planning by surprise

designing for climate adaptation

planning the unthinkable

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VAN HALL LARENSTEIN

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DESIGNING FOR CLIMATE ADAPTATION

PLANNING FOR THE UNTHINKABLE

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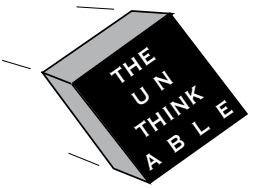
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INTRODUCTION

Designing for climate resilience

Climate change will make the Netherlands wetter. More rain, more meltwater in rivers and rising sea levels will all lead to a greater risk of flooding. This means that climate change is becoming an intrinsic element in water management, coastal defences, urban development and nature conservation. All designs for urban or area development will have to allow for the possible consequences of a warmer planet — in other words, they will have to be climate-resilient, to use a fashionable term.

That is why the Van Hall Larenstein University of Applied Sciences is teaching future professionals in the field of landscape architecture about the latest insights and options in designing for climate resilience.

Climate change is a key study topic in teaching and research within the 'Green Living Environment of Cities' lectureship. As part of this, students studying Garden and Landscape Architecture do concrete projects and take part in national and international workshops. The students share their findings with local councillors, government officials and other interested parties and stakeholders. In this way, the students are contributing in the search for solutions to a very important social problem. At the same time students learn to think about current topics in their discipline. What is more, the know-how acquired in this way feeds back into the teaching process so that other students can build further on that.

The question of how to design climate-resilient landscapes plays a major role in the European projects in which the green university has been involved, such as Future Cities *(www.future-cities.eu)* and F:ACTS! *(www.factsproject.eu)*. These are projects in which various European organizations, government authorities and universities have joined forces to find an answer to climate-related issues. Van Hall Larenstein also collaborates with Almere, a relatively new Dutch municipality that is changing rapidly and that prioritizes climate resilience in its development. Over the years there has been a clear development in climate-adaptive planning, both in education and in practice.

Surprising planning process

Strategic planning, with different scenarios for different situations and outcomes, is increasingly being used as a means of dealing with the growing uncertainty in spatial planning. This means that the whole planning process is becoming more and more complex. Spatial planners can assume they will have to cope with uncertainty and with an opaque or even chaotic situation at some stages of the process.

As a result the outcome of the planning process can be very surprising, even for the professionals involved.

The thinking about adapting to climate change and area development has evolved in distinct phases. The first chapter in this booklet considers the consequences of climate change, the approaches to adapting areas to cope with this and the implications for planning aimed at developing highly urbanized areas.

The second chapter looks at traditional planning, which focuses on technical and local solutions. This is illustrated by the proposals students made for the Arnhem-Nijmegen urban region in the Netherlands as part of the *Future Cities* EU project. The proposals were aimed at protecting the region from flooding and making it climate-resilient.

The third chapter shows a new development in education, in which themes such as water and sustainability become the guiding principles in the design process. The various student projects in Almere in the context of the *F:ACTS!* EU project are a good example of that.

This also leads nicely into Chapter 4, which covers integrated designs and the *Cradle to Cradle* principle in which sustainability becomes an integral part of the design process. It also shows how adaptive measures can be embedded in a broader regional strategy in which other developments and interests play a part. This way of working is demonstrated with examples taken from the *F:ACTS!* EU project, including an international student workshop.

Chapter 5, the final chapter, goes one step further in considering the increasing levels of uncertainty facing planners and designers. Both climate change and the economic crisis necessitate flexible planning methods. What is more, carefully designed plans for area development can be completely invalidated by a disaster or extreme event. How can you plan for the unthinkable?

1 CLIMATE, PLANNING AND COMPLEXITY

Climate change and spatial planning

The climate is changing and that has major consequences for the landscape. It is still far from clear how fast and how far these changes will go, but even conservative estimates predict an average rise in global temperatures of two degrees Celsius over the next hundred years. In the worst-case scenario, the earth will be six degrees warmer by 2100, a disaster for humans and nature.

ONe thing is certain: climate change will have a radical impact on the planet's appearance. Even if temperatures only rise by one or two degrees, vast areas - including Southern Europe - will experience less rainfall and longer, more persistent heatwaves. The Netherlands on the other hand will have milder winters and more rain. This means climate change is becoming an intrinsic element in water management, coastal defences, urban development, residential building, recreation and nature development.

In 2010, climate change was explicitly allowed for in more than one hundred investments in the field of spatial planning and residential construction. This finding is the result of a study by the Dutch foundation Knowledge for Climate. According to the Wageningen climate expert Pier Vellinga, a professor at Wageningen University and the VU University Amsterdam, there is a need to use "broader horizons in terms of time and space" when deciding on the layout of our living environment. "This demands considerable creativity and commitment from

stakeholders," argues Vellinga in his book *Hoezo klimaatverandering. Feiten, fabels en open vragen [Climate change - oh, really? Facts, fables and unresolved questions]*. He says that this often leads to innovative solutions.

Moderation and adaptation

It is too late to reverse the process of climate change, but we can try to put the brakes on that process. The jargon word for combating or moderating the effects of climate change is mitigation. Various measures are available for curbing climate change, such as the use of green energy rather than fossil fuels. For example, the integration of wind turbines and solar panels in the landscape and housing is really starting to take off.

Another example of mitigation is the storage of carbon dioxide (CO2) in former gas fields and other underground structures. That is because the release of greenhouse gases such as carbon dioxide and methane into the atmosphere is accelerating the global warming process. Capturing these gases and reducing emissions can therefore slow down climate change. Another method is planting or replanting forests, with the trees and bushes providing oxygen and storing carbon. Businesses often pay for trees to be planted as a means of compensating for the CO2 emissions caused by their activities. Private individuals who travel by plane can also pay extra to have trees planted.

But even if we do manage to reduce global warming, we will still have to face the effects of climate change. People in the Netherlands will have to tackle both rising sea levels, due to

polar ice and Alpine glaciers melting, and more rain. Solutions need to be available in good time, such as higher dykes and more flood areas or buffer zones that can be flooded if necessary. Other countries will have less water and so will need to use water and store rainwater more efficiently. Some parts of Southern Europe will need to keep flooding in check and deal with forest fires in the summer. Cities will become warmer everywhere; cities form what is known as heat islands. That effect can be counteracted by having more water and greenery in the city. Such measures are aimed at coping with the effects of climate change. The jargon term for dealing with, or adapting to, the effects of climate change is adaptation.

Complex processes

There are many important aspects to take into account in the layout of public space. On the one hand there is the landscape, the characteristics of the soil, water and nature and the ecological cohesion. On the other hand there are human activities in the area, such as home life, work and recreation and all the associated economic and social aspects. Furthermore, since the 1970s, stakeholders have been given a role in the planning process in the Netherlands, which means that communication and public debate are now also part of that process. The consequence is that the outcome of such planning processes is no longer as clearly defined as in the past - on the contrary.
Strategic planning, with different scenarios for different situations and outcomes, is increasingly being used as a means of dealing with the growing uncertainty in spatial planning. Thus

the whole planning process is becoming more and more complex. Spatial planners can assume that they will have to cope with uncertainty and with an opaque or even chaotic situation at some stages of the process.

As a result the outcome of the planning process can be very surprising, even for the professionals involved. But taking account of the impact of climate change makes what was already a very complex and at times confused planning process even more difficult.

2 THE FIRST GENERATION OF PLANNING

Local solutions

The traditional approach to area development involves a local analysis of the problem, resulting in a plan of action followed by implementation. It is largely municipalities and other local authorities that take measures aimed at adaptation to climate change. Often this is to avert a potential danger such as the risk of flooding. Fortunately, awareness is gradually growing that climate adaptation needs to be placed in a much broader context in the long term, one that takes account of human activities and their impact on the environment. Up to now, though, the practice has often been to work on purely technical, local solutions.

In education too, climate change was initially viewed from a location-specific and technical perspective. In 2009, third-year Landscape Architecture students at Van Hall Larenstein studied the rivers in the Arnhem-Nijmegen urban region as part of the *Future Cities* European project (*www.future-cities.eu*). They came up with design proposals for dealing with floods. Global warming is causing more meltwater to enter the rivers from the mountains. Soon, rivers such as the Rhine, the Waal and the IJssel will no longer be able to transport all that water and will start to burst their banks. That is why there is a need for overflow and water storage facilities. The Dutch Directorate-General for Public Works and Water Management has been working on this issue for years throughout the Netherlands under the slogan *'Room for rivers'*.

The Rhine, for example, will need to be able to handle a peak flow of 2,000 cubic metres more water per second by the year 2100 than it does now. At present, up to 16,000 cubic metres of water pass through the Rhine every second but by the year 2100 we will need to allow for a maximum of 18,000 cubic metres per second.

Room for river water

The students analysed the area the rivers flow through, drew up a master plan for the area and worked out the details for subareas on a smaller scale. They had to make sure that infrastructure that is important to the economy, such as motorways and railways, remained dry.

One of the solutions they came up with was to increase the size of the River Linge in the Betuwe, the region between the Rhine and Waal rivers, as a way of relieving the major rivers. Another outcome was to designate the area around the Linge as an overflow area. There was also a plan to split the Betuwe up into compartments. Then if there is danger of flooding, you can let one or more of the compartments fill up with water.

