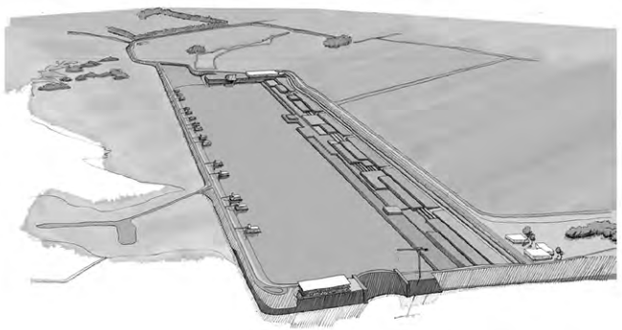
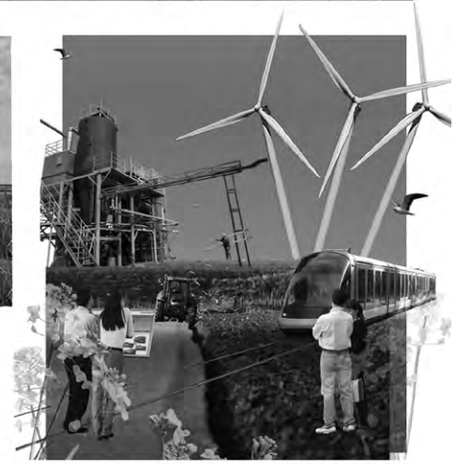
BEYOND FOSSILS

ENVISIONING DESIRED FUTURES FOR TWO SUSTAINABLE ENERGY ISLANDS IN THE DUTCH DELTA REGION

Sven Stremke
Rudi van Etteger
Renée de Waal
Henk de Haan
Claudia Basta
Maaike Andela





RESULTS OF THE 2011 ATELIER - WAGENINGEN UNIVERSITY
CHAIR GROUPS: LANDSCAPE ARCHITECTURE, LAND USE PLANNING, CULTURAL GEOGRAPHY

Beyond fossils, envisioning desired futures for two sustainable energy islands in the Dutch delta region

Editors:
Sven Stremke
Rudi van Etteger
Renée de Waal
Henk de Haan
Claudia Basta
Maaike Andela

Graphic design:
Paul van Dijk
Jaime Gomez de la Fuente

ISBN 978-94-6173-152-4

Contact:
Landscape Architecture Group
phone: +31 317 484 056
fax: +31 317 482 166
e-mail: office.lar@wur.nl
www.lar.wur.nl

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ENVISIONING DESIRED FUTURES FOR TWO SUSTAINABLE ENERGY ISLANDS IN THE DUTCH DELTA REGION

RESULTS OF THE 2011 ATELIER - WAGENINGEN UNIVERSITY

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Preface

Renewable sources of energy – such as biomass and wind, solar, hydroelectric and tidal power – are essential alternatives to fossil fuels. Their share in total energy production is slowly increasing. Europe's energy and climate policy aims at an average share of 20% in EU countries in 2020, a target that is tailored to each individual country according to its potential to employ renewable sources of energy. For the Netherlands the target is 14%, which is lower than average because hydroelectric power and biomass play smaller roles here than in other EU countries. In 2010, about 9% of the Netherlands' total energy consumption was renewable energy.

The need to switch to renewable sources of energy is beyond dispute. Fossil fuels are depleting and the exploitation of new sources is increasingly expensive and/or causes severe environmental damage. Many do not consider nuclear power an acceptable alternative. The Fukushima catastrophe may well have marked the beginning of a new era, one that is characterized by a 'green revolution'. Germany – Europe's most industrialized country – wants to switch off all its nuclear power plants within the foreseeable future. This raises questions about, for example, whether renewable energy sources can really be a reliable alternative, what the transition to these sources will cost and what the consequences will be for our landscape, since the majority of these sources will be employed above ground.

Against this background, representatives of the municipalities of Schouwen-Duiveland and Goeree-Overflakkee – two islands in the provinces of South Holland and Zeeland, respectively – commissioned Landscape Architecture, Planning and Socio-Spatial Analysis students at Wageningen University to develop plans for sustainable energy landscapes on both islands. Goeree-Overflakkee was supported in this by the Mooi Nederland programme of the Ministry of Infrastructure and the Environment.

The students carried out this assignment in the 'atelier' that forms part of their Master's study programme. From March to June 2011, they worked both in teams and individually on developing visions for self-sufficient, sustainable energy futures for the islands, while taking into account both landscape quality and its perception and valuation by the islands' inhabitants and visitors. They conducted research on a wide range of aspects related to the assignment, made plans for an energy transition and designed sustainable energy landscapes.

A selection of their work is presented in this book. When I studied the students' texts and designs, I was impressed by their serious engagement with the subject, their remarkable ability to deal with the complexity of the concept of 'energy transition' and the highly creative way in which they envisioned future energy landscapes. They investigated the full range of possible solutions with open and unprejudiced minds. Although their solutions may be at odds with present policies, they serve as a source of inspiration for future developments. I therefore warmly recommend this book to the reader.

Finally, I should like to thank the commissioners for giving the students the opportunity to immerse themselves in the spatial challenges faced by the islands and to familiarize themselves with the efforts the municipalities are making to achieve a sustainable energy transition. I should also like to thank the external experts for providing the students with lots of critical information, my colleagues from the Landscape Architecture, Land Use Planning, and Cultural Geography chair groups of Wageningen University for

supervising the students, and, above all, the students themselves for giving their best in their research and their planning and design proposals.

Adri van den Brink
Professor of
Landscape Architecture
Professor of
Land Use planning
Wageningen University

BEYOND FOSSILS

Rudi van Etteger, Sven Stremke, Renée de Waal

This book is the concrete product of an academic exercise: the Master's course 'Designing and Planning Sustainable Energy Islands Atelier.' It is the condensed result of three months' work by six teachers and sixty students from the disciplines of landscape architecture, spatial planning and cultural geography at Wageningen University. These people spent three months considering the matter of a sustainable energy future for Goeree-Overflakkee and Schouwen-Duiveland, two islands in the south-west of the Netherlands. They envisioned a future in which enough renewable energy is generated to fulfil at least the need of the island's residents in a sustainable way.

It is important to stress that the topic of this exercise is not academic in the pejorative sense. It is not a matter for idle reflection: fossil fuels will be banned, physically depleted or, most likely, made economically redundant through the development of renewable energy sources. And if a sustainable energy landscape is to work, it will have to work in this environment, in rural landscapes where there is ample room for harvesting renewable energy. If we cannot turn these islands into self-sufficient and sustainable energy landscapes, there is no chance that we will be able to make it work in the nearby densely populated areas of Antwerp, Rotterdam and The Hague. The good news is that the results show that it can be done.

However, at an early stage of the atelier it became clear that this was not merely a technical matter, even though the results might suggest otherwise. The key question is not by which technical means renewable energy should be provided (as there are various technologies that could make the two islands energy self-sufficient), but how to do it in a manner that fits, on the one hand, within the landscape of the islands and with the needs, wishes and desires of its inhabitants about their living environment, and on the other hand, with the needs, wishes and desires of the tourists who visit these islands and provide a solid source of income for the islanders. This question matched the learning objectives for our students and enabled them to apply their existing skills, as they are not technical engineers but researchers, planners and designers.

The island character of both Goeree-Overflakkee and Schouwen-Duiveland can play a positive role in the development of a sustainable energy future. First of all because there is an historical precedent of self-sufficiency on these island. However, this must not be overstated: these islands are not and have never been entirely separate from the rest of the country. Zierikzee (the capital of Schouwen-Duiveland) has a history of international maritime trading, especially during the 17th century. Today, now that the estuaries have been closed off from the sea by dams, it is sometimes hard to feel that you are actually on an island. However, the border is there between the island and the other side, and between the islanders and the overkanters (people from the other side), who even after living on the island for years are still considered strangers. These sentiments of separation and the subsequent wish for self-sufficiency can be tapped into when developing a vision for sustainable energy islands. The very existence of renewable energy cooperatives – such as Deltawind – in which local people participate in wind energy projects, is a clear sign of the important role of the local identity on these islands.

During the work on Goeree-Overflakkee and Schouwen-Duiveland, we visited the Danish island of Samsø, where local renewable energy provision exceeds local energy demand. There is

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currently a trade-off (overproduction of wind energy to compensate for fuel for cars and ferries), but this issue is being worked on. The fact that local people, with a little help from outside, have transformed their energy system so that it works with renewable sources motivates the next step: to engage with sustainable energy on larger and more densely populated islands, such as Goeree-Overflakkee and Schouwen-Duiveland.

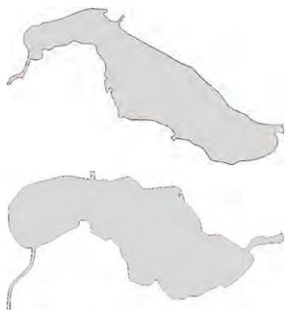
The islands as they are today are beautiful, thanks to the scenic qualities of the beaches and the dunes, and to the sometimes stark but functional beauty of agricultural production landscapes. Even if we outsiders doubt these qualities, the people who live on the islands have a strong connection with the landscape. The islands' inhabitants have chosen to live there, and their decision to do so is linked to the landscape. The beauty is worth considering when we make the change to sustainable energy, but it is also slightly false, as part of the ugliness connected to the current use and production of energy is transferred to the Rotterdam harbour area and to faraway places like Nigeria and Alberta in Canada, where oil spills and oil extraction from tar sands are taking their toll on the landscape.

While energy generation was once prominent in the Dutch landscape, scattered as it was with windmills, it is now hidden, but it will return to the landscapes again. In which shape or form, though, is a matter for discussion. The students have provided us with many wonderful ideas and considerations about alternative futures and have illustrated these ideas by means of photomontages, maps, graphs, charts and cartoons. They should be concerned with renewable energy as, as it is their future we are thinking about. We do not want them to make the same mistakes that previous generations made and that we have found out the hard way. It is to this discussion about their future that the atelier and this book contribute, not by supplying concrete, directly implementable solutions, but by providing ideas and images to aid the discussion about the way in which solutions should be shaped.

In terms of content, the process of research, planning and design was influenced by the idea that even though windmills would be an easy solution for the generation of energy, there are sentiments that they are not the best, or at least not the only solution from a landscape point of view. The students made efforts to work with this sentiment, but as they were limited by the time frame of the atelier, they were unable to scientifically prove this. It was, however, a sentiment that was aired to them by several sources during their introductions on the islands. However irrational, unproductive and temporary this sentiment may be, the students took it as a cue to also search for other ways to produce energy in a rural landscape.

One of the obvious options is the production of biomass. There are complicated issues involved in the production and use of agricultural crops for energy, for example, competition with food production and the quality of the agricultural land on the islands. Whether these soils should be devoted to energy crops or other, currently more economically viable crops is a matter for debate. This debate should, of course, take into account that at the moment tulips are being cultivated on the islands, which is another form of competition for food production that somehow seems to be exempt from discussion. However, the proficiency of biomass use in almost all the students' proposals can be seen as an alternative to wind power. Small-scale biomass production also seems to fit with the dominant land uses and subsequent landscapes of the islands, as well as with the knowledge and skills present on the island. If this leads to the conclusion that compared to the impact of wind turbines, biomass is unacceptable in other terms, then that is a result made visible by the students in their designs.

The large number of students who participated in this exercise meant that we could study both Goeree-Overflakkee and Schouwen-Duiveland, and to make comparisons between the two. Although the two islands might look similar in terms of their physical landscape, the powerscape of Goeree-Overflakkee is very different as it belongs to the province of South Holland. The fact that the island is scarcely populated but belongs to a densely populated province may have significant consequences. Whereas



there is scarce space for windmills in the urban parts of South Holland, it exists in abundance on Goeree. In order to deal with easy solutions for complying with agreements about provincial task loads in terms of providing wind power, Goeree needs to offer alternatives. The network of local initiatives seeking sustainable solutions seems to be denser on Schouwen-Duiveland. In terms of its physical landscape, Schouwen-Duiveland is partly older and consequently less open than Goeree-Overflakkee; it can therefore accommodate small-scale energy-conscious interventions more easily. Goeree-Overflakkee on the other hand, has large-scale landscapes and can profit from its proximity to Rotterdam, particularly in the scenarios that focus on global developments, but may also have to deal with overflow effects from this urban region.

The students' exercise was framed by questions that we, as teachers and commissioners, put to them, as well as by the method we asked them to apply in the atelier. The results were meant to display a wide variety of options in order to avoid repetition and redundancy, which could easily occur in such a large group of students. To generate differences, the groups were set to work under different contextual scenarios, namely sketches of possible developments related to the project of getting the island energy neutral in the near future. It can be compared to a travel itinerary: the destination is more or less fixed, but whether you wear shoes or flip-flops may influence the best way to get there.

The use of the scenario method is also linked to the difficulties involved in generating long-term designs. External circumstances beyond the control of planners and landscape architects may influence the choices. This has consequences for how we should look at the results. Certain measures are part of all visions, no matter what the contextual scenario. These are the no-regret measures that seem to fit all possible futures. Some measures, however, may fit with only one or two scenarios and should be weighed against that context. Even though one may not agree with a particular vision, the proposed energy-conscious interventions may still be viable options if circumstances change over the course of the coming 10 or 20 years.

The atelier spanned a three-month period. In order to provide the students with some guidance, a -step approach (see figure 1) was introduced for analysing the landscape and further exploring the assignment. Using such a framework allowed the group's results to be comparable. Operational methods within each phase differed between the groups. In phase 1, students were divided between the two islands: one group worked on Schouwen-Duiveland, the other on Goeree-Overflakkee. The two groups were then divided into four subgroups (each composed of about eight students), each of which focused on one of the following four landscape types that are found on the islands:

- The coastal landscape
- The agricultural landscape
- The recreational landscape
- The urban landscape.

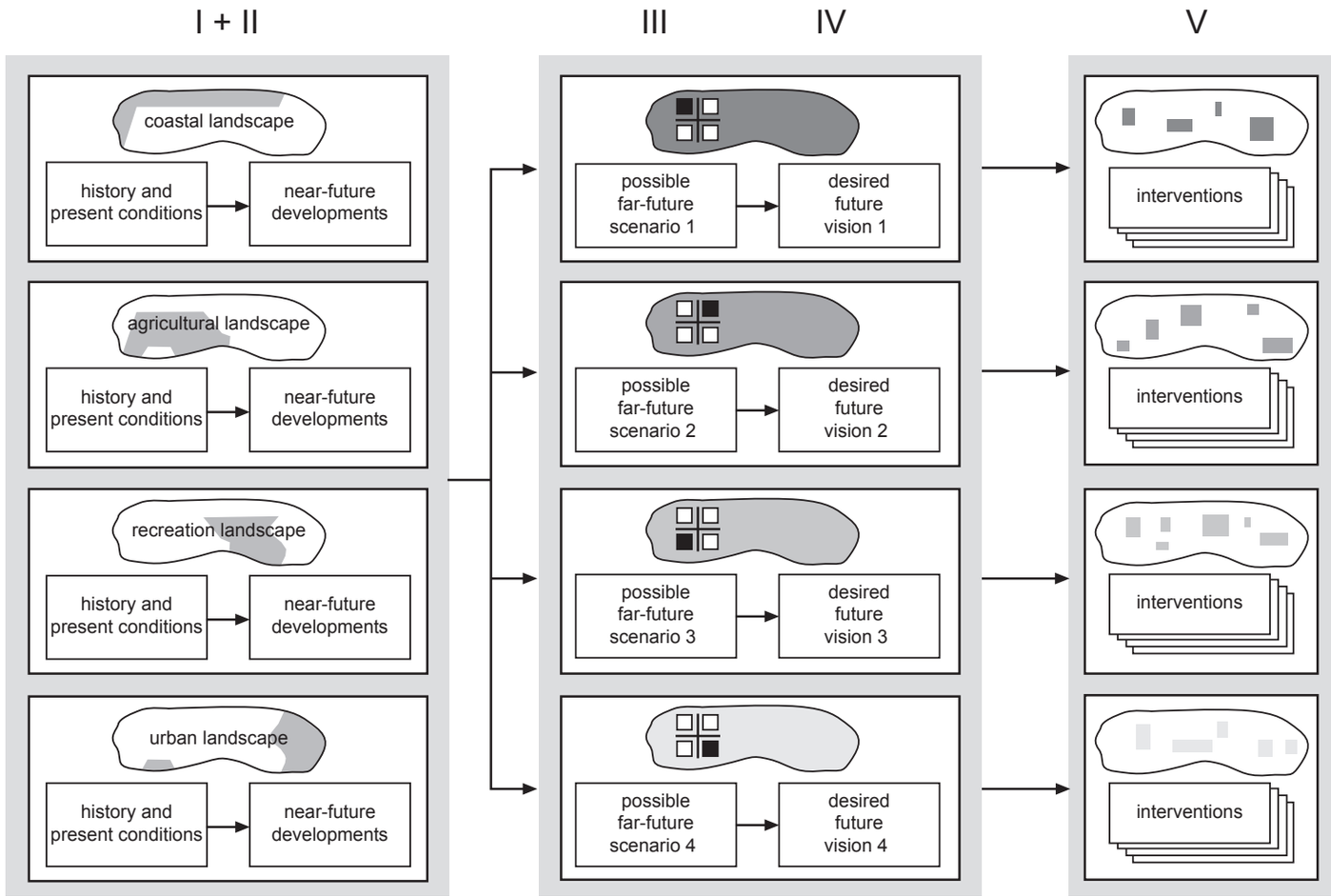
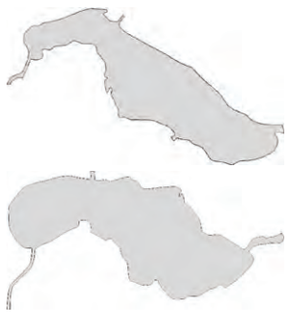


figure 1 Five step approach, Sven Stremke, 2011



For each of the four landscape types, the analysis focused on four aspects (steps I and II in figure 1):

- History
- Present conditions
- Spatial potentials and limitations for the assimilation of renewable energy
- Near-future developments.

The goal of phase 1 was to get the students acquainted with the islands, to provide perspective and to refine the societal question into research, planning and design questions.

In phase 2, the students on each island were divided into four new groups, allowing them to share the group-specific knowledge they had already gathered. The students then investigated and concretized existing scenario studies (step III in figure 1). Each subgroup subsequently composed a vision on how to turn 'their' island into a sustainable energy island, given the conditions described in the respective scenario (step IV).

In phase 3, the students worked individually on a landscape architecture, planning or socio-spatial analysis assignment. They could choose to focus either on a particular topic (e.g. energy infrastructure) or on a specific area (e.g. village X). During this phase, a large number of energy-conscious interventions (both physical interventions and policies) were worked out (step V in the scheme). The students described the impact of the proposed interventions and presented their ideas to the tutors and commissioners of the atelier.

The research and design presented in this book is part of ongoing research into sustainable development at Wageningen University. Some of this research was location driven as provided by landscape architecture ateliers on sustainable futures for Groningen and the region of South Limburg, while some was method driven, as in the PhD research by Sven Stremke. In this study, we brought the method to the location of the islands and tested what we can do today in this field of research, planning and design. This book is not the end of our involvement; rather, it represents another important milestone in our research on and design of sustainable energy landscapes. The results will be further reflected upon and serve as input for research conducted by Renée de Waal. We are also working towards:

- A book on sustainable energy landscapes, edited by Sven Stremke and Andy van den Dobbelsteen, that will include a chapter on the atelier (Taylor & Francis in 2012).
- A book chapter by Sven Stremke presenting a selection of the students' projects and their relation to energy-conscious concepts that can be found in nature (Birkhäuser in 2012).
- A quickscan of the contributions to the 9th Eo Wijers-prijsvraag, a design competition focusing on shrinkage, energy transition and spatial quality in the Veenkoloniën, the Netherlands.
- Contract research for several regions and municipalities in the Netherlands.
- Participation in the Knowledge for Climate Research Programme, which is a collaboration between Wageningen University and Research centre, University of Utrecht, VU University, KNMI and TNO/Deltares.

Even before this book was finished, some of the work had already been done. What happens if you release 30 students on one island and 30 on another, and they start asking the islanders all kinds of questions about renewable energy? They brought people together and asked them for their ideas. And they also brought into contact with each other the commissioners of the two islands, who had had no contact prior to the exercise even though they are dealing with the same issues.

The local people are now informed about – or rather reminded of questions concerning – their energy future, and we hope that the creative energy we brought to the islands will

lead to the birth of new ideas. We also hope that this book and the presentations that will be given on the island in the autumn of 2011 will inspire politicians, companies and individuals to get started.

Finally, we should like to thank all the people on and outside the islands who helped to make this atelier possible, for making it happen. If nothing else, it provided the sixty students and six teachers involved with a valuable learning experience. But read on. There is much more to learn from this book.

Rudi van Etteger
Assistant Professor
Landscape Architecture
Wageningen University

Sven Stremke
Assistant Professor
Landscape Architecture
Wageningen University

Renée de Waal
PhD researcher Landscape Architecture
Wageningen University

THE IDENTITY OF ENERGY LANDSCAPES

Nieske Bisschop, David van Zelm van Eldik

Between 2009 and 2011, the Dutch Ministry of Infrastructure and the Environment ran the Mooi Nederland ('Beautiful Netherlands') innovation programme to stimulate efficient and multiple land use, to counteract fragmentation in landscapes and to enhance the spatial quality of the environment. Strengthening and improving place identity became a key aspect in realizing these goals, as did collaboration and sharing knowledge. In a total of 96 projects, stakeholders – such as municipalities, companies, NGOs and the general public – sought ways to strengthen the identity of their place, area or landscape.

The innovation programme consisted of a subsidy regulation to stimulate innovative projects. Thirteen million euros were allocated to two tenders, which co-financed 58 projects in 10 themes. The programme also provided a knowledge and education module and a virtual meeting place (www.kennispleinmooinederland.nl) for professionals and the other parties involved. The Wageningen University Master's course Designing and Planning Sustainable Energy Islands Atelier became part of the knowledge and education module because of its close affinity with the 'Identity of energy landscapes' theme.

The 'Identity of energy landscapes' theme challenged the idea that the production of renewable energy in the Netherlands should be increased and that this development should enhance the spatial quality of landscapes rather than threaten it. But how to do that? In the projects that were submitted to the innovation programme, it was apparent that besides attractive landscape design, innovative business cases and the formation of new alliances at the regional scale are important factors for success. Moreover, interdisciplinary project teams comprising administrators, technicians, entrepreneurs, environmentalists and landscape architects enhance integration and help to discover the added value of renewable energy projects.

'Beleef het op Goeree-Overflakkee' is one of the 14 projects co-financed within the 'Identity of energy landscapes' theme. Goeree-Overflakkee is an island in the southern part of the province of South Holland. A collaboration (Intergemeentelijke Samenwerkingsverband Goeree-Overflakkee; ISGO) between the four municipalities on the island developed the idea to increase renewable energy production in order to counteract the negative effects of climate change, and economic and population decline. The question is, however, how more renewable energy production can be combined with the present, highly valued tourism and leisure activities and the characteristic identity of the island.

Besides the co-financing, the Landscape Architecture chair group at Wageningen University became involved with the Mooi Nederland programme as part of the knowledge and education module. The course description for the Designing and Planning Sustainable Energy Islands Atelier was developed in collaboration with ISGO. Financially supported by the ministry, a group of 60 international students in landscape architecture, spatial planning and cultural geography further developed the initial ideas for sustainable developments and renewable energy on Goeree-Overflakkee in the form of a design and planning atelier. Because of the large number of students participating, the study area of Goeree-Overflakkee was extended to the neighbouring island of Schouwen-Duiveland, a municipality that is facing problems similar to those faced by Goeree-Overflakkee.

The student's analyses of the landscape and the energy

Nieske Bisschop
Senior policy adviser at the Ministry of Infrastructure and the Environment

David van Zelm van Eldik
Former manager of the 'Mooi Nederland' Innovation Programme

figure 1.2 Rural character

figure 1.3 Outer-dyke area

figure 1.4 Recreational area. Images by Ministry of Infrastructure and the Environment, photographer Mischa Keijser

problem, their scenarios and individual planning and design elaborations created an enormous body of site-specific knowledge and creative images for the islands and the Mooi Nederland innovation programme. The international team of students displayed an innovative and critical attitude towards the topic. The research, scenarios, energy visions and designs created in the atelier show that renewable energy production can add to the identity and spatial quality of a place. Even in rural areas with strong identities – like Goeree-Overflakkee and Schouwen-Duiveland – it is possible to increase the renewable energy production in a way that suits the islands and their inhabitants. Although the Mooi Nederland programme was wound up in 2011, the ministry is pleased that the ideas and ambitions of the programme continue in developments taking place in regions such as Goeree-Overflakkee and Schouwen-Duiveland.

ISGO AND WUR FOR A SUSTAINABLE AND ATTRACTIVE GOEREE-OVERFLAKKEE

Lennard Seriese

In early 2011, ISGO was offered the opportunity to collaborate with Wageningen University in the Master's course Landscape Architecture and Planning Atelier. The collaboration was related to the project 'Beleef het op Goeree-Overflakkee, duurzaam recreëren in een energielandschap' that ISGO submitted to the national Mooi Nederland innovation programme. In this project it is stated that Goeree-Overflakkee wants to develop sustainable energy, tourism and recreation, and its economy, and to provide its inhabitants with opportunities to take realistic paths towards the future. When the Ministry of Infrastructure and the Environment offered Wageningen University the opportunity to participate in this project, we leapt at the chance. This marked the beginning of a period of intense collaboration between the region and the university. Due to the large number of students who enrolled in the course, Wageningen University expanded the course to include Schouwen-Duiveland, which is one of our neighbouring islands.

ISGO is a collaboration between the four municipalities on the island of Goeree-Overflakkee, which is situated in the Dutch delta area. ISGO works for and with the municipal, provincial and national governments in enhancing the sustainability, safety and attractiveness of Goeree-Overflakkee. Among a wide range of activities, ISGO coordinates waste collection, environmental permits and enforcement, traffic safety, joint purchasing and the construction of cycling and walking routes on the island. ISGO also advises on water, climate, recreation and tourism, agriculture, the economy, the environment and spatial planning policy. Part of ISGO is the regional archive, which is the centre for the preservation of the cultural and historical heritage of the island.

In the process of making a regional structure plan (structuurvisie) in 2009 and 2010, several opportunities and challenges were identified to be taken on by the four municipalities. The declining population, decreasing facilities for inhabitants, a weak economic structure and a social vitality that is under pressure, all require attention. The structure plan also identified ways for the region to reverse these negative developments. The development of sustainable energy and tourism represent major opportunities for the region to strengthen the local economy. The presence of wind, sun, water and biomass, together with abundant space, would allow the large-scale production of sustainable energy. The combination of an extensive beach, masses of water and plenty of sunshine is already a proven concept: Goeree-Overflakkee is the foremost tourist region in South Holland when measured by visitor numbers. However, people fear that the development of sustainable energy will conflict with the development of tourism. This led ISGO to commission research into the possible consequences of sustainable developments in relation to local tourist and recreational ambitions. This provided the Wageningen University students with an excellent and real case to use to investigate the chances for and constraints on the island in its attempt to become sustainable.

During the atelier, ISGO acted as a commissioner to the students. Being the representative of ISGO, I gave a presentation to introduce them to the island, starting with a global introduction that included facts and figures about the surface area, land use, number of inhabitants, CO2 footprint and current sustainable energy production in the region. After my presentation, we felt that were familiar with each other. To deepen our relationship, I presented six topics that have great but uncertain implications for

Lennard Seriese
Policy advisor
environment and
sustainability

Goeree-Overflakkee. These topics are:

- climate change
- declining demographic growth
- a downward socio-economic spiral
- a rising demand for sustainable energy
- the integration of the four municipalities into one
- the political uncertainties related to nature development and the large body of water surrounding the island.

All of these topics need to be tackled by a new way of thinking. To use the words of Albert Einstein: 'We cannot solve problems with the same way of thinking we used when we created them'. Therefore, the students were posed the question: What is the Goeree-Overflakkee way of working towards a sustainable future?

While drawing up the regional structure plan, ISGO and the four municipalities had identified future targets in overcoming the challenges of the island. These are ('we' representing the island):

- We are proud of our beauty and identity
- We are a lively and vital community within the Delta
- We work with others for our future well-being
- We add experience and socio-economic value to our landscape in innovative ways
- We are climate proof and work with water rather than against it
- We are sustainable and provide more energy than we use on the island.

These six future targets were the result of a design atelier with ISGO, the four municipalities and the province, and should be evaluated as success factors when we look back in the year 2030. How to achieve those targets was the question we put to the students. To give them direction, we laid down six preconditions that had to be taken into consideration.

The preconditions were derived from the challenges we are facing and the future targets we want to reach. First, being an island in the Dutch delta means that the sea, lakes and rivers are omnipresent. Climate change could be a serious threat to Goeree-Overflakkee, in the form of flooding and problems related to salinization. Flooding could be very harmful to the inhabitants, and fear of another big flood like the one in 1953 is not to be taken lightly. Salinization resulting from the changing weather pattern and/or water quality, has negative consequences for the availability of drinking water and agricultural production. We demanded that any idea should enhance safety or seek new solutions to possible threats from water and weather, in order to make the island more climate proof and sustainable ('no regrets' policy).

Our next precondition is related to the ambition to strengthen regional tourism and recreation and thus develop that economic cluster. Any new developments should make the island even more attractive than it is now. This could be done by using aesthetic principles in landscape design, as well as by introducing a new technology or activity that will attract visitors. Combining tourism and sustainability as a strong force to create win–win situations is truly desirable.

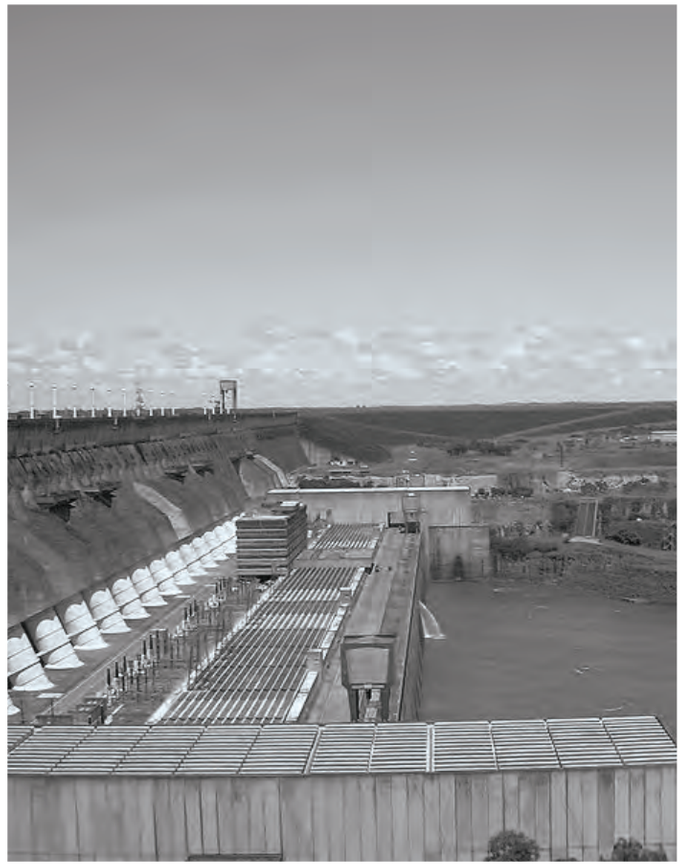
Our third precondition is related to the character of the people and the landscape on the island. The typicality of Goeree-Overflakkee must be maintained; due to religious and cultural aspects, change is not easily accepted or considered necessary. People cherish the current way of living, working and the way things are on their island. This means that new visions and ideas in developing, for instance, the economy, community and landscape should correlate with the local feeling and experience.

