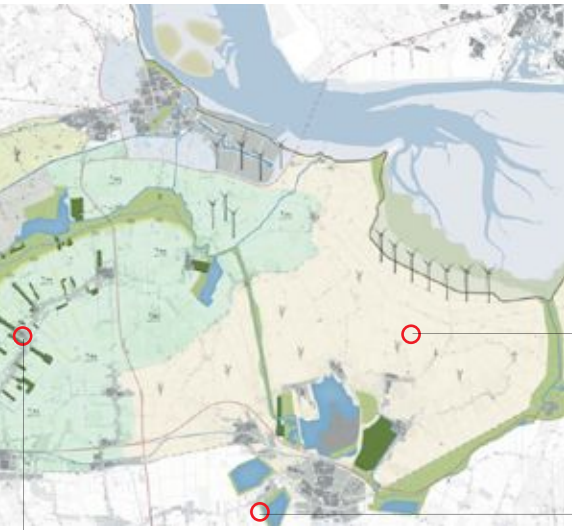
Slochteren ‘ribbons’

-widening canals = increased water storage
-change of current agriculture into grassland with cattle
-reed along canals can be harvested as biomass
-areas along canals can be used for recreation



[Above from left to right]
-Energy farming
-Fish Farms
-Final concept

[Below from left to right]
-Concept Slochteren
-Impression slochteren



Living with water

-water storage for agriculture in lakes
-possibilties for living and recreation

Self-sufficient villages

-big scaled agriculture next to self-ufficcient villages
-possbiblity of keeping people in this area, by new ways of living
-farms selfsufficient in : food,energy and water cleaningsystems
-people can be attracted to live there if they get the land for free
-big scaled agriculture: widening of canals to store more water in winter

New kind of housing

[Above from left to right]
-Concept Living with water

[Below from left to right]
-Concept Self-sufficient housing
-Impression New kind of housing

03.2 Serve the servants: Slochteren in the future...

Jeroen Hamers

Slochteren, lovely hearth of the Province....

Slochteren, in the area of Duurswold, is a beautiful and open area. It is an agricultural area, where farmers have been growing grain, potatoes and vegetables for ages.

Main landscape features are Duurswold canal, Schildmeer and the roadvillages on the higher sandy ridges.

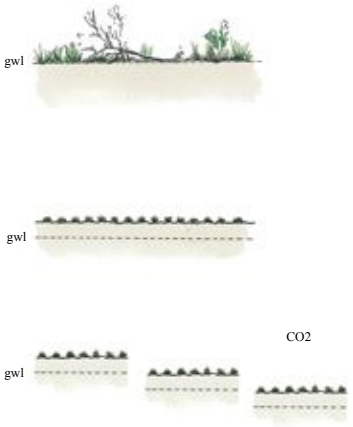
Plans for nature...
Nature plans in this area are breaking the hearths of the farmers. Their grandpa's and greatgrandpa's 'made' this land out of wilderniss, and generation after generation they made bread and life out of this land.

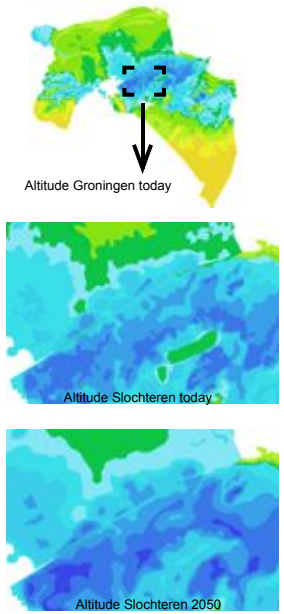
There is food scarce in the world and grain prices are rising. But reed doesn't make bread.
Farmers have always been stewards (servants) of the land. They have 'in depth' knowledge about the land.
It is important to let these people participate, and to handle with respect to the farmers.

The land is the servant of the people, people have to serve it in turn.

Problems

1. Peat-oxidation
2. Climate change: more (extreme) rainfall
3. Future declining by gas-extraction





[Above from left to right]
-Introduction Slochteren

[Below from left to right]
-Peat oxidation process
-Slochteren Gas extraction

Situation today

+ increasing rainfall

+ declining ground

Future?

Problem conclusion

What means climate change for Slochteren?

More water in winter, and less water in summer make it necesarry to increase the capacity of the water system. The system should be able to store more water, to cope with extreme storms as well as with drought.

Altitude

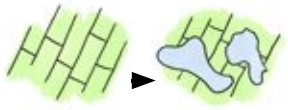
Slochteren is already the lowest area of the province! The lowest point is 2.50m -NAP! The highest point on the sandy ridge is 2.50m +NAP.

Due to gas-extraction the land is going to decline even more in the future! The whole area will be about 50cm lower in 2050.

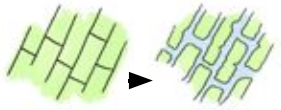
Which shape?

NOT like:

NOT:



BUT:

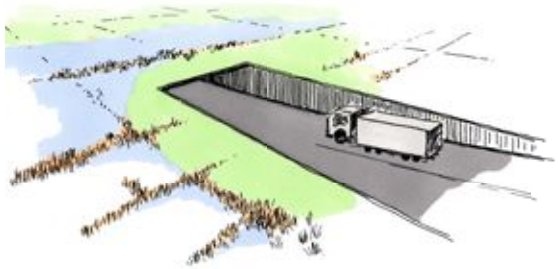


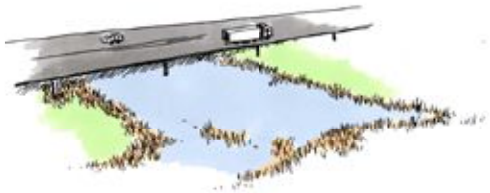
NOT: NATURE + WATERSTORAGE = ORGANIC FORMS

Use existing pattern of the landscape:
- Capture the story of the land
- Use places which have already eco-logical values: broaden ditches and canals

03.2 Serve the servants: Slochteren in the future...

Jeroen Hamers





Experience Slochteren

The land of Slochteren has always been serving the people, the people should serve the land in turn. Farmers, the servants of this land, should be able to keep their strong relation with the land. In the future they will play an important educational role, significant in a society where kids get detached from nature, cows and potatoe fields. Other future functions of the farmers will be maintenance and supervision of the area, and recreation.

[Above from left to right]
-Impressions Slochteren
-Design plan

Bikepath along the canal: (1.) on the plan

Culture, farms and agricultural activities

Shelter of forrest and 'wild nature' experience

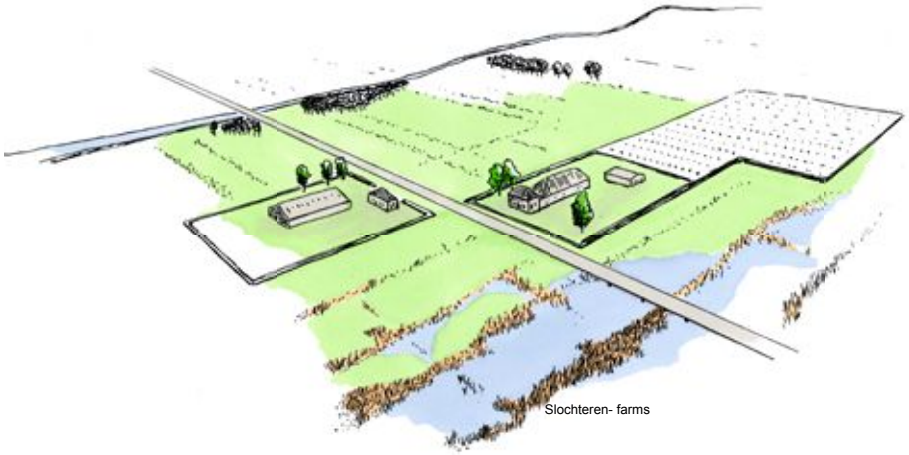
Walking route 'into' nature

Experience Slochteren

Ecological hearth

Bufferzone

Recreation



Slochteren- farms

[Above from left to right]
-Impressions Slochteren

[Middle from left to right]
-Design explanation ecology
-Design explanation buffer
-Impression Slochteren farms

[Below from left to right]
-Design explanation recreation

Design Goals:

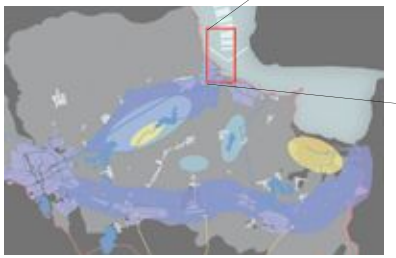
1. Store water on peat soil
(stops oxidation of peat, land will grow again)
2. Continuous line of water
(enable mammals to migrate north)
3. Variation of bush, reed / swamp, water, grassland (different nature types for different species, different experiences for recreants)
4. Show landscape story
(the land has an important history, it serves as the basis for new developments)
5. Integrate recreation, create variance of experiences
(nature for the people, a new attractor in the area)
6. handle with respect to farmers
(they made this land, they know this land and they should have a future in this land)

The ecological hearth is situated in the most quiet area and is for the larger part situated on the lowest places of the area. 5x more water than today can be stored!