The final proposal was called '*Beyond the dyke*'. It involved renovating and raising the dykes around Beuningen, on the River Waal to the west of Nijmegen. That would not just give room for river overflows in the flood plains and additional subsidiary channels to be built, it would also enable parts of the area on the landward side of the dyke to be flooded. It would also be possible to flood farmland in low-lying basins in a controlled fashion. The farm buildings themselves would have to be on

raised artificial mounds, and other housing would have to be on higher banks.

Mitigating measures

There was also a group working on mitigation, or the tempering of climate change, in the *City Vegetables* project. Supervised by researcher Vincent Kuipers from Alterra, the science institute for the green living environment, the students investigated the options for local organic food production. The idea behind this was that producing food close to home rather than having to transport it great distances would bring major benefits in terms of a reduction in the emissions of greenhouse gases.

What is more, city farming can be incorporated on a wider regional scale in multifunctional agriculture in which there is also consideration for aspects such as ecology, recreation or healthcare. This also makes the surrounding countryside a more attractive living environment for the city.

Another theme was the creation of a so-called 'energy landscape'. Students came up with designs for an energy-neutral landscape based on what is known as the *energy triad*: energy requirements are reduced, energy is generated locally and in a sustainable fashion wherever possible, and the use of fossil fuels is minimized. It is notable that these energy landscapes did not end up full of solar panels, wind turbines and fields of rapeseed. That was because measures such as heat & cold storage and the integration of solar cells in housing architecture enabled small-scale, decentralized energy generation.

The climate and cities

In 2010, Garden and Landscape Architecture students worked on another theme for the *Future Cities* project, namely the urban heat island effect. The temperature in cities can be up to eight degrees Celsius warmer than the surrounding countryside due to the buildings, the asphalt, traffic, economic activity and air pollution. One problem is that the heat cannot escape at night because of the compact urban structure. This effect will only increase once the summers become warmer and the number of heatwaves rises because of global warming. Heat scans in Arnhem and Nijmegen show that the city centre, shopping centres and business parks are particularly prone to this problem while districts with plenty of greenery and water are cooler.

In the long term, town planning will need to look at structural changes to deal with the urban heat effect. Buildings will need to be lighter in colour, making more use of heat-resistant materials. Greenery on roofs and walls will help to insulate buildings and keep them cool in the summer. In general, more trees, plants and water keep cities cooler. The students also proposed using the cooling winds from the Veluwe nature area to the north-west of Arnhem by constructing ventilation corridors, open avenues and areas that give the winds access to the city.

3 PRIORITY: WATER AND SUSTAINABILITY

Strategies produced by the EU project F:ACTS!

Up until 2011, the approach to landscape in education was dominated by themes such as water, city farming and energy. In 2011 there was a change in how an area was considered. In that year, the third-year Landscape Architecture students were given the task of thinking up a design for the Dutch municipality of Almere.

Almere and Van Hall Larenstein are both participants in the *F:ACTS! (Forms for Adapting Climate change through Territorial Strategies)* project. This interregional EU project focuses on areas with an increased risk of water shortages, salination, forest fires due to drought or floods due to heavy rainfall as a result of changes in the weather associated with climate change (see *www.factsproject.eu*). Fourteen organizations in eight countries are involved in *F:ACTS!* They come up with solutions by exchanging expertise and experiences, for example through coaching visits. Van Hall Larenstein is one of the partners, through the university's Green Living Environment of Cities lectureship. Dienst Landelijk Gebied (DLG, the Dutch government service for land and water use), Vlaamse Landmaatschappij (a similar agency for Flanders in Belgium) and the University of Santiago de Compostela in Spain are also involved, as are various ministries, regional authorities and municipalities such as Varna in Bulgaria and Almere. Through *F:ACTS!*, the teaching staff at Van Hall Larenstein are also actively involved in the issues facing the municipality of Almere.

Rural city district

There was nothing there when the town of Almere was founded in 1976 in the area of reclaimed land known as the Flevopolder. But in a matter of decades Almere has grown to become a town with 190,000 inhabitants. The municipality wants to continue expanding and plans to build another 60,000 houses by 2030. Most of the growth is on the west side of the town, towards Amsterdam. That part is becoming very built-up and acquiring a highly urbanized character. But there are also plans to build another 15,000 homes on the east side of the municipality, in the Almere Oosterwold district. The idea is that this new district will have a spacious layout with a more rural character, a wide variety of options for living and working plus city agriculture. Adjoining this district will be the robust ecological corridor of Oostvaarderswold, which will soon be connecting the two nature areas of Oostvaardersplassen and Horsterwold as part of the Ecological Main Structure, a network of ecologically significant areas in the Netherlands.
The students thought up plans for the layout of the residential district, for the layout of the ecological corridor and for sustainable development of the area. Their designs had to fit in with what the municipality calls the Almere Principles. Growth must be organic and take place in phases, and there must be room for changes, innovation, private initiatives and community organization. Development of the area must be sustainable and climate-resilient, linking the urban areas to nature.

Sustainability analysis in layers

The project kicked off with the students spending three days in Almere to get to know the area. Government officials and others talked about the plans and ideas for Oosterwold and the students visited the site of the future district and ecological corridor.

Then they started on an analysis of the area using the *layer approach*. This approach sees the spatial structures in cities and landscapes as being composed of three layers. The first layer is the layer underground containing the water, soil and creatures living there. Climate change and soil subsidence often have far-reaching effects on the underground layer, which is marked by long-term processes. The second layer, the network layer, consists of the physical infrastructure, the totality of roads, railways, waterways, flight routes, sewers, underground piping and invisible connections for IT, telecommunications and image traffic. This layer is a major determining factor in the geographical and spatial-economic structure of the landscape. The third layer is the occupation layer. This is about how humans use the underground layer and the networks, and how that is organized, covering such aspects as land use, planting vegetation and division of the land into plots.

Functions such as home life, work, recreation and nature are influenced and determined by all three layers. It is crucial for sustainable spatial development that the interaction between the layers works as it should and the characteristics and functions of the different layers support each other.

Water as a guiding principle

It soon became clear during the analysis process that water would not simply be one of many themes in the design - it would be the guiding principle. It was soon evident that agriculture, recreation, nature development and residential building on reclaimed land all depend on the water management. The soil on the east side of Almere is settling further and further, which makes conventional residential building impossible there. So a group of part-time students suggested in their well thought out plan *'Almere 2.0'* that the new homes would have to be built on the edge of the area while at the same time the groundwater level would have to be raised to prevent further soil subsidence.

In the past the motto was *"The water level depends on the function"*. If a farmer grew potatoes, the groundwater level was adjusted to the best level for the purpose of his harvest. Over the past 10 to 15 years the opposite idea - *"The function depends on the water level"* - has taken hold. That will increasingly need to be the assumption in the future for areas susceptible to soil subsidence such as reclaimed land and areas of marshland fields. Almere Oosterwold should also be developed in accordance with the philosophy that the function depends on the water level.

Almere 2.0

The basis for the student design Almere 2.0 is a sustainable water system in which water is captured, purified and recycled. The students want to store the water during wet seasons

in storage basins in the landscape. They also want to combine water with residential housing and greenery, producing four different residential environments.

For instance, there is a wadi district on the higher-lying land in which rain water is carried off in shallow gullies, or wadis. There is also something similar to the traditional Dutch terps or artificial mounds - low-density housing on raised islands in the open water of a water storage basin. The same principle applies for the urban residential area, surrounded by open water and dissected by canals.

Finally there is an eco-district in a wet, marshy, low-lying section where the water management of the homes and wider area are connected by such means as rainwater capture and water filtering.

The students also worked out the details of a design for the ecological corridor, paying considerable attention to water management, the options for crop production, nature targets, recreation and financial aspects. By making optimum use of ecosystem services and by combining different types of nature and crop production, they were able to guarantee a high degree of biodiversity as well as obtaining a natural area that generated money.

In the end, the overall Almere 2.0 design for the Oosterwold district and Oostvaarderswold was so ‘robust in terms of water’ that it was also able to cope with the effects of climate change such as more rainfall or warmer, drier periods.

Nature area, hi-tech and wellness

Another group of students worked out a specific plan — 'Rich Nature' — for the ecological corridor and the adjacent nature area. The area around the *OerEem* in the Oostvaarderswold, which connects up the natural areas of Horsterwold and the Oostvaardersplassen nature reserve, occupied a key place in their design. There are channels under the ground through which the former River Eem used to flow; the soil composition is different to the rest of the area.

The students want to develop functional nature in this *OerEem* zone by creating reed marshland for water purification, a channelled stream that captures water and water buffers to prevent flooding. There is room in this zone for water-resilient housing and the so-called *EcologyDelta*, a hi-tech campus for companies that specialize in the sustainable knowledge economy. In addition, part of the area is adapted for use for city farming and multifunctional farming such as care farms. Another aspect is that urban growth must incorporate the use of renewable energy sources. The design also includes a solar panel 'forest' in the *OerEem* zone and an increase in the number of wind turbines.

Furthermore, the students see opportunities for '*eco wellness*' and recreation as a means of obtaining funds for new nature in the whole planning area. On the one hand a large wellness resort is envisaged with hotels, a cinema, a theatre, restaurants and cafés and other commercial functions, designed to attract both Dutch and international tourists. On the other hand the students want to build '*eco lodges*' for real nature

lovers in the new wooded area that they want to create in the higher lying south-eastern part of the *OerEem* zone. According to the students, if the area can be made financially viable this will increase the chance that people will continue to be able to enjoy the nature in the future.