Improving economic growth was the fourth precondition. In both the regional structure plan and the Energy Vision (Energievisie), Goeree-Overflakkee states that sustainable energy is a way to provide an impulse to the local economy, preferably by harvesting sustainable energy and reducing energy consumption in households. Economic benefits could be a strong incentive for the local municipality, inhabitants and companies in taking up opportunities to promote a sustainable island economy.

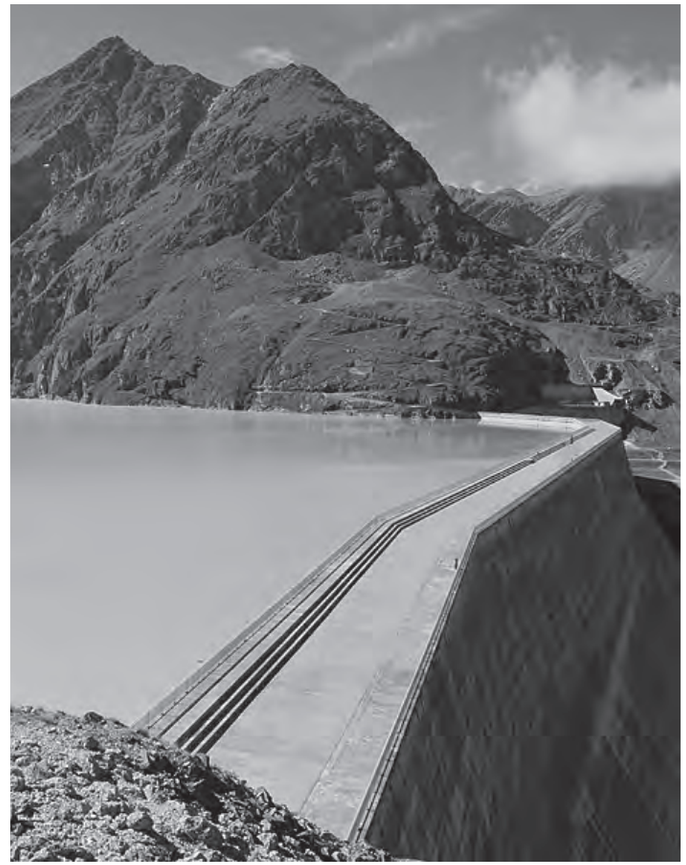
Although these four preconditions seem to complicate matters enough, there were two more. Innovativeness and distinctiveness of thoughts and ideas were specifically emphasized and asked for. Working together with Wageningen University was an extraordinary opportunity for the island to gather fresh ideas and thoughts. Although we stated our preconditions to the Wageningen students and provided an image of the kind of island that Goeree-Overflakkee wants to be in 2030, they were free to use in their planning and design proposals choose whatever path they found the most promising, although we did say that we would prefer their proposals to be realistic.

At this point, we asked the students for their help in showing Goeree-Overflakkee how it can become a sustainable island, while taking into account tourism and recreation, local politics, the existing landscape, the inhabitants and other relevant interests (farmers, energy companies, etc.). All the results are useful to us in defining how we can become a sustainable and enjoyable island in the most successful, profitable, recognizable, innovative and desirable way.

INTERNATIONAL REFERENCE STUDY OF ENERGY PROJECTS



Itaipu Dam



Grand Dixence Dam

HYDROELECTRIC

Itaipu Dam

Location:
Parana River, Brasil and Paraguay

Operational time:
since 1984

Capacity:
14,000 MW, 20 turbines of 700 MW each

Characteristics:
2nd largest Hydroelectric plant in the world

Grand Dixence Dam

Location:
Hérémence, Switzerland

Operational time:
Since 1964

Capacity:
Installed capacity 2,069 MW

Characteristics:
Gravity Dam with a wall of 285 m high

WIND

La Ventosa Windfarm

Location:
Oaxaca, Mexico

Operational time:
25 tubines of 167 in 2009

Capacity:
250 MW, 500,00 inhabitants aproximately

Characteristics:
Onshore

Stateline Windfarm

Location:
Washington and Oregon Provinces, USA

Operational time:
1st phase open in 2001, 3rd phase in 2009

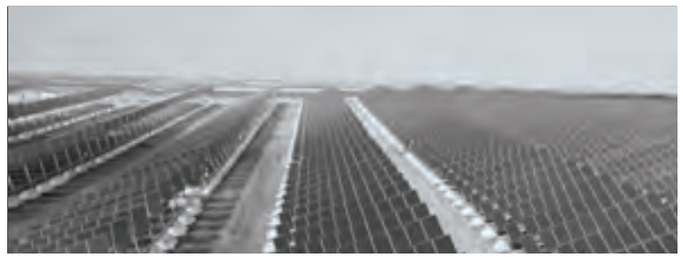
Capacity:
Installed capacity 222 MW

Characteristics:
Onshore
Hub height of 50 and 64 meters
Owner: Florida Power & Light

La Ventosa Windfarm

Stateline Windfarm

Olivenza PV Power Plant



PS10 Solar Power Plant

SOLAR

Olivenza PV Power Plant

Location:
Badajoz, Spain

Operational time:
2008

Capacity:
18 MW, 70 Hectares

PS10 Solar Power Plant

Location:
Sanlucar la Mayor, Andalucía, Spain

Operational time:
2007

Capacity:
11 MW, enough for the supply of 5,500 households.

Characteristics:
Europe first commercial concentrated Solar power plant, it uses 624 Heliostats
Owner: Florida Power & Light

GEOTHERMAL

Nesjavellir Power Plant

Location:
Thingvellir, Iceland

Operational time:
since 1990

Capacity:
120 MW

Characteristics:
Plant delivers 120 MW electricity and 1,800 litres of hot water per second

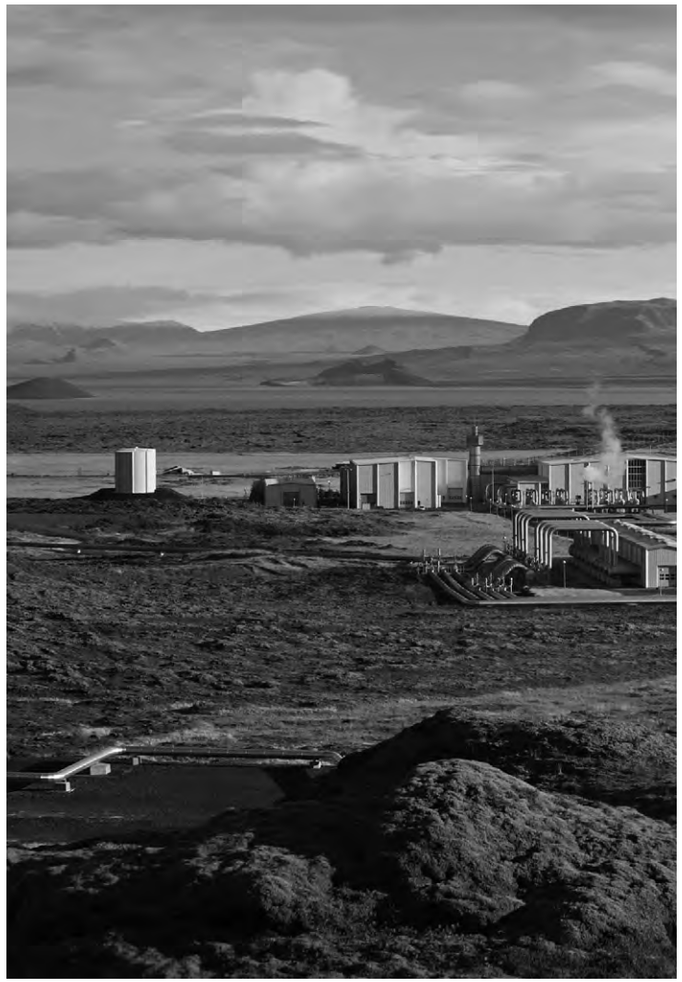
Hellisheidi Power Plant

Location:
Hengill, Iceland

Operational time:
Since 2009

Capacity:
213 MW

Characteristics:
Second largest Geo-Thermal power plant in the world
Owner: Florida Power & Light



Nesjavellir Power Plant

Hellisheidi Power Plant

Jühnde

Güssing

BIOMASS

Jühnde

Location:
Germany

Operational time:
Since 2005

Capacity:
700kW Biogas installation and 550kW Heat Plant with 5500 m local heat network to consumers

Characteristics:
Biomass sources are energy crops and cow manure from farmers within the municipality and wood chips

Güssing

Location:
Austria

Operational time:
Since 2001

Capacity:
8 MW fuel capacity, 2 MW electrical capacity and 4,5 MW thermal capacity

Characteristics:
Combined heat and power plant (CHP) running on locally available wood chips, making use of thermal gasification technique instead of traditional combustion of wood

WAVE & TIDES

1. Rance Tidal Power Station

Location:
Bretagne, France

Operational time:
Since 1966

Capacity:
240 MW

Characteristics:
Use the system of tidal barrage

2. Aguçadoura WaveFarm

Location:
Póvoa de Varzim, Portugal

Operational time:
since 2008

Capacity:
2.25 MW

Characteristics:
World first wave farm
Owner: Florida Power & Light

Rance Tidal Power Station

Aguçadoura Wave Farm




INTERNATIONAL EXCURSION TO DENMARK AND SWEDEN

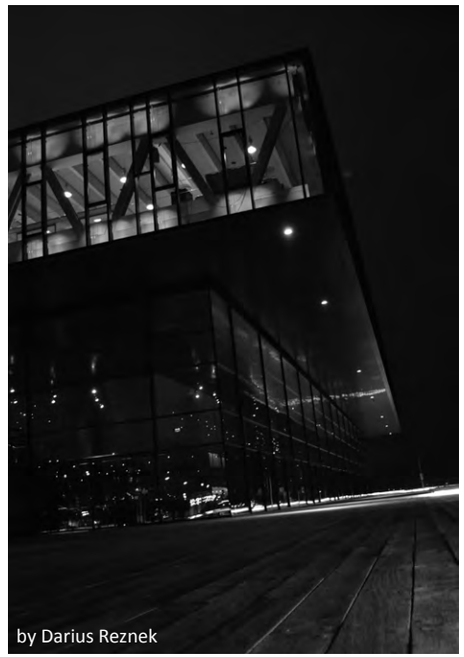



4TH TO 9TH OF APRIL 2011



by Darius Reznek

all photographs without reference by Wageningen University



by Darius Reznek

by Koen Verhoeven

by Darius Reznek

by Koen Verhoeven

by Sjoerd Radstaak

by Hjordis Sigurdardottir

GOEREE-OVERFLAKKEE: STUDENTS AT WORK FOR A SUSTAINABLE ENERGY ISLAND

Rudi van Etteger, Renée de Waal, Maaike Andela

Goeree-Overflakkee (pop. 47,000) is an island in the Dutch delta area. It is separated from the islands of Hoeksche Waard and Voorne-Putten by the Haringvliet, from the mainland of North Brabant by the Volkerak and from the island of Schouwen-Duiveland by the Grevelingen lake. Goeree-Overflakkee is in the province of South Holland, although in terms of landscape it is similar to the Zealand islands further to the south.

The four municipalities on the island – Dirksland, Goedereede, Middelharnis and Oostflakkee – are in the process of being merged into one. At present, a collaborative administrative body called Intergemeentelijk Samenwerkingsverband Goeree-Overflakkee (ISGO) works for and with the four municipalities on regional issues. In 2010, Lennard Seriese submitted on behalf of ISGO the project 'Beleef het op Goeree-Overflakkee' to the Mooi Nederland ('Beautiful Netherlands') innovation programme of the Ministry of Infrastructure and the Environment. The project was awarded additional funding to research how the island can develop in a sustainable way, with a focus on renewable energy, while maintaining its present character and identity and its role as a regional leisure and tourism centre.

Goeree-Overflakkee is not the only region in the Netherlands that sees renewable energy production as a way to strengthen the local economy and to secure future energy supplies. However, as in many such cases – for instance, the recent development of a wind park near the town of Urk in the Dutch province of Flevoland – citizens on the island fear a negative impact on their living environment. In tourism and leisure regions there is extra need to be critical towards developments that will have a great impact on the landscape. Research on combining renewable energy production with spatial quality, tourism and leisure activities can increase the understanding of forces that lead to negative attitudes. By means of landscape planning and design it can be investigated, communicated and discussed what the possible and desirable future developments are when working towards sustainability goals on the one hand and raising public support on the other hand. Goeree-Overflakkee offered an excellent study case because the island situation provides clear boundaries for calculations related to energy consumption and production, and it was expected that a clear landscape character and island identity could be found.

In the meantime, the Ministry of Infrastructure and the Environment agreed that Wageningen University could participate in the knowledge and education track of the innovation programme. This is how the university got involved in the Goeree-Overflakkee project and in similar sustainable developments on the neighbouring island of Schouwen-Duiveland. A group of sixty students participated in the Master's course Landscape Architecture and Spatial Planning Atelier, of whom half focused on Goeree-Overflakkee.

The course lasted three months and was held in the spring of 2011. During the first days, introductory lectures were given on, for example, renewable energy and its relation with space, because this topic was new to many of the students. Lennard Seriese – the representative of ISGO and a commissioner to the project – gave a presentation about Goeree-Overflakkee and the results he expected from the course.

The course was dedicated to making an analysis of the islands and their inhabitants and to critically interpreting the assignment. Near-future spatial developments were also inventoried. The students were divided into four groups, focusing on the coastal,

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Ministerie van Infrastructuur en Milieu

agricultural, recreational and urban landscape types on the island. A two-day excursion was organized to visit these landscape types. A forester, Ted Sluijter, took us around Kwade Hoek, which is a nature area in the north of the island. The area is unique; it is the only place in the Netherlands where natural dune erosion and sedimentation still take place. Farmer Frans Oudijk explained to us why he used green electricity on his farm (because it is the most economical option) and why he has no wind turbine on his land (because he believes that a turbine is not an economical option). As a farmer he appreciates the high quality soils on Goeree-Overflakkee and is proud of his yields. He would therefore never switch from food crops to energy crops.

Monique Sweep – director of Deltawind, the local cooperative for wind energy – told us that the potential for wind energy is very high on the island. The fact that the cooperative only accepts participants from Goeree-Overflakkee helps to involve people in implementing wind energy, and the shared economic benefits increase the acceptance of the turbines. Dick van Puffelen, one of the island's aldermen, was very curious about the possibility of using renewable energy sources other than wind, because there are many people on the island who think that there are already enough wind turbines . One possible solution might be found at the Brouwersdam, where Lennert Langerak and Jacob van Berkel presented the possibility to use tidal energy in case the dam should be opened in the future. To illustrate recreational landscapes, we visited a typical Dutch bungalow park – which some of the foreign students found quite a remarkable way of holiday-making. Finally, we visited two towns on the island, to show the students the historic character that many of the buildings have, as well as such problems as population decline, which threatens the liveability of the communities.

It was concluded from the analysis done in this phase that Goeree-Overflakkee has an attractive rural countryside and villages, whose image is highly appreciated by both inhabitants and visitors. The potential for energy from wind, solar, water and biomass is high, but there is also the potential to extend recreation and tourism. The cultural attitude of the people is based on conservative religious ideas and they are not open to unnecessary change. However, we were warmly welcomed by the islanders, and they were helpful to the students when approached during their analysis work or for an interview.

In phase 2 of the course, the students were divided into four new groups to work on scenarios and energy visions for Goeree-Overflakkee. They adapted the Dutch Welvaart & Leefomgeving ('wealth and environment') scenarios Strong Europe, Global Economy, Regional Communities, and Transatlantic Markets) to Goeree-Overflakkee. We then challenged them to make the island 'climate proof' and more sustainable by increasing the production of renewable energy. Since there is a wide variety of scenarios and storylines, the resulting energy visions are very diverse. Students in all scenarios calculated that 100% of the energy consumption could indeed be generated sustainably from local resources. Students working on the Global Economy scenario found that there is potential to achieve as much as 300%, which would give Goeree-Overflakkee the opportunity to export sustainable energy to other parts of the Netherlands or even abroad. Of course, the spatial consequences for and appreciation by local citizens and other stakeholders are just as diverse as the possibilities that were presented, making the visions interesting input for political discussion on what is desirable. A more detailed account of the results from phases 1 and 2 can be found in the students' contributions, which follow this introduction.

To inspire the students with foreign reference projects, we organized a study trip to the island of Samsø (Denmark) and to Malmö (Sweden). Samsø is an island in the Kattegat that managed to make the transition to sustainable energy in just ten years. Eleven onshore and ten offshore wind turbines generate electricity, while straw and solar boilers are used to generate heat for households that is distributed via local heat networks. The spatial integration of renewable energy on the sparsely populated island was less problematic than it would be on Goeree-Overflakkee. Nevertheless,

it is a convincing example of successful energy transition. The Energy Academy – the building for public information on energy issues – has a remarkable and low-energy design. The western harbour area in Malmö is an example of sustainable development in an urban context close to the sea, which it has in common with the (much smaller) towns on the islands of Goeree-Overflakkee and Schouwen-Duiveland.

In phase 3, the students worked individually on a research or planning topic or on a detailed design elaboration, to clarify or study the feasibility of the ideas in the energy visions. During a three-day workshop facilitated by ISGO, the students had the opportunity to visit their study areas and to talk to the commissioner or important stakeholders once again. There was also extra time to meet the Wageningen tutors or an external landscape architect. In this book, six students present their individual work, namely renewable energy crops on a climate-proof dyke, an energy route along the Middelharnis canal, an energy-neutral concept for farmyards, an energy assimilation and storage system for a recreational facility, a blue energy plant at the Haringvlietdam with its spatial consequences for the island, and a research into population decline versus renewable energy. The atelier presented ISGO and the Ministry of Infrastructure and the Environment with extensive analyses, visions, scenarios and designs for renewable energy that is combined with leisure, tourism and other land uses on the two islands.

Wageningen University looks back on a successful atelier on Goeree-Overflakkee. We should like to thank the students, the commissioners and all the other people involved in the course for their immense enthusiasm and never-ceasing energy.

Rudi van Etteger
Assistant Professor
Landscape Architecture
Wageningen University

Renée de Waal
PhD researcher
Landscape Architecture
Wageningen University

Maaike Andela
Teaching assistant
Land Use Planning
Wageningen University

STEP 1: EXISTING CONDITIONS - COASTAL LANDSCAPE

The rise in sea level has played an important role in the development of Goeree-Overflakkee, and will continue to do so. In 1953 almost the entire island was flooded. This led to the construction of the Delta Works. As a result safety on the island improved however, the creation of the Delta Works also had major influence on the nature on the island. One of the most obvious results is the disappearance of the gradient between salt and sweet water. Since the construction of the Delta Works lakes are either sweet or salt and the changes in water flow even influence areas outside the Delta Works

As a result, there are many historical geomorphological and human remains in the landscape. The creeks and other signs of frequent flooding are sometimes still recognizable.

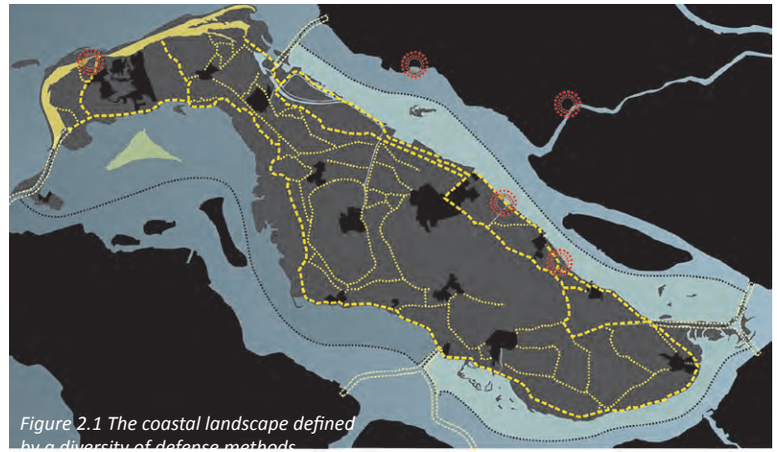


Figure 2.1 The coastal landscape defined by a diversity of defense methods

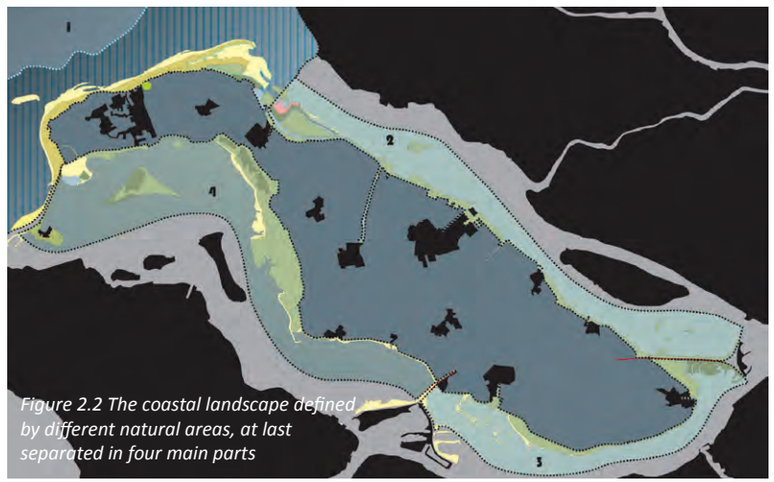


Figure 2.2 The coastal landscape defined by different natural areas, at last separated in four main parts

Figure 2.3 The coastal landscape defined by a diversity of historical-cultural remains

GROUP 1
Martijn Haag
Sangwhan Lim
Karlijn Looman
Diana Lukjanska
Darius Reznek
Daisi Yang
Jessie Wolters
Christiaan van der Zwan

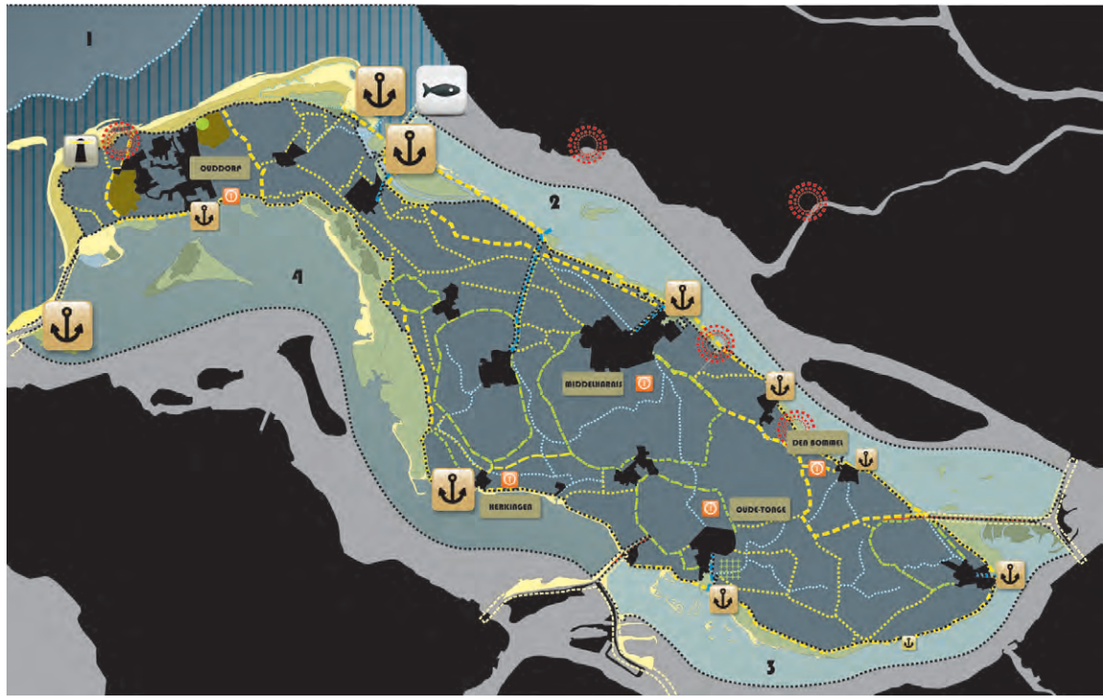


Figure 2.4 Conclusion map of the analysis of Goeree-Overflakkee

In addition to the Delta Works, many other coastal defences are in place to protect the inhabitants. The dunes are well maintained and the coast is supplemented with sand to allow the dunes to grow. The island is also surrounded by a ring of primary dykes and a line of secondary ones.

Fishery has been an important part of both the culture and the economy throughout the history of Goeree-Overflakkee. The Delta Works led to drastic changes in this. The largest part of the island's fishery is based in Stellendam on the Haringvliet. Stellendam has an auction and harbours the largest fishing fleet in the Netherlands.

Tourism is also important for the island's economy. Tourists are attracted to the island by its beaches, nice weather, and spacious landscape. The results for the landscape include the building of yacht harbours, bungalow parks, and cycling and hiking paths, to name just a few. Thereby tourism thus makes an important claim on the available space. Because of this, conflicts between stakeholders may arise.

Both the history and the present are important in the formation of Goeree-Overflakkee's identity. Because of the different claims on space and place, no singular identity can be defined, as differing meanings are given to various places and events. It is also important to note that identity, which is formed throughout and by history, is not static but ever changing.

STEP 1: EXISTING CONDITIONS - AGRICULTURAL LANDSCAPE

The landscape of Goeree-Overflakkee consists of three main parts: Goeree in the west, Flakkee in the east and the middle part, which connects these two former islands. The three parts have different landscapes, different histories and different identities, but together form the island.

Goeree has sandy soils, sand dunes, beaches and a small-scale agricultural landscape, which is diverse and green and has many different types of vegetation and land uses. Flakkee is formed of many polders; they are circular and still visible in the landscape. Flakkee's landscape is an open agricultural production landscape. The middle part – the connection between Goeree and Flakkee – is the youngest part of the island. This rural landscape is characterized by straight lines and large-scale open rural areas surrounded by rows of trees, dykes and sometimes windmills on the horizon.

Roads on the island are typically small and often on top of the dykes. When you drive around, you get an overview of the surrounding landscape; you look down on the landscape and experience it as a whole. Farms are located along the dyke; to enter them, you have to leave the dyke. In doing so, you really enter the agricultural landscape. From being a viewer of the landscape, you become a participant in the landscape. The agricultural landscape

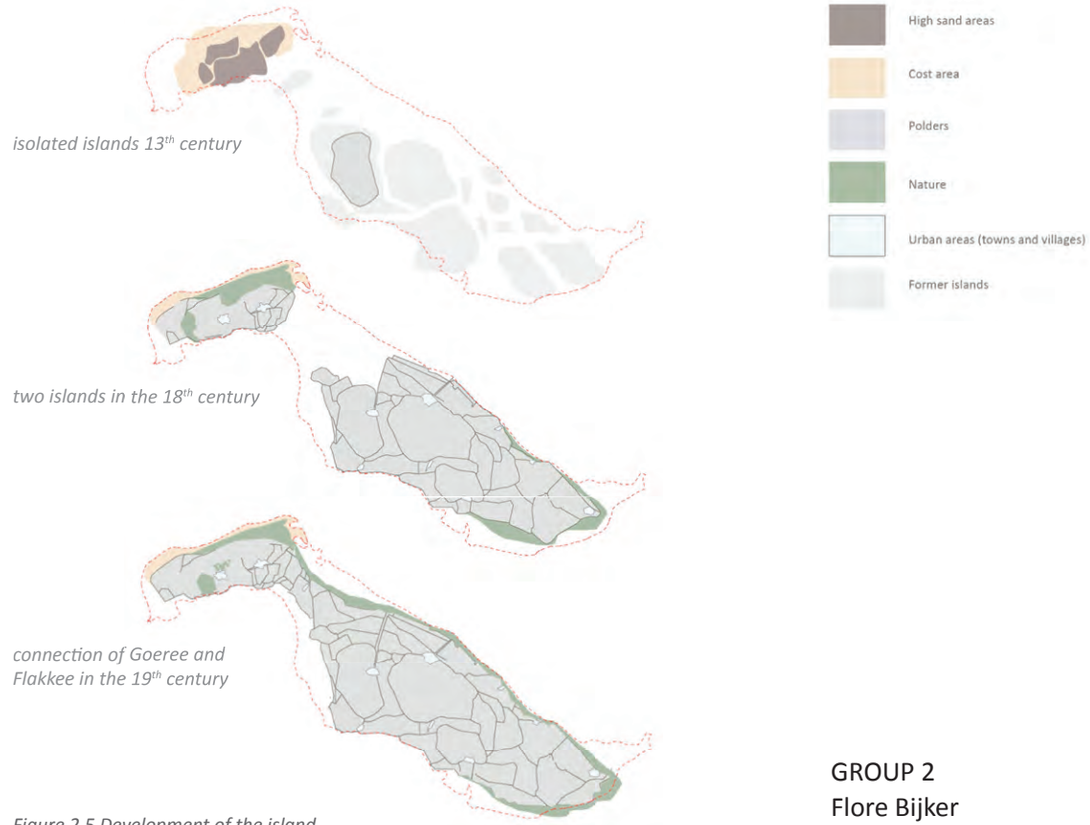


Figure 2.5 Development of the island

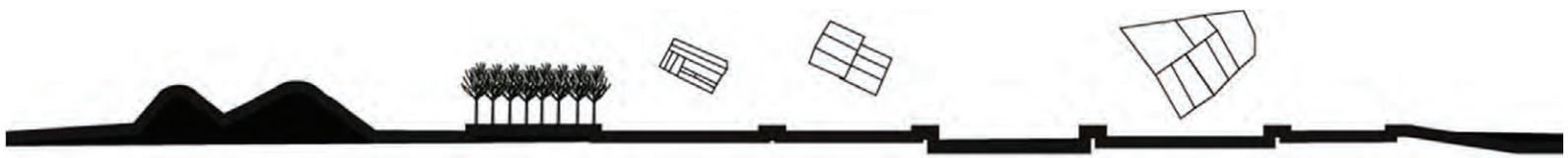


Figure 2.6 Section of the landscape with the scale and pattern of the agricultural plots.

GROUP 2
Flore Bijker
Iulia Dobrovie
Lisa Verbon
Hugo ter Heegde
Taícia Marques
Talida Boanca
Sjoerd Radstaak
Susanne Goransson
Ziyi Liu

Figure 2.7 Current situation

Figure 2.8 How the landscape is experienced: wide and open

comprises not only fields, but also agricultural buildings; the farms are dotted about in the landscape.

The soil on Goeree-Overflakkee is very fertile and hence very good for crop production. The area is one of the Netherlands' richest agricultural areas because of the high amount of clay. Other factors that contribute to the rich agricultural sector are the mild climate and the large amount of sunshine. The biggest agricultural production can be found at Flakkee; production consists of sugar beets, potatoes, grains and onions. On Goeree, where the soil is sandier and less fertile, there are many more small-scale farms and their main production is flower seed.