Recreation is concentrated along the canal. From a bike path on the canal-dike people will have beautiful views over the area.
A stripe of (wet) meadowland serves as bufferzone between nature and agricultural use.

03.3 Re-thinking Water: Delfzijl

Antje Herrmann



Situation

Delfzijl is living with the water

Delfzijl harbour

Future Water problems:

1. Closing the harbour
2. Wall as second safety
3. Rain water inundation area
4. Islands = floodprotection

RE-THINKING WATER

1. Opportunity for high quality housing and business areas
2. Attractive element of the city
3. Connection between city and sea
4. Islands for nature and recreation

Delfzijl

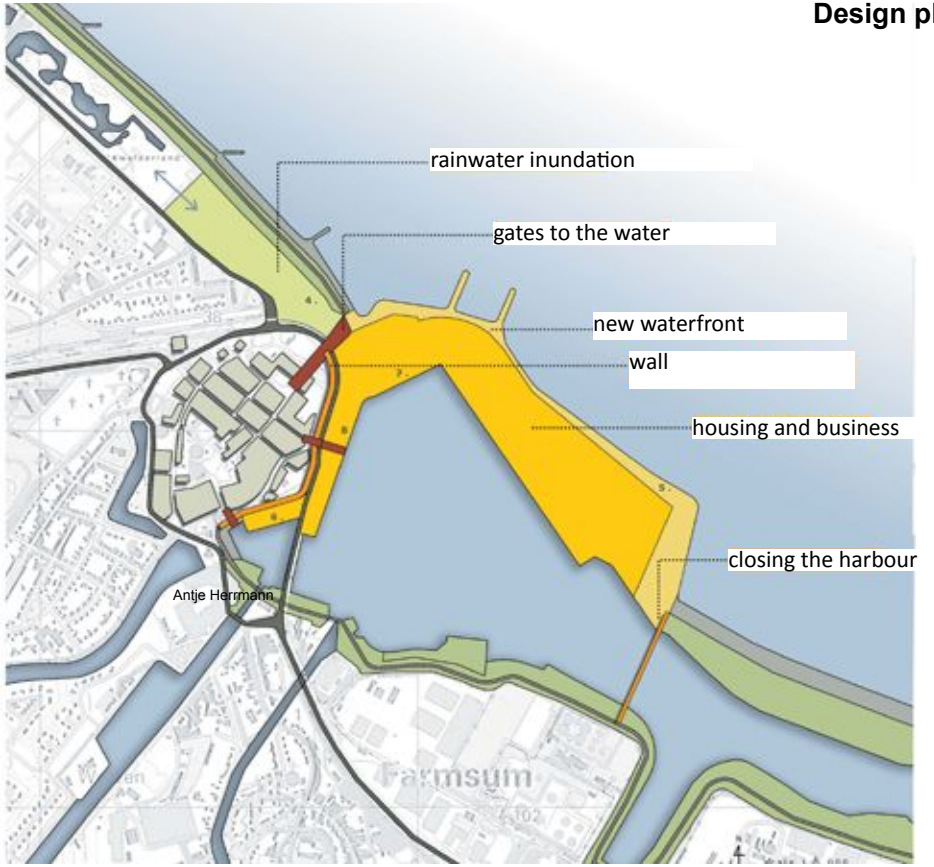
Autumn storm in Delfzijl

Springtide +1,50m sea level rise

[Above from left to right]
-Situation
-Delfzijl harbour
-Bird view harbour
-View harbour

[Below from left to right]
-Water level rise: Delfzijl

Design plan



[Above from left to right]
-Impressions

[Middle from left to right]
-Water infiltration on Hondsrug
-Plan view Hondsrug inflitration
-Ecoduct

[Below from left to right]

Housing and business

Business relaxation

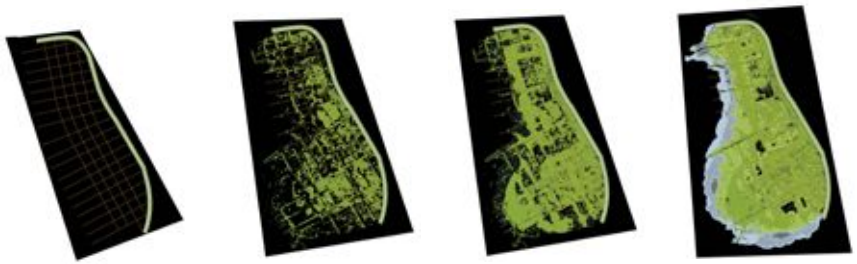
03.3 Re-thinking Water: Delfzijl

Antje Herrmann

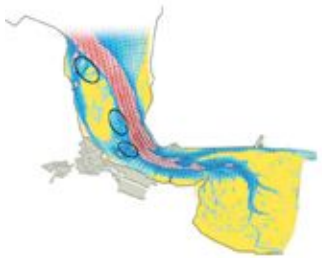
Wall; second safety

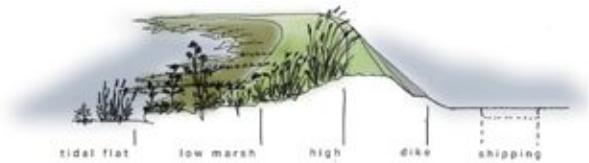
Rain water inundation

Islands



Island Development: Marsh land





[Above from left to right]
-Impression Sea wall
-Impression Water inundation

[Middle from left to right]
-Salt marsh development

[Below from left to right]
-Gradient Salt marsh

Island for vacation

Island for guided tour

Island for nature

New waterfront

[Above from left to right]
-Impressions islands

[Middle from left to right]
-Impression new water front

[Below from left to right]
-Impression water recreation
-Impression new water front

New waterfront

New waterfront

03.4 Re-connecting Delfzijl

Matgorzata Jasiorowska

Existing situation of Delfzijl

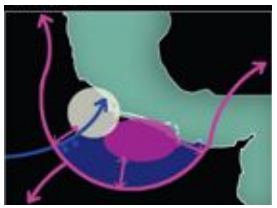
Danger of overflowing the Eemscanal

Spread of pollution in case of flooding

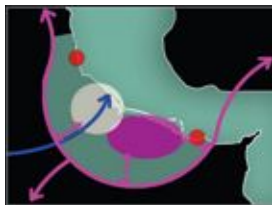
Problem analysis

Concept

Re-connecting Delfzijl



Protect Delfzijl, in case of canal overflow



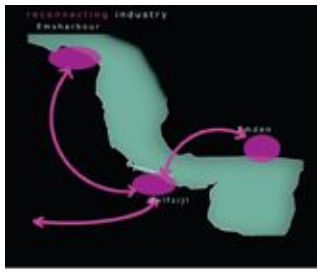
Protect Delfzijl, in case of flooding

[Above from left to right]
-Problem analysis

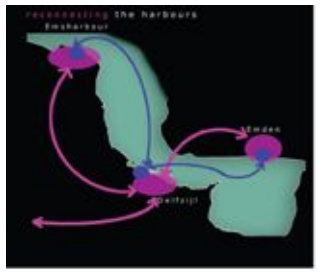
[Below from left to right]
-Concept explanations