4 INTEGRATED DESIGNS

Cradle to Cradle designs

Water was not the only guiding principle for the student designs for Almere. The approach to studying an area and coming up with plans for the layout evolved over the course of time. Initially, when climate change was first taken into account in projects, for example for *Future Cities*, areas were considered from the perspective of different themes more or less in parallel, such as water, city farming, energy, vegetation and infrastructure. But the Almere project showed the enormous importance of water management for all other functions and human activities. It gradually became clear that the different themes were interrelated and interacted with each other. This close interrelationship is illustrated by the cycles for water, food, energy, waste and transport, for example.

The next step is to have closed cycles within a particular area wherever possible in order to foster and increase sustainability. This is in line with the *Cradle to Cradle* philosophy. The founders of this philosophy, the German physicist Michael Braungart and the American architect William McDonough, take the product cycles as their starting point and want raw materials to be recycled. On the one hand they assume an ecological cycle of biodegradable products and on the other a technological cycle of products that can be disassembled.

Vincent Kuipers from Alterra, the Dutch science institute for the green living environment, and the DLG have jointly come up with an interpretation of the *Cradle to Cradle* philosophy

for area development. Apart from area development, this approach is primarily geared to regional closed production cycles such as closed water systems, sustainable energy systems and waste management. The layer approach used in area development can help distinguish between slow and rapid processes. Interventions have more of an impact in the long term in a layer with slow processes, such as the underground layer. A student proposal for *Cradle to Cradle* area development for the Oosterwold district in Almere lists the design principles for a landscape based on this outlook:

1. Design clean closed cycles in time and space.
2. Create added value for people, planet, profit and collaboration.
3. The area development process has a strategic component and an operational component, which can reinforce each other.
4. Make use of existing capital in terms of landscape and people.
5. See area development as sustainable evolution without beginning or end.

The overall picture

Aspects such as water, energy, waste and transport all have priority in sustainable, climate-resilient landscape designs, which makes the task for landscape designers themselves much more complex. From the *Cradle to Cradle* viewpoint, you can get to grips with an area by dividing it up into different scales, from a house to a street, district, town, then adding the

surrounding countryside and finally the region. The various aspects such as water, energy, waste and transport are then considered on those different scales. That makes it easier to see the interactions. For example, water can mean a pond in the garden at the scale of a house or a river or large lake at the regional scale. But you can also use water to cool down a building or an entire city.

However, it became clear during the project that another essential aspect was missing from the usual model: Van Hall Larenstein added food to the list. If you consider food at the regional level, for instance, you end up with city farming.

Looking at a landscape from the *Cradle to Cradle* perspective gives an increasingly clear picture of the interrelationships between the aspects that go to make up that landscape. Landscape architects have to be able to design across the different layers and scales, as it were. The approach highlights not just different geographical scales but also different timescales, from the distant past when the landscape was formed to the distant future up to which interventions in the landscape can have effect. Future designers will also have to learn how to take social and community wishes, rapid and gradual developments and the consequences of their interventions into consideration.

Out of the box

Ten years ago, if students had an assignment in which they had to look at the ecological links between the Veluwe nature re-

serve and the River IJssel, for example, they would have had to concentrate on analysing the landscape. Now they have to put forward a proposal for the development of an area in which 15,000 people will be living, for whom facilities have to be provided, and in which new nature needs to be developed and to be profitable too. After all, there is less and less money available for nature from the government. What is more, the students need to allow for more extreme weather conditions. A more integrated approach is being adopted in education. This development is partly in response to the issues arising from climate change.

The students challenged various taboos in their proposals. For instance, they said an ecological corridor could also be used for storing water, and they championed the growing of crops and food production through city farming. One unusual idea came from a Belgian student, who used to hunt at home. He proposed shooting the excess numbers of deer and selling the meat as a way of generating a product from the corridor and making it profitable. His plan met with considerable resistance amongst his fellow students, a good indication of the public debate about animal welfare that would erupt if this plan were actually to be implemented.

The clients, the municipality of Almere, received the students' reports with enthusiasm. The proposals for the development of Oosterwold and the adjacent ecological corridor were creative and often showed a fresh or even controversial take on things. The clients got an alternative viewpoint and could see

the results of the students' out-of-the-box thinking. Although many of the plans will turn out not to be applicable or feasible in practice, the ideas help local government officials and politicians and others involved to be aware of the options and opportunities beyond their usual routines and frame of reference.

Best practices

Traditionally, planning focused on looking for technical, local solutions. The next step was to link climate adaptation to other important regional issues. That can be seen clearly in the students' work for Almere. After all, the developments in practice are directly reflected in teaching.

Spatial planning is no longer just used to solve problems arising from the consequences of climate change. Other strategic priorities, such as economic development, nature conservation, food issues and public safety, can also be incorporated in climate-resilient area development. This approach to working has been applied in the European project *F:ACTS!*

There is a great deal of knowledge in academic circles about climate adaptation, but there is a divide between the academic world and practice. In 2010 through to 2012, the participants in *F:ACTS!* studied how best to convert that knowledge into concrete measures in the form of best practices in area development. Now around 20 best practices have been developed and studied. A viewpoint document has been drawn up for each country stating what has been learned.

The benefit of *F:ACTS!* lies in the incorporation of scientific

knowledge in policy. A telling example is the municipality of Varna in Bulgaria. Varna is in a bay surrounded by steep hills. It has problems with heavy rainfall and flooding due to the lack of a good drainage system. Furthermore, six local municipalities want to develop and promote the area as a seaside resort. But at present a cloudburst means that tourists risk swimming afterwards amid the sewage from the overflowing sewers. Measures need to be taken to guarantee the quality of the bathing water and prevent risks to health. Telling municipalities there is a climate problem that needs to be tackled with expensive measures does not work. But in the case of Varna that problem is linked to the wider strategic vision for the region — in this case tourism — and the interests of several municipalities. Now, the necessary measures have become an essential element in Varna's town planning.

Besides Varna, the EU project has four other pilots in areas that are facing the consequences of climate change: Galicia in Spain, Limburg in Belgium, Aveiro in Portugal and the Greek nature area Strofylia. The solutions that have been conceived for these areas could also be implemented in other areas of Europe with similar problems.

Student workshops

One of the best practices is to get the education system involved in area development and climate adaptation. On the one hand students often come up with innovative ideas, on the other it is good to have the acquired knowledge feeding back into education. Collaboration with students from other coun-

tries and other disciplines is also a key feature of the exchange. Accordingly, the University of Santiago de Compostela and Van Hall Larenstein have organized four student workshops under the *F:ACTS!* banner: two in Portugal's Fuga delta, one in De Wijers in Belgium and one in Strofylia in Greece.

Van Hall Larenstein has been experimenting with interdisciplinary workshops lasting several days, known as charettes, since back in 2008. In these workshops students taking different subjects look for solutions to area-related problems. It is a kind of pressure cooker in which students get an overload of knowledge and information and then have to come up with solutions with minimal supervision. The interdisciplinary collaboration is often an eye-opener for the students.

The results are just as new to the lecturers and supervisors as they are to the students themselves. That is because the students are free to decide what route they will take.

At the end of the workshop the students present their findings and ideas to a group of stakeholders, government officials and politicians. Every time, the students' fresh take and focus on the future turn out to be a source of inspiration for local officials.

This unusual teaching method has also aroused the interest of the Land Laboratory at the University of Santiago de Compostela, where teaching tends to be more controlled from above. The Land Laboratory and the Green Living Environment lectureship are collaborating on analysing, describing and improving the *charrette*.

Hercules to the rescue of Greek nature

In May 2012, Dutch third-year students of Garden and Landscape Architecture visited the Greek nature area Strofylia. Along with students from the University of Santiago de Compostela, the Greek University of Patras and the Albanian University of Tirana, they came up with plans for the area's future during a five-day *charrette* from 21 to 26 May.

The nature area is close to the port of Patras on the northwestern coast of the Peloponnese peninsula. Strofylia is unique because of the sand dunes, the wetlands and the rare stone pine (also known as the umbrella pine). Unfortunately farming and tourism are leading to pollution. There is camping, hunting and tree felling — all of which are illegal. What is more, the droughts in the summer increase the risk of forest fires. NEA, the development organization for the region of Western Greece, formulates policy for management of the area but it has little money and few powers. The idea is that in future rather than being a threat to each other, nature management, tourism and agriculture should bolster each other, for example through ecotourism and small-scale farming activities.

After a visit to the area, interviews with local stakeholders, various lectures and an awful lot of discussions and hard work, the students completed their plans. One group concentrated on climate change and came up with solutions such as raising the height of the sand dunes, a plan for fire protection and education for children. Another group advocated a *Cradle to Cradle* approach that included organic farming, rainwater

storage and waste treatment. A third group focused on *eco-tourism*, drawing on the Greek myth of the demigod Hercules as a way of putting Strofylia on the map. Hercules with his superhuman strength carried out most of his heroic labours in the northern Peloponnese. His mythical field of action lay between Delphi and Olympia, which largely coincides with a number of nature areas, including Strofylia. He was supposed to have built a huge wall there as protection against enemies. The students' idea was that the area could become better known by linking nature to the myth.