The island of Goeree-Overflakkee uses in total around 4.2 PJ per year; this is equal to 1167 million kWh per year or 3.20 million kWh per day. Some 22% of the total energy consumed (0.703 million kWh per day) is renewable energy produced on the island (K. Braber, J. Fens, M. Langeveld, 2010). Agriculture consumes 4% of the island's total energy consumption and uses 93% of the space. The 33 windmills on Goeree-Overflakkee produce a total of 48.5 MW.

STEP 1: EXISTING CONDITIONS - RECREATION LANDSCAPE

The population of Goeree-Overflakkee is estimated at 48,257 inhabitants (2011). According to a survey carried out in 2010, people aged between 50 and 60 represent the largest age group, indicating a process of ageing within the population of the island. The majority of professional, educated people and most employees work in the sectors of repairing consumer goods and health care. However, most companies are present in the agricultural and specialized business services sectors. Religion plays a significant role in people's attitudes to tourism and recreational activities; for instance, most of the religious people prefer to have a quiet Sunday, rather than work in the leisure sector. They would rather rest or attend church services then engage in leisure activities.

The population density on Goeree-Overflakkee is relatively low, namely around 182 inhabitants per square kilometre. Rural areas have historically been used to produce food, energy and primary materials; nowadays, however, they also accommodate leisure and recreational activities. Rural consumption is becoming more important than rural production. This changing meaning of rural areas from production areas to consumption areas implies a different use of the space. Green areas have more ecological functions, leisure areas are being developed to meet the needs of urban residents. Furthermore the countryside is becoming an escape zone, there is more interest in protected sites (historical, natural and landscape heritage sites), and rural areas can also be the reservoirs of energy in the form of wind, sun and biomass.

Due to the island's location next to the North Sea, a lot of tourists visit the island for coastal and water recreation, especially during the summer. In 2009, 274,000 visitors (1,800,000 overnight

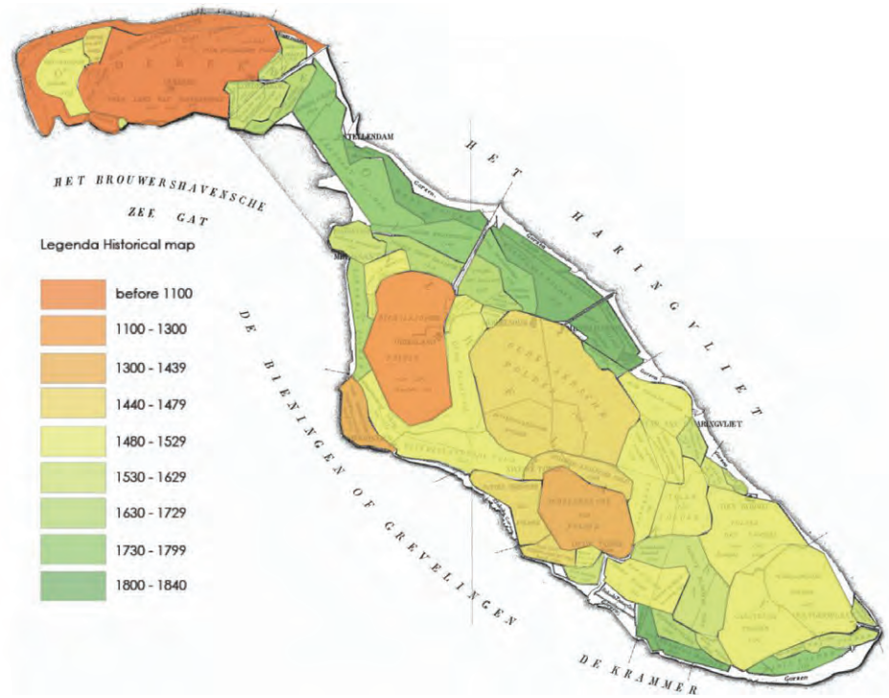


Figure 2.9 Historical development of the island, 1000-1840 A.C.

GROUP 3
Jesper Borsje
Koen Verhoeven
Anhilde de Jong
Kim van Gent
Cynthia Gharios
Yuqiao Liu
Ioana Nica

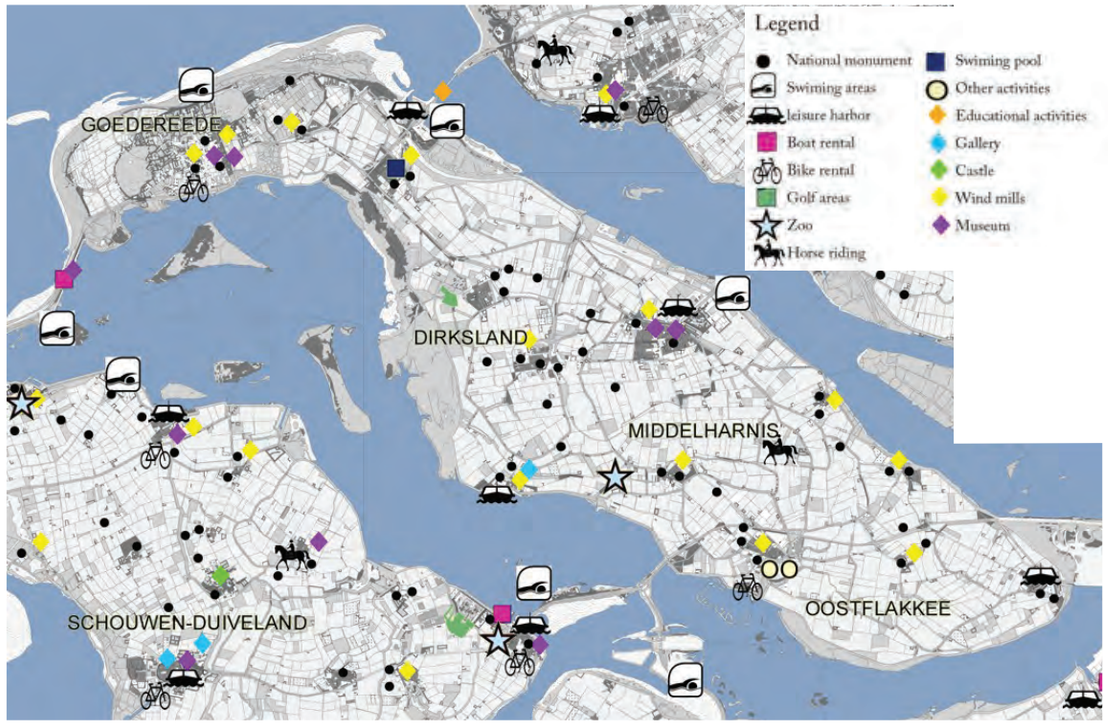


Figure 2.10 Potential Leisure activities on the island, 2010

stays) came to the island. Visitors to Goeree-Overflakkee are concentrated in the age groups 6–14, 30–39 and 50–63.

Tourism is a profitable sector on the island. It promotes such facilities as restaurants, bars, holiday parks and marinas, and thereby job opportunities: 8.4% of all jobs in Zeeland are in the recreation sector (14,400 employees); in Goeree-Overflakkee, the percentage is slightly lower. As for visitor attractions, monuments and old windmills are spread out over the entire island, there are museums in Ouddorp and Middelharnis, and there are various swimming areas, mainly on the island's north coast.

Several assumptions were made in order to calculate the energy used by tourists. For every overnight stay it was assumed that a group of tourists uses the same amount of energy that it uses at home (i.e. 9.6 kWh/day). The 450,000 overnight stays of groups on Goeree-Overflakkee multiplied by 9.6 kWh/day comes to a total of 4.3 GWh/year. It was also assumed that tourists travel the same number of kilometres as the average person in the Netherlands. Some 274,000 holidays are taken on Goeree-Overflakkee each year. Because there is almost no public transport, it is assumed that all these holiday makers visit the island by car. A tourist's car will be on the island for an average of 7.6 days. The assumed average distance travelled by one car is 13,000 km/365*7.6 days = 270 km. This comes to 0.189 MWh per car. 274,000 holidays multiplied by 0.189 MWh per car makes a total of 51.8 GWh/year for the transport of tourists.

STEP 1: EXISTING CONDITIONS - URBAN LANDSCAPE

An important aspect for keeping Goeree-Overflakkee liveable is the level of the facilities. At the moment, the level is sufficient, although the municipalities of Goedereede and Dirksland do not have many facilities. About 40–50% of the population does not live in the vicinity of a primary school, a pharmacy and a supermarket. In the smaller places, these facilities may be under pressure due to a too small market. The 20 schools on the island may be affected by the ageing population and some may need to close in the future.

The current situation on Goeree-Overflakkee was analysed with the layer approach. Creeks had an important function for Goeree-Overflakkee, since they formed the connection between the villages and the sea. The first settlements on Flakkee originated within the ring polder levees and therefore have a special meaning for this part of the island. The identity of the island is based on this unique occupation pattern.

Figure 2.13 shows the existing mass elements, including towns, villages, recreation parks and industrial areas. By comparing this map with the layer map, one can see the connection between the villages and the ring polder levies. The part that lies within the ring polder levees is often the oldest part of the village. The development of the Delta Works improved the flood protection and thus the inhabitants' safety, and the new town developments often happened outside the ring polder levees.

The last layer is the network layer, which shows the network of main roads on Goeree-Overflakkee. The island is connected to the mainland by two bridges. The bridge over the Haringvlietdam leads to Rotterdam and The Hague. The other bridge – the Volkerakdam – leads to Rotterdam, Breda and Antwerp. Goeree-Overflakkee is connected to Schouwen-Duivenland by the Brouwersdam and the

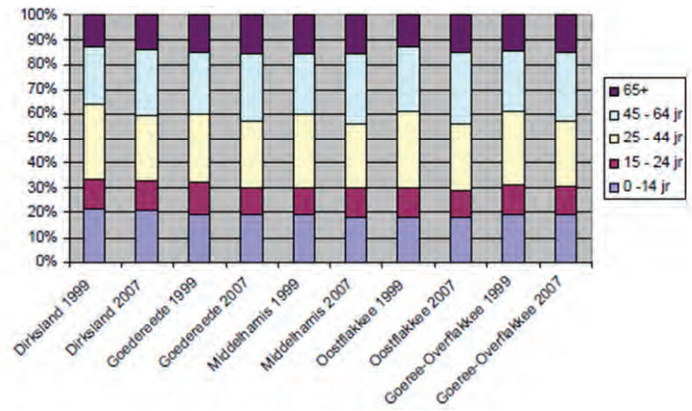


Figure 2.11 Development of the composition of the population in the municipalities on Goeree-Overflakkeebetween 1999 and 2007 (RBOI Rotterdam, 2010).

GROUP 4
Jeroen Castricum
Loes van Schie
Hanna de Winter
Bart Plijner
Maria Georgieva
Ya-Ping Chang
Ying Tzu Lin
Lucia Pro

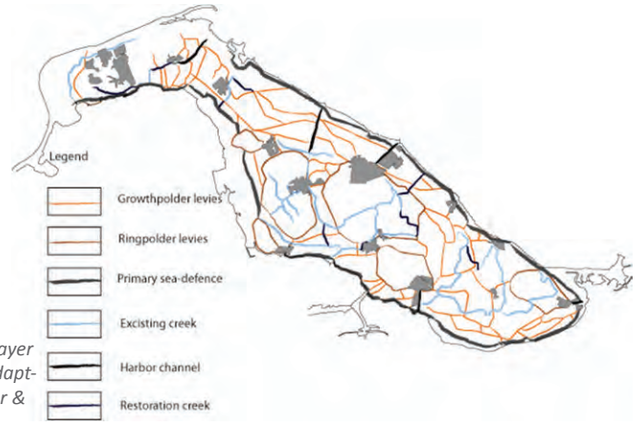


Figure 2.12 Underground layer of Goeree-Overflakkee, (Adapted from Bureau Alle Hosper & Arcadis, 2003)

Figure 2.13 Occupation layer of Goeree-Overflakkee, (Adapted from Bureau Alle Hosper & Arcadis, 2003)

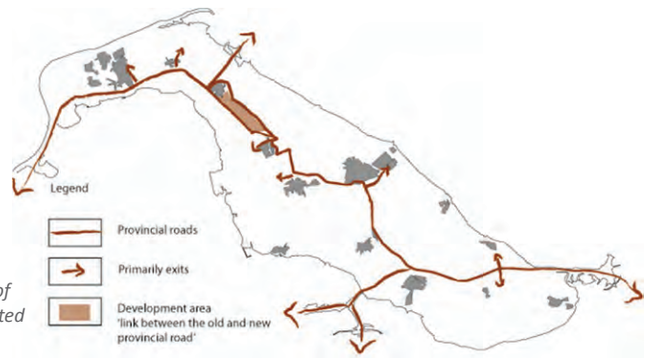


Figure 2.14 Network layer of Goeree-Overflakkee, (Adapted from Bureau Alle Hosper & Arcadis, 2003)

Grevelingendam and to Tholen by the Philipsdam. These dams are important tourist routes because they are the connection to other coastal areas. The bridges are linked to the main road that runs along the island.

STEP 2: NEAR FUTURE DEVELOPMENTS - COASTAL LANDSCAPE

The island faces a large amount of uncertainty related to climate change. The most significant consequence of climate change for Goeree-Overflakkee is a rise in sea level, due to the very low position of the island. While the degree of these changes is highly uncertain, a combination of a rise in sea level and an increase in the intensity of storms poses a very serious threat to the island.

The threat of climate change is the reason for worldwide attempts to reduce CO2 outputs and therefore to switch to sustainable forms of energy. So far, Goeree-Overflakkee has focused on wind turbines, which now provide the island with 25% of its energy demand. To achieve the goal of energy neutrality or even export, more than wind turbines will be required.

Other interesting sources of renewable energy at or near the coast of Goeree-Overflakkee are the sun, the tide, sea waves, biomass and differences in water salinity (known as 'blue energy'). For all of these, Goeree-Overflakkee has a high potential compared to other locations on a regional or even national scale.

The most interesting locations for above energy sources are in the western part of the island. There is more wind and more sun there, the sea is strongly tidal, and there is the difference in salinity. Waves are of course much higher at sea, and seaweed farming for biomass also requires the sea.

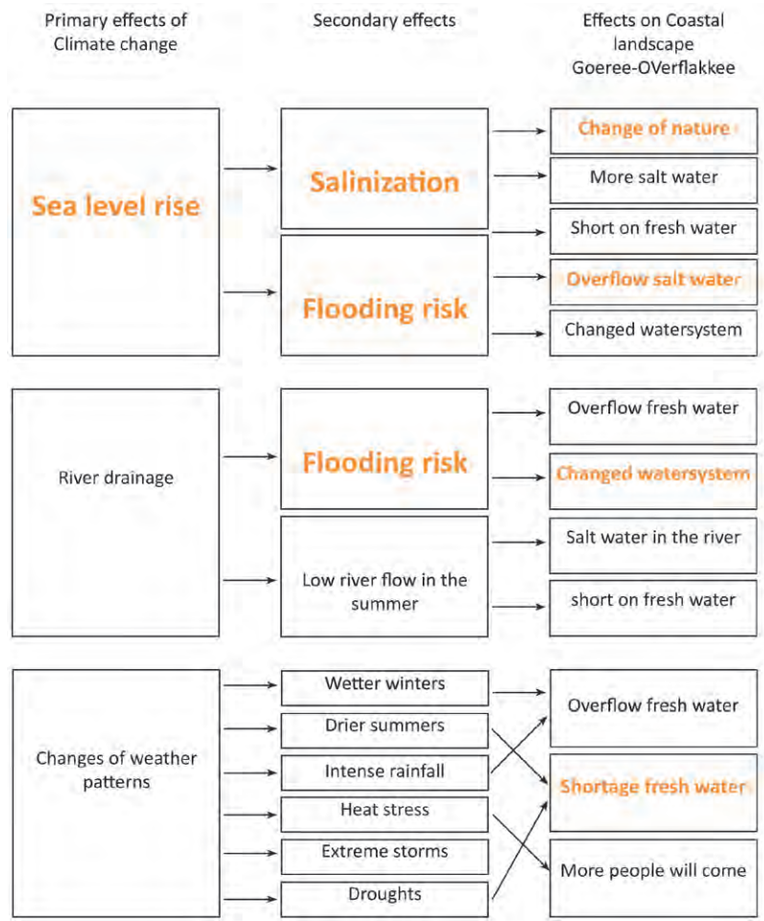


Figure 2.15 Potential effects of climate change on Goeree-Overflakkee

GROUP 1
Martijn Haag
Sangwhan Lim
Karlijn Looman
Diana Lukjanska
Darius Reznek
Daisi Yang
Jessie Wolters
Christiaan van der Zwan

Given the goal of energy neutrality and, if possible, energy export, the transition to sustainable energy will be a huge task. Yet, important topics such as climate change and the identity of the island's community cannot be ignored. Like the energy transition, climate change and identity are dynamic processes that transit over time from one phase to another. Synergy between sustainable energy, climate change and identity is required for a smooth energy transition.

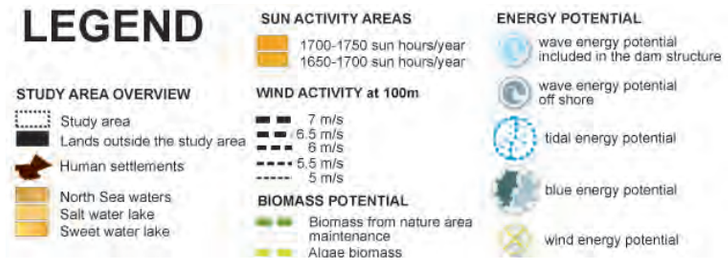


Figure 2.16 Sustainable energy potential in Goeree-Overflakkee

Figure 2.17 Possible historic identity of the island

Figure 2.18 Possible contemporary identity of the island

Figure 2.19 Possible future identity of the island

STEP 2: NEAR FUTURE DEVELOPMENTS - AGRICULTURAL LANDSCAPE

The new rural development paradigm is a reality on Goeree-Overflakkee. This means that the rural area, in this case almost the entire island, is facing the challenge to adjust itself to economic, social and environmental changes. In other words, a shift from top-down to bottom-up development is necessary, with an emphasis on the development of resources found on the island ('endogenous development').

To achieve this, it is important to include the locals in new development processes, and to encourage the expression of local tradition, local production, local customs and local creativity. At the same time, new renewable energy technologies that fit within the area could be implemented and combined with local tourism to provide a new source of economic growth.

Although one may think that there is enough space on Goeree-Overflakkee, all the land is already in use and therefore different land uses are struggling for their own share of the land. There are several land uses that are already a serious threat to farmers, such as new residential developments, the development of tourism, the storage of open water, and nature areas. If agriculture is to survive as a profitable sector, intensive restructuring of the sector is needed. It is therefore proposed to strengthen the agricultural production structure wherever possible (expansion, scaling, new crops, improving marketing structure) or to broaden the homestead (agricultural nature and landscape conservation, recreational uses, etc.).

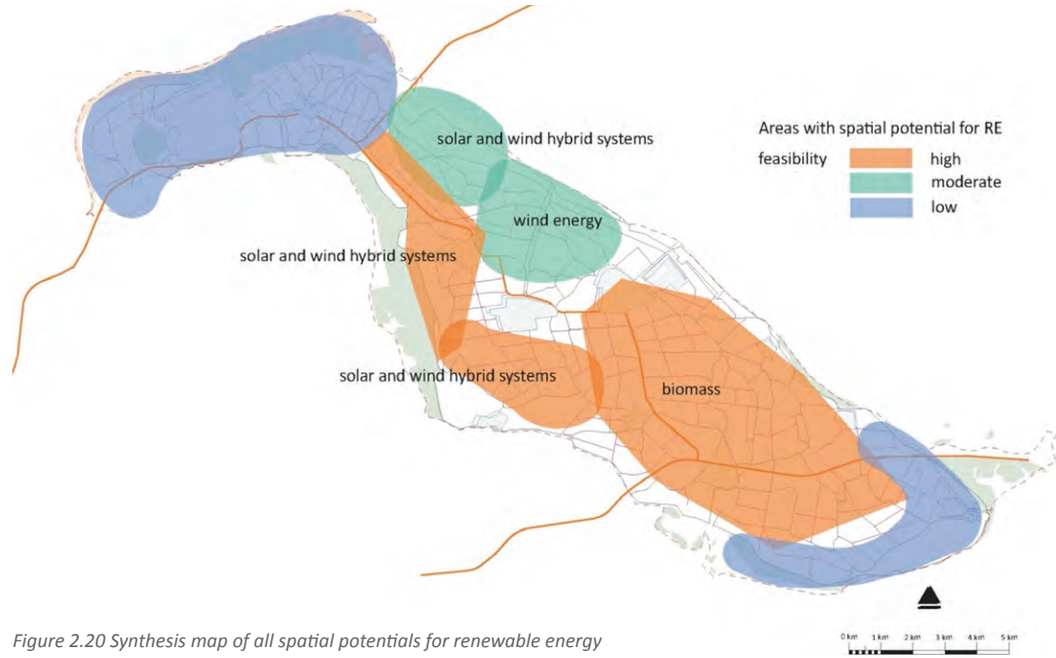


Figure 2.20 Synthesis map of all spatial potentials for renewable energy

GROUP 2
Flore Bijker
Iulia Dobrovie
Lisa Verbon
Hugo ter Heegde
Taícia Marques
Talida Boanca
Sjoerd Radstaak
Susanne Goransson
Ziyi Liu

Figure 2.21 - 2.26 Landscape impact of windmills in Goeree-Overflakkee

A rapidly developing land use form is renewable energy. Many developments have already taken place in the agricultural area, and more will take place in the future. On the island there is potential for the implementation of solar, wind and bio-energy plants, but in order for new energy technologies to be successfully implemented, they have to be accepted and supported by the local governments, organizations and inhabitants.

We think that energy from renewable sources could be well developed on the island's agricultural land if people's negative perceptions can be strategically steered towards recognizing both the merits of using such technologies and their benefits for the environment and the economic well-being of the island. Moreover, it is necessary to take into account the qualities of the landscape and the characteristics of the existing community, and to listen to what the landscape asks and provides and what the people need and prefer.

STEP 2: NEAR FUTURE DEVELOPMENTS - RECREATION LANDSCAPE

The island's aim is to stimulate and facilitate touristic activities mainly in the north (municipality of Goedereede), where the dunes, the beach and the main historical part are located, and then to extend tourism to the other parts of the island via 'stepping stones'. Here, the emphasis will be on the development of facilities for holiday makers and water recreation, as well as on research into combinations with other land use functions, such as culture, nature, wind parks and water storage (ISGO, 2010). There are many opportunities for various forms of recreation and tourism on Goeree-Overflakkee (figure 2.27).

The western part of the island is considered an area where coastal recreation can be developed, with several concentration areas (indicated by the sunshades on the map). The bright green indicates opportunities to improve and expand holiday tourism around Stellendam and Middelharnis. The orange and the dark blue areas indicate cultural tourism and ecotourism, respectively. In the light blue zone there are possibilities to improve marinas and to develop multifunctional agriculture (ISGO, 2010).

Creating a sustainable image for Goeree-Overflakkee requires more than just sustainable energy: a complex network of environmental, economic and sociocultural aspects must be considered. By focusing only on the environmental benefits of sustainable energy, important economic and sociocultural aspects will be overlooked and sustainability will not be achieved. For this reason, combinations of renewable energy with the other two dimensions are necessary in order to create a sustainable recreational landscape. Within this landscape, the most important economic pillar is tourism. Considering the sociocultural facet, the identity and the character of the island are highly valued by

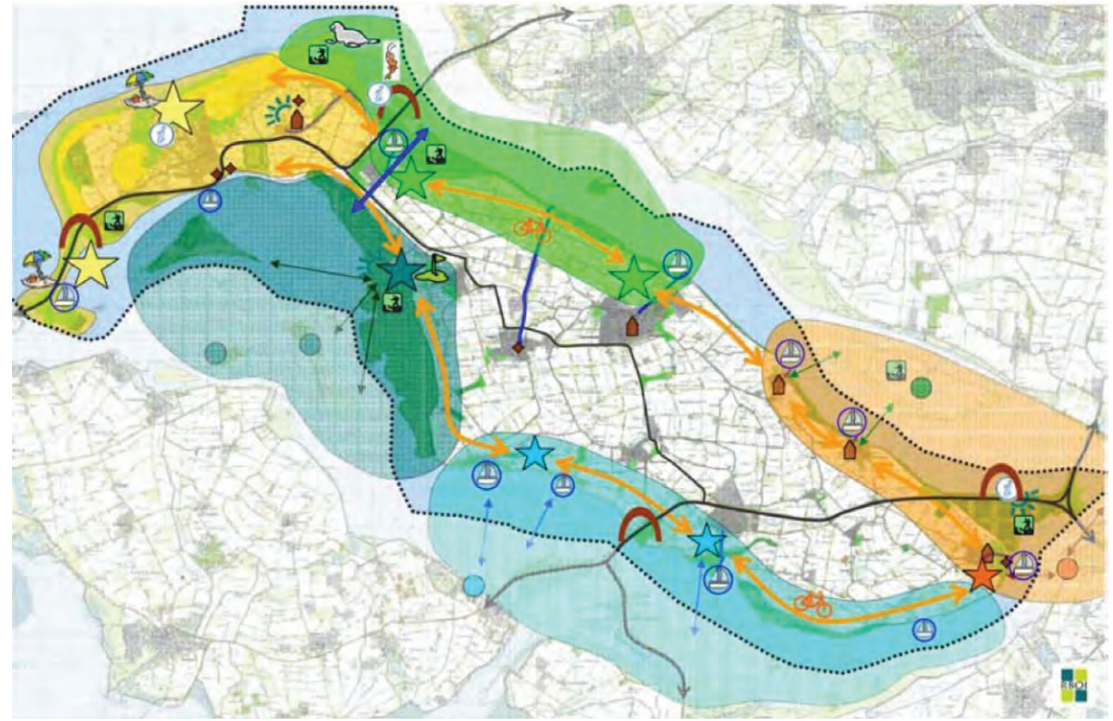


Figure 2.27 Manifold opportunities for recreation and tourism on Goeree-Overflakkee, (ISGO,2010)

GROUP 3
Jesper Borsje
Koen Verhoeven
Anhilde de Jong
Kim van Gent
Cynthia Gharios
Yuqiao Liu
Ioana Nica

Figure 2.28 Areas with potential to combine sustainable energy with the reacreation landscape to improve tourism while considering the identity of the island.

many people. A balanced combination of these elements will make the recreational landscape sustainable; all these elements should therefore be taken into account. Windmills, solar energy and tidal energy are possible sustainable solutions in relation to tourism.

The most interesting sites on which to develop a balanced combination of the different aspects of sustainability are shown in figure 2.28. As Goedereede attracts by far the largest number of tourists compared to the other municipalities on the island, the first logical way to promote the green image of Goeree-Overflakkee to tourists is to make renewable energy visible in the landscape. On the other hand, Oostflakkee is the municipality with the least amount of land for recreational purposes, and thus there is a lot of room for improvements and development in this sector.

STEP 2: NEAR FUTURE DEVELOPMENTS - URBAN LANDSCAPE

A prognosis for the future is that there will be a decrease in population numbers between 2015 and 2020. There will also be a change in the age composition of the population: a decrease will occur in the 35–50 age group, while increases will occur in the 50+ age group. These changes in the composition of the population will have consequences for the housing policy: there will be an increased need for seniors' housing (care housing) and care facilities. The main plans for and policy on housing projects are those of the local governments and are intended to improve the vitality of the villages.

Future urban energy projects are rare on the island since most of the interest lies on renewable energy in the rural and coastal landscapes. However, new houses will be more energy efficient and inhabitants will be provided with information about energy saving.

The Energy Research Centre of Netherlands (ECN) states that the task of sustainable energy development needs to be worked on in three dimensions. First, reduce the demand for energy and save the energy that is unnecessarily wasted. Second, use energy smartly: make efficient use of fossil energy to meet the demands for different energy qualities. Third, develop renewable energy sources that can replace fossil fuels.

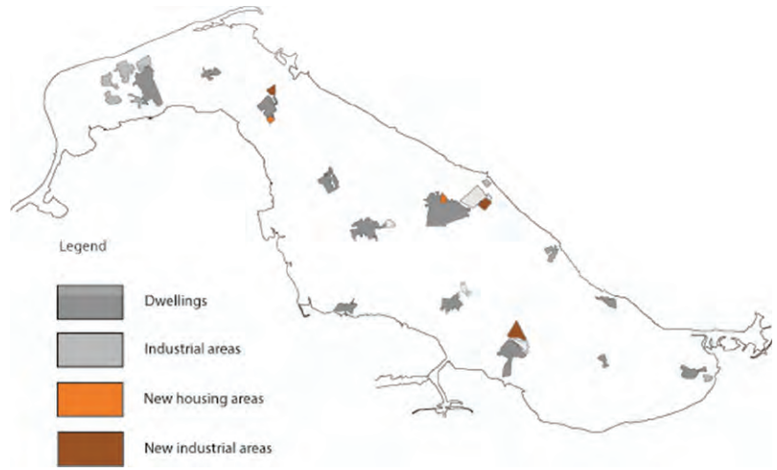


Figure 2.29 Planned developments for Goeree-Overflakkee

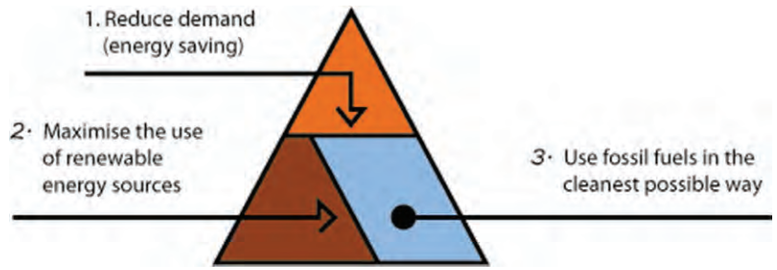


Figure 2.30 Triangle of ECN, 2011

GROUP 4
Jeroen Castricum
Loes van Schie
Hanna de Winter
Bart Plijner
Maria Georgieva
Ya-Ping Chang
Ying Tzu Lin
Lucia Pro

Improving the efficiency of existing energy use is the first step towards achieving sustainable development; it is possible to manage the urban energy use in such a way that less waste is produced. The reduction of waste as a passive way of saving energy requires people to be conscious of how much energy they use.

Designing a sufficient and efficient energy use is an important aspect not only for the use of renewable energies, but also better to use fossil fuels. This compels, for example, combining functions in order to use and reuse energy that would otherwise be wasted, utilizing local energy sources and endogenous resources, reducing the energy demand, and reusing and converting the existing system (we can try to use and convert existing systems for energy distribution in order to not have to build new networks to deliver renewable energy).

STEP 3: POSSIBLE FUTURE SCENARIO 1 - STRONG EUROPE

The local government wants to transform Goeree-Overflakkee into a sustainable energy island. ISGO therefore asked: 'How can Goeree-Overflakkee become a sustainable energy island?' This seems to be a quite simple question, but there are multiple aspects involved in the transition of the island. Besides becoming a sustainable energy island, a combination has to be made with tourism. Furthermore, the cultural and historical identity of the region is highly valued by the inhabitants and should therefore be preserved.

A way to transform Goeree-Overflakkee into a sustainable energy island is being sought within the context of the 'Eurisland scenario', in which the influence of the European Union will increase. It is assumed that the EU will designate Goeree-Overflakkee as a renewable energy area. Besides producing enough energy to meet the island's own demand, a surplus of 50% of the own demand should be generated for export. Furthermore, the EU regards the nature on the island and the realization of the Ecological Main Structure as highly important.