Urban development & infrastructure

Industrial development



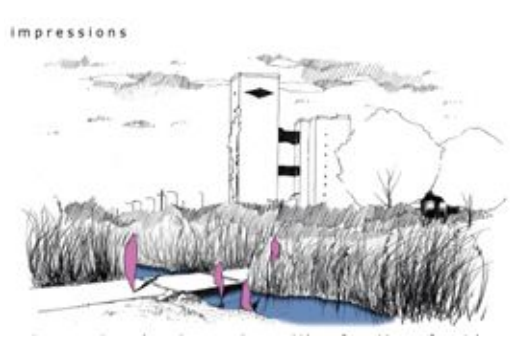
Reconnecting industry

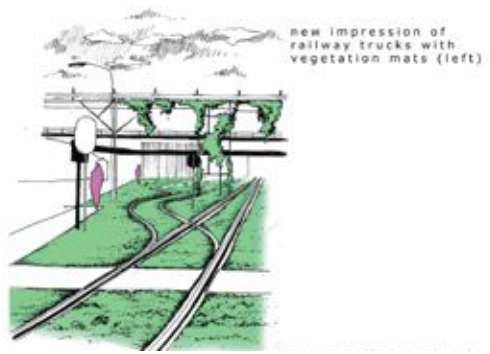


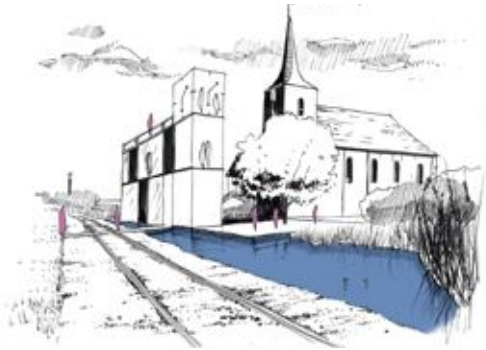
Reconnecting the harbours









[Above from left to right]
-Impressions current situation

[Middle from left to right]
-Impressions

Concept of reconnecting Delfzijl was made to improve quality of living in the city, but the most important reason was solving urgent problems of possible flooding. But also to to connect industrial areas of Delfzijl with other industrial areas and harbours, to give the impuls for development.
In the first place a new flood protection system is designed which allowed new developments to appear in the vicinity of Delfzijl, like new housing, new research centres for new kinds of agriculture. New fields of biomass, algae production and development of nature areas of salt marshes.
One of the most important issues of this design was to find solutions for disturbances caused by industry: which was made by different kinds of greening the industrial sites.

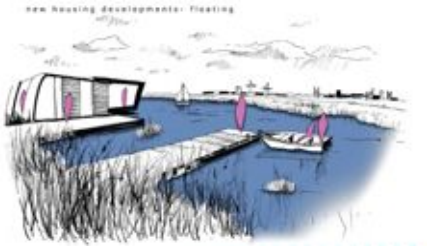
03.4 Re-connecting Delfzijl

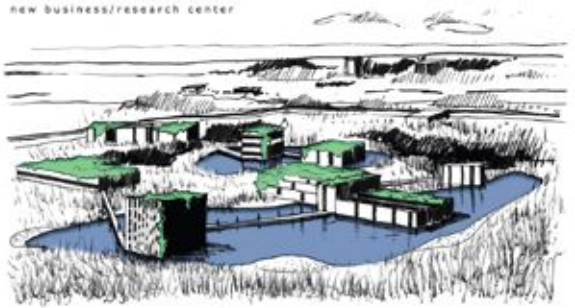
Matgorzata Jasiorowska

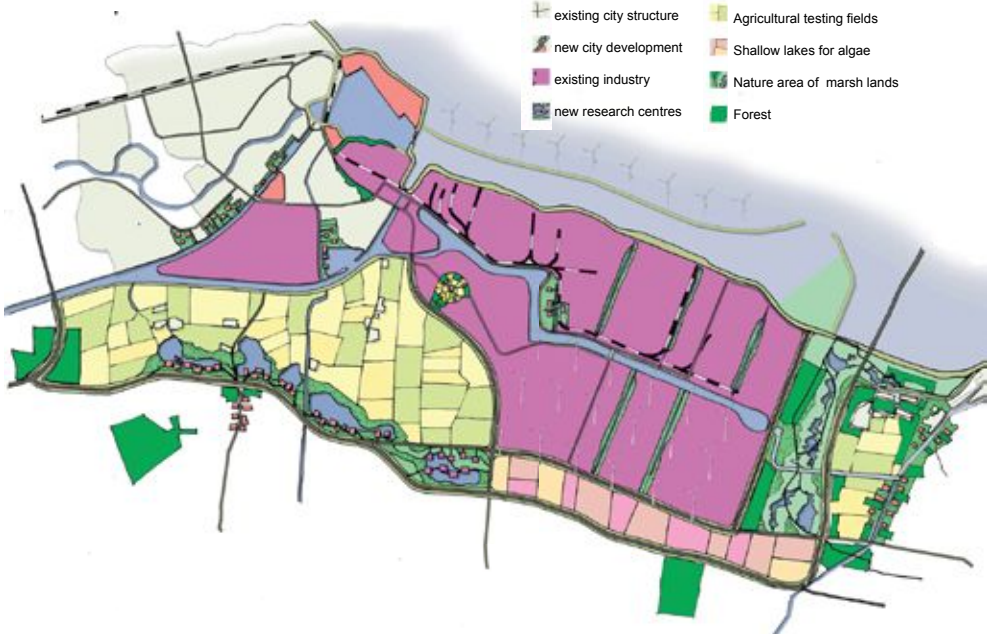
Design

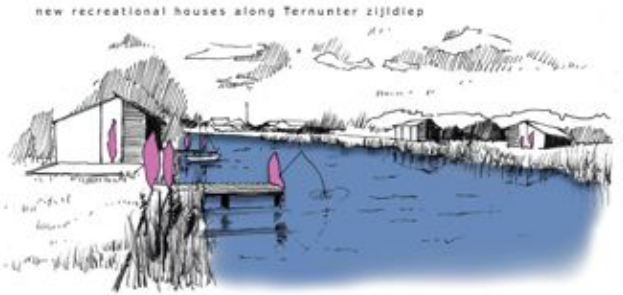
Impressions

[Above from left to right]
-Design explanations



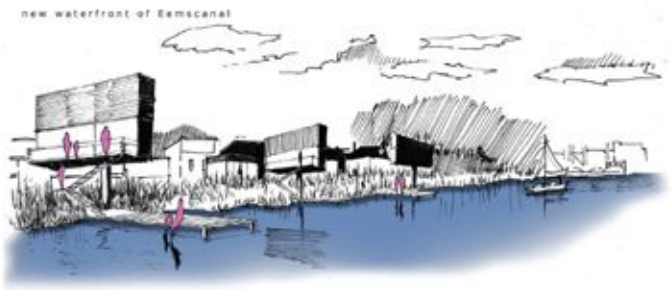






[Above from left to right]
-Impressions

[Middle from left to right]
-Final design



03.5 Water for future

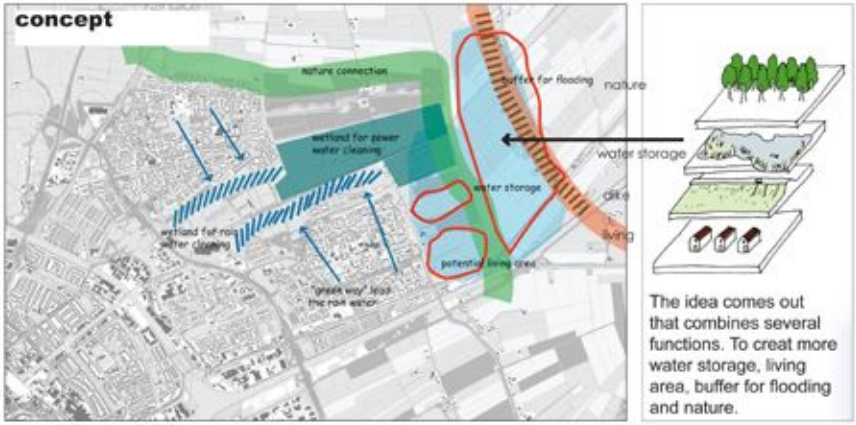
Xu Xiaoyu

The force of water from four derections

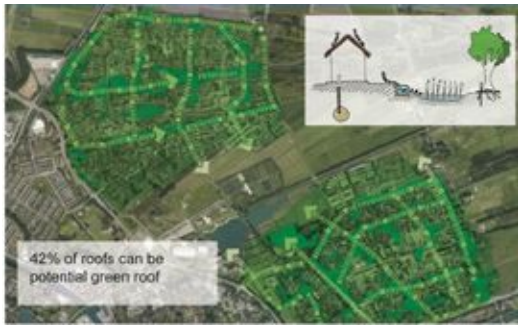
The potential living area

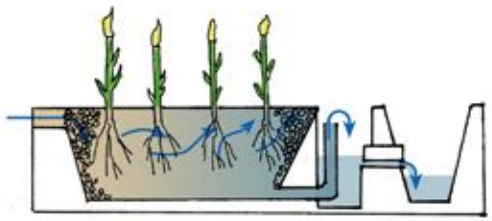
ecological connect from Meerstad to Reitdie.