Making a link between history, location and nature is a good example of the integration of climate adaptation in a wider strategy. The area can raise its profile by using the link to history to promote the nature areas. As its name becomes better known, this will lead to more tourism and therefore more income. At the same time there will be more awareness of the importance of these nature areas and the need to protect the area.

5 AN UNCERTAIN FUTURE

Tipping points

The traditional planning process is based on the ability to monitor events, on stability and linear developments. The aim of these planning methods is to take precautionary measures to deal with various events that are expected. However, climate change is not a predictable process. That introduces a substantial degree of uncertainty into the planning process. There is still a lot of debate and lack of clarity about the extent to which the climate will change. Estimates for global warming range from one to two degrees up to a maximum of six degrees over the next hundred years. What is more, there is a big risk of tipping points.

A tipping point is a critical point in a process that leads to a new, irreversible development. The term 'tipping point' probably originated in epidemiology to describe the point at which a contagious disease can no longer be contained locally and starts to spread uncontrollably. The term was also used for every-day, sociological changes by Malcolm Gladwell, a well-respected journalist for the New Yorker and author of the book *The Tipping Point: How Little Things Can Make a Big Difference*, which appeared in 2000. Gladwell describes how products, news and changes in behaviour can spread like a virus, giving as examples the huge popularity of the Hush Puppies brand of shoes and the steep fall in New York's crime figures in the 1990s. According to Gladwell, the tipping point for a change is a threshold or a boiling point.

A tipping point is often a turning point. Sometimes it is used to indicate that the increase or event is not in itself particularly unusual but that it is precisely the incremental change that leads to such a large effect. In chaos theory, for example, the flap of a butterfly's wing at a certain point in time could have an unexpected and unpredictable impact on the weather. But the consequences of a tipping point being reached are usually clearer, as in the case of climate change.

The greatest danger for humans and ecosystems lies in the climate system reaching tipping points. Changes are rarely gradual in the climate system; they tend to come in abrupt shocks. These tipping points play a significant role here, both at global and local scales. Take the example of the icecap melting in Greenland, where we are not sure if this is an irreversible and self-accelerating development. Or imagine that large tropical rainforests such as the Amazon dry out due to faster evaporation as a result of global warming, and fall prey to forest fires. Or that global warming causes greenhouse gases that are currently stored in the layer of permafrost in the Arctic and in the ocean bed to be released more quickly, thus accelerating global warming.

There can also be local tipping points. For example, the temperature in the Netherlands could increase to such an extent that we get insects from warmer climes that spread diseases such as malaria. Incidentally, changes can also go in the other direction. For example, unexpected effects could lead to more rain falling in the Sahara, which might actually curb further climate change.

Greater flexibility in planning practice

On top of the uncertainty due to climate change, the practice of area planning in the Netherlands is also being affected by social and political developments that suggest even greater unpredictability in the longer term. Some examples are the changing composition (ageing) of the population and the economic crisis that has been going on for years. The housing market has come to a standstill and no more new homes are being built. There are empty offices and abandoned industrial parks. Building plots are left vacant. There is an increased need for flexible planning, including for residential building. In the past, the size of the plot and the type of dwelling were fixed but now there is a need to change the size and type depending on demand in the market.

In addition, municipalities are increasingly giving permission for vegetation to be planted temporarily on vacant sites. Municipalities are also increasingly setting up such sites as city gardens. A vacant site like this can take on an attractive appearance if used for city farming. What is more, municipalities save on maintenance costs this way. Legislation does not always allow for the option of temporary vegetation or temporary nature but more leeway is gradually being created.

So area planners or landscape architects are increasingly seeing the need for more flexibility in design and implementation. However the public authorities are often lagging behind. It is sometimes still difficult to operate as you might wish, even in the case of more technical and local solutions incorporating climate adaptation. Area development projects are

now more organic, and there needs to be more room in the process to respond to demand. The result is a kind of organic growth in which small jigsaw pieces increasingly have to be made to measure. Unfortunately, designers, planners, architects, government officials and other professionals often run up against legislation that does not take account of recent developments. For example, planning permission for increasing the height of a dyke is valid for a certain period only. Therefore the height increase has to be implemented before the planning permission expires, whereas now the idea is you should work on this bit by bit depending on various developments. So legislation and regulations should allow more room for this more flexible and less predefined way of working. Much greater adaptability is needed to cope with the changing financial situation and the rapid changes in society.

Planning for the unthinkable

If the complexity of the planning process continues to grow, it may then become necessary to make the planning process less rigid, as it were. Only then can room be created for unpredictable circumstances, uncertain forecasts and unexpected events, whether these are major or minor and whether they take place in the short term or the long term. You cannot cover all possible scenarios beforehand, but planners are increasingly working with long-term scenarios, including unlikely events. In fact, you should always consider the question of what should be done if the unthinkable happens.

'Out of the blue' brainstorming sessions can help come up

with unexpected developments and events, together with possible solutions. This lets you plan for gradual, controlled changes instead of changes that are extreme and unexpected. This can be a climate-related event, such as a flood, or a completely different kind of crisis.

A good example is nature conservation in the Netherlands. For years nature conservation organizations had conducted surveys and set up planning processes… until the unthinkable happened. In 2010 the first coalition government headed by Mark Rutte came into power. The coalition government consisted of VVD (the Liberals, a right-wing party) and CDA (the Christian Democrats, a centre party) but enjoyed the official support of the far-right PVV (Party for Freedom). This government placed little value on nature conservation and nature development, and it scrapped 70 per cent of the government budget for nature. This put long-term plans for the ecological main structure on hold. The nature organizations' scenarios had never allowed for the possibility that the flow of grants would dry up completely. And of course there is also the possibility of cuts in European grants in the future or of nature organizations having to work on a more commercial basis.

Extreme events

To summarize, you have to allow for the unthinkable in your plans. What should you do if the financial crisis becomes worse, if your country is run by a prime minister from a far right party, if a superstorm hits the Netherlands or if a terrorist attack or disease wipes out half the population? Room must be

left in the design for unforeseen events. Designers are having to face the question of how to allow for the fact that things can go wrong. There is also the question of the timescale you are designing for.

Climate change can also lead to unforeseen events as a result of extreme weather or a tipping point being reached. Such uncertainties are incorporated in flexible adaptive planning. First, the possible scenarios for the very long term are studied and described. Next, small unconventional but specific measures for the short term are proposed within the framework of those scenarios.For example, the Ems delta is the weakest point in the coastal protection for the northern Netherlands. As sea levels rise, the Ems delta area is likely to be the first to flood in the event of a fierce storm in combination with spring tides. The traditional solution would be to raise the height of the dykes and strengthen them in that area. But even the strongest dyke can break, and the stronger the dyke, the greater the disaster when it does eventually break. That is why another approach has been proposed now. It involves making a hole in the dyke to enable minor, regulated flooding. Various areas are being adapted for flooding depending on different degrees of increase in sea water levels. This is a design based on a long-term horizon and that can come into operation quickly and at an early stage.

In one hundred years' time

The closing conference of the European project *F:ACTS!* was held on 29 and 30 November 2012. The organizations taking

part in the project presented their best practices for tackling the consequences of climate change. To liven things up a bit, there were also four students attending from Van Hall Larenstein. The students were taking the Development Planning minor. As preparation for the closing conference, they were given a master class in 'swarm planning', in other words flexible adaptive planning. That taught them to consider solutions for problems on a timescale of 100 years rather than 10 to 20 years.

At the closing conference participants presented their findings, followed by a response from experts. The Van Hall Larenstein students took part as 'student experts'. For instance, De Wijers, an area in Belgium, has huge carp breeding ponds. These face future threats due to heavy rainfall and longer periods of drought. The Belgians were focused on how to preserve the ponds for the coming period of up to 20 years. However the students looked 100 years to the future; they proposed moving the ponds to the towns where they could also play a part in water purification. Thus urban areas become intermeshed with the countryside. Such a relocation is obviously not possible in a 20-year timescale but can be done over a much longer period in which houses gradually make way for water. It is also easier to implement such a plan in financial terms in this way with a longer timescale.

The people attending the conference were pleasantly surprised by the broadening, innovative feedback given by the students. Some said students come up with different ideas because they have less experience but the feedback did spark off

a debate. It is difficult to implement a change like this for the longer term because politicians and government officials are focused on the short term.

The students also had something to say about Almere, which is threatened in the longer term by rising sea levels. The students argued that you cannot really keep making the dykes higher and higher in the longer term. They advocated building floating homes instead. If all new residential districts are built to allow for higher water levels from now on, the city will be prepared for the eventual rise in sea levels. You are working with the climate change rather than trying to resist it. Floriade, the Dutch horticulture exhibition that takes place every ten years, will be held in Almere in 2022. The students thought it would be a nice first move for all the new buildings for the Floriade to be built on stilts. The attendees found this piece of advice from the students rather more off-beat and difficult to imagine. But it did get people thinking again and got a discussion going.