The location of the island provides great opportunities for both renewable energy and nature, as well as for the desired tourism. The wind speed and the number of hours of sun on Goeree-Overflakkee are high compared to the rest of the Netherlands, which creates potential for renewable energy generation. The fact that it is an island surrounded by the North Sea and other water bodies, makes it an attractive tourist destination. This is especially so for coastal and water recreation during the summer. Finally, due to the salinization gradient along the island, there is an opportunity for unique salty nature with a high degree of biodiversity.

By making models and combining them into a vision for 2040, a possible desired future for the island has been prepared.

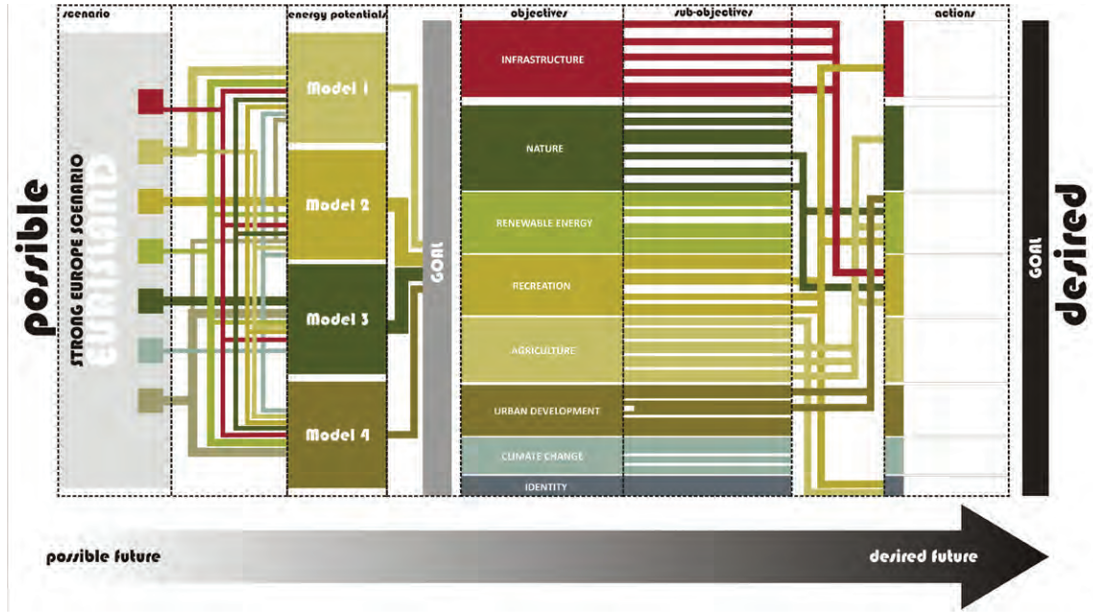


Figure 2.32 Framework for Methodology, from the strong Europe scenario, via models, goals, objectives and actions to a desired future

GROUP 1
Darius Reznek
Martijn Haag
Sjoerd Radstraak
Hugo ter Heegde
Yuqiao Liu
Anhilde de Jong
Hanna de Winter
Ya-Ping Chang

Figure 2.33 Impression of the tourism model

Figure 2.34 Impression of the urban model

While the focus of all models is the same (sustainable energy), each has a different emphasis, namely agriculture, tourism, nature and the urban landscape. The four models are presented in figures 2.33-2.36.

Figure 2.35 Impression of the nature model

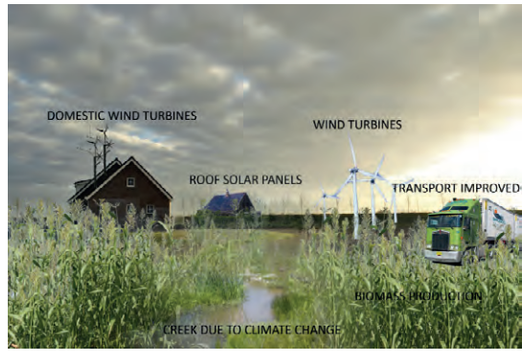


Figure 2.36 Impression of the agricultural model

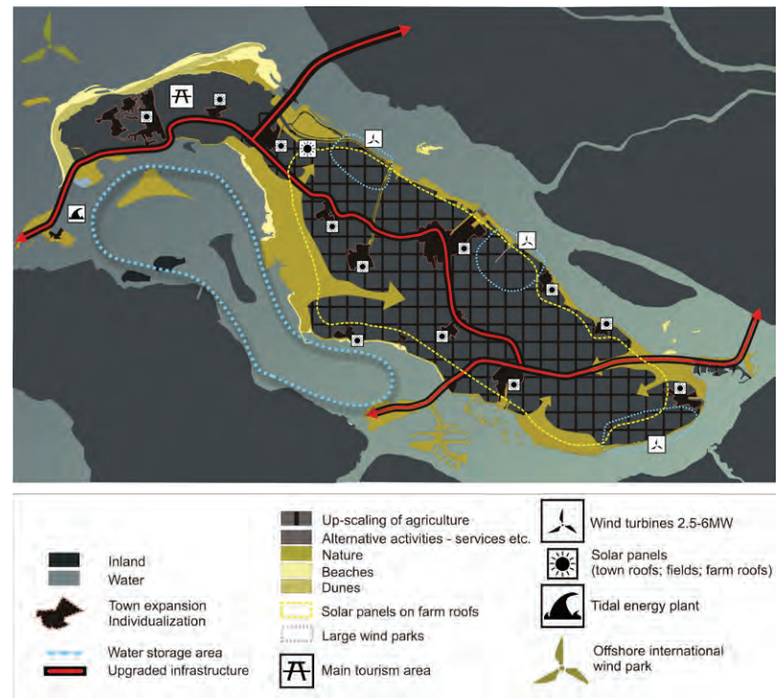


Figure 2.37 Strong Europe scenario base map, starting point for the developed models

STEP 3: POSSIBLE FUTURE SCENARIO 2 - GLOBAL ECONOMY

The 'Global Economy scenario' focuses on the stimulation of global growth, where neither governments nor organizations impose severe big limitations or very strict guidelines. Trade is completely free and the main purpose is to make as much profit as possible.

Three possible futures for 2040 were developed: GO's exporting, GO's to the edge and GO's producing ('GO' = Goeree-Overflakkee). These possible futures are a combination of the urban, agricultural and tourism landscapes analyses. The coastal landscape is included in all of the combinations because it is an existential characteristic of the island. Each future is a combination of two sectors that are the driving forces for the development of the island within the scenario of the Global Economy.

In the 'GO's exporting' model, the main focus is on urban expansion and the development of agriculture. The urban areas will increase and become satellite cities of Rotterdam. The agricultural sector is the other main stakeholder. It will develop a new market for niche products that will be sold all over the world. These will be special products that can be produced on the island better than in other agricultural areas throughout the world. The goal is to make an island that is producing and exporting energy and niche products for the global market.

In the 'GO's on the edge' model, the tourism sector and the urban developments are the main focus and have the leading role on the island. This results in a lot of new space for touristic areas and in large, expanding cities, as a result of commuters travelling to and from Rotterdam. The pulling force for Goeree-Overflakkee is the growth of and profit from tourism, together with the energy generation. The expanding cities contribute to a more lively society and create a mixed population on the island. The key sources of

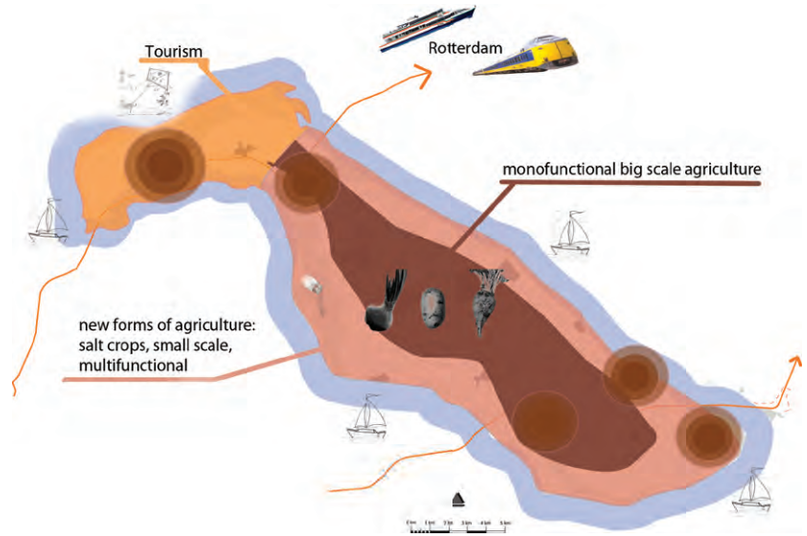


Figure 2.38 Impression of a possible future for Goeree-Overflakkee based on the global economy scenario

Figure 2.39 Perception of the present identity of the island

GROUP 2
Karlijn Looman
Christiaan Van der Zwan
Flore Bijker
Talida Boanca
Koen Verhoeven
Cynthia Gharios
Loes van Schie
Lucia Pro

Figure 2.40 Perception based on urban and agricultural development

Figure 2.41 Perception based on urban and tourism development

Figure 2.42 Perception based on agricultural and tourism development

renewable energy are wind, sun and biomass.

In the third model, 'Go's producing', the agricultural sector is a main stakeholder. Again the focus is on the development of a new market for niche products as described in the GO's exporting model. On the other hand, tourism is increasing and is also creating good connections with the global world. Energy provision is the main task for the island. The sources for the energy generation are the wind, sun, agricultural waste, algae production and blue energy.

STEP 3: POSSIBLE FUTURE SCENARIO 3 - REGIONAL GOVERNMENT

In the 'Regional Communities scenario', the globalization of world trade has come to an end, and therefore all trade blocks are internally oriented. Due to this, economic growth is very low. In the Netherlands, the population is ageing and in 2040 there will be a shrinking number of inhabitants. In this scenario, the government is the key actor, implementing policies according to a top-down approach. To achieve this implementation, the national government delegates responsibility to regional authorities.

In order to tackle the challenges and pitfalls of the Regional Communities scenario, it is essential for the local government to benefit from the support of the island's organizations and inhabitants. Stakeholders were divided into subgroups, each of which has its own future scenario. Three models were generated regarding the particularities of each subgroup of stakeholders.

The first subgroup of stakeholders – the Slow Core group – comprises identities that are embedded in different typologies, such as those of farmers and fishermen, keeping in mind the religious influence (the Church). This group represents the conservative residents of the island; the corresponding identity is defined by agricultural production, semi-natural coastal environment, old dykes for coastal defence and historical human settlements. In this model, the main idea of the energy landscape is to ensure that the renewable energy provision is less visible and to preserve the island's traditional landscape.

The key actors in the second, mainstream subgroup are the island's visitors, the focus being on recreational and educational tourism. The target identity is within the outsider's perspective, recognizing traditional values but also accepting changes and new possibilities regarding energy transition and its effect on the

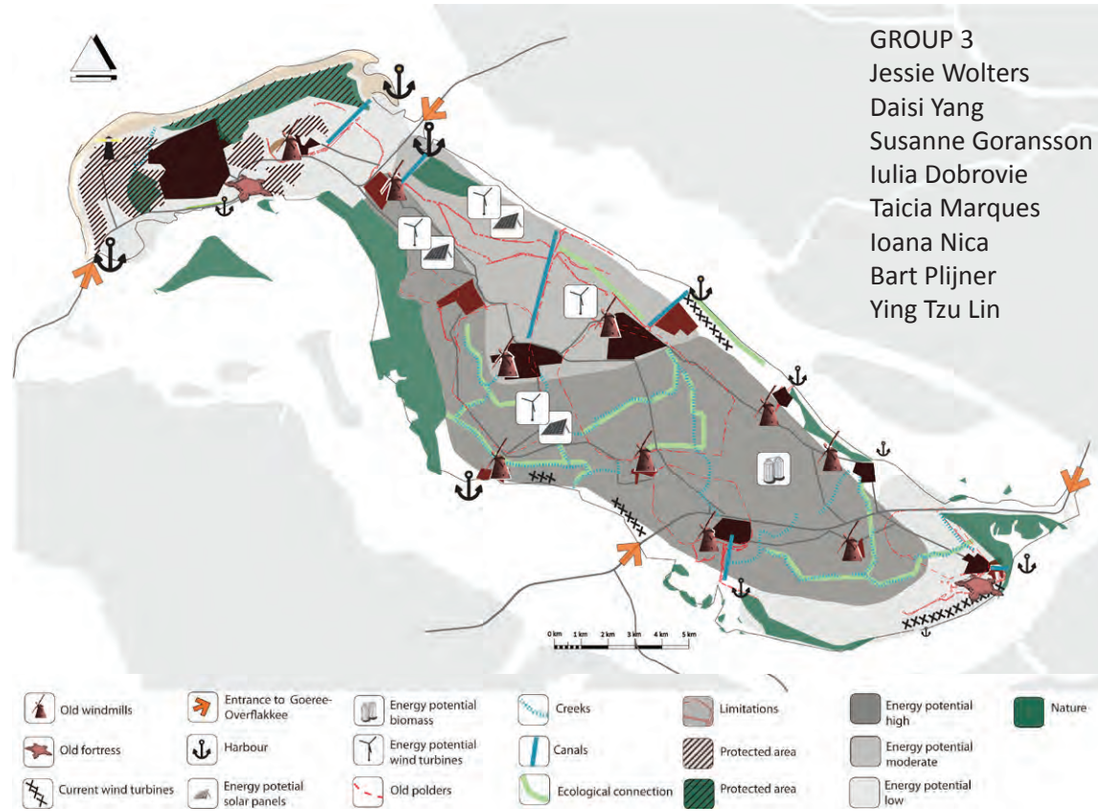


Figure 2.43 Scenario base map based on typology of the island, identity and energy

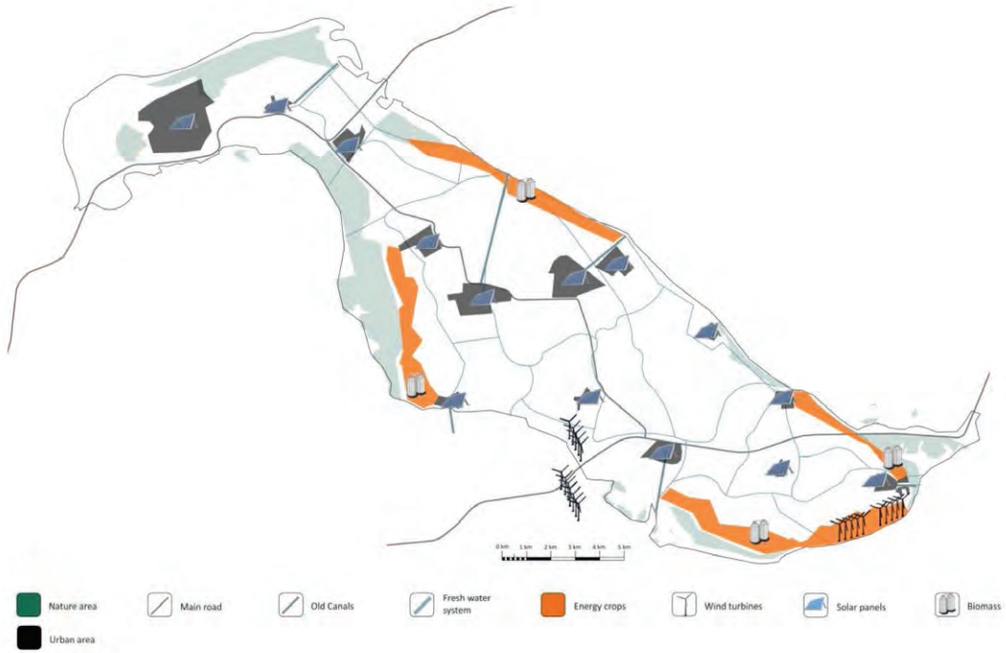


Figure 2.44 Energy sinks and -sources in the slow-core model

landscape. This mind frame will drive the changes, improvements and new developments on the island through a transitional model that integrates the energy production with the landscape rather than concentrating it in urban areas.

The third subgroup – the Drum ‘n Base group – represents the far futuristic development in extreme sustainability. The stakeholders in this group are Deltawind, the water board and researchers. The major driving force in this model is sustainability that is open to change. The energy landscape is visible, thus becoming the identity of Goeree-Overflakkee.

Figure 2.45 Collage slow core model

STEP 3: POSSIBLE FUTURE SCENARIO 4 - REGIONAL CIVIL SOCIETY

In the 'Independent Island scenario', the emphasis is on a self-sufficient society and a strong local economy with an inward orientation. This requires the use of local resources and the power of a strong community. Consequently, the private sector plays a very important role. There is a large degree of freedom for strong, local, private companies and businesses to steer the market. A local market-led, small-scale economy leads to increased and more diverse labour productivity and employment.

Several examples of simple concepts are offered to make Goeree-Overflakkee a sustainable energy island (figure 2.46). These form a starting point, the first step in the development of three concept models, namely the local concept model, the central concept model and the offshore concept model.

In the local concept model the focus is on the sinks, which are the villages. Heat, electricity and food are directed to the sinks. These sources are as close as possible to the sinks in order to reduce transport losses. Sources with the highest losses on larger distances are closest to the sinks.

In the central concept model, the island consists of an inland production area and a coastal sink area. All the produced energy, heat and food is transported to the coastal area. The inland area is fully optimized for production.

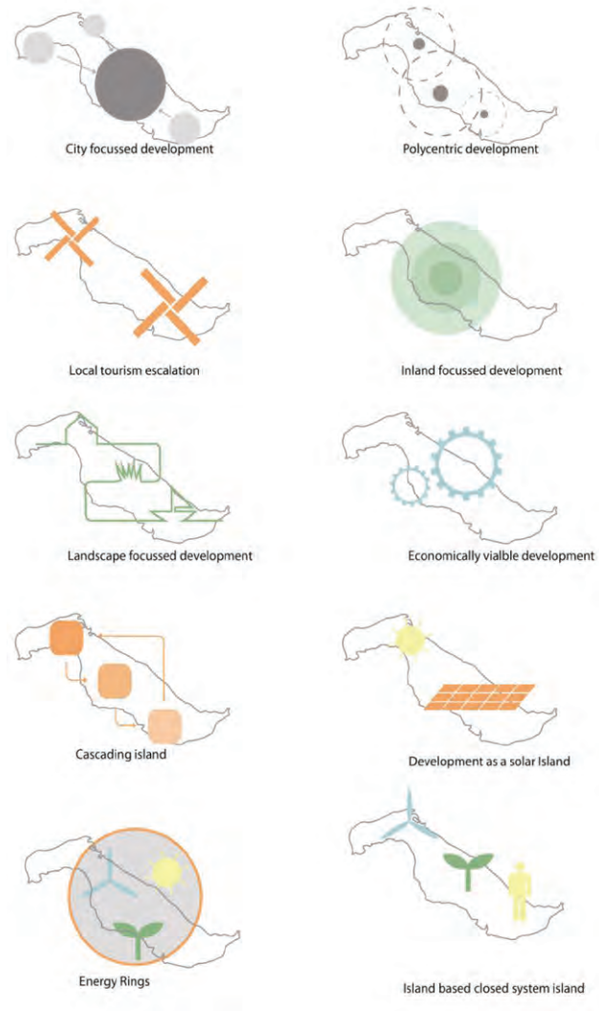


Figure 2.46 Concepts for a sustainable energy island

GROUP 4
Sangwhan Lim
Diana Lukjanska
Lisa Verbon
Ziyi Liu
Kim van Gent
Jesper Borsje
Maria Georgieva
Jeroen Castricum

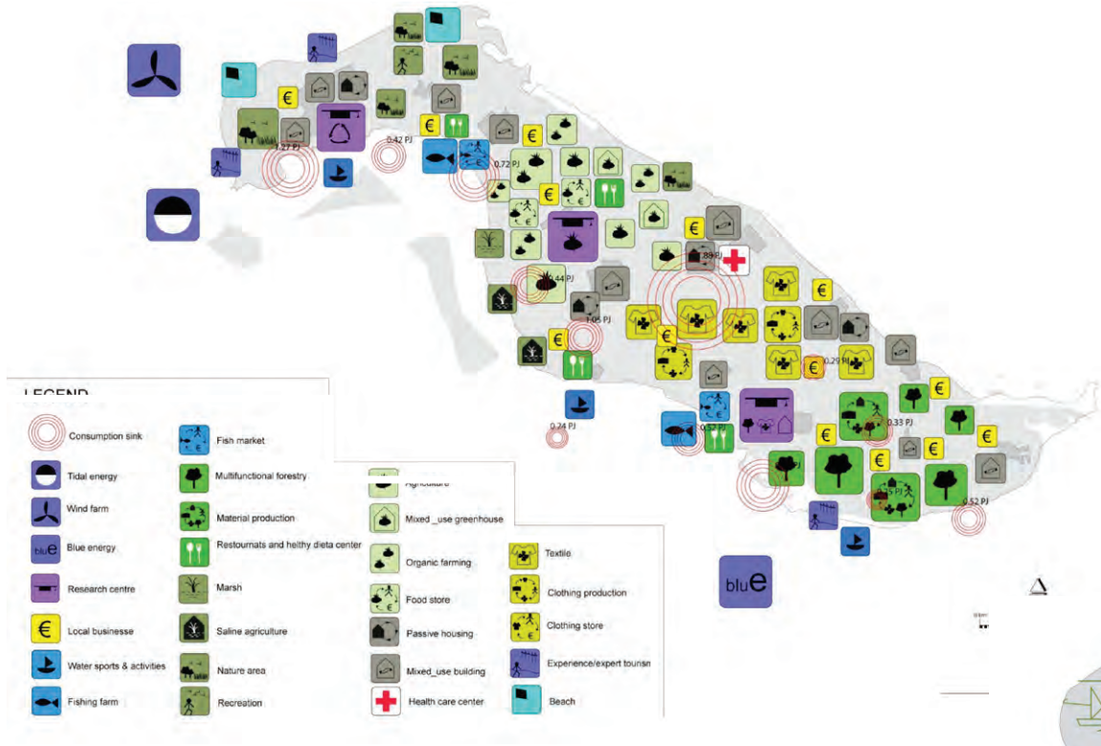


Figure 2.47 Developed offshore model based on offshore production and inland consumption

Producing all energy offshore is the focus of the offshore concept model. Here, the high energy potentials in the surrounding waters are used (tidal and blue energy). The island itself can now be used for the production of food and materials and is fully self-sustaining. By developing the tidal and blue energy potentials, the island can be an interesting place for knowledge accumulation and education.

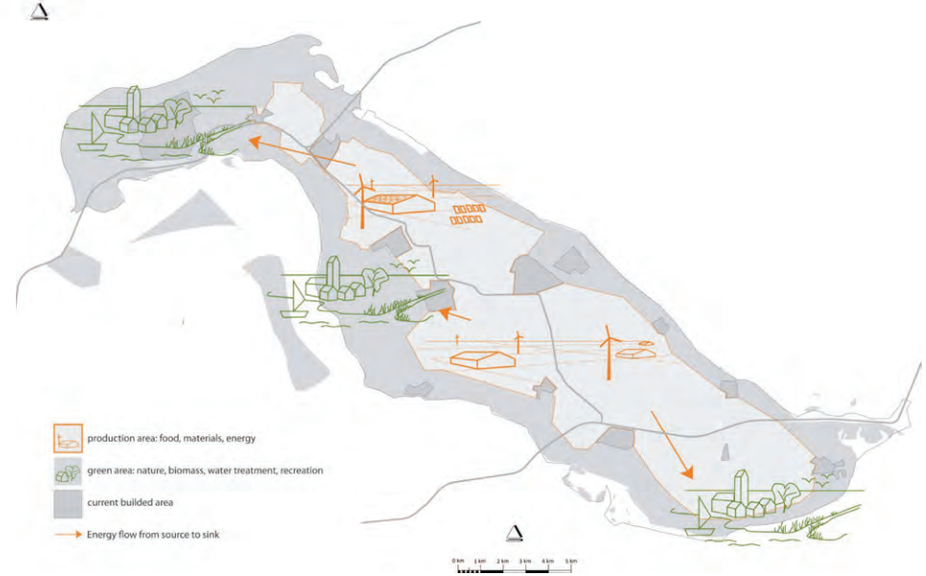


Figure 2.48 Basic central model, an inland zone for energy production, other functions take place along the shoreline

STEP 4: DESIRED FUTURE - ENERGY VISION # 1

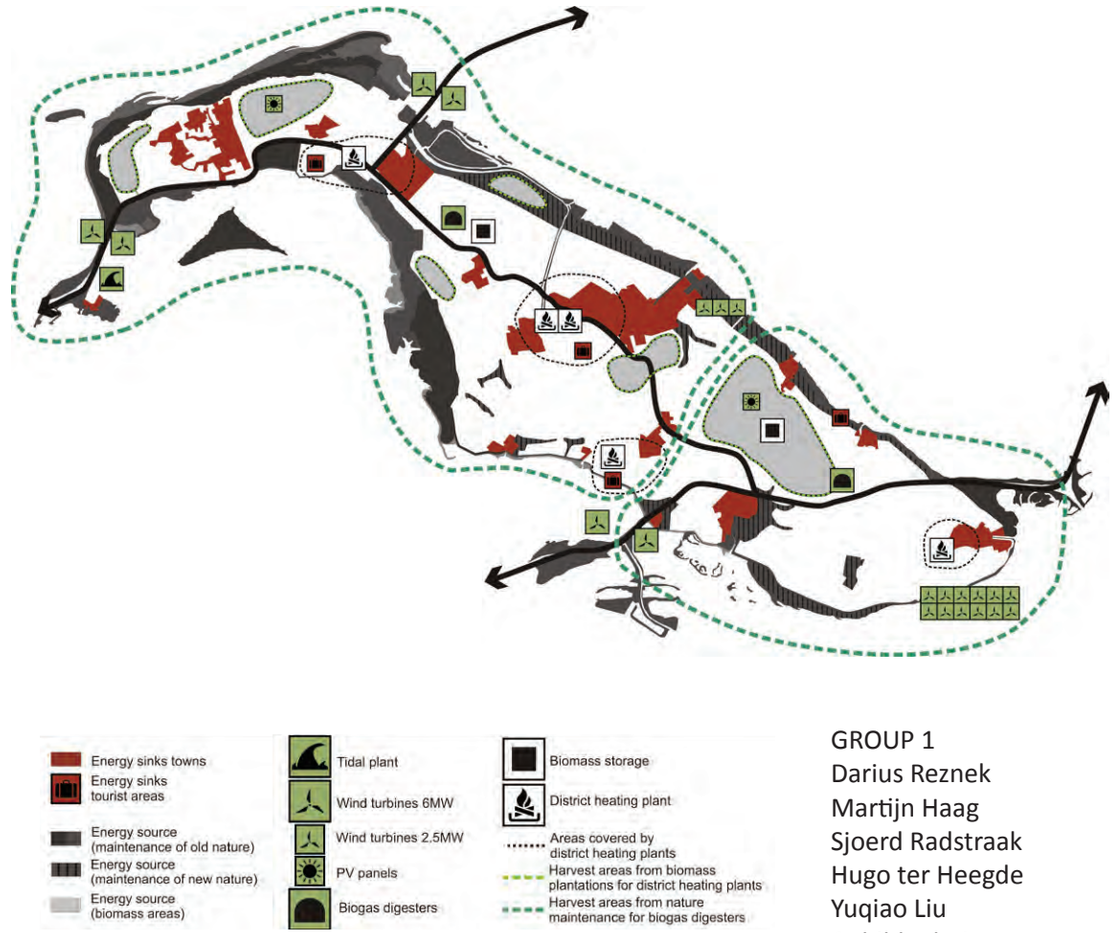
A natural, touristic, energy producing Goeree-Overflakkee

In order to develop a vision, the agriculture, recreation, nature and urban models were combined. As the vision is to be in line with the 'Eurisland scenario', nature and tourism are highly important. Following this, the main goal was divided into eight sub-objectives that involve infrastructure, nature, renewable energy, recreation, agriculture, living and working, climate change, and identity.

The resulting vision is based on a couple of considerations of the conditions provided by the external scenario. First, the nearby urban areas of the Randstad and Antwerp are expected to show a large growth of people and economy. This provides a demand for nearby recreational areas. Second, nature and environment are important issues for the EU, leading to numerous policies, restrictions and actions. Part of this will be the opening of the Haringvliet sluices. Third, this provides problems for large-scale agriculture, as environmental restrictions and salinization will reduce its effectiveness and possibilities.

The agriculture model succeeds in providing the island with a strong economy based on large-scale agriculture and some tourism, using the nearby harbours and airports to transport products across the world. The landscape will receive major changes from the up-scaling and large wind turbines and the role of nature on the island is minimalized.

Taking this into account, tourism and recreation provide the most opportunities for Goeree-Overflakkee, especially since it is easy to establish a synergy between these two. At the same time, the economic growth of Rotterdam may provide some employment for people on this island. For agriculture it is possible to combine the functions of nature, recreational facilities and food production. Add energy provision as well and you have a large variety of



2.49 Energy potential map, energy production is integrated in the landscape and combined with recreation

GROUP 1
Darius Reznek
Martijn Haag
Sjoerd Radstraak
Hugo ter Heegde
Yuqiao Liu
Anhilde de Jong
Hanna de Winter
Ya-Ping Chang

activities and landscapes that can contribute to each other.

For the provision of renewable energy, it will be necessary to implement energy facilities, such as wind turbines, solar panels and a tidal plant. Combined with strategies for energy saving, Goeree-Overflakkee will become an energy-neutral island. In addition, large, attractive wind turbines will function as landmarks at the island's entrances.

By following the vision and the accompanying spatial planning actions, Goeree-Overflakkee will have a unique, natural landscape in which renewable energy provision is integrated in such a way that it is an attractive tourist environment.