Waste water from the neighbourhoods and small villages beside.



The idea comes out that combines several functions. To creat more water storage, living area, buffer for flooding and nature.

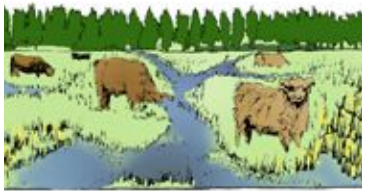


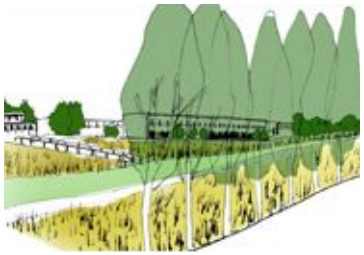



Design
N
1:10000
legend
building
canal
dike
fishpond
grass
green roof
green way
forest
road
building
sedimentation tank
wetland for rainwater cleaning
floating house
wetland for sewerwater cleanin

03.5 Water for future

Xu Xiaoyu





[Above from left to right]
-The ecological connection

04 Groningen South

80 __ 04.1 Groningen South: Towards equilibrium

88 __ 04.2 Ruiten AA

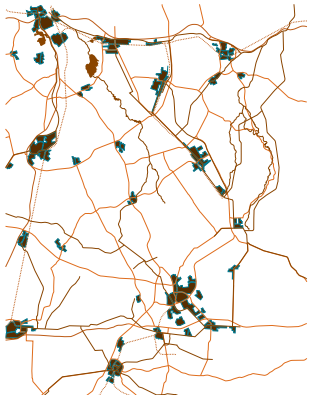
92 __ 04.3 Ecological adaptation to climate change

96 __ 04.4 Caring for moor

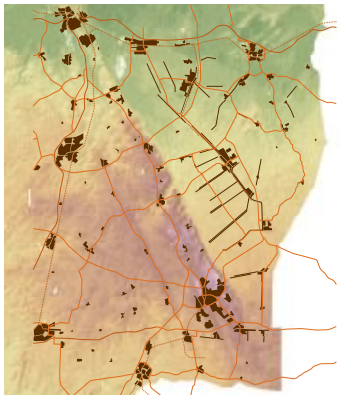
100 __ 04.5 Autarkic living

04.1 Groningen South

Towards equilibrium

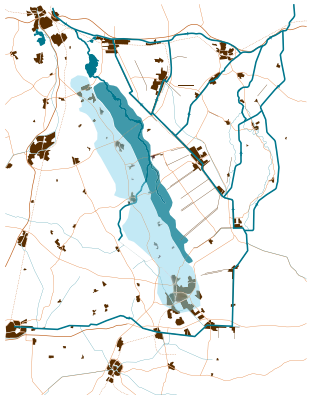


Situation



Height

High terrain
Low terrain



Watersystem

Infiltration area Seepage
area

[Above from left to right]
-Situation Groningen south
-Height map
-Analysis watersystem

Inventory

Situated in the south east of the Province, also involving the province of Drenthe till the edge of the Hondsrug (western border) and the peat park of Bargerveen (southern border).

Climate is changing, on worldwide, national and regional scale. One of the major problems in the Netherlands is the sea level rise but that's not the main problem in the study area.

In the southern part of Groningen and the north-eastern part of Drenthe the main problem is dealing with extremes. In autumn and wintertime the rainfall will increase and in summertime there will be increasing droughts.

This will have big influences on both agriculture and nature.
Being the highest area of Groningen, the area is bordered by the Hondsrug in the West and the higher creek area of Westerwolde in the East. In between lie the lower peat colonies.

Sandy high lying soils of the Hondsrug form the major infiltration zone within the area while seepage occurs mainly along the creeks Hunze and Ruiten Aa. The peat colonies are extensively drained through a network of canals and ditches. During droughts however, large quantities of water are pumped from the Ijsselmeer into the peat colonies to fulfil agricultural requirements.

Villages are scattered over the project area with lineair villages typically occurring in the peat colonies and the so-called 'esdorpen' on artificially elevated terrains alongside the creeks and higher terrains.
The forest areas of the Hondsrug and Westerwolde are keystone areas in the dutch Principal Ecological Network (EHS). The Hunze forms an important ecological corridor to connect these forests with a series of protected wet nature areas called the 'wet axis'.

Three main landscape types are distinguished in the area: 1. the enclosed forested area of the Hondsrug 2. the half-open creek landscapes of Hunze and Ruiten Aa; 3. the open landscape of the peat colonies.

Infrastructure

- Main roads
- Railways

Nature

- Forest
- Grassland and swamp
- Nature along arable land

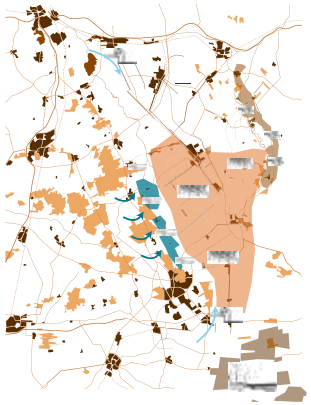
Landscape types

- Enclosed forest
- Open peat colonies
- Creek landscape

Problem analysis

Main problems relate to the hydrology: water surplus in winter and droughts during summer obstruct agricultural land use. Every year, millions of liters of water are pumped into the peat colonies to prevent prolonged drought. On the other hand, the seepage zone alongside the Hondsrug is often waterlogged and too wet for cultivation.

Chances are thus to be found in retention of local water, cultivation of energy crops and connecting existing nature areas through ecological corridors.



Problems

- Drought(Westerwolde)
- Drought(agriculture)
- Seepage
- Co2 loss

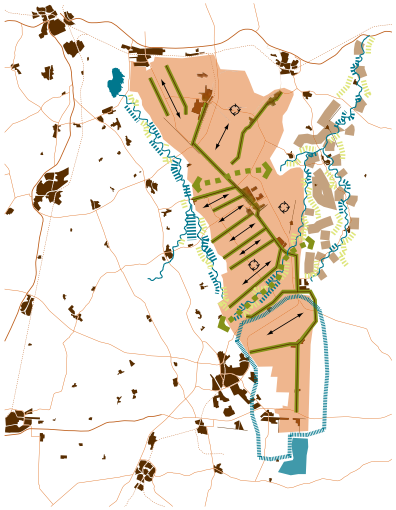
Chances

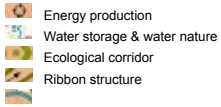
- Water storage
- Agriculture(potato)
- Agriculture(energy)

[Above from left to right]
-Analysis infrastructure
-Analysis nature
-Analysis landscape types

[Below from left to right]
-Problems
-Chances

04.1 Groningen South
Towards equilibrium





Concept

According to the analysis, the main problem of the area is found in peaks of droughts and precipitation. Opportunities can be found in sustainable energy production and nature development.

Towards equilibrium: about bringing down the peaks and at the same time creating opportunities for a better quality of nature, energy supplies and dwelling.