Finally

We can prepare for an unpredictable future by making sure that the landscape is ready, whatever happens. That will put us one step ahead of the uncertainty and the potential dangers due to climate change. Rather than a defensive, reactive approach, it would be better if proposals anticipated climate threats, as in the plan for the Ems delta and the far-reaching student proposals described above. Incidentally, the same applies to some of the student proposals discussed in Chapter 1

for coping with the danger of flooding from the rivers Waal, Rhine and IJssel in the Arnhem-Nijmegen urban region. These proposals too included regulated flooding in designated compartments and adapting the area in advance to deal with the potential consequences of climate change.

This form of flexible adaptive planning in conjunction with a broader regional strategic vision for an area will increasingly be applied by designers and planners as the world they work in grows more complex. By allowing the future to take place now, residents, public authorities and local stakeholders can adapt before the event occurs.

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Garden and Landscape Architecture graduation projects, Van Hall Larenstein university of applied sciences

'*Almere 2.0 Landschap Ontwerp + Ecologie*' *[Almere 2.0 landscape design + ecology]* by Moniek de Bonth, Maki Ryu, Shera van den Wittenboer and Martijn Zwagerman, 2012

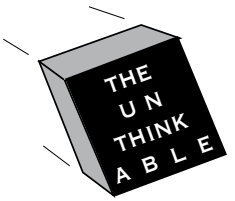
'Rijke Natuur' [rich nature] by Marianne Tijs and Guusje van Ruth, 2012

'Almere Oosterwold. Cradle to Cradle gebiedsontwikkeling' [Almere Oosterwold. Cradle to Cradle area development] by Judith Scharff and Jacqueline Nelisse, 2012

Area development projects are now more organic, and ask for more room in the process to respond to demand. The result is a kind of organic growth in which small jigsaw pieces increasingly have to be made to measure. But, designers, planners, architects, government officials and other professionals often run up against legislation that does not take account of recent developments. For example, planning permission for increasing the height of a dyke is valid for a certain period only. Therefore the height increase has to be implemented before the planning permission expires, whereas now the idea is you should work on this bit by bit depending on various developments. So legislation and regulations should allow more room for this more flexible and less predefined way of working.

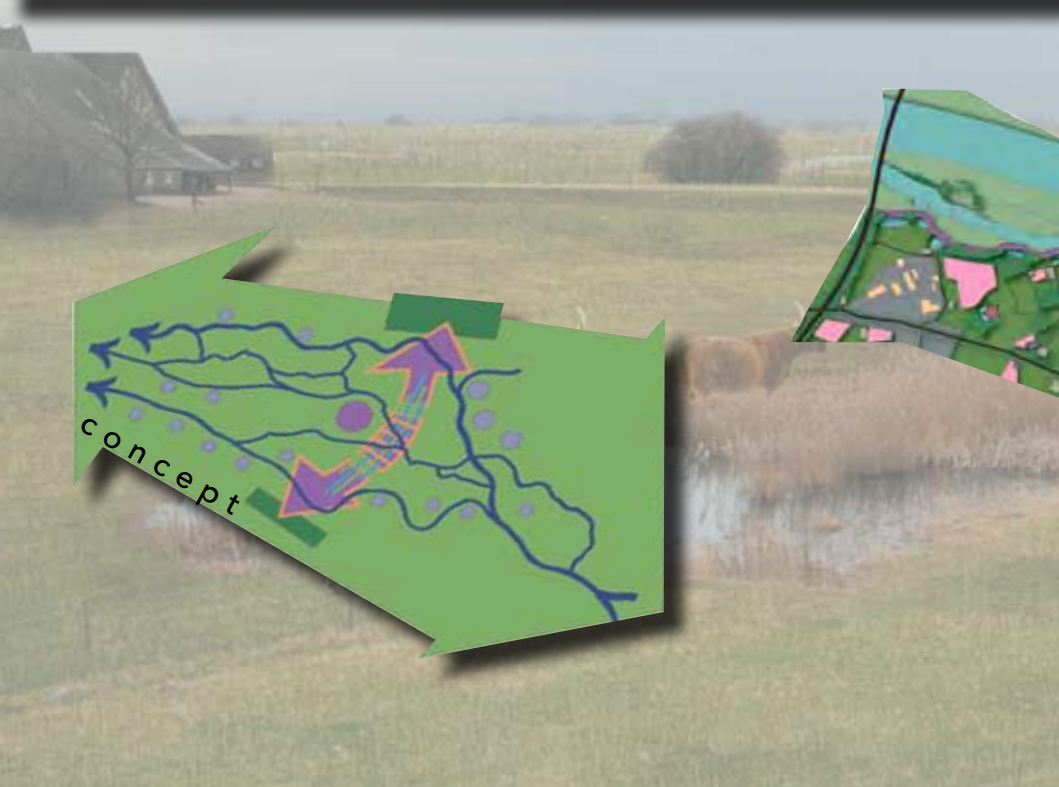
DESIGNING FOR CLIMATE ADAPTATION

planning for the unthinkable



phpto merge
Jos Jonkhof


MASTERPLAN

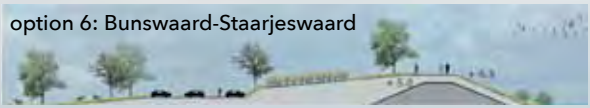

concept

BEYOND THE DYKE

option 8: connection old Waaldijk

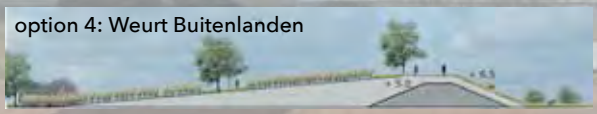
option 7: Moespotsewaai-Oude Waalbandijk