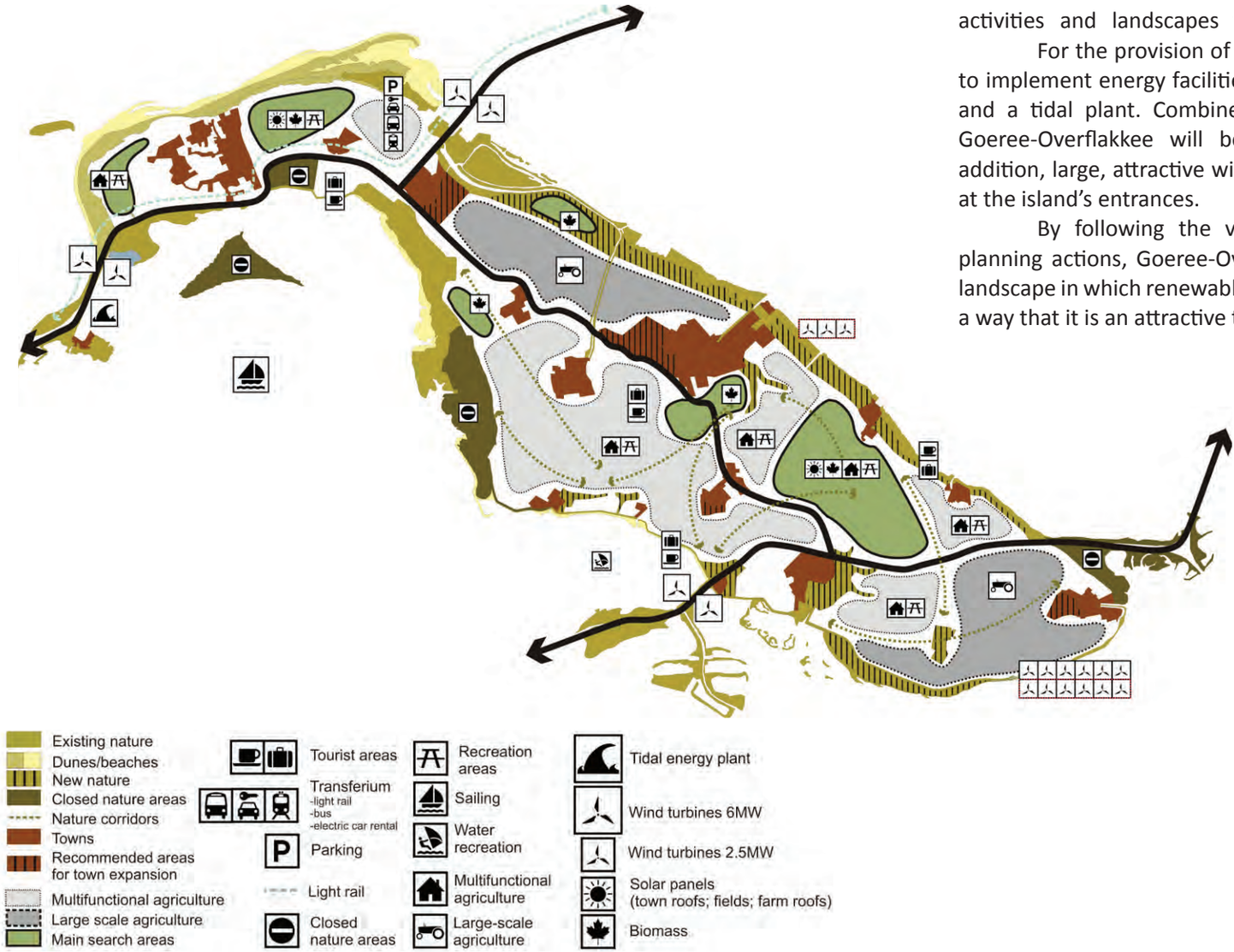


Figure 2.50 Visualisation map. Goeree-Overflakke with an unique, natural landscape in which renewable energy production is integrated in such a way it will be an attractive tourism environment

Figure 2.51 Recreation in Miscanthus nature

Figure 2.52 Summer recreation

Figure 2.53 Windturbines at the entrance of the island

Figure 2.54 Local branding in the agricultural area

Figure 2.55 Solar panel fields in agriculture

Figure 2.56 Solar panels on existing houses

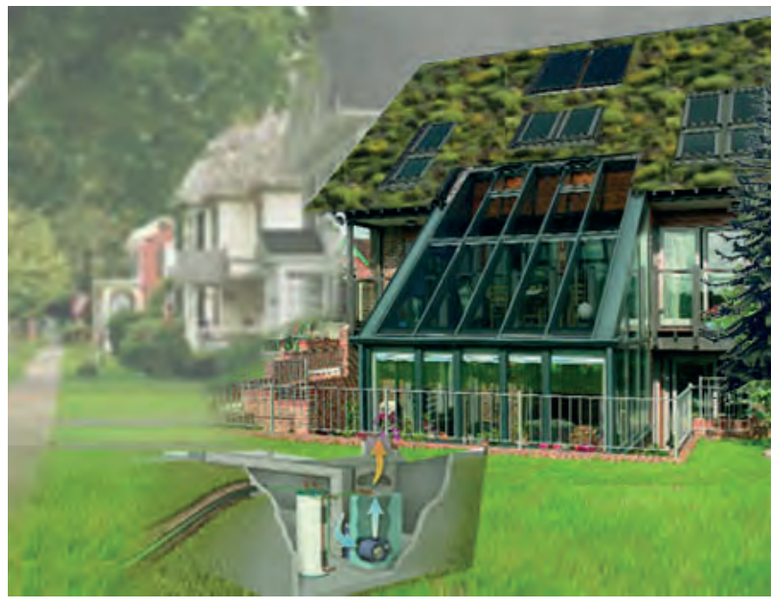


Figure 2.57 Local heating system

Figure 2.58 The 'new' identity of the island

STEP 4: DESIRED FUTURE - ENERGY VISION # 2

GO's Global, GO's Innovative

The three models gave a broad range of options and possible futures for the island. These possible futures are the basis for the derived futures. These were developed as a selection of possibilities, based on calculations and research. Each possible future was thus turned into a derived one. Selecting and rearranging the characteristics of these derived futures, the integrated future is developed as the most desirable one.

The concept for the island takes into consideration agriculture and urban development, integrated with renewable energy and the enhancement of transport facilities. The island will be divided into four main functions. First, to encourage the development of fresh water agriculture (niche products for the global market) and biomass, the Haringvliet dam will remain closed. Second, innovative salt-water agriculture will be developed in the south-west of the island and help to deal with the threat of salt-water intrusion. Third, the west and the south coast of the island will keep their recreation and natural attractiveness for tourists. Finally, the urban growth will develop along the main transport routes. Onshore wind turbines will be aligned with the railway. Figure 2.59 is a conceptual representation of the development on the island.

Wind turbines along the railway will provide energy for the island. This decision was made because of the positive effect on the identity of the island: wind turbines will be a landmark to stress the transition from the traditional landscape to the new landscape. Moreover, there will be a direct link between the trains that use the electricity and the windmills. Energy calculations show that the energy produced by these windmills will meet the entire island's energy demand, taking into consideration seasonal fluctuations. They will provide energy for housing and public transport. In order

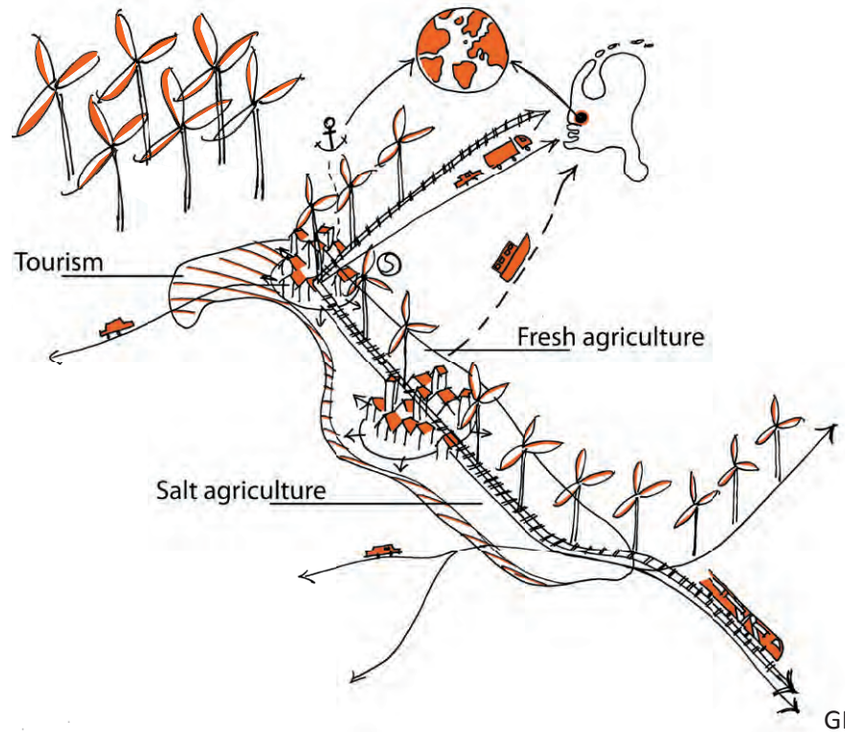


Figure 2.59 Potential developments on the island

GROUP 2
Karlijn Looman
Christiaan Van der Zwan
Flore Bijker
Talida Boanca
Koen Verhoeven
Cynthia Gharios
Loes van Schie
Lucia Pro

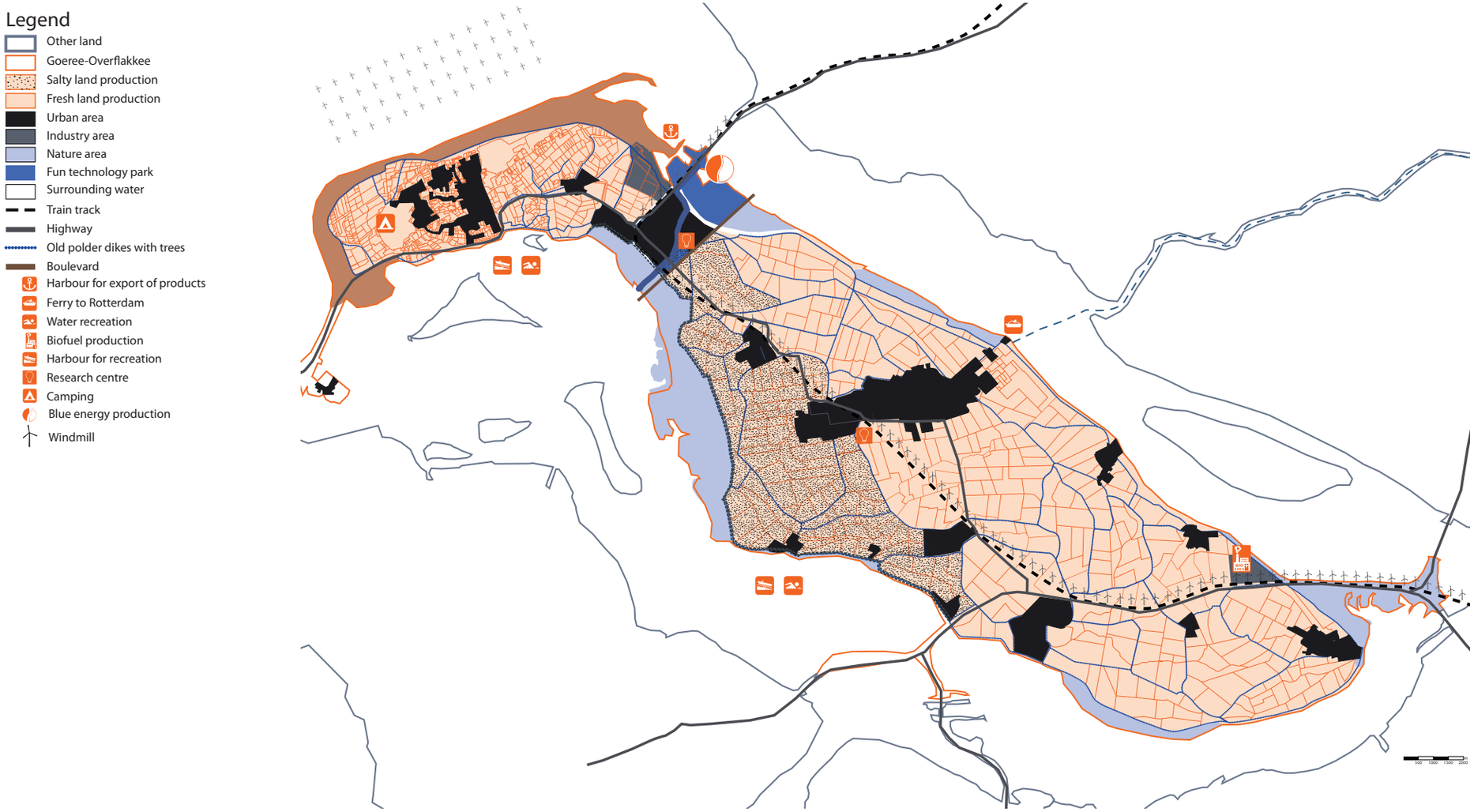


Figure 2.60 The developments go together with a big growth of energy production, using sun, wind, biomass and water. The new developments in the urban and agricultural area provide new chances for innovative and big scale production of renewable energy.

to profit from renewable energy, the surplus energy will be exported to Rotterdam and further.

The changes that emerge from the Global Economy scenario are extreme and will change the identity of the island. An energy-producing island will be different from the current one. If actors accept the new integrated vision, almost every sustainable energy solution can be created on Goeree-Overflakkee.

Figure 2.61 New situation on Goeree-Overflakkee

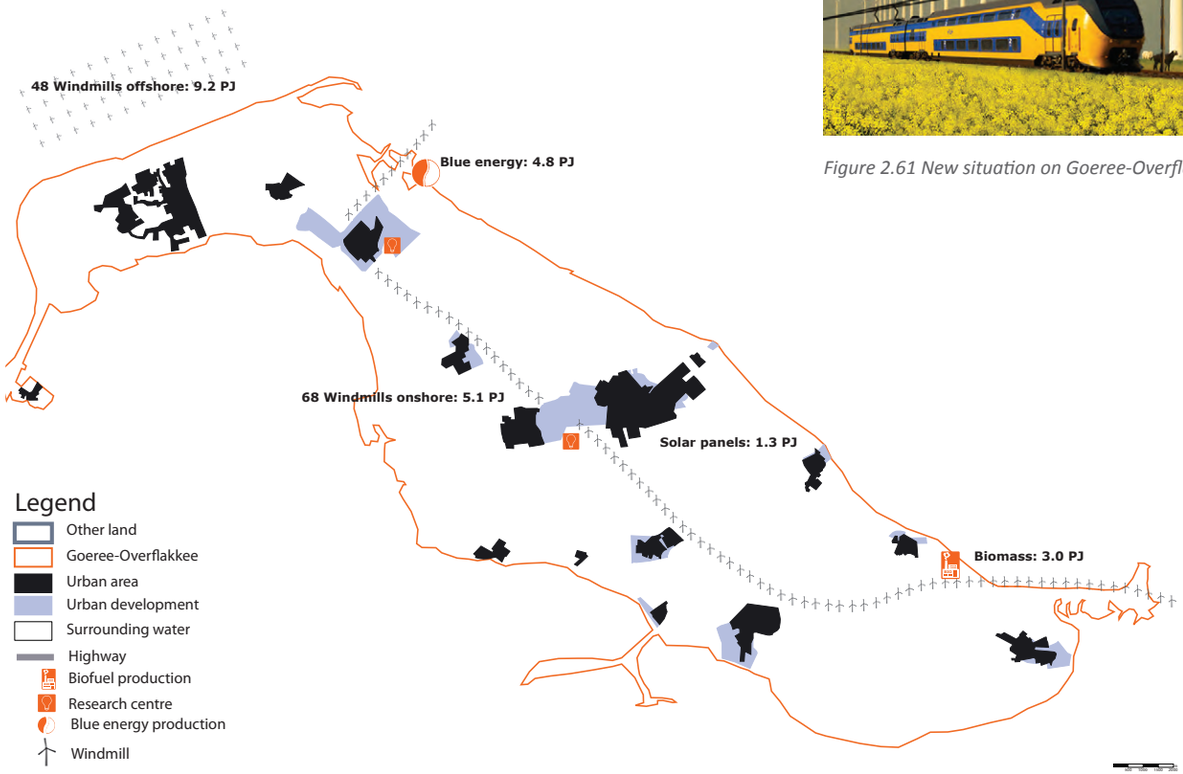


Figure 2.62 Sustainable energy potential

Figure 2.63 Current situation of Goeree-Overflakkee

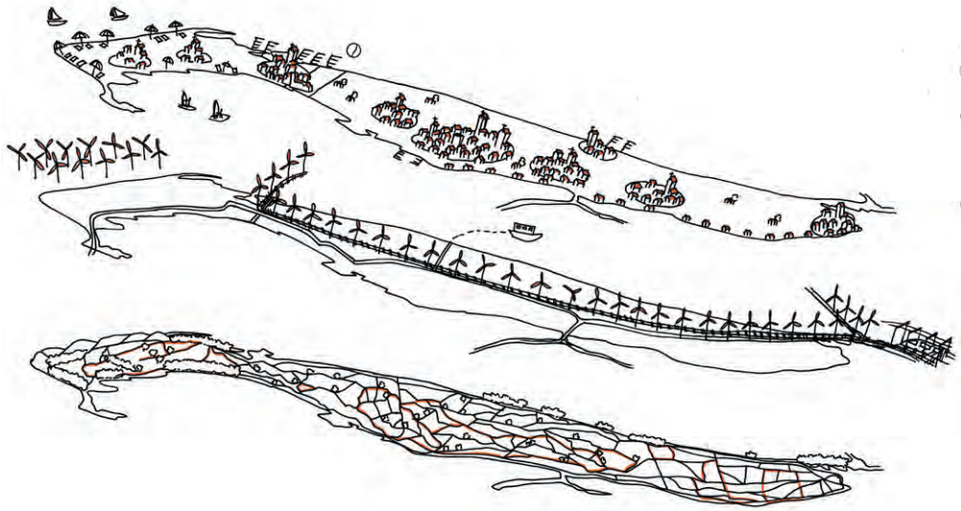


Figure 2.64 Future situation of Goeree-Overflakkee. The landscape remains the same, the windmill line is introduced and urban expansion takes place near existing cores.

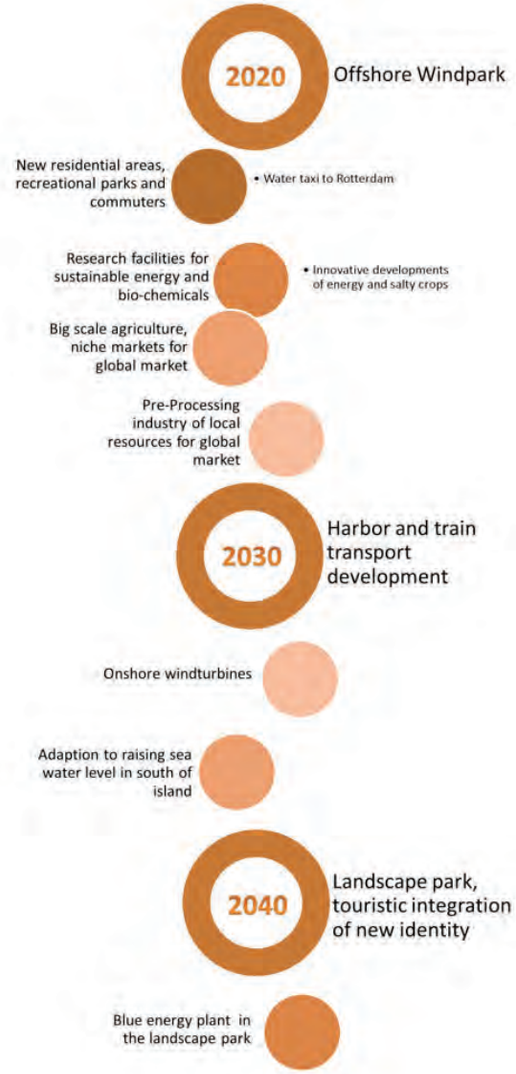


Figure 2.65 Timeline of developments on Goeree-Overflakkee

STEP 4: DESIRED FUTURE - ENERGY VISION # 3

ISoLANDisation

The vision is composed of the elements of the three models. Each model represents a distinct identity that can be perceived by several stakeholders; the vision interweaves the three models. The concept used for the vision is based on a three-layer approach that will be implemented within a time frame of 30 years. Figure 2.67 is a schematic view of the concept, wherein the most important ideas are shown.

This vision was developed within the boundaries of the Regional Community scenario, based on the principle of constant small-scale, self-sustainable development while maintaining the diverse place identities and land uses on Goeree-Overflakkee.

For the energy plan, the general objectives are 30% solar energy, 12% biomass, 53% wind energy and 5% energy saving. A renewable energy landscape does not necessary mean that it is a sustainable landscape. However, through the sustainable landscape design, the energy landscape on Goeree-Overflakkee could be sustainable in terms of both energy and the economic and social aspects.

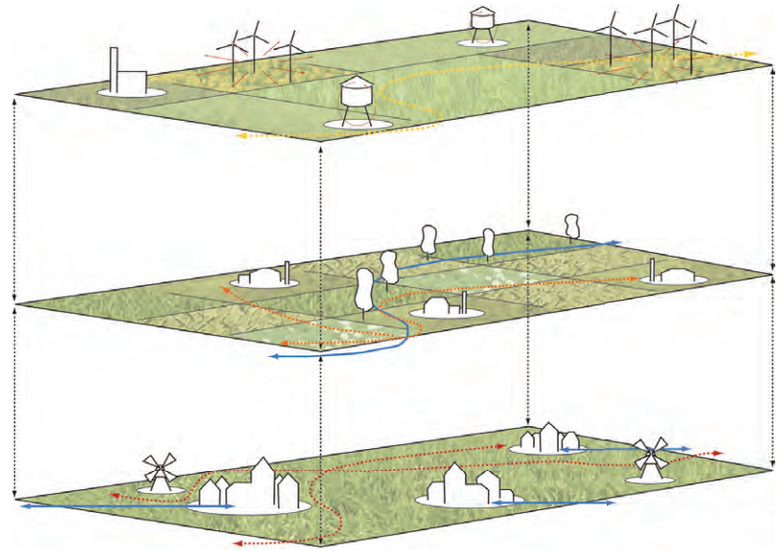


Figure 2.66 The concept used for the vision is based on a layer approach, existing of three different layers, which will be implemented within a time frame spread over 30 years.

GROUP 3
Jessie Wolters
Daisi Yang
Susanne Goransson
Iulia Dobrovie
Taicia Marques
Ioana Nica
Bart Plijner
Ying Tzu Lin

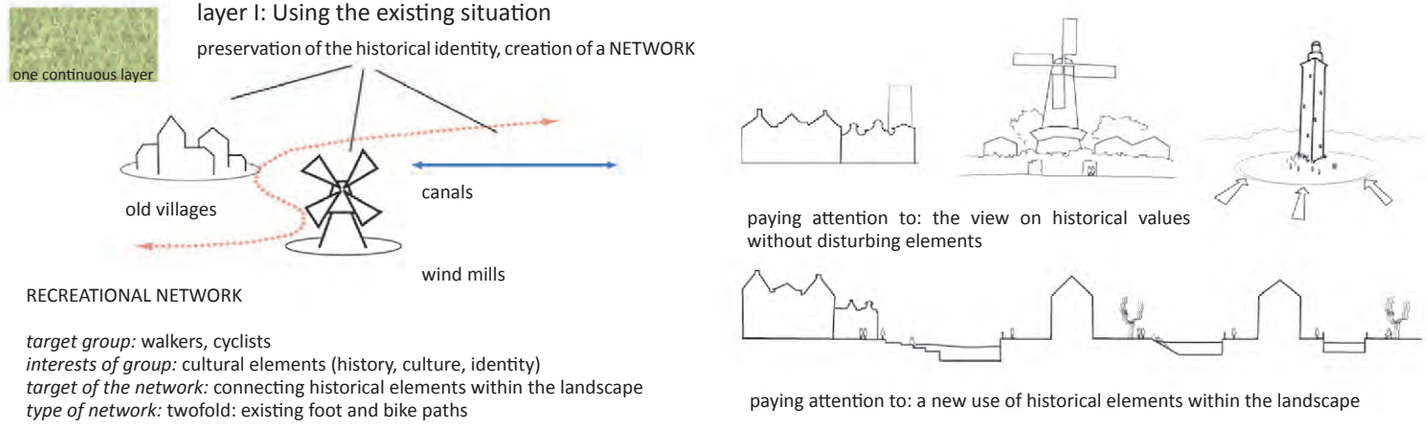


Figure 2.67 Detailed information on step one and two of the concept

A sustainable landscape was designed for Goeree-Overflakkee on the basis of the general setting of the renewable energy plan. The agricultural land use comprises small fields of traditional food production and salt crops production; the focus will be on branding local products. The larger plots will mainly be devoted to the production of energy crops. In the salt marsh area, sheep husbandry will be introduced to maintain the vegetation. To preserve the fishery identity, small-scale production fisheries will be established in specialized harbours.

The vision presents a 100% sustainable energy landscape and strengthens the unique identity of Goeree-Overflakkee in 2040.

Figure 2.68 Collage of the vision

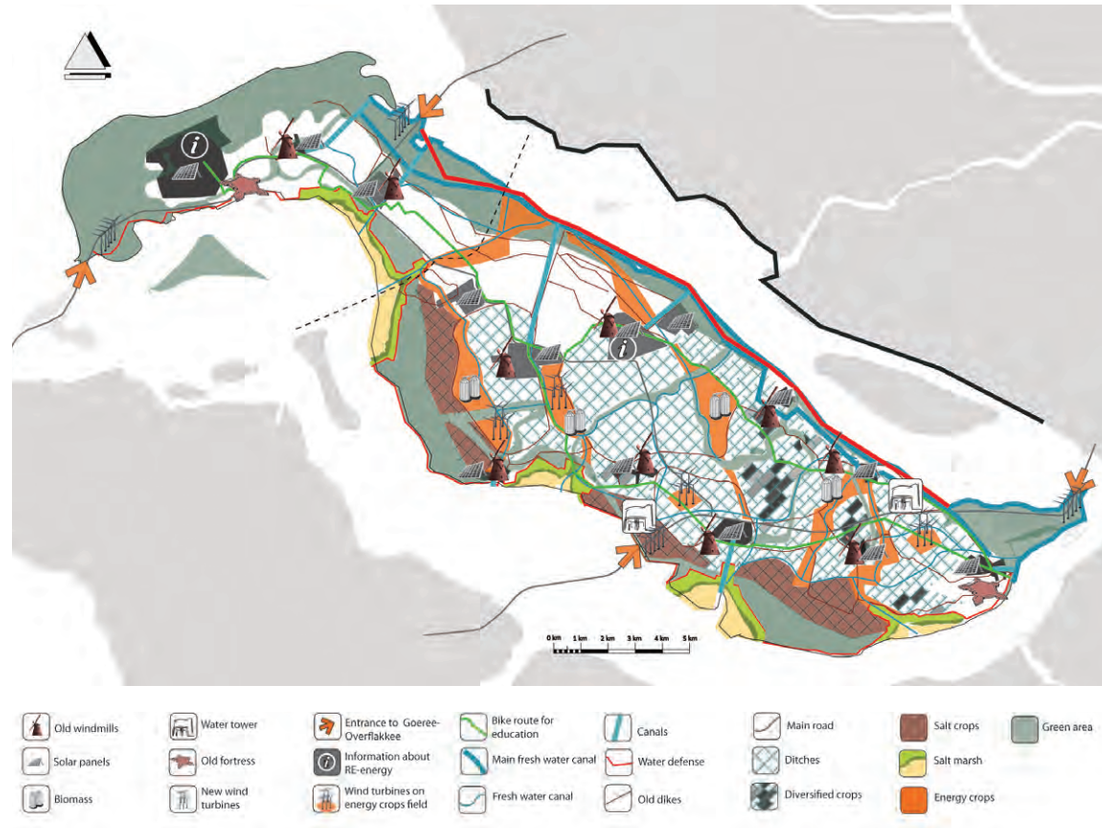


Figure 2.69 Vision on Goeree-Overflakkee. The vision is developed within the boundaries of the scenario Regional Community, the principle of development being the constant small and self-sustainable scale development, meanwhile maintaining the diverse place identities and land use on Goeree-Overflakkee.

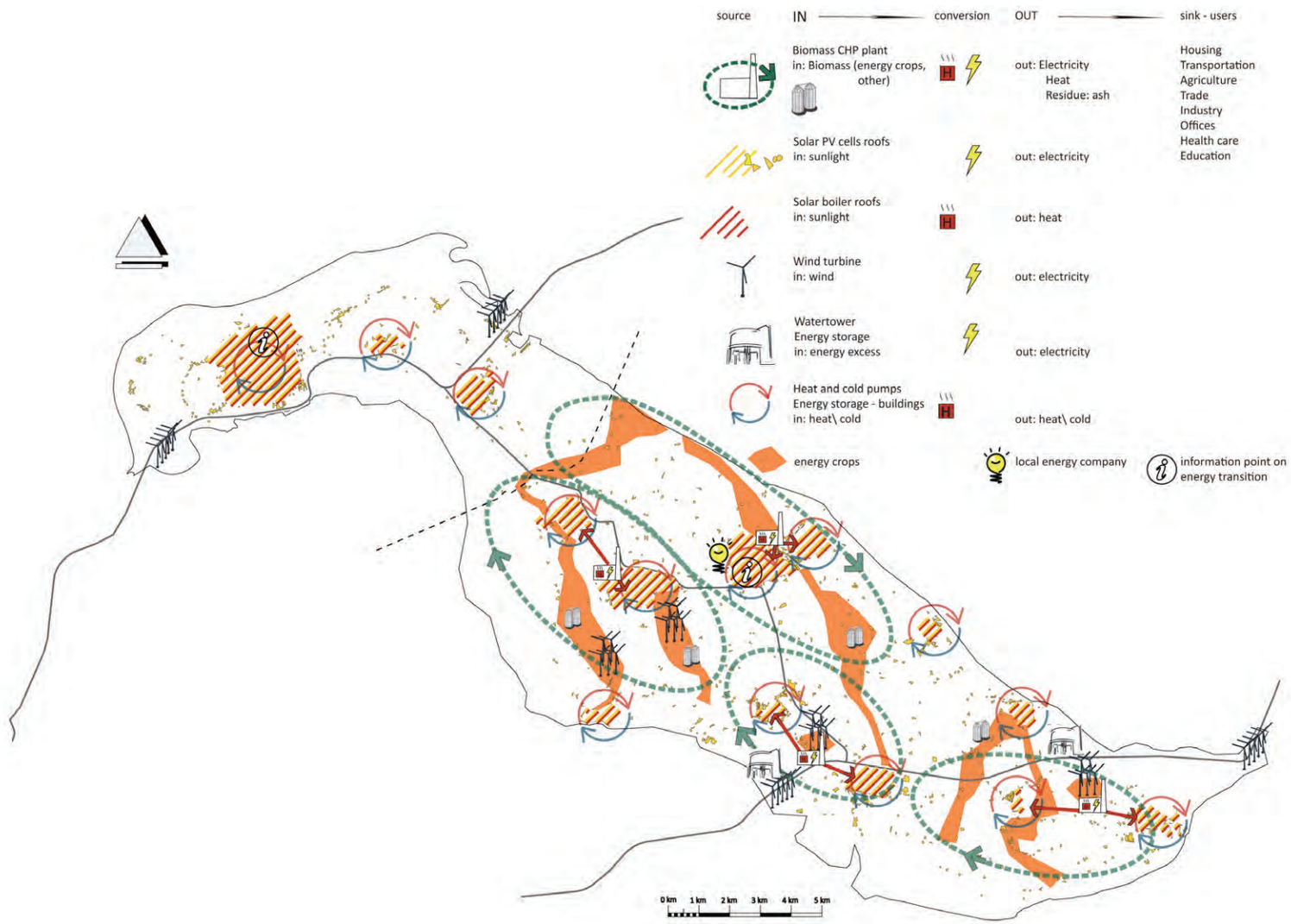


Figure 2.70 Map of alternative possibilities to produce energy in the future

STEP 4: DESIRED FUTURE - ENERGY VISION # 4

Independent island

The vision was developed by combining and reinforcing the characteristics of each model. Input from local research, literature studies and case studies guided and inspired the development. For the vision, three core zones were developed: the inland area, the coastal zone and the sea, each of which has its own specific qualities and functions.

The inland area primarily serves to produce heat, gas and materials, such as fertilizers, food and non-food products. The coastal area is mainly for dwelling and recreation. Biomass is produced in nature areas, by biomass growth nutrients are filtered from the water which is beneficial for nature development. The sea zone is then the principal area for energy provision. This area provides tidal energy and possibilities for blue energy, which are to be further explored. Another significant role of this zone lies in its facilities for water recreation.