This way, the concept can be described by the following criteria:
-Reducing the negative impacts of precipitation surplus and droughts by storing water
-More room for nature: opportunities for forest and swamp, connecting to provincial and national robust structures
-Chances for sustainable energy in using rest products of nature and shifting of crops
-Creating an attractive environment for sustainable living and recreation, pointing out the different landscape types

Measures:
-Storing more water in the area of the peat colonies

Design principles

-Creating water basins around the peat park of Bargerveen in order to protect it and to store
-Re-meandering of the creeks storing more water from the peat colonies and creating opportunities for wet nature
-Bringing back the old creek in the peat colonies storing more water and a new ecological corridor from the Hondsrug to Westerwolde
-Restoring the tree structures of the peat colonies enhancing the lineair landscape type
Restoring and extending the tree structures of Westerwolde enhancing the half open atmosphere and creating new opportunities for nature

Water

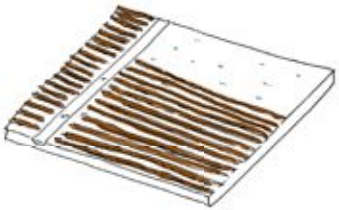
Remeandering of the creek

Stronger meandering of the creek

Meandering and extra creek basins

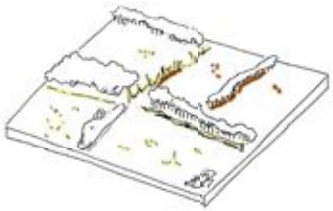
[Above from left to right]
-Concept:Towards equilibrium

Agriculture



Cultivation of potatoes

Smaller plots



More extensive agriculture

Nature

Agricultural wetlands

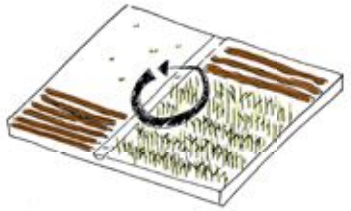
Wetlands: swamps

Increase of swamp area

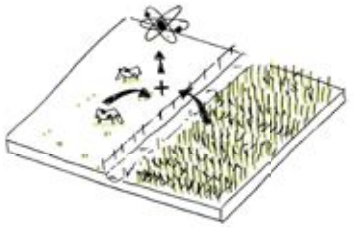
Dwelling

Living in the ‘esvillage’

Energy



Energy crop rotation



Biofermetation

Actual situation

-Water:remeandering the creek
-Agriculture:Cultivation of potatoes
-Nature:Agricultural wetlands
-Dwelling:Living in the esvillage

Near future(2030)

-Water:Stronger meandering of the creek
-Agriculture:Smaller plots
-Nature:Wetlands, swamps
-Energy: energy crop rotation

Far future(2100)

-Water:Meandering and extra creek basins
-Agriculture:More extensive agriculture
-Nature:Increase of swamp area
-Energy:Bio-fermentation

04.1 Groningen South
Towards equilibrium

Landscape implementation

The maps above show different landscape types in the area:
A. the transition zone to the Hondsrug (creek area)
B. the peat colonies
C. Westerwolde (creek area)

Each landscape type is then given in three time scales:
I. historical structure
II. recent structure
II. future structure, according to the concept

A. Creek area

I. Old system of meandering creek, ‘essen’ at the dryer areas at the Hondsrug

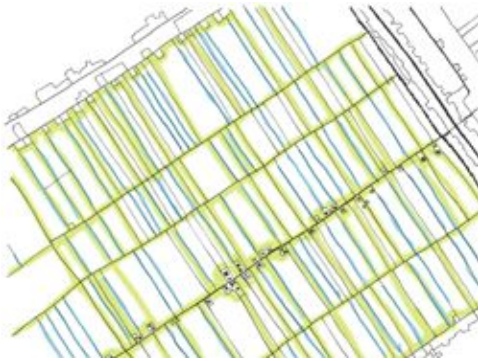
II. Larger plots alongside the canalized creek

III. Bringing back the old meanders for water storage and nature development

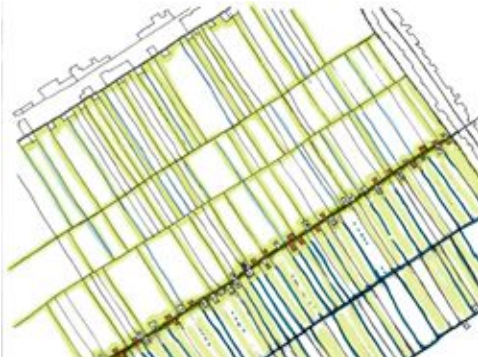
B. Peat areas

I. Agricultural system with small, even plots and lots of canals

II. Larger plots with crop (potatoes) production, some of the canals are stilled



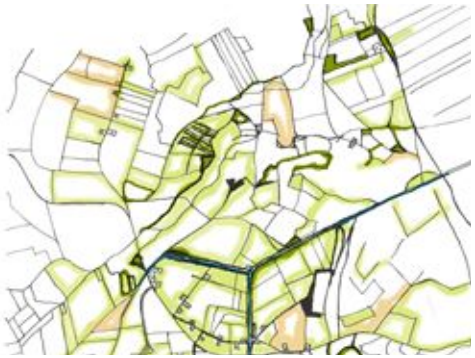
III. Raising the level of existing ditches and canals (in extreme conditions land use shifts from crops to grassland), restoring the tree structures and creating new opportunities for dwelling within the 'ribbons'



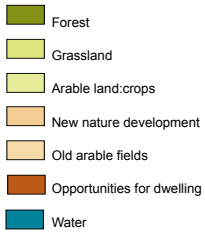
C. Westerwolde

I. Agriculture and forestry alongside the canalized river

II. Larger plots, less forestry



III. Adding more forest based on the structure of the old 'essen', creating new opportunities for dwelling and recreation



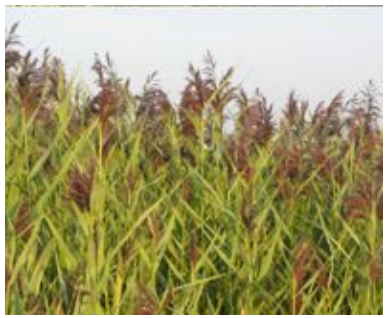
04.1 Groningen South
Towards equilibrium

Impressions










[Above from left to right]
-Higher water level in canals
-Extensive agriculture
-Recreational activities
-Impression dwelling

[Middle from left to right]
-Structural elements: dwelling
-Quality of living
-Energy from biomass
-Willow biomass

Final plan

North

- Remeandering the creeks
- Water nature(swamp) along the creek
- New forest area along the creek
- Existing nature
- Pointing out the ribbon structure
- Higher water level in the ditches
- Water basin in the peat colonies
- Restoring the structure of 'houtwallen'
- Preserving and extending the peat parcels

Anne-Margreet Niemeijer, Elise Quaedvlieg, Paul van Dijk, Milan Belicky

04.2 Ruiten AA

Milan Belicky

History

1850

1930

2004

Analysis

Analysis

Problems

Drought
Low diversity
Population decrease
Economical problems
Low connectedness

Opportunities

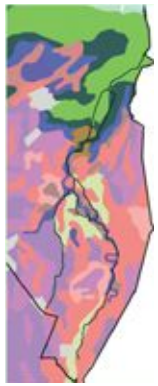
Slowing down water
Natural development
Development of tourism
Agricultural diversity
Traffic development

Overal

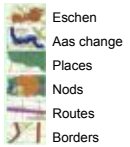
Height

Watersystem

Soils



Landuse



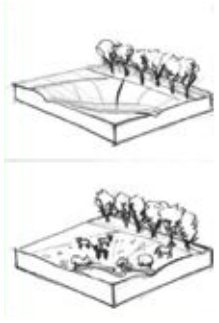
Concept in time

Water

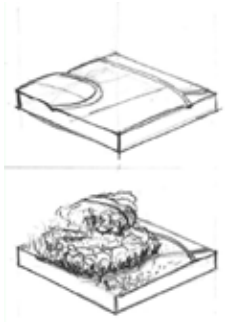
[Above from left to right]
-Historical context
-Problem analysis
-Impression

[Middle from left to right]
-Concept in time

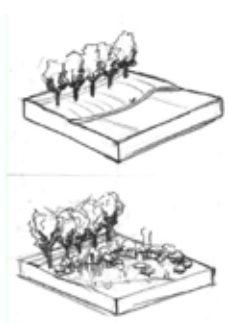
[Below from left to right]
-Analysis site, altitude, water, soil, landuse
-Concept water



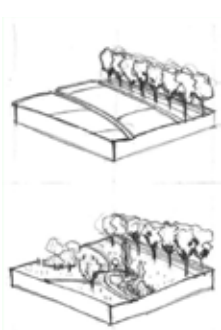
Agricultural development



Natural development



Wet corridor



Routing

[Above from left to right]
-Impressions area

[Middle from left to right]
-Concept in time

[Below from left to right]
-Concept Agriculture
-Concept Nature
-Concept Corridors
-Concept routing