option 6: Bunswaard-Staarjeswaard



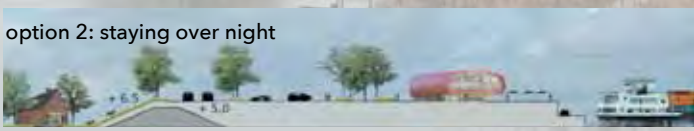
option 5: Duivelswaai

option 4: Weurt Buitenlanden



option 3: Weurt north side

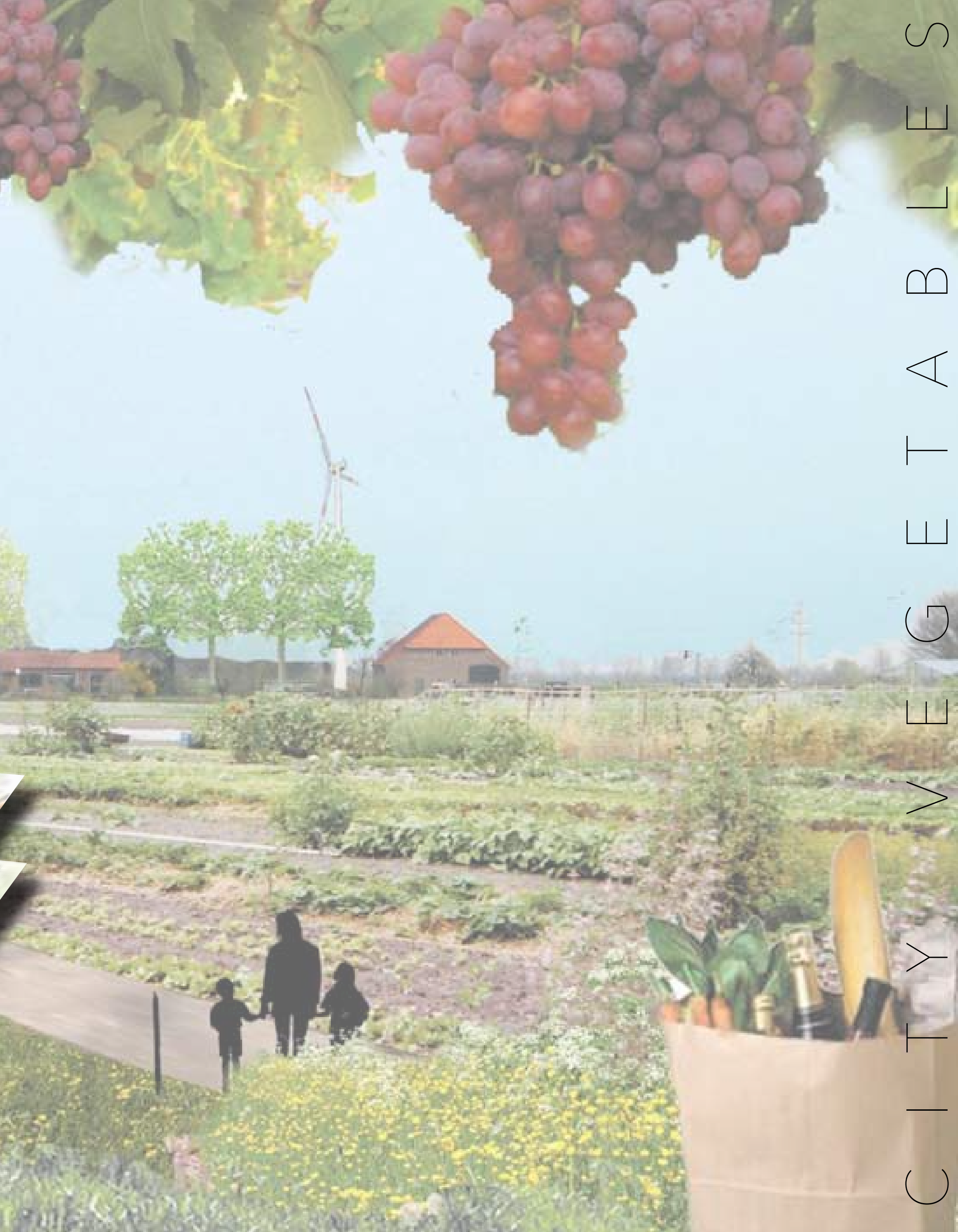
option 2: staying over night



option 1: Weurt east side

BEYOND THE DYKE


developments 2010-2020
spatial view - partial
landscape structure plan


CITY VEGETABLES

VEGETABLES

Overgang stad / landschap

Kassengebied in Bergerden

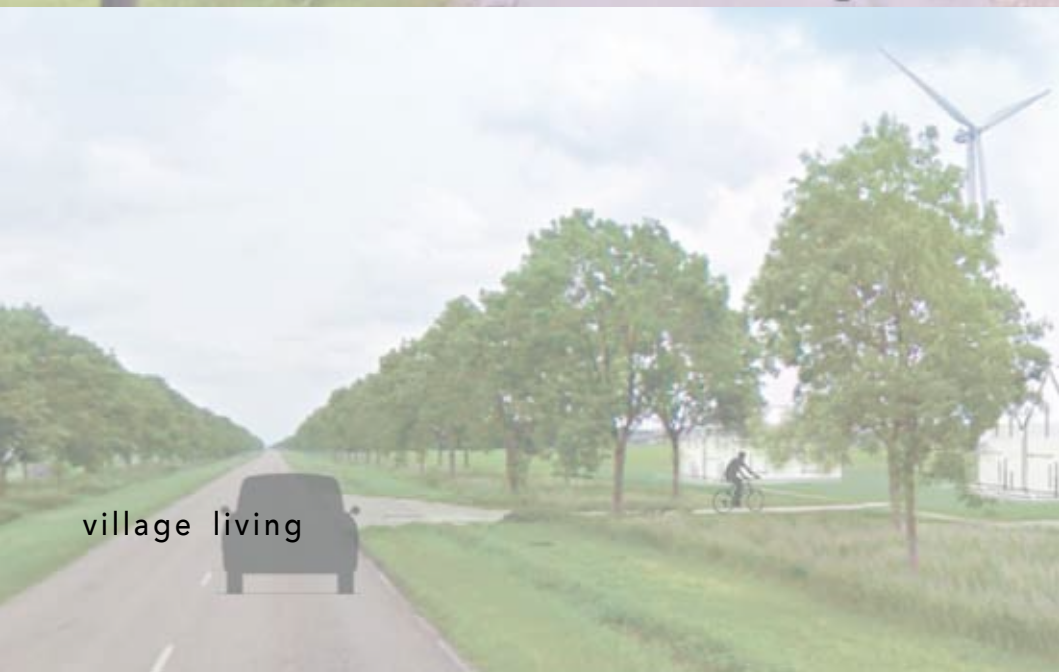
Waterrijk langs de Linge

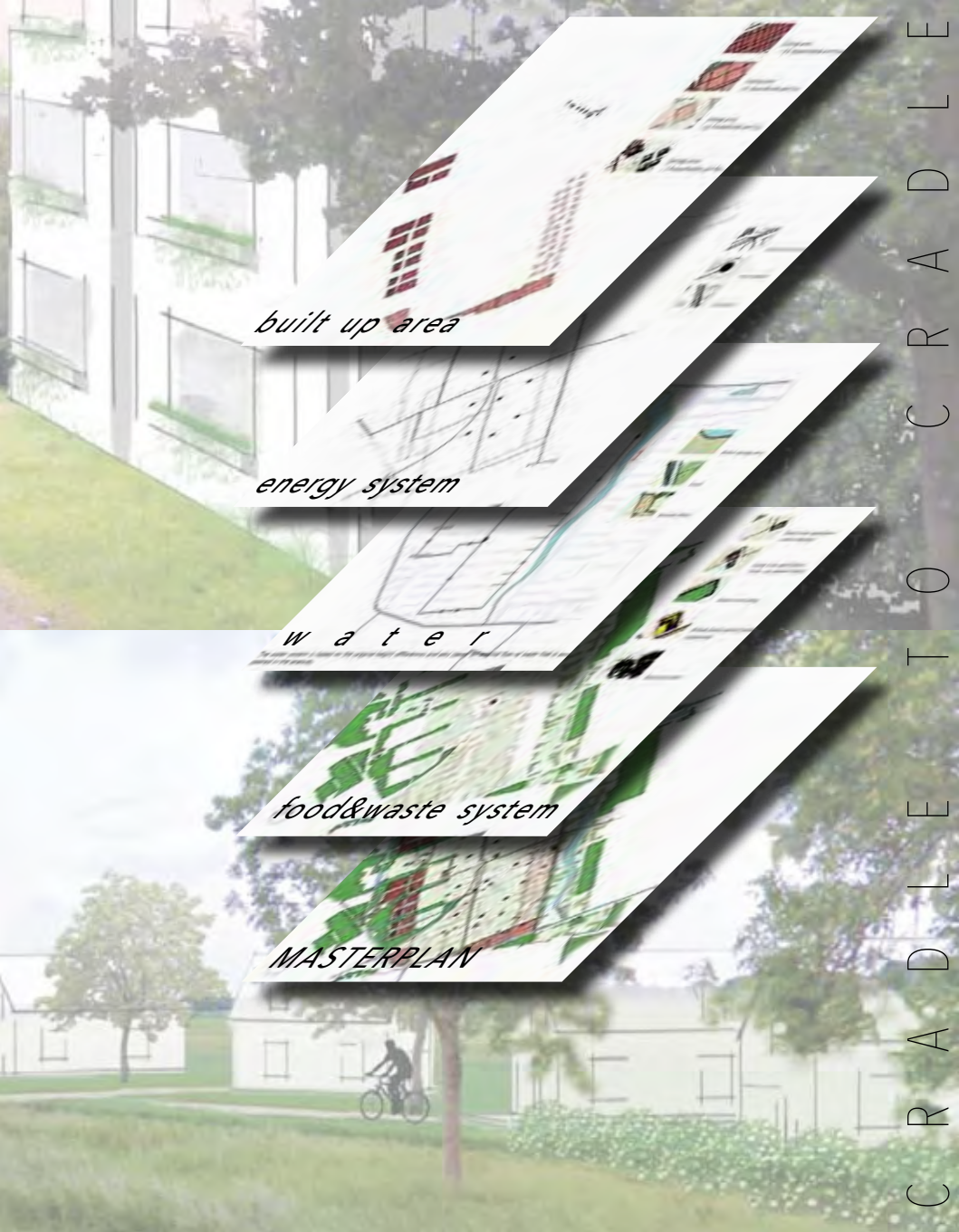
Bebouwingsrandzone/buitengebied

Tuinbouwgebied

Kassengebied

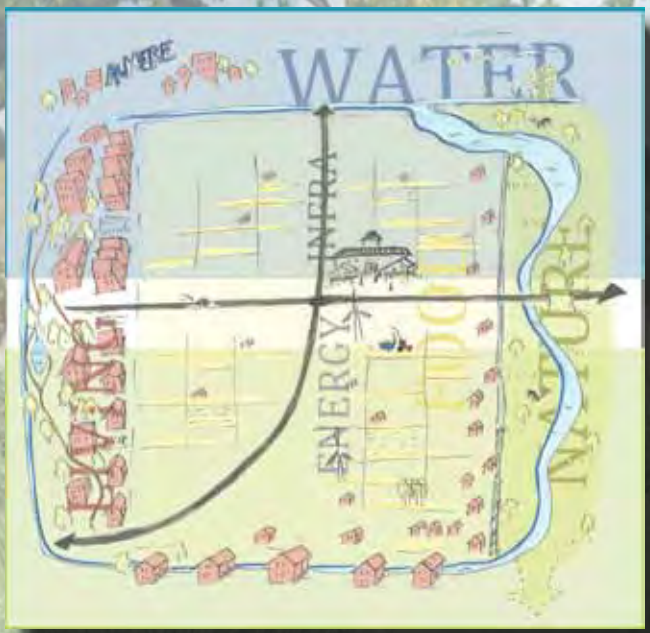

urban living


village living



C R A D L E T O C R A D L E

central market



CRADLE TO CRADLE

nature edge living

water living

Zoet klei-oermoeras

1-5 jr 1

5-10 jr 2

10-40 jr 3

40-90 jr 4

Elzenrijk Essen -Iepenbos

1-5 jr 1

5-10 jr 2

10-40 jr 3

40-90 jr

Droog Essen -Iepenbos

1-5 jr 1

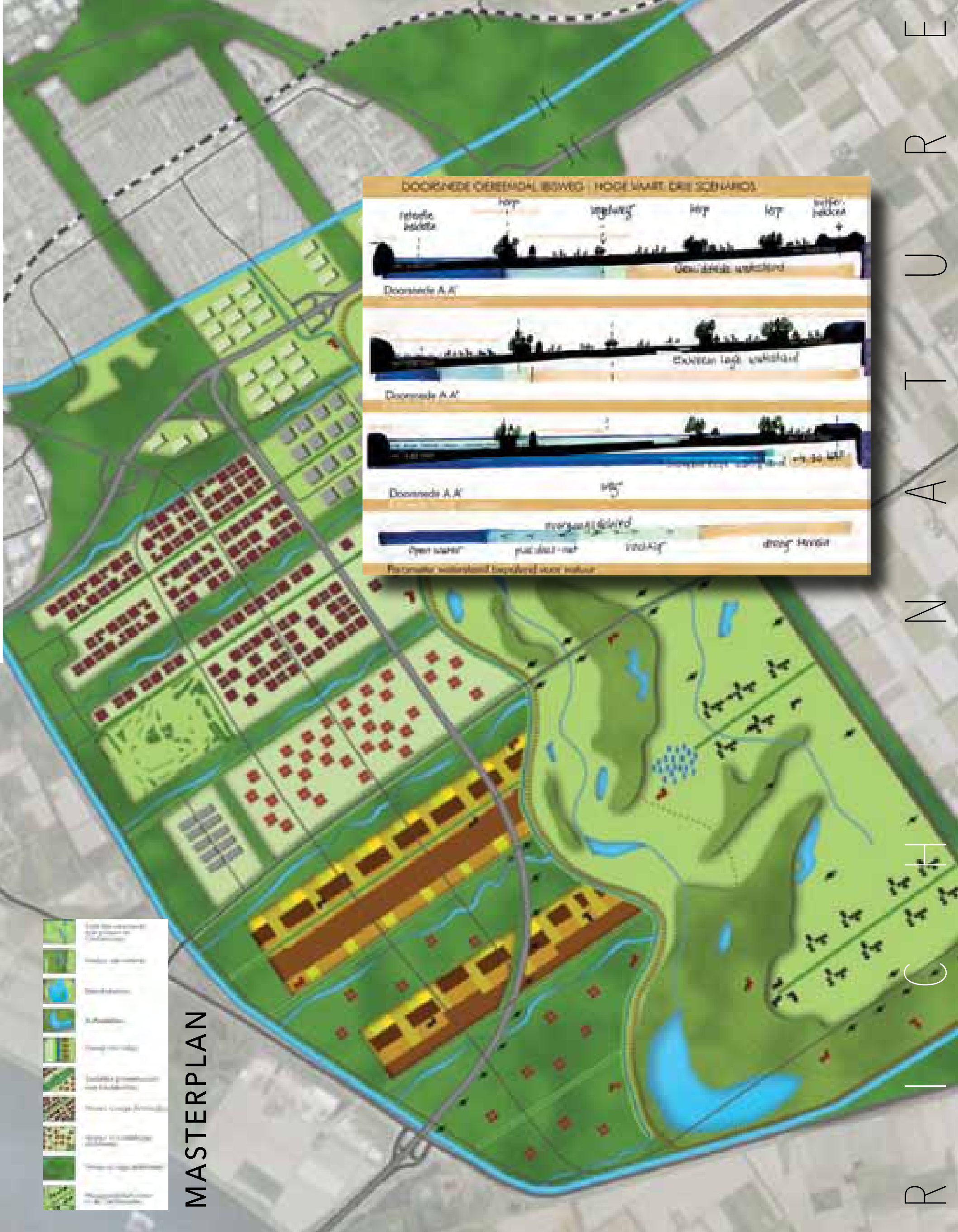
5-10 jr 2

10-40 jr 3

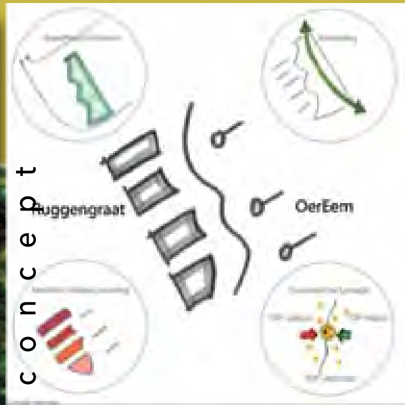