The vision shows that the transition to a self-sufficient energy island can be realized by saving energy and producing renewable energy. Saving is done by insulating buildings, using heat–cold storage in buildings and greenhouses, and heat cascading. The generation of renewable energy should be focused on tidal energy, solar energy and energy from fermentation plants. These are the options that are preferred by the inhabitants of Goeree-Overflakkee and provide solutions to reach 100% energy sufficiency. Cascading is an important tool to link the processes of food production, processing and energy provision. It includes the use of organic waste flows to produce energy in the form of CNG (compressed natural gas) and heat in fermentation plants. Water and nutrient cascading is also part of the transition to a sustainable island. By using vegetation to filter the nutrients from the water,

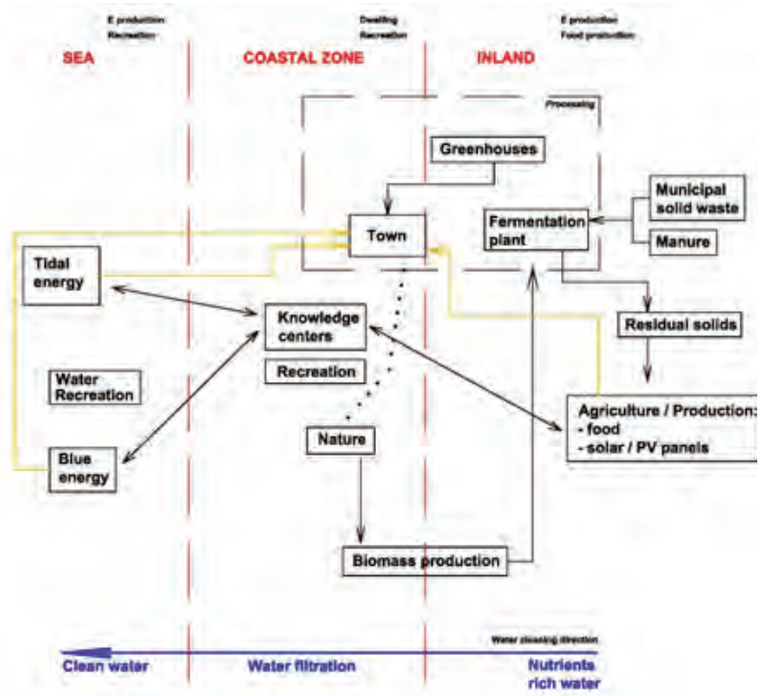


Figure 2.71 Structure of the vision with the sea, the coastal, and the inland area as the three core zones

GROUP 4
Sangwhan Lim
Diana Lukjanska
Lisa Verbon
Ziyi Liu
Kim van Gent
Jesper Borsje
Maria Georgieva
Jeroen Castricum

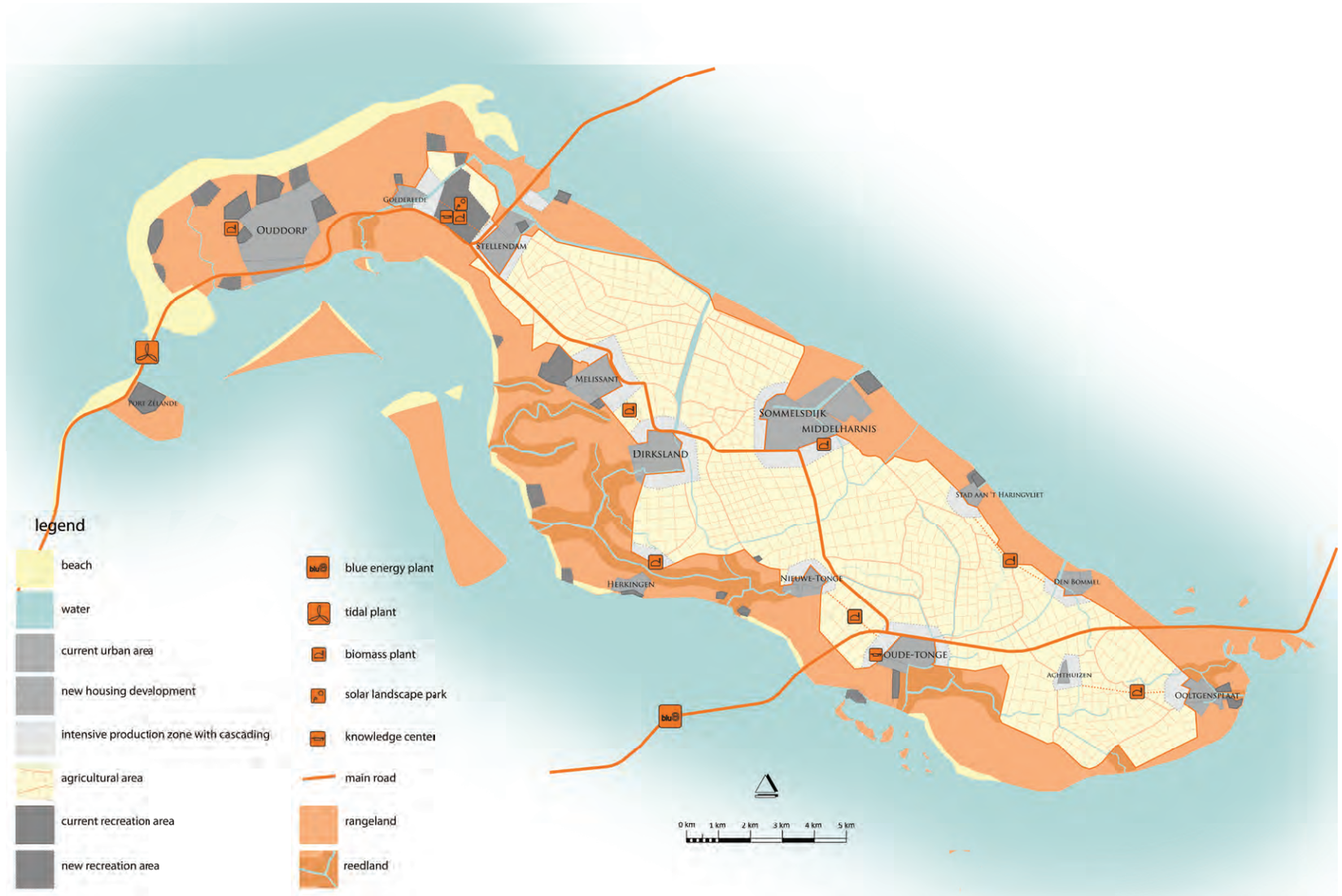


Figure 2.72 Vision map. Transition towards a sustainable energy island by saving and producing renewable energy

clean water and biomass are produced. In the vision, the island is divided into three main zones, each with its own qualities and potentials. It is thus possible to strengthen the landscape qualities while introducing renewable energy.

To achieve the goal of becoming a sustainable energy island, it is important to stimulate the participation of local actors, such as Deltawind, farmers' organizations and recreation enterprises. If one important actor shows that implementing renewable energy can be successful, others will follow.

Figure 2.73 Sustainable greenhouse landscape

Figure 2.74 Multifunctional nature in coastal area

Figure 2.75 Urban close to nature

Figure 2.76 Respected and strenghtened landscape

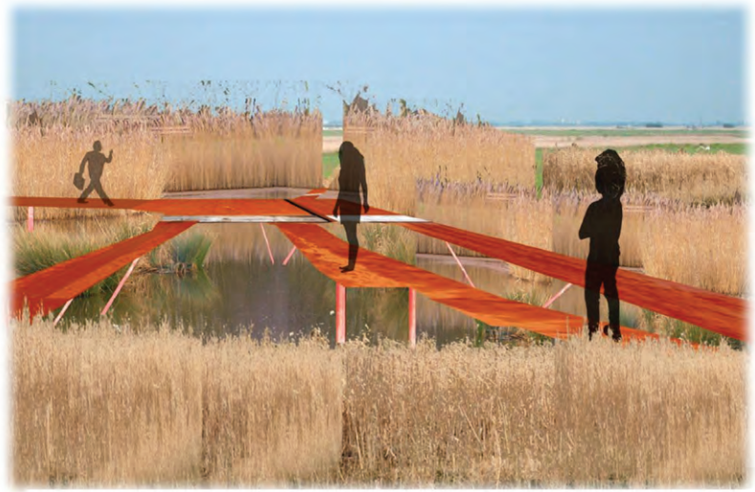


Figure 2.77 Aesthetical experience of biomass

Figure 2.78 Solar art park

STEP 5: ENERGY-CONSCIOUS INTERVENTIONS

Chasing the curves

The proposed design for the recreation area near Stellendam shows that it is possible to use the periodic fluctuations in sustainable energy sources for recreational purposes. This can be a direct use of an energy fluctuation, that is, using more energy when it is cheap for extra recreational functions, for example heating the swimming pool at midday on weekends. The direct use could also be the direct use of a storage facility, for instance a body of water near the greenhouse, which could also be used as a swimming pool. The latter being an indirect use, like the use of waste heat from hydrogen burning as heat for recreational purposes.

There are some important remarks and recommendations concerning the project. First, in contrast to the vision, wind turbines appear in this design. This is because wind turbines can level out the largest fluctuations in the PV power. More energy sources will result in smaller short-term fluctuations, which is favourable for energy storage. A recommendation for further research and design is to work out in more detail the energy flows in the various facilities. In this way the cascading and the use of heat and electricity fluctuations can be further optimized. One should also keep an eye on new developments in the sustainable energy sector. New developments can provide new inputs and new options for the use of energy fluctuations for recreation.

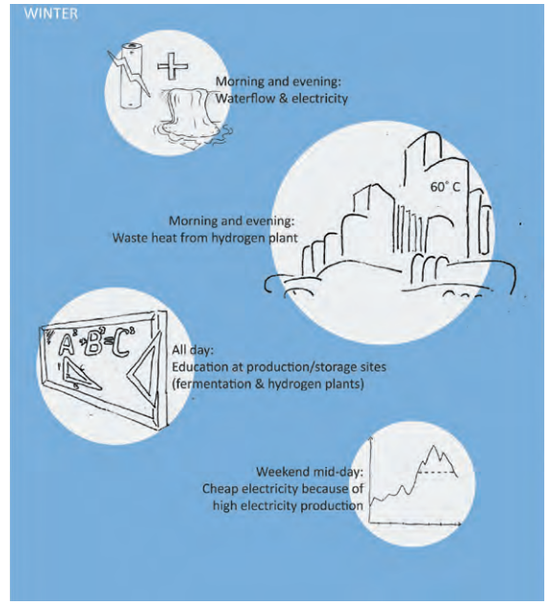


Figure 2.79 Useful fluctuations in energy flows for recreation in winter

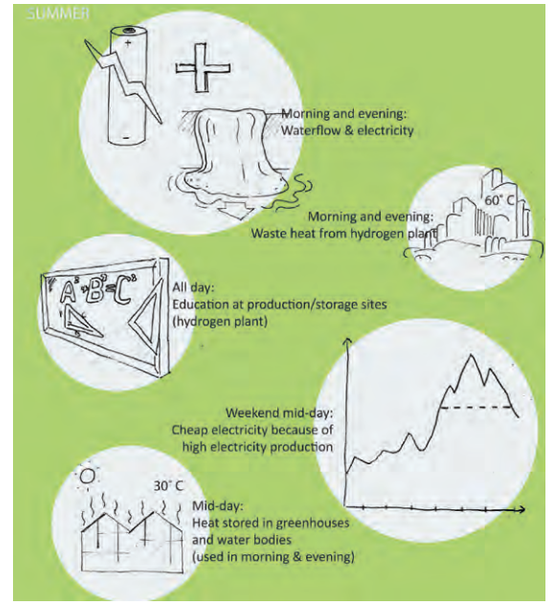


Figure 2.80 Useful fluctuations in energy flows for recreation in summer

Figure 2.82

Figure 2.83

Figure 2.84

As a final point, it is important to note that the systems proposed in this design can be used more broadly. The functions of the systems are not rigid, but can be adjusted to different situations and locations. Since the same energy fluctuations appear in different scenarios, the plan is interesting not only at different locations, but also in different scenarios.

Figure 2.81 Recreational Landscape design

Figure 2.82 - 2.86 Visualisations

STEP 5: ENERGY-CONSCIOUS INTERVENTIONS

GO's Golden dyke

Karlijn Looman

The 'climate-energy dyke' concept is about producing energy on the climate-proof dyke. The biomass produced on the dyke is converted into biofuel on the dyke. The biofuel is for the farmers on Goeree-Overflakkee; the farmers, in return, take care of the biomass on the dyke.

The climate dyke is terraced with production of biomass on the separate terraces. It was difficult to decide how big the terraces should be, as they must be small enough to fit into the landscape but large enough to produce the 0.02 PJ needed for agriculture. The large-scale agriculture on the island was used as a reference.

Because the dyke has a large mass it cannot make the angles the existing dyke makes. The new dyke will be straighter and will encroach on some nature areas, which will be turned into agricultural land. In the agricultural area, the dyke will be a golden line in the landscape that also incorporates renewable energy provision (see figures 2.89 – 2.91, which show what the climate dyke looks like and how it works).

The new dyke is a large element in the landscape and will be in conflict with the urban areas. Therefore, each part must be designed so that it fits into the landscape.

The climate dyke is a very important element in the landscape, representing the beginning of a new green period for Goeree-Overflakkee. The climate dyke testifies not only to the consequences of the overuse of fossil fuels, but also to the renewable energy provision and a safe and sustainable future.

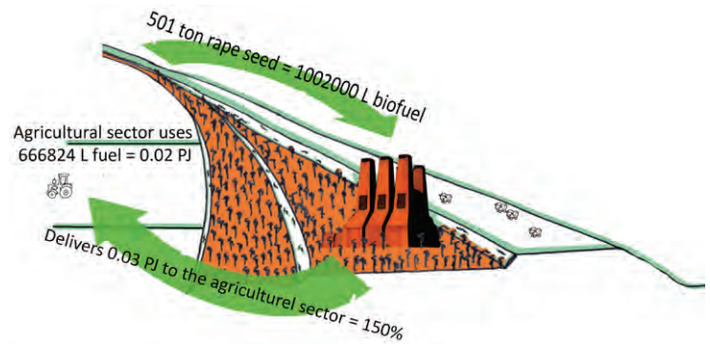


Figure 2.87 Dyke as a landscape machine

Figure 2.88 Master Plan Golden Dike

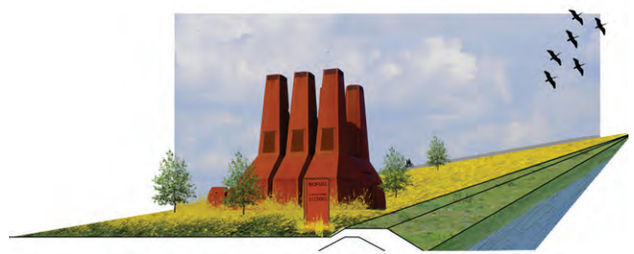


Figure 2.89 - 2.91 Visualisations of the golden dyke

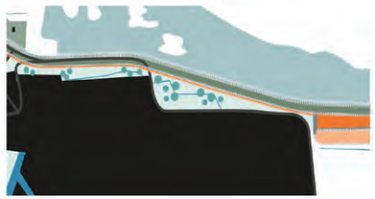


Figure 2.92 Dyke in the urban area

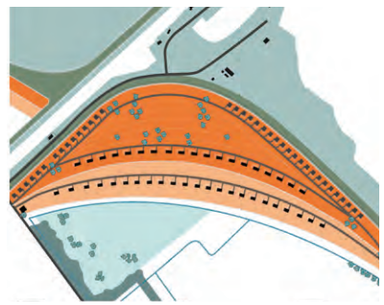


Figure 2.93 GO'S Golden Camping

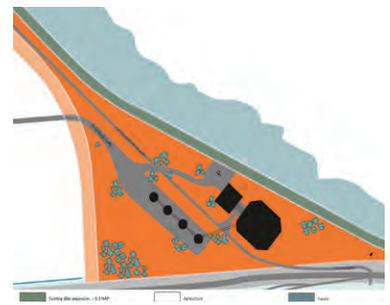


Figure 2.94 GO's Energy Plant

Figure 2.95 Farm of the new dyke

STEP 5: ENERGY-CONSCIOUS INTERVENTIONS

Energy Route Middelharnis: Identity through Renewable Energy

Taicia Marques

The area along the canal in Middelharnis is a suitable place to establish the 'Energy Route: identity through renewable energy'. As Middelharnis has a population of 17,700, the potential amount of biomass produced on 256 ha (1.7% of the area) would be enough to provide only 2.62% of the population with energy. This calculation emphasizes the need to find an integrative system to produce energy. By using a cascading system, for example, the demand for heating can in some cases be reduced by as much as 50%. Solar energy combined with boilers powered by biogas from waste (e.g. from farms) is another example.

Wind turbines, solar panels, hydrokinetic energy and such future solutions as algae and the use of sludge should be implemented as complementary systems. Based on this strategy of multiple sources of renewable energy, a design was created for the canal in Middelharnis with a focus on how the landscape along it can be experienced by both the inhabitants and tourists.

Energy sources can be experienced in various ways within the landscape. For instance, while 100 metre high wind turbines can be see n from many hundreds of metres away, the nature development can still look 'natural' but provide its wastes to be used as biomass. A simple calculation shows the need for an integrated system when considering new alternatives for producing energy. In addition, most of the renewable energy sources are greatly influenced by seasons, differences in the speed of wind or water, or the number of hours of sunshine. As a result, it is important to understand the landscape and all its possibilities regarding energy consumption, generation and saving before proposing a design. Another important remark is about the correlation between people and landscape. By understanding how people experience a particular

Figure 2.97 Sinks and sources map

Figure 2.98 Energy Square

Figure 2.99 Biomass Trend

landscape, together with the knowledge about the diverse possibilities to tackle problems that originated in the past, current developments and uncertainties about the future, it is possible to define where and how the designer wants to interfere in the landscape. Thus, the case of the Energy Route along the canal in Middelharnis is an example of how it is possible to associate some of the various kinds of renewable energy sources in a rich and still attractive landscape.

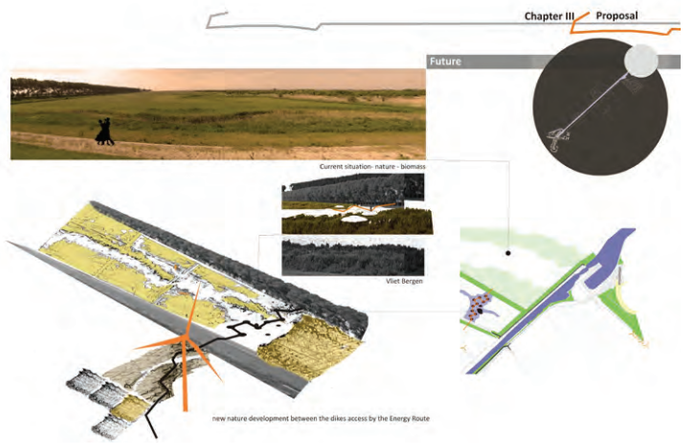


Figure 2.100 Biomass future & nature

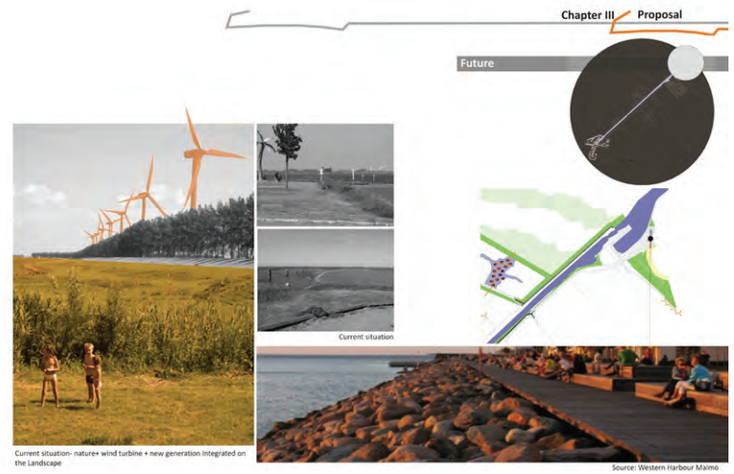


Figure 2.101 Wind turbines

STEP 5: ENERGY-CONSCIOUS INTERVENTIONS

re***NEW***ed farmyards: A sustainable approach to town extensions

Darius Reznek

The proposed design for town expansions on the island of Goeree-Overflakkee is an attempt to find a link between the transition in energy terms and the transition in the landscape, and their link with society. It is an attempt to investigate whether those two parallel transitions could be linked with transitions in social manifestations. The basis of this investigation is the assumption that in order to facilitate renewable energy acceptance, we must stimulate changes in culture and society. The new forms of energy must in turn be platforms that generate cultural manifestations that are representative of the new energy sources and are historically grounded. In this sense, the assumption is that these factors will stimulate energy transition in a new and beneficial way.

The idea is to use farm buildings, which are available and unused due to the up-scaling of agriculture, and convert them into necessary functions for town extensions. This provides an economic advantage and ensures that the developments are rooted in the history of the place. With this as the starting point, we can move on to the other principles guiding the design, namely landscape

Figure 2.102 Master Plan

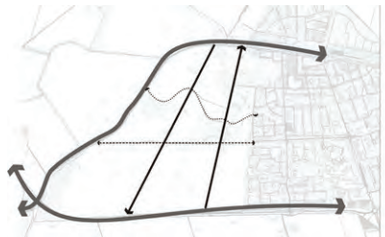


Figure 2.103 Inner traffic Scheme

Figure 2.104 Conceptual scheme of design

Figure 2.105 Public space scheme

Figure 2.106 Land use Scheme

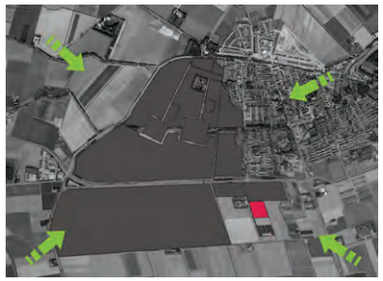


Figure 2.107 Biomass transport

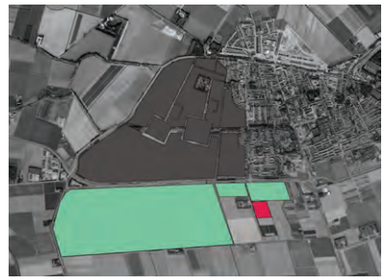


Figure 2.108 CO2 Distribution

Figure 2.109 Heat cascade

Figure 2.110 Ash as fertilizer

integrative urbanism and cultural and historical integration. The existing lines in the landscape were taken as the main structure of the developments, linking everything together. Adding images of typical Dutch farms, grounds the design in cultural terms and links it to the identity understood by locals.

The result of this juxtaposition is a hybrid landscape that is grounded in terms of landscape and culture in the spirit of the place and provides a viable framework for future developments (figures 2.103 – 2.106).

It takes the straight and efficient lines of the agricultural roads as structuring elements and clusters of housing developments ringed by trees in a typical Dutch farmhouse image as focus points, and adds to those the contrasting bike path line (straight and efficient) and the winding line of the creek (experiential in a phenomenological sense). This generates the coherent structure that guides the entire process of extension towards the desired result.

The main concept of the energy system is heat cascading and heat generation from biomass burning. Although steps are taken towards offering solutions for solar panel implementation and offering self-sufficiency in terms of electricity, the system requires further study.

Figure 2.111 -2.112 Sections

STEP 5: ENERGY-CONSCIOUS INTERVENTIONS

Blue Landscape Park Stellendam

Koen Verhoeven

The concept of the design is the provision of blue energy and how this is implemented in the landscape. Blue energy has three major requirements, namely the availability of fresh water, the availability of salt water and the capacity to drain brackish water. The concept of the design is based on these three requirements. Furthermore this concept is extended to create an even more reliable source of energy combined with nature, housing and recreation.

The blue energy plant is located near the Haringvliet dam. The brackish water needs to be drained in a place that is not connected to the sea or a fresh water lake in order to prevent that water becoming brackish. The brackish water is therefore pumped into the Grevelingen lake, passing through a storage area and a canal that links the storage area and the lake. Blue energy is a new source of energy, one that is unknown to many people. To show the presence of the blue energy plant, the transport of the brackish water to the storage area will be made visible.

The storage area is needed to provide energy at times when the blue energy plant is not producing enough energy. All the brackish drainage water can be stored in this area for a while. If energy is needed, this area will be drained into the canal, while using a water turbine to produce the required energy. Besides the storage function, the area also becomes a valuable nature reserve.

The canal connects the storage area with the Grevelingen lake. It is accessible to boats and other kinds of water recreation. The canal will be implemented using the current water system as much as possible. Nevertheless, it crosses some major roads, which requires bridges and other technical solutions. The canal is designed in such a way that the various surrounding landscapes can be seen from it. Together with the recreation the housing will

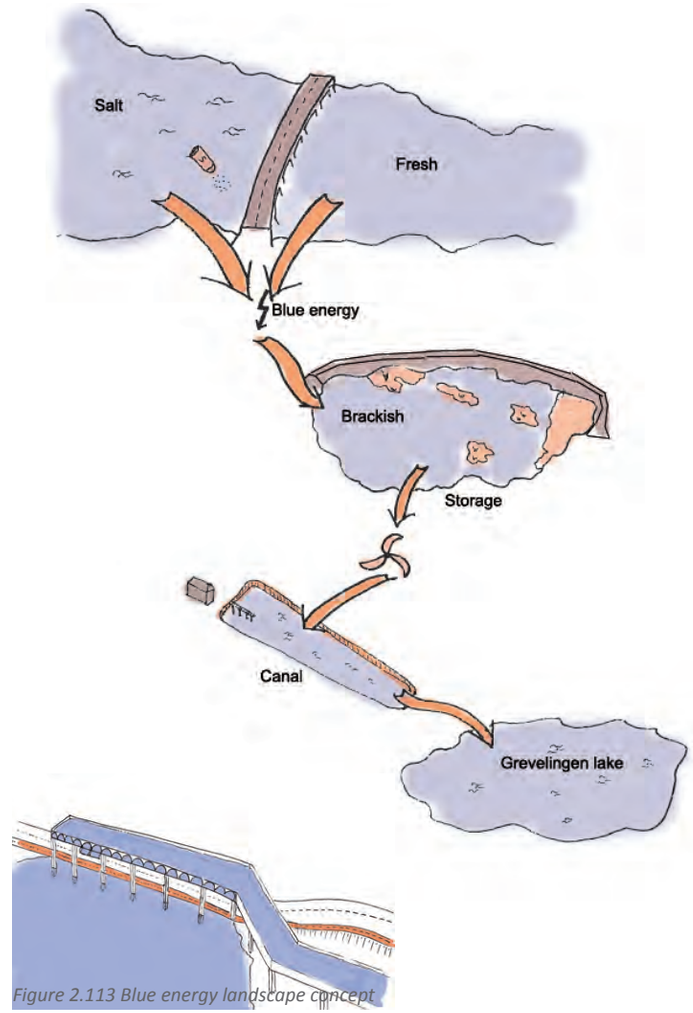


Figure 2.113 Blue energy landscape concept

develop towards the canal. The canal drains into the Grevelingen lake. The level of this already brackish lake can be managed using the existing sluices in the Brouwersdam.

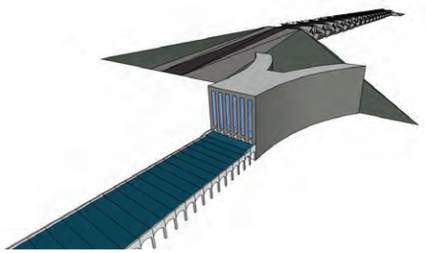


Figure 2.114 Blue energy plant with Haringvliet dam

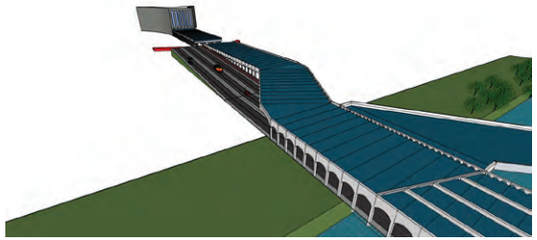


Figure 2.115 Detail of aquaduct over and besides the roads

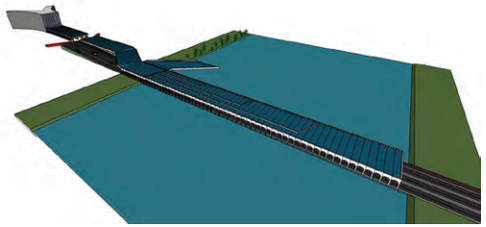


Figure 2.116 Overview aquaduct from blue energy plant to nature

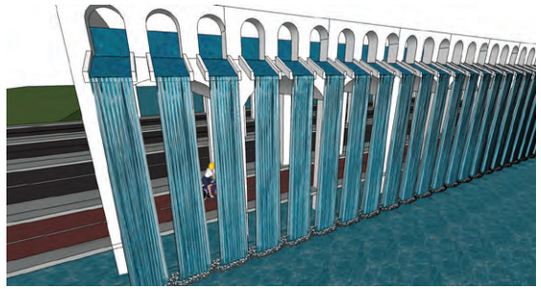


Figure 2.117 Detail of waterfall into the nature reserve

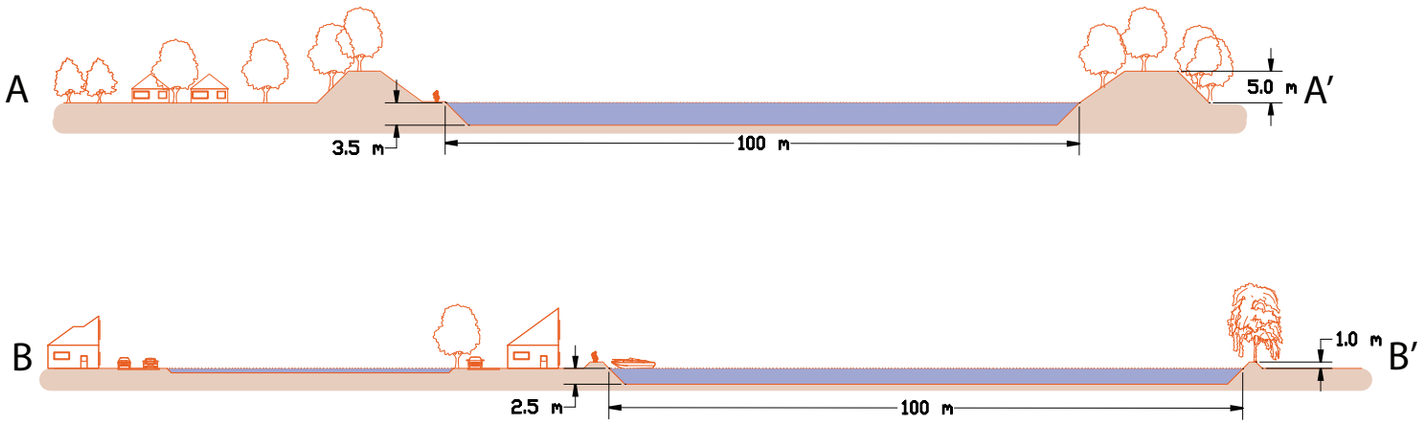


Figure 2.118 Cross sections

STEP 5: ENERGY-CONSCIOUS INTERVENTIONS

Middelharnis: Population decline versus renewable energy

Anhilde de Jong

The aim of this study is to provide ISGO with guidelines about the ways in which renewable energy facilities can be used to anticipate the population decline in such a way that the level of liveability will be maintained or improved. A way is sought in which these two aspects can be combined such that the renewable energy generation can be used as a method to anticipate the population decline.