04.2 Ruiten AA

Milan Belicky

Impressions

[Above from left to right]
-impressions

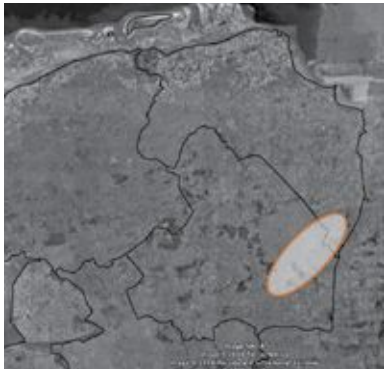
Final Design

[Above from left to right]
-Final design

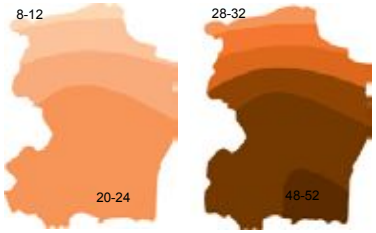
04.3 Ecological adaptation to climate change

Paul van Dijk

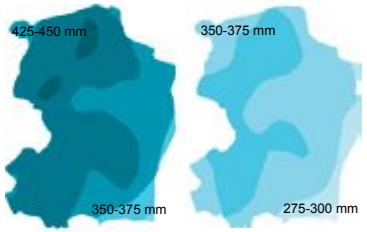
Climate change and ecology



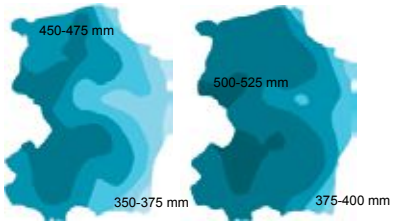
Study area



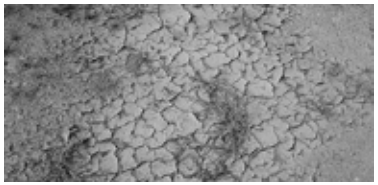
Img. 1-2 Number of summer days (temp. >= 25°C



Img. 3-4 Precipitation in summer



Img. 5-6 Precipitation in winter



Climate is changing on a worldwide scale. Due to the greenhouse effect temperatures are rising, the ice caps are melting and weather is changing.

The KNMI made different scenerio's which predict the effects of this climate changes for the Netherlands. Image 1 - 6 show the changes between the actual situations and the predictions for 2050. What is clearly visible is that the summer become hotter and dryer while the winters become much wetter.

The climate change influences our whole environment. A particular interesting relation is the relation between eco-logy and climate change.

Temperature rise and the decrease in precipitation in the summer causes drought in natural area's (photo 1&2) while the increase in precipitation in wintertime causes flooding (photo 3). These fluctuations cause problems for both flora and fauna.

Another ecological problem that is caused by climate change is the shift of habitat which is shown in image 7 - 9.

Image 7: The actual distribution of habitat.

Image 8: Due to the heating of the earth habitat is shifting to the North-East. Some habitat is lost but at the same time some potential habitat is gained.

Image 9: The main problem with the shifting of habitat is some of the potential gained habitat is not reachable for species. Due to this fragmentation species are not able to move 'with the habitat' which causes isolation or possible extinction.

To solve the problems of fragmentation it's important to connect habitat so that species can move 'with the habitat'. An extra advantage of connecting habitat is that a sustainable population can develop.

Image 7

Image 8

Image 9

[Above from left to right]
-Situation study area
-Number of summer days
-Precipitation in summer
-Precipitation in winter

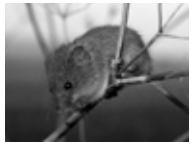
[Middle from left to right]
-Impressions climate change

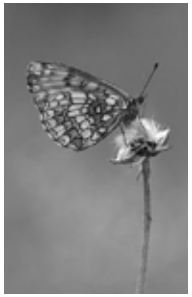
[Below from left to right]
-Ecological problems: Habitat distribution
-Shifting habitats
-Habitat fragmentation

Ecological connection

Hondsrug
Hunze
Westerwolde

Valtherdiep





[Above from left to right]
-Ecological core areas
-Valtherdiep
-Heath Fritillary
-Harvest Mouse
-Natterjack Toad
-Sooty Copper
-Great Crested Newt
-Root Vole

The area of Northern Drenthe and Southern Groningen consist of 3 main natural area's: The Hondrug, the Hunze and the Wes-terwolde.

The Hondrug is a mix of mainly decidious forest and agricultural land.
The Hunze is a wet area with a lot of seepage water from the Hondrug, which is transported by the Hunze creek.
Westerwolde is a combination of the Hondsrug and the Hunze, it consists of a mixture of forest, creek systems and extensive agriculture.

To adapt these area's to climate change they should be connected so that a strong habitat network can develop.
The connection between the 3 area's should consist of the nature types that can be found in the area's.

These different nature types are also dependent on the water and soil qualities. In this case we're talking about roughly 5 nature types:
-A creek systen
-Swamp area
-Wet grassland on sandy soils
-Flower rich grassland on sandy soils
-Developping forest

The design shows the ecological connection alongside the dug out Valtherdiep. It consists of different patches of the nature types which will develop due to slight differences in height.
There are 3 problem area's of particular interest which are explained in more detail, these area's are:
1: Source of the Valtherdiep
2: Corridor Musselkanaal
3: Corridor Mondeweg

There are different target species that go along with the different nature types. These target species are mostly habitat specialists or species with a small dispersal
capacity. So when the ecological connection is suitable for these target species it's also suitable for a lot of other species who are more habitat generalists or who have a greater dispersal capacity.

Some of the target species for the connection between the Hondrug, the Hunze and Westerwolde.

04.3 Ecological adaptation to climate change

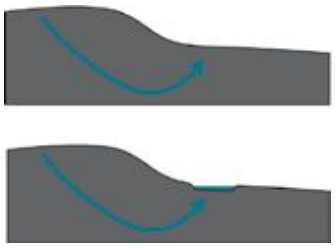
Paul van Dijk

The
Ecological connection

[Above from left to right]
-The ecological connection

Impressions

Source of the Valtherdiep



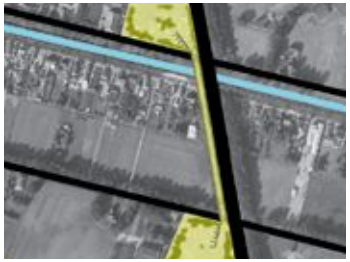
The Valtherdiep has to be fed with water, partly this is seepage water from the Hondrug . Water is infiltrating on top of the Hondsrug and comes out in a lower area.

The rest of the water comes from the higher agricultural area in the South with naturally flows towards the Valtherdiep. The village Musselkanaal is one of the bottlenecks in the ecological connection as this is a canalvillage where there are no gaps between buildings where a ecological connection can cross.

The way to solve this problem is an ecoduct next to an existing car bridge crossing the canalvillage

To protect the animals that are using the ecoduct there should be some bushes on both sides and tree stumps in between under which the animals can find shelter.
Adding some impermeable layers the ecoduct can also be used by amphibians in wetter periods.

Corridor Musselkanaal



The Mondeweg is another barrier in the ecological connection but it is less of a problem then the bottleneck at Musselkanaal. The road is mainly a problem for amphibians and water animals.

The problem is solved by bridging the Valtherdiep and leaving some space on both sides of the creek so that amphibians and terrestrial animals can cross the Mondeweg. Screens can be used to guide the animals toward the passage.