40-90 jr 4

MASTERPLAN

RICH NATURE

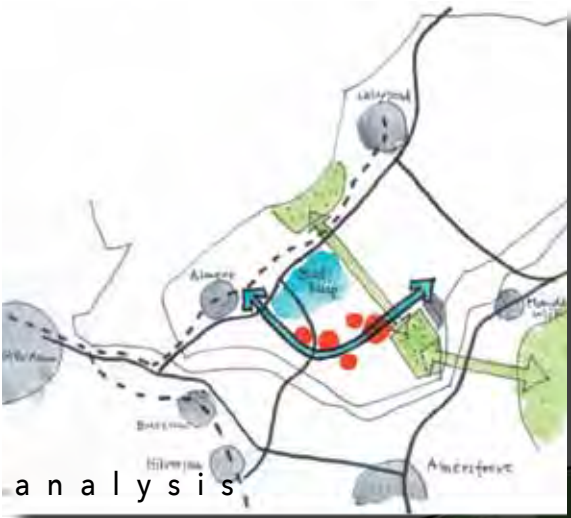


tordoir partial area

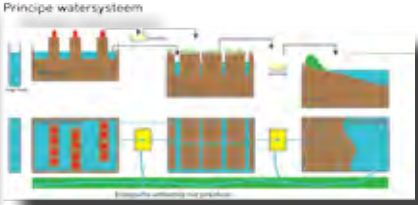


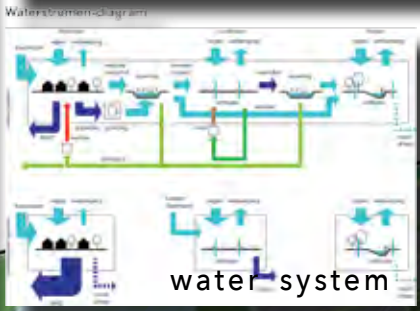
concept

R I C H N A T U R E



a n a l y s i s





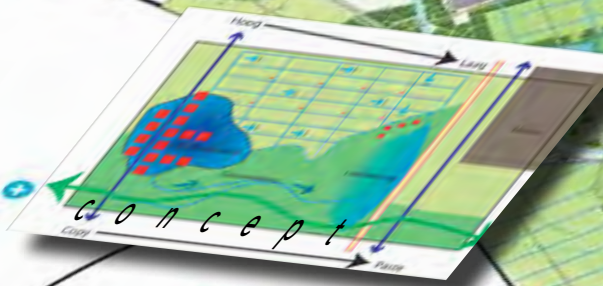
water system

ecologisch wonen

De exclusieve ecologische woningen liggen aan de rand van de natuurlijke zone. De natte, enigszins ruige natuur met uitzicht op water, levert een aantrekkelijk woonmilieu op, maar hier zijn niet vanzelfsprekend alle infrastructuurvoorzieningen aanwezig. De situatie vereist nieuwe manieren van bouwen zoals amfibische woningen.

van compact naar ruim

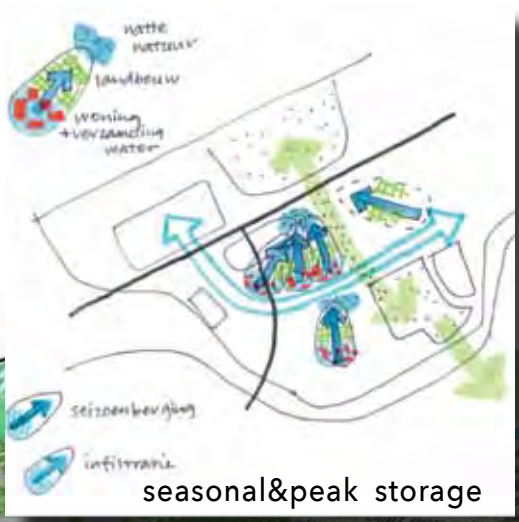
Naar de randen toe neemt het percentage groene openbare ruimte toe en worden de kavels steeds groter. Het is buitenwonen, maar met alle voorzieningen van een compacte kern in de buurt.
Op deze hoger gelegen gronden vind je het de open, natte natuurvegetaties van waterrijke zones, maar soortenrijke weiden van de voedselrijke gronden