Here, this is done for the town Middelharnis, which functions as an example for all the cities on the island. According to the 'Eurisland scenario', Middelharnis has been designated a housing expansion area. Due to the search areas for large-scale agriculture and multifunctional agriculture combined with recreation, the new nature areas for biomass, the appointed district heating plants and the nearby wind turbines, the surroundings of the town form a complex area that is facing multiple spatial developments.

To anticipate the predicted population decline in Middelharnis, a two-scenario approach is used. By not only combining liveability with the two-scenario approach but also adding renewable energy, this method can be used to anticipate the shrinkage of the population by making use of renewable energy facilities. In the second step, an inventory of the major current developments will be made. The spatial impacts of these developments will be expressed in an external scenario. A vision on the desired future should be developed in step three of the two-scenario approach. This vision will show what the area will ideally look like, while taking the external context into account. Finally, in step 4 of the approach, the external scenario and the vision of the desired future are compared in order to develop a policy strategy. In this policy strategy measures are formulated that could be used in order to develop the current situation of the area

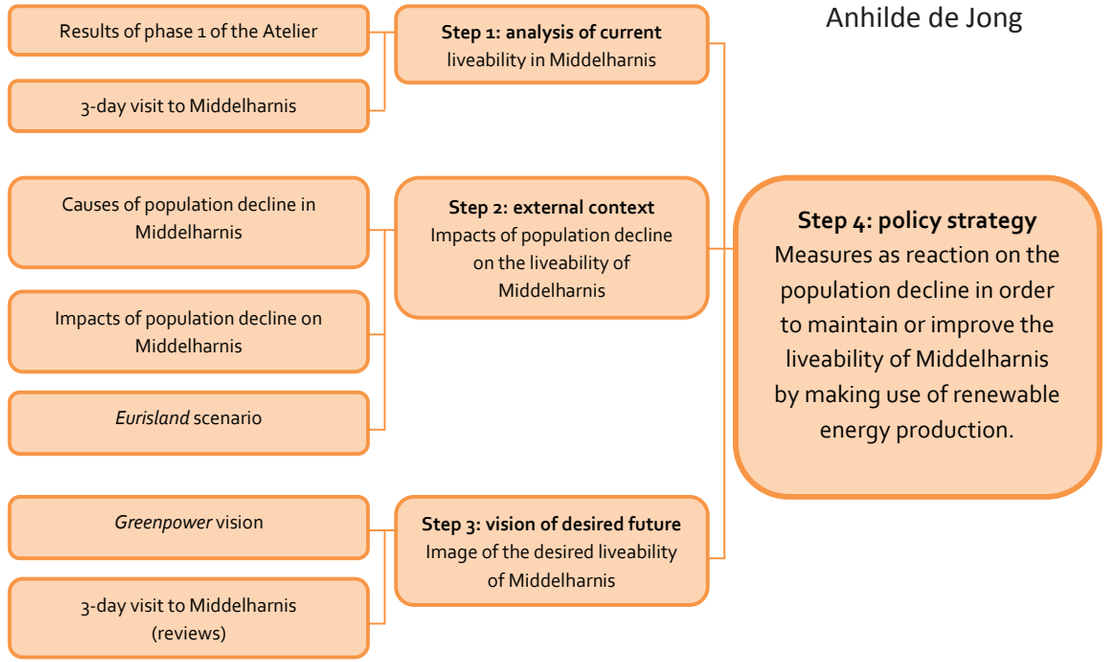


Figure 2.119 Research Framework

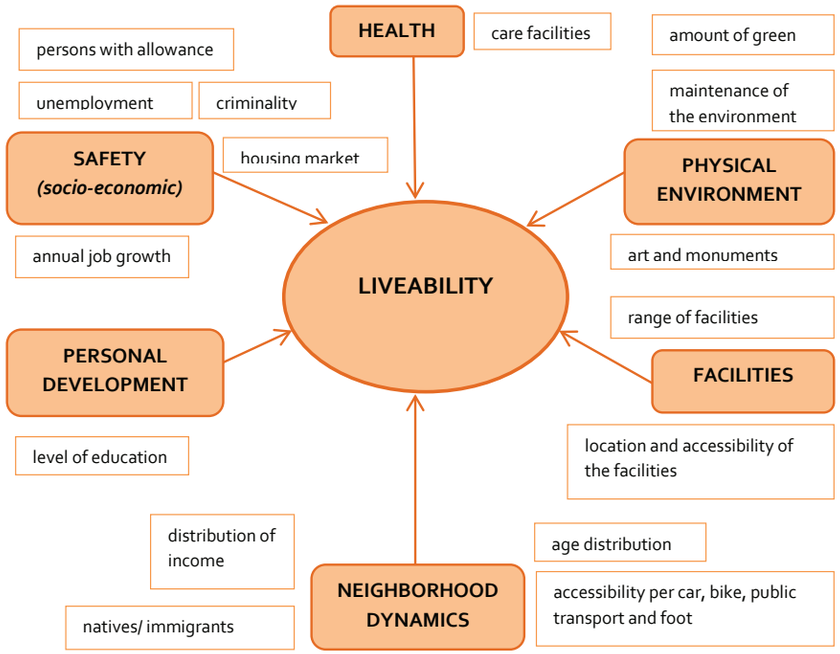


Figure 2.120 Components and subcomponents of liveability

into the desired future, taking into account the external context.

As a result, one can say that population decline will influence the spatial organization and structure of living areas, but does not necessarily have to lead to a decrease in the level of liveability. The impacts of population decline can only be labelled positive or negative if the desired level of liveability for a living area is known. By combining the desired vision with the external scenario, it becomes clear on which components of liveability population decline will have a negative impact and will therefore impede the realization of the desired vision, and on which components population decline will provide possibilities to realize the desired vision. This provides insight into the kinds of measures that should be taken in order to reach the desired level of liveability.




GOEREE-OVERFLAKKEE WORKSHOP AND EXCURSION


all photographs without reference by Wageningen University



by Darius Reznek

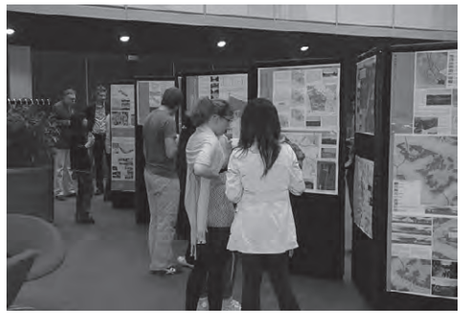


by Koen Verhoeven



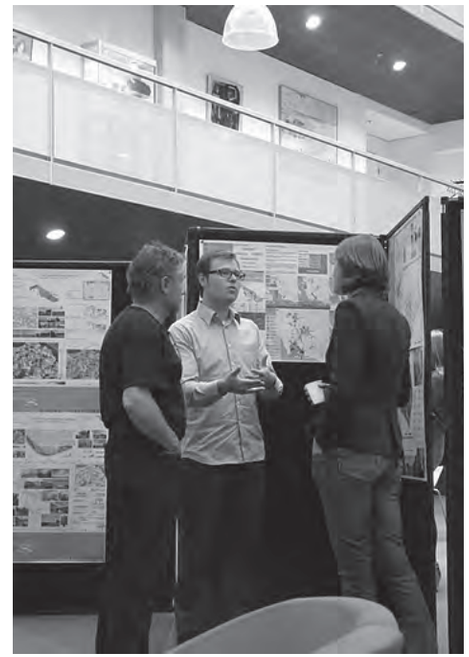
by Darius Reznek


by Christiaan van der Zwan




GOEREE-OVERFLAKKEE FINAL RESULTS AND PRESENTATIONS



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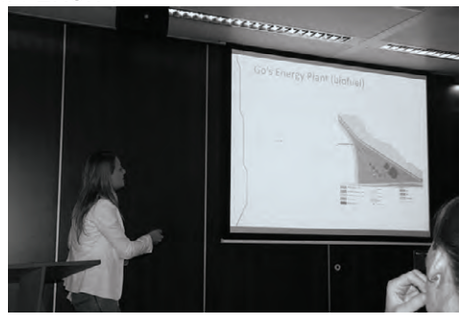

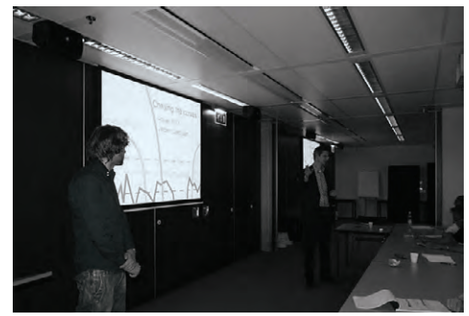

photographs by Wageningen University

SCHOUWEN-DUIVELAND: BETWEEN LOCAL IDENTITY AND GLOBAL CHALLENGE

Henk de Haan, Claudia Basta, Sven Stremke

3

Schouwen-Duiveland is the most northern island in the province of Zeeland. It is surrounded by the Grevelingen lake to the north, the North Sea to the west and the Eastern Schelde to the south, and has four connections with the other islands in the Delta. As a result of recent reforms, the island consists of only one municipality; the local government seat is in the capital, Zierikzee.

Like other regions in the Netherlands that are facing the transition to a global economy while attempting to preserve their local identities, Schouwen-Duiveland is concerned about both its near and its far future. The risks associated with climate change, together with the forces of globalization, are potential threats to the very existence of the island, its people's livelihood and its landscape. Local authorities are well aware of this and have formulated ambitious visions on a sustainable future. In these visions the threats faced by the island are not only converted into opportunities, but are also emphasized as opportunities that could strengthen the island's values. Such 'expressive' values include the rural and historical landscapes together with the related cultural identities, and more generally the island's orientation towards socially and culturally sustainable solutions. In order to understand these ambitions it is necessary to broadly sketch the present difficulties faced by Schouwen-Duiveland while the island is equipping itself to tackle the global transition challenge.

The island has a long tradition in coping with natural forces and global changes, and it has always done so from a number of basic precepts. First, an open and receptive attitude towards technological innovations with regard to water and land management has always been at the forefront. Second, the entrepreneurial spirit of the inhabitants is strongly directed towards the wider, global economy. The long traditions of trade, commerce and market-oriented arable farming demonstrate an outwardly directed mentality of taking all possible opportunities created by global markets. This mentality is overtly demonstrated by the way in which the population has recently opened up its natural resources in response to the growing national and international demand for tourism and leisure facilities.

There is, however, a third principle that structures the developments on the island in a significant way: the insistence on conserving an outspoken identity, characterized by a rather closed and inclusive culture of community. While open technological and commercial orientations can be characterized as instrumental strategies for physical and economic survival, the insistence on a closed social and cultural identity can be considered a way to protect the everyday life-world from alienation and disintegration.

Schouwen-Duiveland is therefore a fascinating place to study from both the landscape and the social perspective. Walking on the dykes, along the coast and through the inland polders, one gets the impression of a timeless, green and pleasant land. The historic villages and small towns blend in seamlessly with the landscape. The mosaic of nature areas, waterfront defences, arable land and leisure areas shapes the characteristic pattern of a landscape that seems to have found a sort of balanced partnership between the forces of the sea and the people who managed to convert it into an experiential resource of pleasure beside of living.

The peaceful coexistence between highly concentrated leisure areas and the rather closed traditional settlements, between highly industrialized, commercial agriculture and an outspoken rural culture, between the power of the sea and the quite inland polders all demonstrate a remarkable co-productive

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WAGENINGEN UR
Gemeente Schouwen-Duiveland
Provincie Zeeland
Ministerie van Infrastructuur en Milieu

interaction between society, culture, nature, markets and technology. The huge changes in the landscape over the past centuries, the constant dynamics in the boundaries between sea and land, the continuing history of transforming, improving and adapting water management technologies and the vulnerabilities of agricultural product markets, have ingrained an innovative and entrepreneurial character in the island people. Community identity may be considered a shield against such a turbulent environment.

In the near and the far future, the population of Schouwen-Duiveland will face major challenges in improving the coastline defence systems, as well as in adapting its landscape to the installation of renewable energy production technologies. It is especially the renewable energy challenge that is interesting. Renewable energy technologies may soon be a profitable way of using the island's land and water resources. But the entrepreneurial efforts needed to transform a fossil-dependent energy system into a fossil-free energy system should not only be seen as possibly rewarding for the local community: by becoming less dependent on fossil fuels, the island would contribute to the solution of problems of global relevance. The dictate 'think globally, act locally' may find a concrete application in the island's experience. That is why today's technological and entrepreneurial challenge differs from any challenge in the past, when although the struggle to survive depended on global integration, the solution of global problems was hardly related to what happened at such a local scale. A reduction in energy use and an increase in renewable energy production have implications that go far beyond the limitedness of everyday life to touch on facets of global consciousness.

Wageningen MSc students in Landscape Architecture and Planning were very enthusiastic from the start to investigate, brainstorm and come up with proposals concerning the possibilities/impossibilities of the island to become self-sufficient in the provision and use of renewable energy. The situation on the island fitted the conditions of a 'laboratory', with all the ingredients for experimental and daring conceptual, spatial and design proposals. The proposals were given shape by using various scenarios. These scenarios (which are described in the general introduction of this book) were adapted in such a way that they were applicable to the condition of a relatively small island. Moreover, they were more or less realistic in the sense that we looked at the real dilemmas that are encountered in the local situation. Thus, one variable was about regulation and actors, contrasting civil society (bottom-up) approaches with central government (top-down) approaches. The second variable continuum contrasted a global, open economy with a closed, endogenous regional economy. Both axes resulted in four experimental modes of looking into the future. The predicaments are well represented in the scenarios, as they correspond with real challenges, as well as with real choices. The role of central governments, the impact of global markets and mobilities, and thinking about the uniqueness of a region, combined with opportunities for self-determination by the people, are real, very urgent and relevant issues – issues that are not just products of out-of-the box thinking, but parts of people's repertoire of contemplating the past, the present and the future.

One of the unexpected results of the four scenario studies is that it is possible, in each scenario, to achieve the goal of self-sufficiently in renewable energy production. Variations exist in the way this goal is achieved. Thus, where the government has more regulative power, the distribution of energy production sites will be more rationally planned and distributed. Where private and civil society initiatives play a role, the realization will be more economically motivated. However, the impact on the environment can in all instances remain within the limits of what is aesthetically and socially acceptable. The scenario that previews a closed local economy fundamentally changes the landscape, but even there it respects most of the historical and other spatial characteristics. Another striking result is that the implementation of renewable energy is not hampered by technological or physical conditions. The energy potential mapping exercises carried out by the students show a multitude of possibilities, including wind, biomass, solar and

geothermal energy.

In conclusion, it is clear that the greatest future challenge lies not in exploring sites and technologies, but in mobilizing people and resources through active and values-sensitive forms of planning and design. People in Schouwen-Duiveland are positive with respect to new energy technologies, but they do not have sufficient economic incentives and political support to realize energy transition. It seems therefore logical that the local government, with the support of national energy programmes and private investors, should take the lead in the transition. The atelier has made clear that such a strategy can be accomplished only in close collaboration with the island's inhabitants, as they will be confronted with the changing landscapes.

The most promising scenario, to the extent that people can take the future into their own hands, seems to be in an intermediate position between regional and global, between civil society and national government, and ultimately between traditions and innovation. But that is how, historically, the island has always developed: preserving the own identity while welcoming broader support in tackling global challenges, confident of its own capacity to take entrepreneurial risks. The role of landscape architects and planners as intermediaries between the government, the landscape and citizens is without doubt fundamental in this mission.

Henk de Haan
Associate Professor
Cultural Geography
Wageningen University

Claudia Basta
Assistant Professor
Land Use Planning
Wageningen University

Sven Stremke
Assistant Professor
Landscape Architecture
Wageningen University

STEP 1: EXISTING CONDITIONS - COASTAL LANDSCAPE

The land use of Schouwen-Duiveland shows large contrasts, the largest of which is that between water and land. The coastal zone, which connects land and water, is used for fishery, recreation and nature. One of the largest nature areas on the island is the Kop van Schouwen. This area contains large recreation and living areas. The middle of the island is characterized by its polders, which mainly have an agricultural function. The south coast of the island comprises mainly natural areas.

The important landscaping structures of Schouwen-Duiveland are formed by human influence and natural forces. The creation of dykes, occurrences of flooding and the reallocation of land have had big influences on the structure of the landscape.

The coastal zone has been divided into three zones: the North Sea coast, the Oosterschelde coast and the Grevelingen coast. The North Sea coast is one of the oldest parts of the island and is part of the Kop van Schouwen. This area is characterized by the large nature area and the intensive living and recreation protected from the sea by sand dunes. The Oosterschelde coast is mainly reserved for nature and nature development. Attempts are being made to connect the nature areas together. This provides opportunities for extensive recreational usage, like biking and hiking. Intensive recreation is avoided in this area (Gemeente Schouwen-Duiveland, 2010). The Grevelingen coast is earmarked for the development of additional recreational activities. The interaction between water and land plays an important role. The Grevelingen lake is a former arm of the sea; since the completion of the Delta Works, it is the biggest salt water lake in Europe. The area contains some islands with a large variety of vegetation types. The Brouwerssluis (a sluice) was built in 1978 to prevent the water sweetening (Alterra, 2010).

Figure 3.1 Underground Layer (Adapted from Hocks 2009)

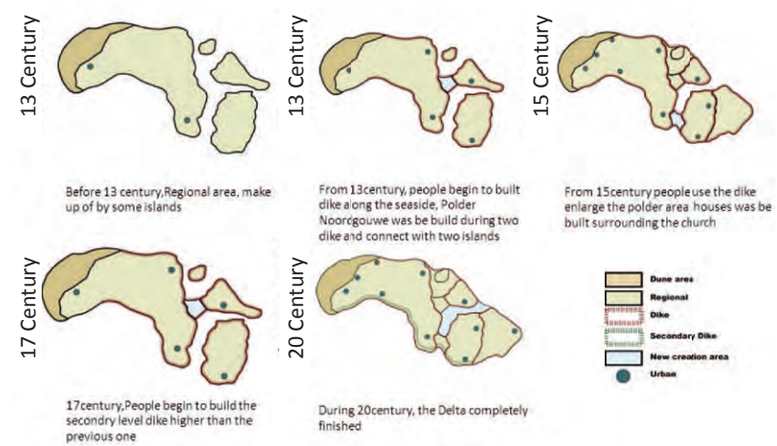


Figure 3.2 Development of Schouwen-Duiveland

GROUP 5
Dirk Harden
Roxana Florescu
Yinyi Chen
Niek Stokkingreef
Halida Sukmala Sudarmo
Anna Veltman
Chunhui Zhou

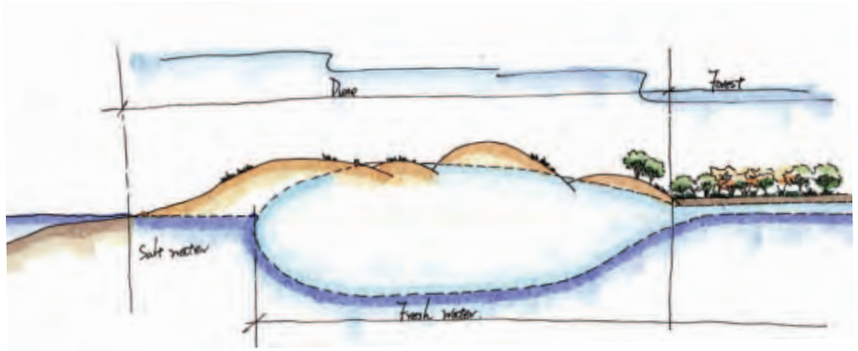


Figure 3.3 Profile North Sea coast

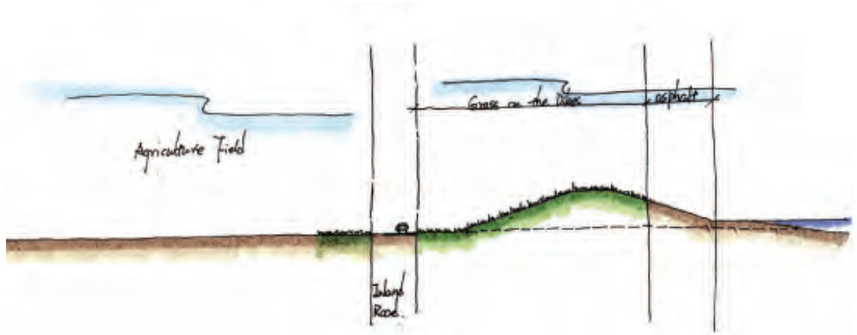


Figure 3.4 Profile Oosterschelde coast

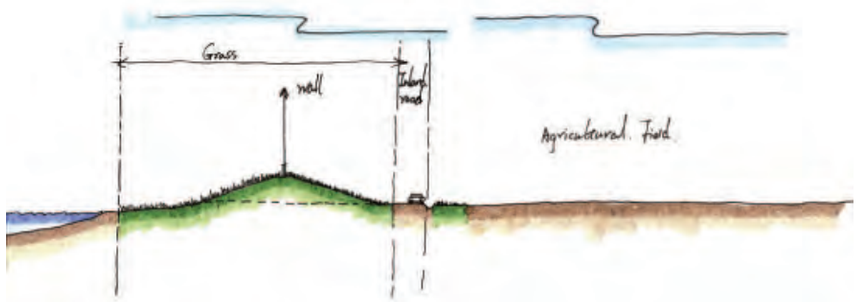


Figure 3.5 Profile Grevelingen coast

Alterra. (2010). Gebiesbeschrijving Grevelingen. Retrieved from http://www.synbiosys.alterra.nl/ natura2000/ gebiedendatabase.aspx?subj=n2k& groep=9&id=n2k115&topic=detailinfo#lan.

Gemeente Schouwen-Duiveland. (2010). Landschapsontwikkelingsplan Schouwen-Duiveland, Deel I Inventarisatie en analyse.
Brons Landschapsarchitecten BV.

STEP 1: EXISTING CONDITIONS - AGRICULTURAL LANDSCAPE

The municipality of Schouwen-Duiveland is one of the largest municipalities in the Netherlands in size, but it is one of the smallest when it comes to the number of inhabitants. Regarding the land use, the majority (77.58%) is related to the agricultural sector. This is not reflected in the labour force: less than 5 per cent of the total work force are employed in the agricultural sector. This great demand for land and the small contribution to the local economy can result in conflicts when it comes to making decisions at a policy level.

The agricultural sector is the major land user in Schouwen-Duiveland because the soil conditions are ideal for growing crops. Although the soils are not among the most fertile in the Netherlands, the introduction of artificial fertilizers has allowed the agricultural sector to grow in this region. The major soil types in the agricultural area are silty clay, light clay and heavy sandy clay; together with a groundwater tables of IV1 and VI2, this provides good, dry , firm soils.

Concerning the agricultural sector, it is stated that because of globalization the economic situation is uncertain. The situation is aggravated by the fact that 40% of the companies do not have a business successor. Second, the agricultural landscape is changing from a production space into a consumption space. The agricultural area lends itself to more functions, especially within the recreational sector.

Figure 3.6 Agricultural lands (GeoDesk 2011)

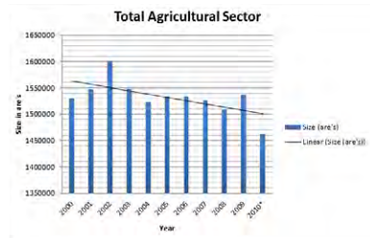


Figure 3.7 Total size of the agricultural sector (CBS 2011)

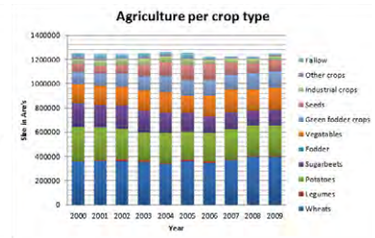


Figure 3.8 Size of arable land per crop type (CBS 2011)

GROUP 6
Maarten Haisma
Jentse Hoekstra
Ruud Tak
Romy Zwiers
Freek Van Tongeren
Irina-Alexandra Panait
Elisabetha Ilie
Yinan Ji
Yi Shan

Figure 3.9 Stakeholder overview

Secondary business activities are becoming increasingly important in Zeeland. Farmers in Zeeland have twice as many secondary activities as do farmers elsewhere in the Netherlands; this is due the important tourist sector. The municipality wants both to increase the productivity of the existing soil-based agriculture and to stimulate secondary business activities.

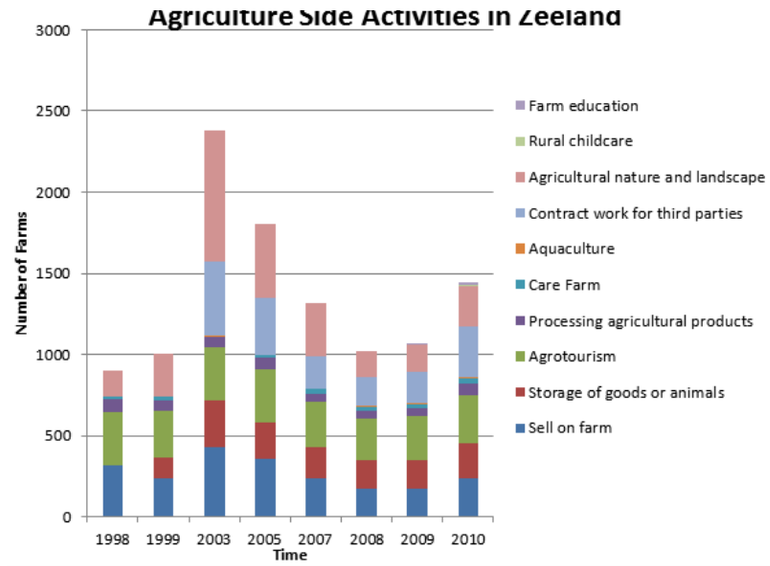


Figure 3.10 Agricultural side activities

STEP 1: EXISTING CONDITIONS - RECREATION LANDSCAPE

Recreation on the island started in around 1900 when holiday estates were built for the upper classes, and developed rapidly after the implementation of the Delta Works in the 1970s. At first, the north-western part saw the development of campsites, followed by resorts. Mass tourism arrived in the period 1985–2000 as a consequence of increased prosperity. What can be concluded is that development of the recreational landscape is linked to chains of events on the island. This offers potential for educational recreation, because the recreational landscape as it is shows how the identity of the island has developed.

The island of Schouwen-Duiveland is now one of the most visited tourist places in Netherlands. It is easy to understand why: it is located far away from the big cities, is near the sea, and has a very nice sandy beach and some really interesting places to visit. In the north-western part of the island, the bigger towns and the coastal zone are the most intensely used recreational landscapes; the agricultural inland area is mostly explored by car, bicycle or on foot and has almost no tourist facilities or accommodation.

Most tourists stay in holiday homes or at campsites. For the implementation of sustainable energy it might be interesting to look especially at these overnight stay facilities, because they represent the majority of the overnight stays on the island. Of all the activities that people undertake during their stay on the island, the most important ones are going to the beach, taking a car trip, going out for dinner and walking.

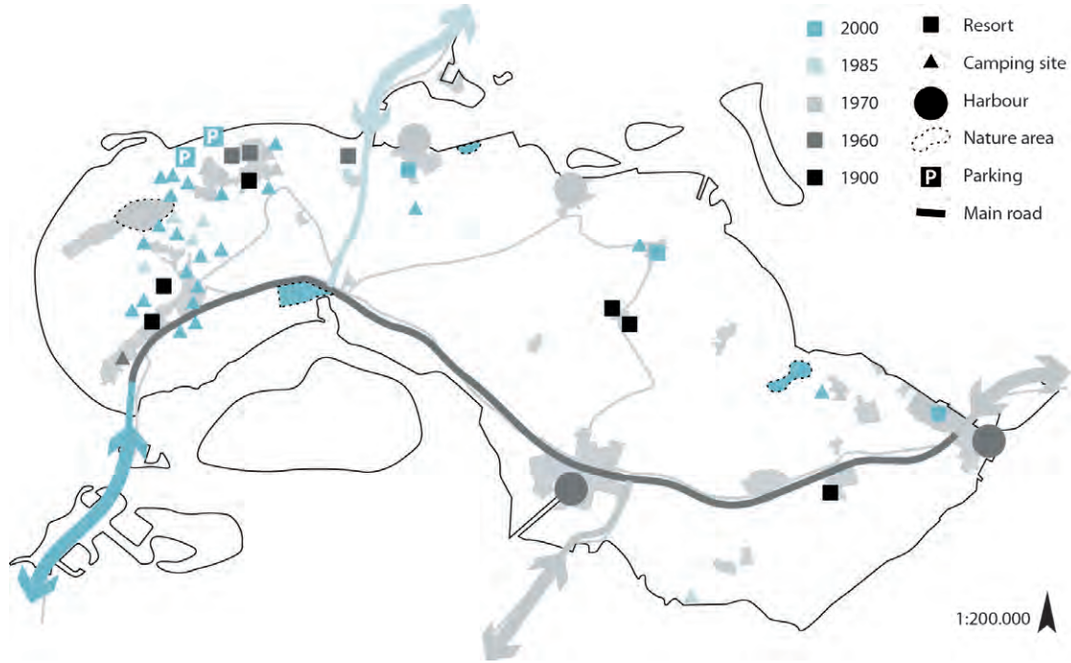


Figure 3.11 Historical development of recreational facilities

GROUP 7
Melanie Koning
Roel Theunissen
Teun Schuwer
Eefke van Weperen
Hjordis Sigurdardottir
Xiao Hu
Irina Hotkevica
Wondifraw Tessema

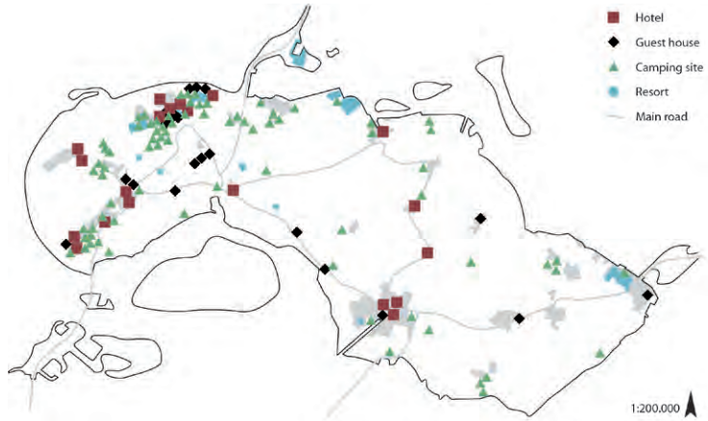


Figure 3.12 Spatial spread of accomodations

Figure 3.13 Spatial spread of recreational facilities

The public transport system to and on the island is weak. Most people come by car and use their cars a lot while they are on the island. For transport on the island to become sustainable, it will be necessary to improve the public transport system and to create facilities for electric cars.

Some calculations have been made to estimate the energy demand of the tourists on Schouwen-Duiveland, which resulted in a demand resulting from overnight stays of 780,000 MWh/y. Compared to the current maximum capacity of windmills (200 MW), this capacity can meet 225% of the demand resulting from overnight stays. This calculation, however, excludes travelling to and on the island, the production and transport of food, and the use of facilities.