[Above from left to right]
-Impressions

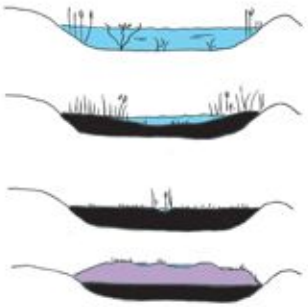
[Middle from left to right]
-Water infiltration on Hondsrug
-Plan view Hondsrug inflitration
-Ecoduct

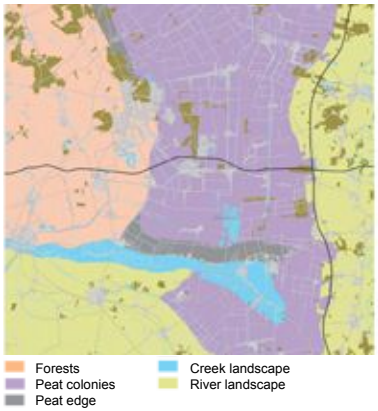
[Below from left to right]

04.4 Caring for moor

Anne-Margreet Niemeijer

History of the moor peat





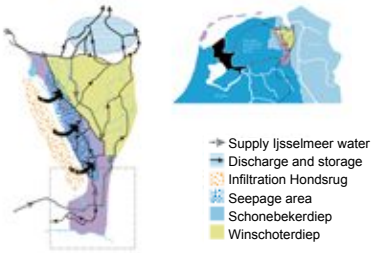
HISTORY OF THE MOOR PEAT
In the south east corner of the province of Drenthe, the Netherlands, and in the regions Emsland and Grafschaft Bentheim, Germany, lies a special area. Here you can find different landscapetypes, quietly, without a lot of trafic, with wide views and agricultural land with villages scattered over the area. But the most special area lies right next to the German border: nature reserve Bargerveen. International of great importance and the largest living moor peat of the Netherlands.

PRESENT SITUATION
Nowadays a lot of water is coming to Drenthe and Groningen from outside the area, from the IJsselmeer. Because of the higher lying Drenthe Plateau the water infiltrates here and comes up again at the lower area, into the Peatcolonies. Not in all parts in the south east of Drenthe water is coming from outside. There are some areas that has enough water in it's own local system. Bargerveen is one of them.

EFFECTS OF CLIMATE CHANGES
Peat, but especially moor peat, is depending on water. The area is now provided with 700-750 mm of rainwater each year (and with an evaporation figure of 510-525 mm each year). This goes up with 4-14% in 2050. This rainwater can be very useful for this kind of peat nature, since it must be fed by rainwater only. Only rainwater can feed the poor and acid nature. Keeping the water on a certain water level is very important. The moor peat can only survive if the fluctuation is between 10 - 20 cm. But when heavier rainfalls, wet winters and dry summers come, the peat is in danger. With the increase of drought, agriculture will have a problem too. The need for water and the dry soil will increase the seepage from the Bargerveen again. The surplus of water must be preserved, both for nature and agriculture, in the winter so that is can be used in the dryer summers. This can be done by extra basins and heightening the waterlevel in the ditches of the peatcolonies.

Connections
Bargerveen is the living area of a lot of rare species (see pictures at the left). The area is so special and unique that several laws and guidelines try to preserve the nature as much as possible. Preserving nature and for an international network the different nature areas must be connected with each other. The moor peat area must be enlarged. The chances of survival and suitable habitat will increase, water can be stored at the same time and the unique area can become an attractive place to be for an European. With the enlarging of the peat area a lot of CO_2 can be stored. One ha. of moor peat, 3 meters deep, can store the same amount of CO_2 as a Dutch forrest of app. 43 ha. Restoring and remeandering the creeks (the Runde in the north), wet nature can be connected all the way up to the Dollard in Groningen. And creating stepping stones from the forrest of Twente and Germany connected to the Hondsrug in the north. All measure can fit and strenghten (with)in the current landscape type, creating also an attracitve landscape for recreation.

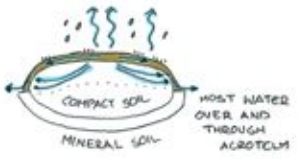
[Above from left to right]
-History map
-Diversity of the landscape

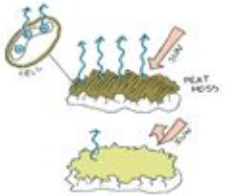


Watersystem

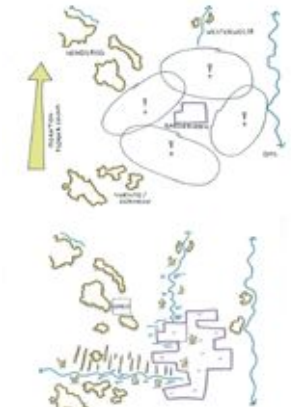
Concept

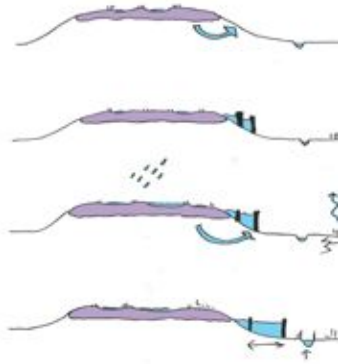
Natural system





Peat and the effect of drought





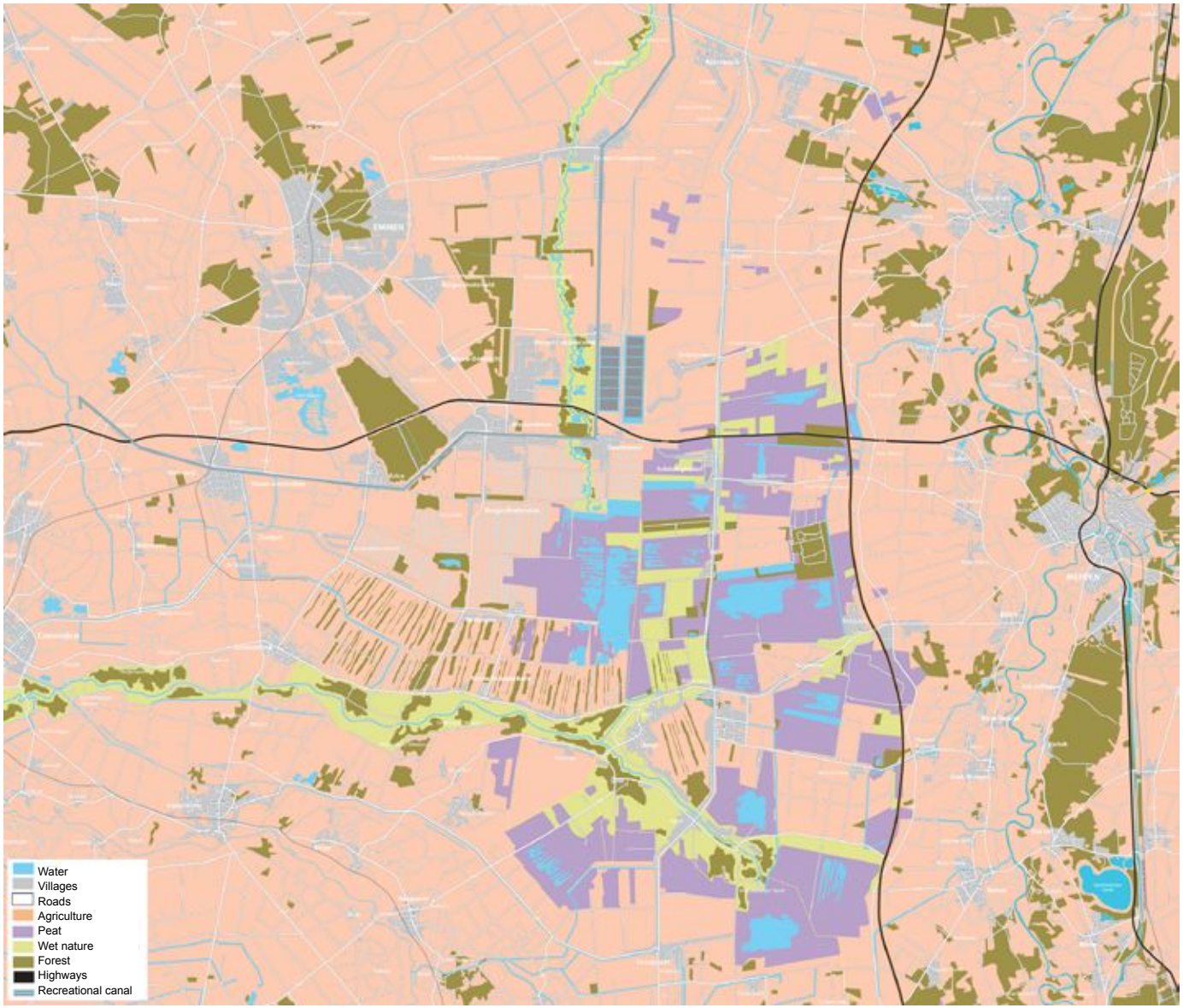
[Above from left to right]
-Impressions

[Middle from left to right]
-Water system
-Concept
-Natural system

[Below from left to right]
-Proces of peat
-The effect of drought on peat

04.4 Caring for moor

Anne-Margreet Niemeijer



[Above from left to right]
-Final plan

Glass house area: water storage, working and recreation

Moor peat nature area: nature and recreation

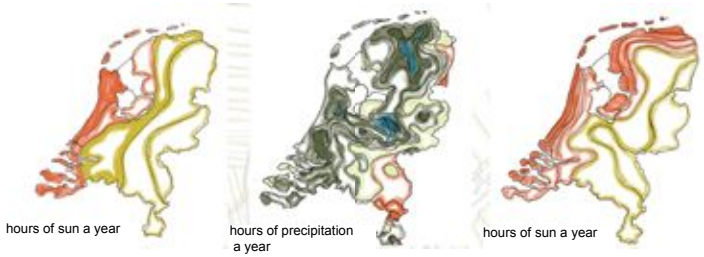
Waterbasins: waterstorage, nature preservation and recreation