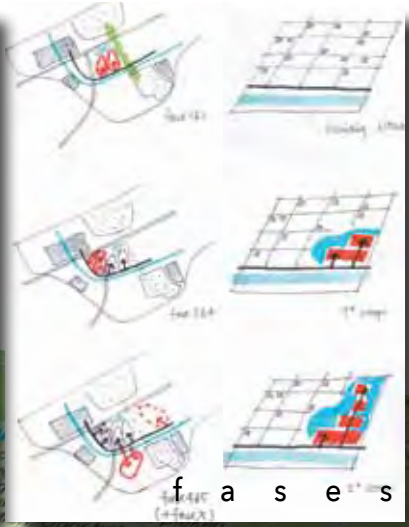
c o n c e p t

vasthouden en infiltreren

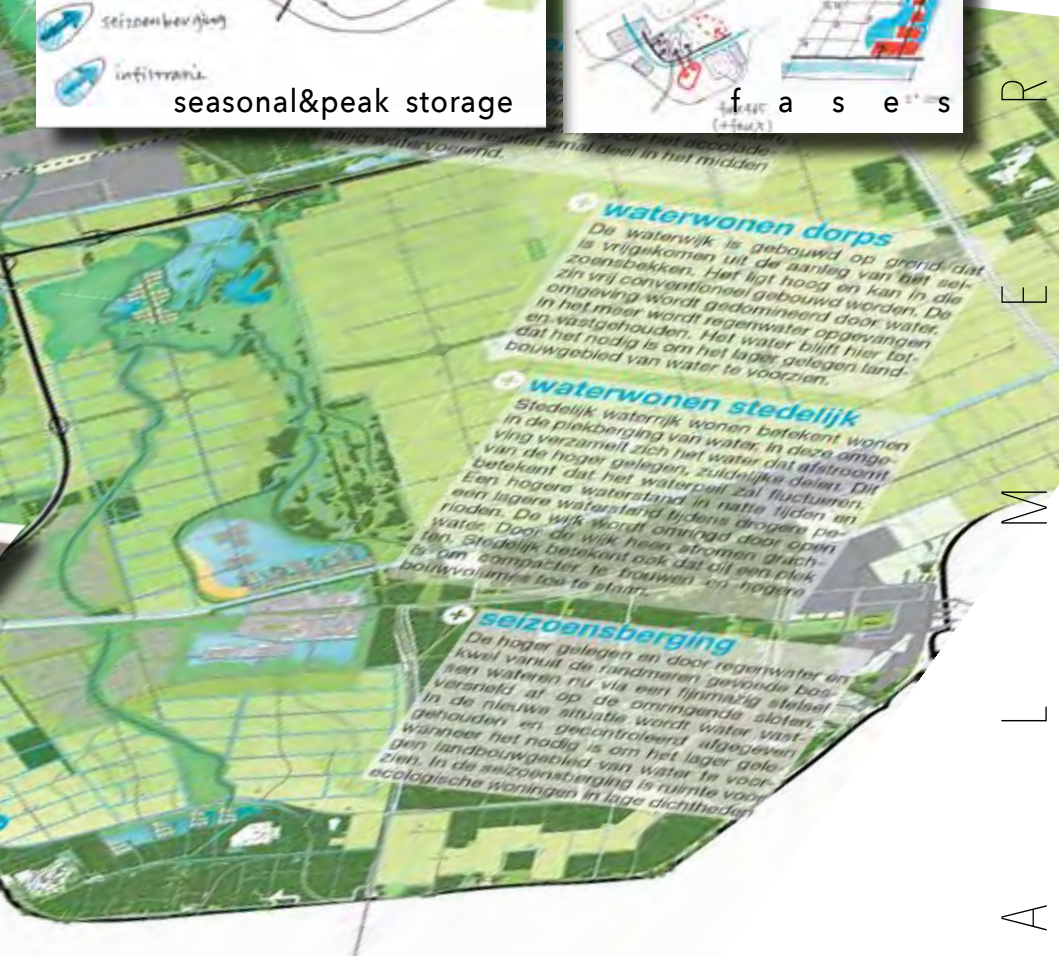
De wadiwijk ligt op de hogere delen. Hier is geen groot open water nodig. Het regenwater wordt opgeslagen in de wijk, voordat het wordt afgevoerd. Hier geldt een (vorm van het) wadisysteem.



seasonal&peak storage



f a s e s



A L M E R E 2.0

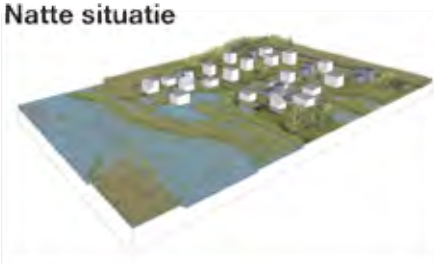
Groen
Begroeiing wordt door de waterdiepte bepaald. In het drogere deel langs het water ontstaat broekbos en in de nattere zones groeien meeras- en oever vegetaties.

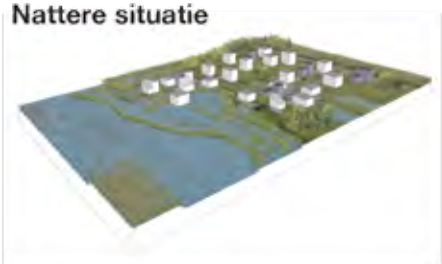
Water
Het bekken bergt het water van het gebied en fluctueert door seizoenen en extreme weerssituaties. Waterdiepte in woonwijk verschilt tussen +0,3 tot -0,5m t.o.v. maaiveld.

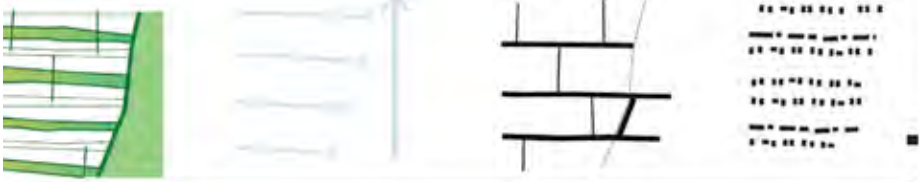
Infrastructuur
De hoofdweg is de centrale as en alle aansluitingen naar de woningen worden vandaar vertakt. Hoe verder van de as is hoe lichter de infrastructuur wordt.

Bebouwing
Strippen voor twee woningtypen lopen langs de hoofdweg. Elke type kent een andere waterdiepte, waardoor er een andere bouwwijze toegepast moet worden.

housing typology eco living







Groen
De voormalige Eemloop geeft de wijk een centrale as, waardoor de wadi's en bomenlanen die oost-west liggen, zorgen voor een mooie overgang.

Water
Het regenwater komt door niveauverschillen terecht in de wadi's. Zodra het water niet meer kan infiltreren wordt via een overstort naar de Eembedding geleid.

Infrastructuur
De belangrijkste wegen in de wijk gaan van oost naar west. De wegen van noord naar zuid zijn eenrichtingsverkeer. De reeds bestaande wegen dienen als ontsluiting.

Bebouwing
De voorzijde van de woningen liggen richting de weg. In de Eembedding zijn twee bestaande boerderijen gehandhaafd, die een recreatie functie krijgen.

housing typology wadi

Watersysteem op wijkniveau

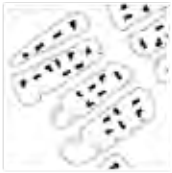
Natte situatie

Droge situatie

Groen
Het groen bevindt zich met name aan de randen van de eilanden. Hier zijn de zuiverende helofytenfilters.

Water
Water is overal in Waterrijk Dorps. Het is het open water wat het karakter van de wijk bepaald.

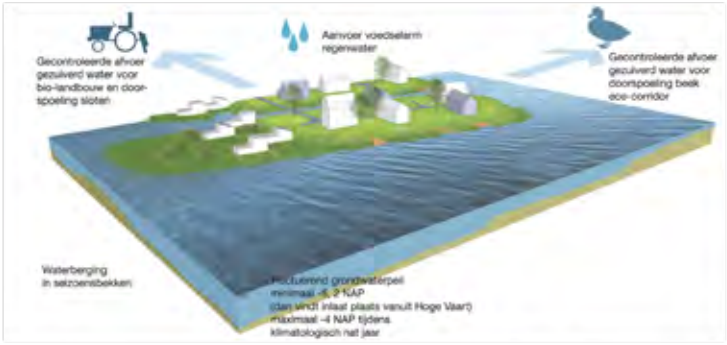
Infrastructuur
De woonelanden takken aan op de hoofdverbindingswegen. Op de eilanden zelf is daardoor geen doorgaand verkeer nodig.



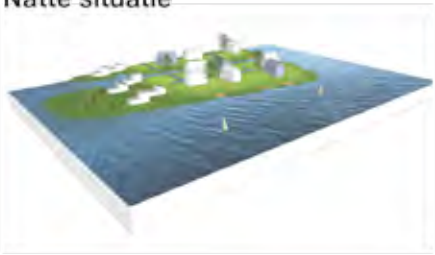
Bebouwing
De bebouwing is op een regelmatige, maar met een zekere afstand van elkaar gesitueerd en gekoppeld aan de dorpsstraat die elk eiland heeft.

housing typology water village

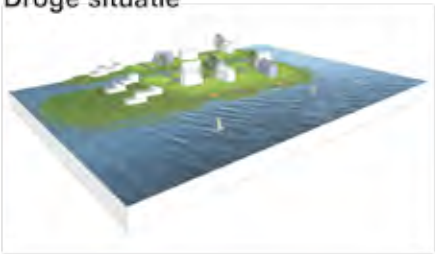
Watersysteem op wijkniveau



Natte situatie



Droge situatie



Groen
Het groen in de wijk bestaat uit parken en stevige laanbeplanting langs de meest bepalende doorgangswegen. In de grachten groeit riet.

Water
Naast het open water wat fungeert als de piekberging is het water ook in de wijk aanwezig in de vorm van grachten.

Infrastructuur
De wegenstructuur is oost-west gericht, waarbij de wijkontsluitingswegen haaks op deze structuur staan en aansluiten op (bestaande) hoofdstructuur.

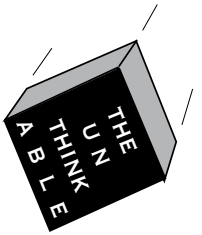
Bebouwing
De bebouwing is gekoppeld aan de infrastructuur en wordt verder gekenmerkt door besloten hofjes of binnentuinen.

housing typology water city

Watersysteem op wijkniveau

Natte situatie

Normale situatie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