The crossections to the right show how a tourist can experience the divers landscape where he is coming through: -Hondsrug
-Villages
-Glass house area with wet nature
-Runde valley
-Agricultural land

[Above from left to right]
-Impressions

04.5 Autarkic living

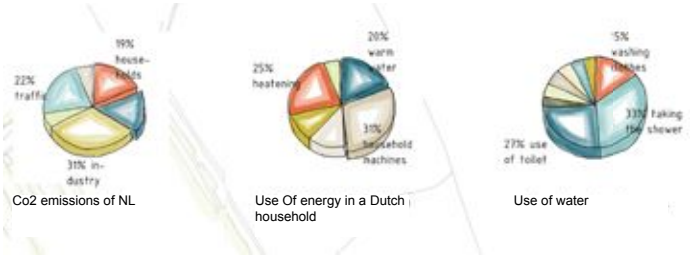
Elise Quaedvlieg



hours of sun a year

hours of precipitation a year

hours of sun a year

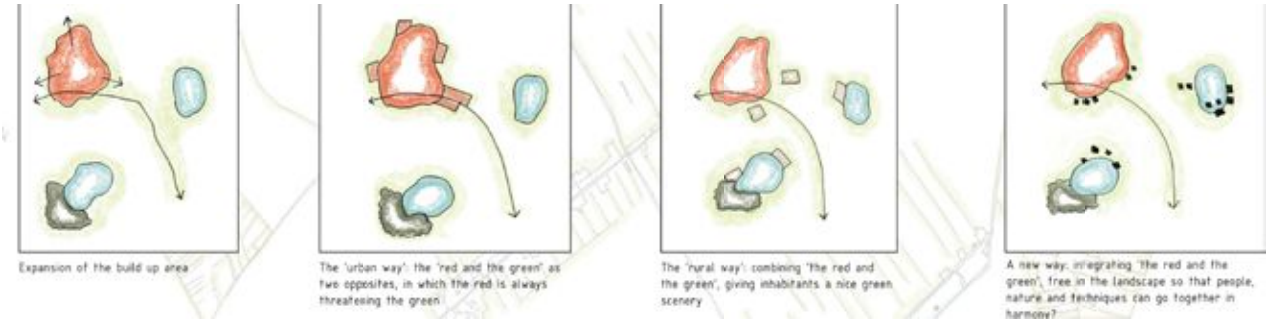


Co2 emissions of NL

Use Of energy in a Dutch household

Use of water

Concept ideas



Expansion of the build up area

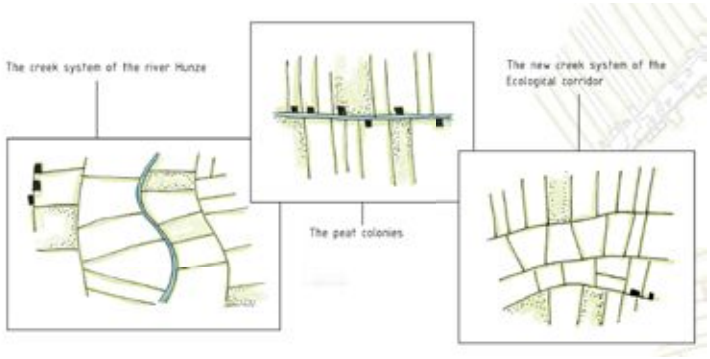
The 'urban way': the 'red and the green' as two opposites, in which the red is always threatening the green

The 'rural way': combining 'the red and the green', giving inhabitants a nice green scenery

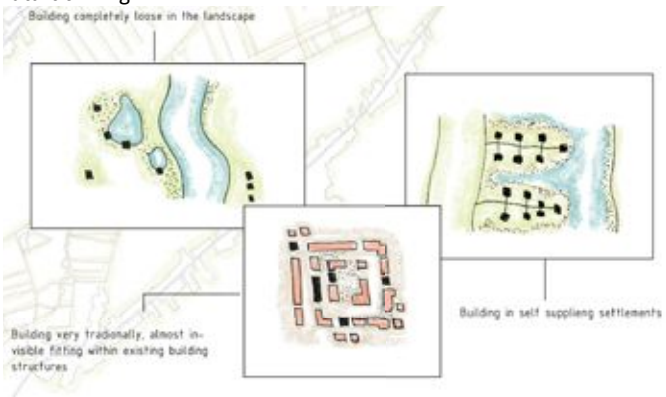
A new way: integrating 'the red and the green', free in the landscape so that people, nature and techniques can go together in harmony?

[Above from left to right]
-Concept ideas

Landscape types

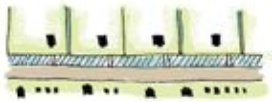


Autartic living



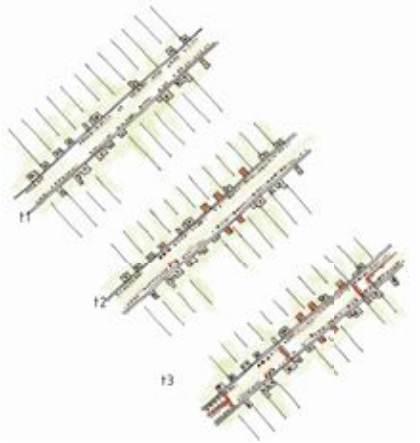
1.

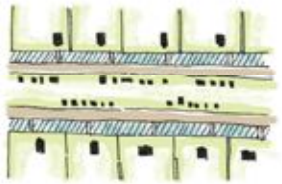
System of a 'Achterdiep', like the city of Stadskanaal



2.

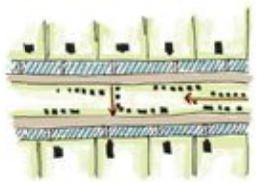
Single canal system: large plots on the north (the other way round also appears: having the large plots on the south)





3. a

Double canal system



3. b

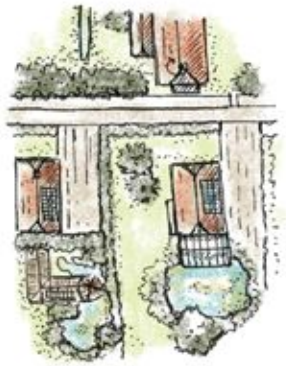
Extending of houses in the double canal system

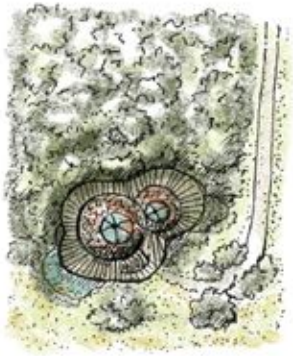
Extending of houses in the single canal system

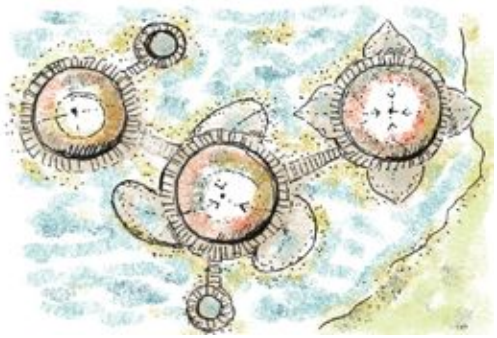
04.5 Autarkic living

Elise Quaedvlieg

[Above from left to right]
-Design plan







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-Impressions Autarkic living