Figure 3.14 Subdivision opf recreational areas

STEP 1: EXISTING CONDITIONS - URBAN LANDSCAPE

The municipality of Schouwen-Duiveland consists of 17 villages ranging in size from around 300 residents in Serooskerke to more than 10,000 residents in Zierikzee. Statistics show that there are especially a lot of residents in the 60–64 age group, and all these people will retire in the coming five years. This is a clear sign of the ageing of the population in the municipality. Predictions for the population development (Scoop, 2009) on Schouwen-Duiveland are that the population will drop by around 2–2.5% in the coming ten years.

Research on liveability (DHV B.V., 2011) has shown that the municipality of Schouwen-Duiveland scores very well compared to other municipalities in the Netherlands.

A couple of the island's urban areas have a clear identity. These are mostly the oldest parts and the centres of the historic places; they are currently called protected cityscapes or village-scapes. The government pays extra attention to developments in the urban areas and their surrounding landscape in order to preserve the existing qualities. Other places of special attention are the other villages on Schouwen-Duiveland, the coastal areas, several agricultural areas, nature areas and the Delta Works.

Regarding the village structures on Schouwen-Duiveland, five characteristic types of settlements can be distinguished: 1) Harbour settlements along the coastline, which are oriented towards the sea. 2) Main street villages, which are among the oldest types of villages in the Newland polders. Such a village is built around a main road that is perpendicular to the beach, with the harbour at one end of the street and the church at the other end. 3) Circular villages. These are the oldest village types in Zeeland. The villages centre around a church, which is in an elevated position and surrounded by a circular road. 5) Dyke settlements and road

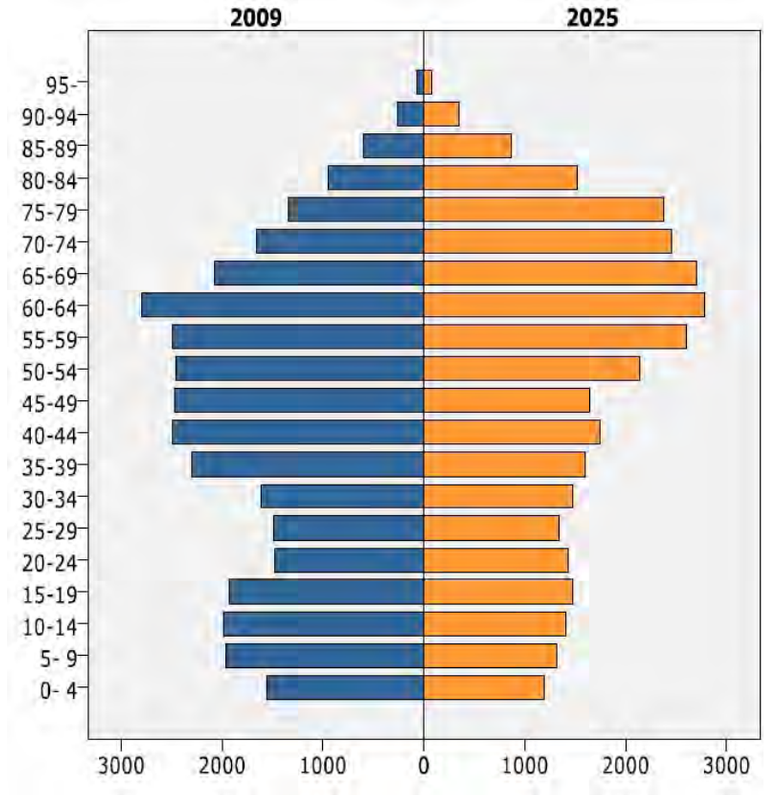


Figure 3.15 Population pyramid 2009-2025

GROUP 8
Maarten Kool
Dolf Derks
Matthijs Willeboer
Minmin Gao
Xin Hua
Zuzana Jančovičová
Luc Verain

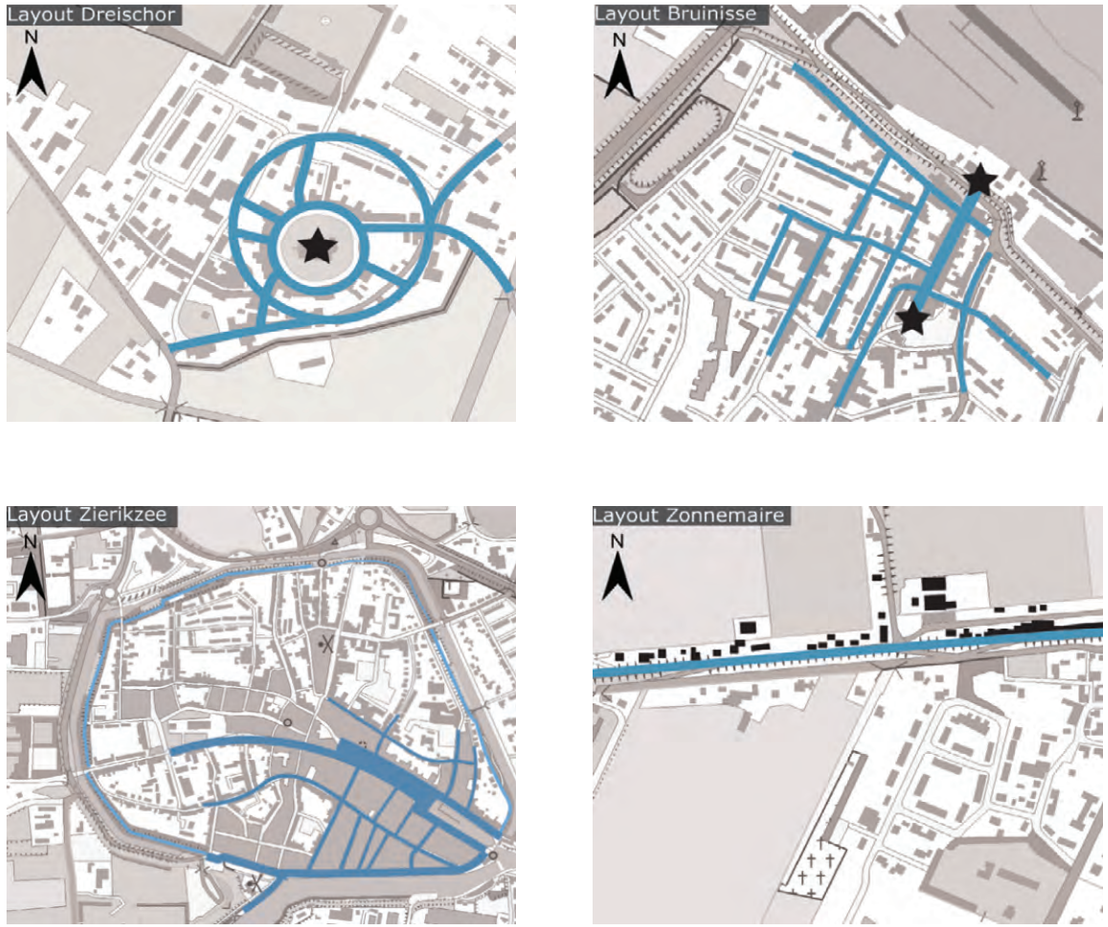


Figure 3.16 Driving forces of development

settlements.

The borders of the urban landscapes on Schouwen-Duiveland can be in the form of a row of houses, a road, a campsite, a harbour, dykes, graveyards, a row of trees, industrial sites, and so on. There is no characteristic type of border that is specific to Schouwen-Duiveland.

STEP 2: NEAR FUTURE DEVELOPMENTS - COASTAL LANDSCAPE

Climate change will be a global problem that also affects the Netherlands. Climate change will cause a sea level rise of 12 to 49 cm due to the thermal expansion of the ocean, 7 to 18 cm due to glacial melting, –1 to 41 cm and 13 to 22 cm due to the melting of the land ice on the Greenland and Antarctic ice caps, respectively, and –5 to 20 cm from local ocean expansion. Targets for the south-western delta concerning climate change are to:

- Create a safe and secure south-western delta.
- Locate and facilitate space for water in big reservoirs for emergencies.
- Improve the quality of the south-western waters
- Create more tidal dynamics in the south-western delta for the benefit of ecology and a more natural system.

The estuary has changed a lot over the centuries with respect to people's security, the sea's dynamic influences on the land, and the accessibility and use of the waters and the land. The goal is to achieve the right balance between these three factors, as then there will be room for both man and nature.

The other problems, such as water quality, are related to the decrease in estuarial dynamics. Another effect of the Delta Works is the isolation of the lakes from the rivers. The nutrient flows from the rivers now end up in the sea. This is a waste, because the estuary and the area of the North Sea near the delta are normally very nutrient-rich areas. Concerning the ecological system, the intertidal zone will disappear before 2050 as a result of 'sand starvation' if no measures are taken. In its present condition, the flood defence system will continue to function optimally until 2050.

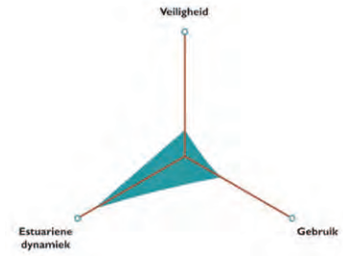


Figure 3.17 Balance of the estuary around 1700

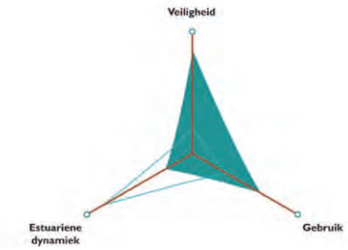


Figure 3.18 Balance of the estuary 1987

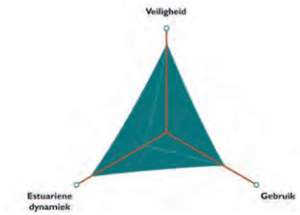


Figure 3.19 Balance of the estuary around 2100

The most important future development is the adaptation of the Delta Works and the influence of these adaptation measures on the coast of Schouwen-Duiveland.

GROUP 5
Dirk Harden
Roxana Florescu
Yinyi Chen
Niek Stokkingreef
Halida Sukmala Sudarmo
Anna Veltman
Chunhui Zhou

Table 3.1 Calculated potential production of renewable energy and limitations

Energy Sources	Power per m2 (W/m2)	Potential Areas (km2)	Potential Power Productions (MW)	Households that can be provided	Possible Limitations
Onshore Wind Farms	2	53	106	11.000 55%	Ecology, Birds, Recreation
Offshore Wind Farms	5	1290	6450	774.000 4000%	Birds, Recreation, Fishing, Shipping
Solar Energy PV	22	53	1166	140.000 700%	Ecology, Recreation
Solar Energy on Grevelingen	22	140	3100	372000 1900%	Ecology, Recreation
Solar Energy (Thermo Panel)	57	53	3021	360.000 1800%	Ecology, Recreation
Biomass	0.5	623	271	32.500 160%	Ecology, Recreation
Tidal Power (Brouwersdam)	-	-	60	7.200 36%	Ecology, Fishing
Tidal Farms	3	1150	3450	414.000 2070%	Ecology, Recreation, Fishing
Geothermal Energy (Dunes)	unknown	35	unknown		Drinking Water Resources

STEP 2: NEAR FUTURE DEVELOPMENTS - AGRICULTURAL LANDSCAPE

The agricultural landscape is affected by such environmental factors as increases in temperature and sea levels (climate change) or salinization of the soil, which leads to alterations of habitats and modifications of crops and yields cycles.

Agriculture is currently undergoing a number of changes regarding both types of products and operational aspects. Biological agriculture, agrarian nature conservation, a diversified production based on indigenous products, salt crops and fresh water aquaculture, are all positive trends that indicate an increased population awareness of environmental issues and courses of action towards the adoption of sustainable agriculture and efficiency in energy use.

On the other hand, a lack of investment in agricultural production, a shift of local economy towards tourism and an ageing population are causes of a decline in spatial qualities (i.e. agricultural up-scaling, visual disturbance caused by holiday tourism).

Future development strategies and design projects will have to deal with the challenge of integrating the conflicting environmental, social, cultural and economic interests into a coherent planning discourse that will facilitate the community's understanding of the importance of renewable energy use as well as a gradual transition to a sustainable lifestyle. This is important, as the use of wind, solar, biomass, waste and geothermal heat has the potential to provide Schouwen-Duiveland with energy in a renewable way. The areas with potential for the various renewable energy sources are shown on the 'Potential Map'.

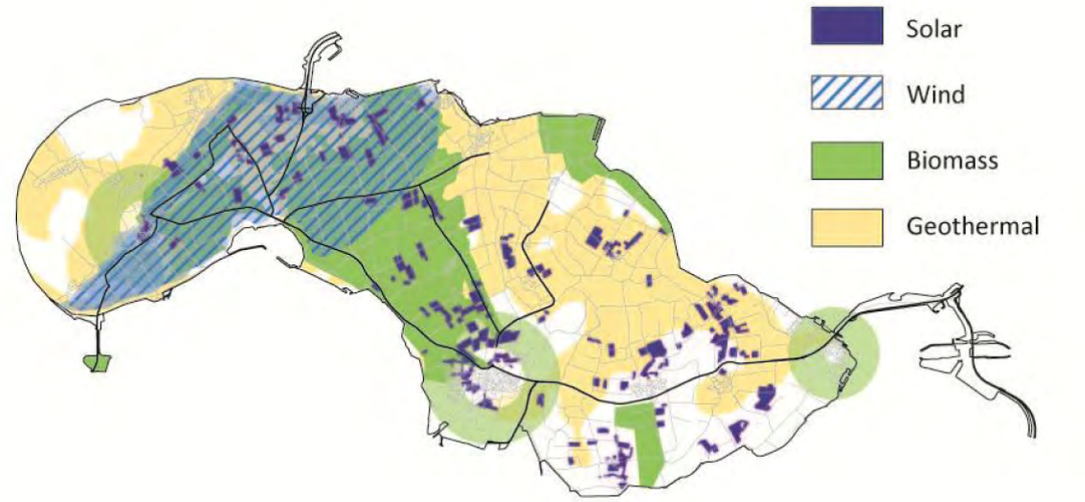


Figure 3.20 Potential locations for various types of renewable energy (GeoDesk 2011)

GROUP 6
Elisabetha Ilie
Maarten Haisma
Jentse Hoekstra
Ruud Tak
Romy Zwiers
Freek Van Tongeren
Irina-Alexandra Panait
Yinan Ji
Yi Shan

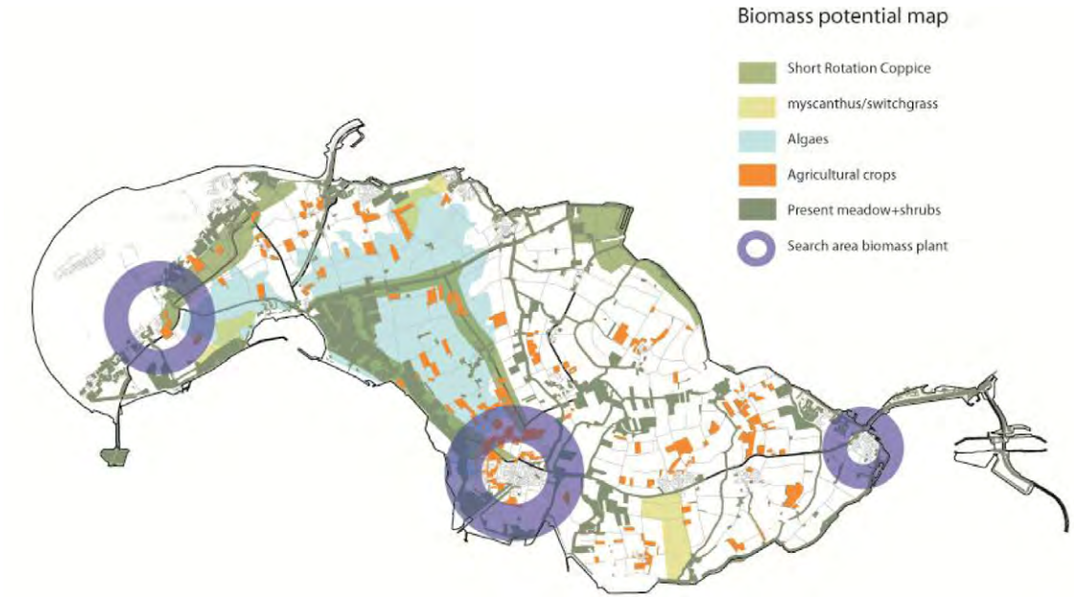


Figure 3.21 Potential biomass energy (GeoDesk, 2011)

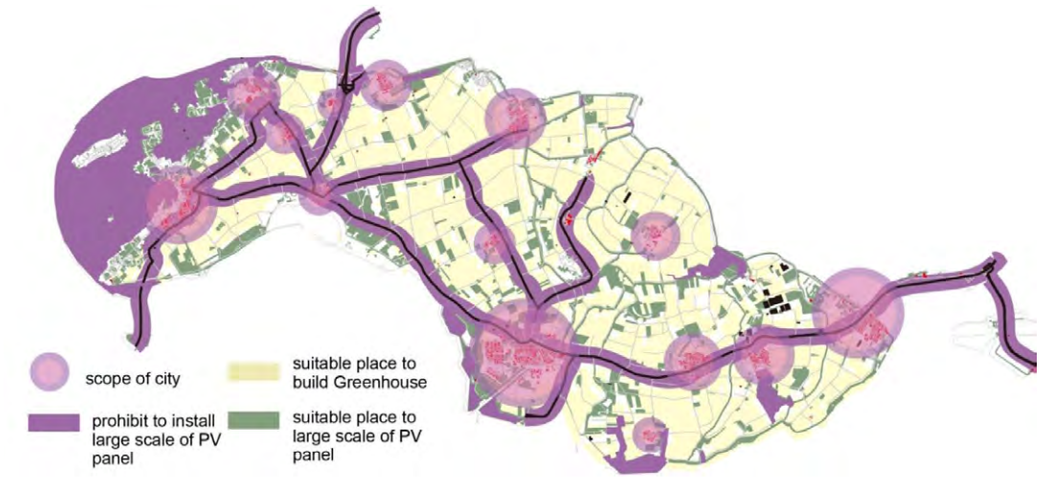


Figure 3.22 Potential solar energy (GeoDesk, 2011)

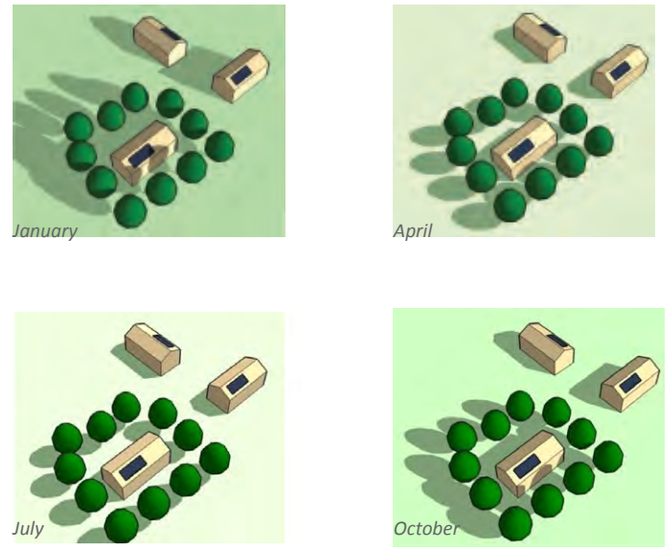


Figure 3.23 Shadow analysis for different time periods

STEP 2: NEAR FUTURE DEVELOPMENTS - RECREATION LANDSCAPE

The Dutch population is ageing and it will be important to create recreational facilities and accommodation for the older people who come to the island. Furthermore, the population of the island is decreasing and it is most important that plans include ideas for a sustainable population.

The municipality and local stakeholders want to differentiate the types of activities and accommodation in order to attract a more diverse tourist public and thus to grow the total tourist industry and become economically more sustainable. In the plans of both the municipality and the stakeholders, recreation will be spread out over the whole island, instead of only in the coastal areas, and both are interested in year-round recreation.

Finally, for the development of a sustainable energy–recreational landscape it will be important that both parties collaborate and that local initiatives be stimulated and supported.

There are different ways to combine sustainable energy and recreation. For example, existing industries can be used to create a cascading system for future recreational facilities and accommodation in the area. Second, almost all holiday resorts are located in areas with high geothermal energy potentials. This technique can be implemented for both heating and cooling houses.

At the moment, the municipality, stakeholders and local people are interested in increasing the tourist influx, especially during the off-season. This can be achieved by improving existing facilities – such as museums and exhibitions – and providing new educational experiences. Moreover, the solar and wind energy farms can be aesthetically attractive, which will make them good places to visit (sightseeing). The tourists themselves can also generate energy while, for example, dancing on disco floors and exercising in the

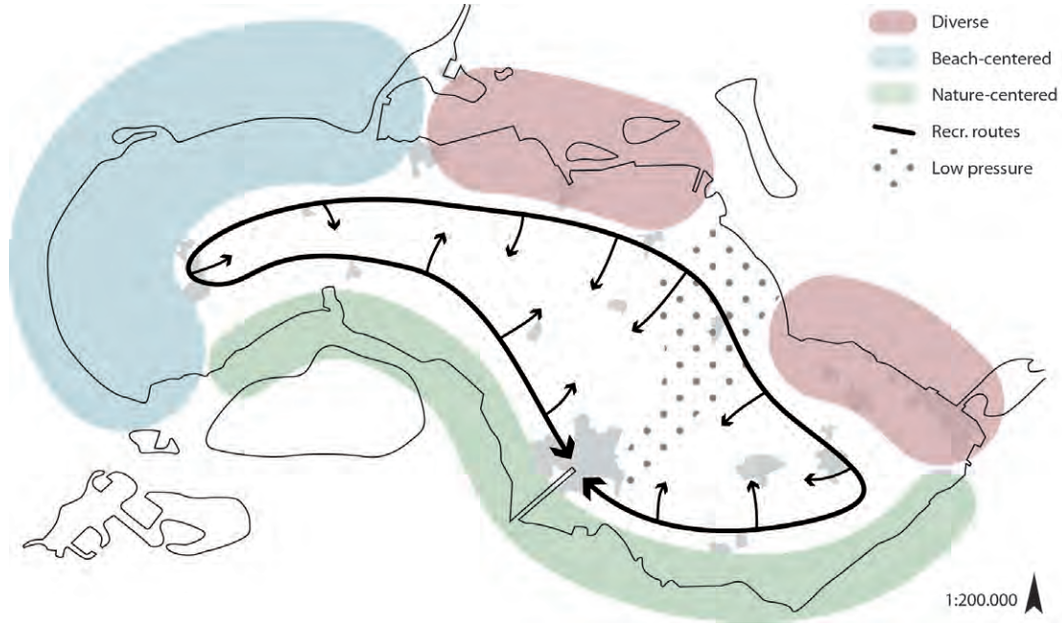


Figure 3.24 Desired developments by the Government

GROUP 7
Eefke van Weperen
Hjordis Sigurdardottir
Irina Hotkevica
Melanie Koning
Roel Theunissen
Teun Schuwer
Wondifraw Tessema
Xiao Hu

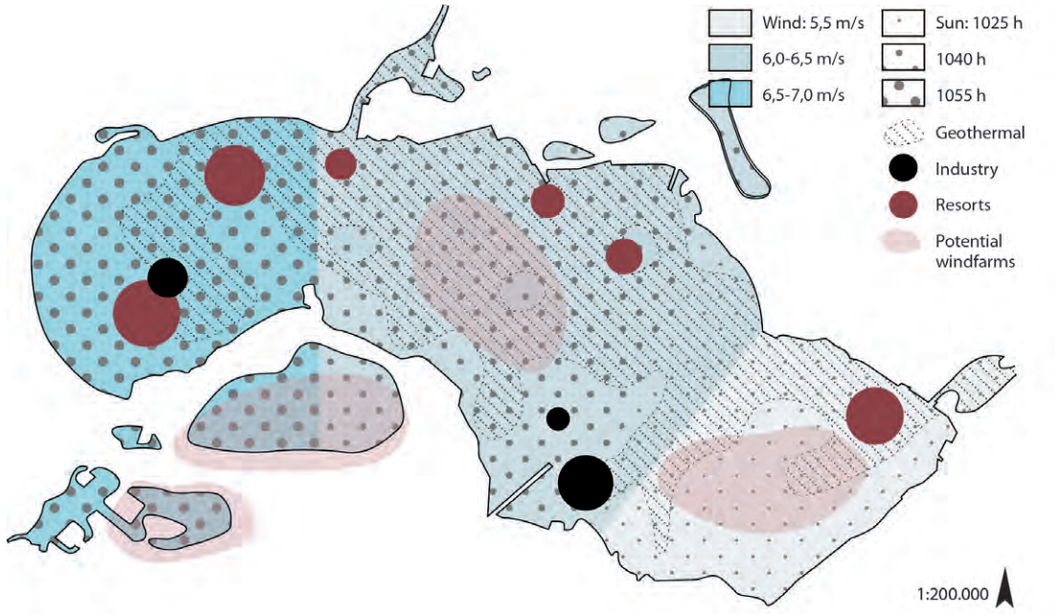


Figure 3.25 Energy potentials

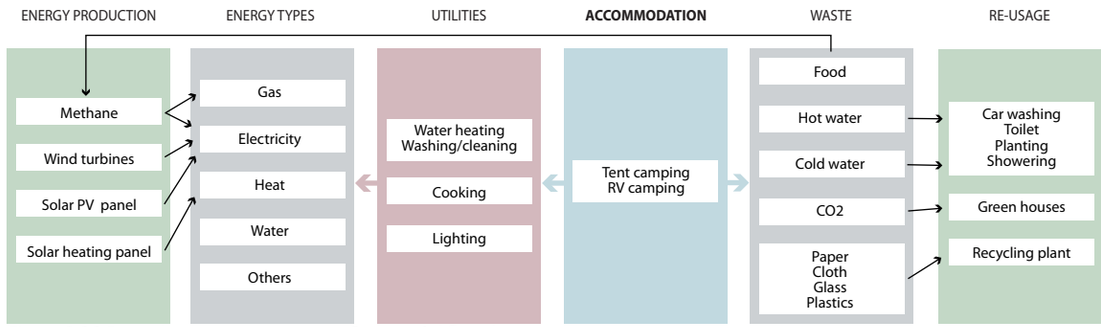


Figure 3.36 Exemplary energy use, waste & potential flowchart

gym.

To intensify the recreational use of the agricultural inland, sustainable energy projects and new types of agriculture can be developed there and used as landmarks and educational forms of recreation. The inland agricultural area can also provide local food, which can help in developing a local food system that is both sustainable and attractive to tourists.

The energy flows in the accommodation and recreation facilities can be used more efficiently by reusing the waste that they produce.

STEP 2: NEAR FUTURE DEVELOPMENTS - URBAN LANDSCAPE

In general, there are not many near-future developments planned for the urban landscape of Schouwen-Duiveland. The most important one is a new business park in Zierikzee. Moreover, there are plans to develop new dwellings in the villages of Zierikzee, Nieuwerkerk and Dreischor.

There exists an initiative called 'Innovation Island' for the villages of Scharendijke, Brouwershaven, Noordgouwe and Schuddebeurs. Twenty-six construction companies united in ProWonEc BV started the initiative. Their objective is to further the aim of the province of Zeeland to increase migration to the region.

The province of Zeeland focuses on the careful use of space in the urban landscape. It therefore promotes the clustering of living areas; that is, 50% of the new dwellings should be realized within existing villages, while industry will be concentrated around Zierikzee.

Much more can be done in the near-future to generate energy and reduce energy consumption. The urban landscape is however not suitable for all sources of renewable energy. This is due to aesthetic considerations and the protection of historic city centres. But there are also more practical reasons; the placement of wind turbines within the urban landscape, for example, proves to be difficult.

The focus, therefore, should be more on efficient energy use and saving energy. Solar energy and underground energy storage are two types of energy-conscious interventions that have great potential in the towns and villages of Schouwen-Duiveland.

Figure 3.27 Future developments on the island (Nirov)

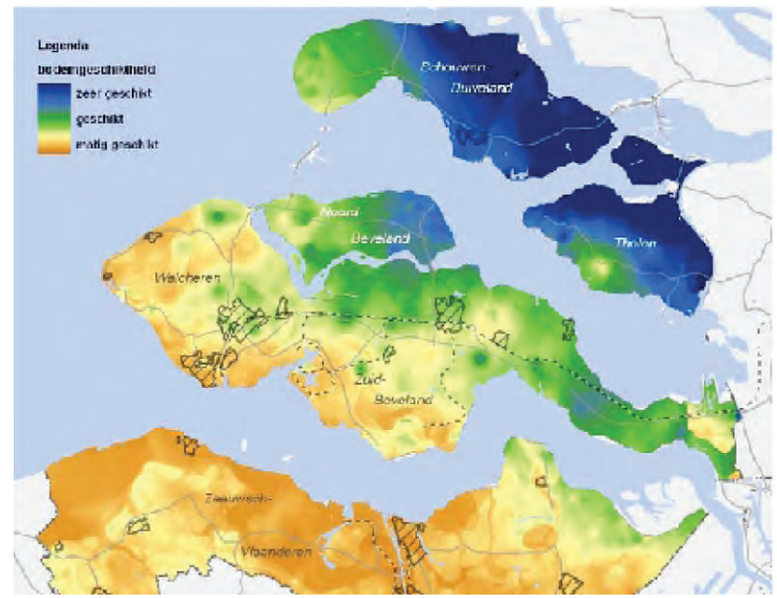


Figure 3.28 Soil suitability map for underground energy storage

GROUP 8
Dolf Derks
Luc Verain
Maarten Kool
Matthijs Willeboer
Minmin Gao
Xin Hua
Zuzana Jančovičová

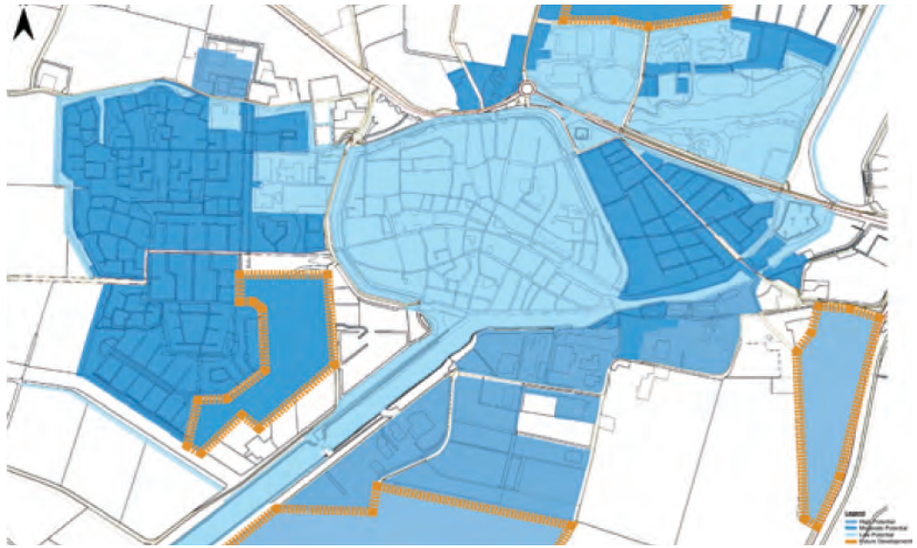


Figure 3.29 Potentials for solar energy in Zierikzee

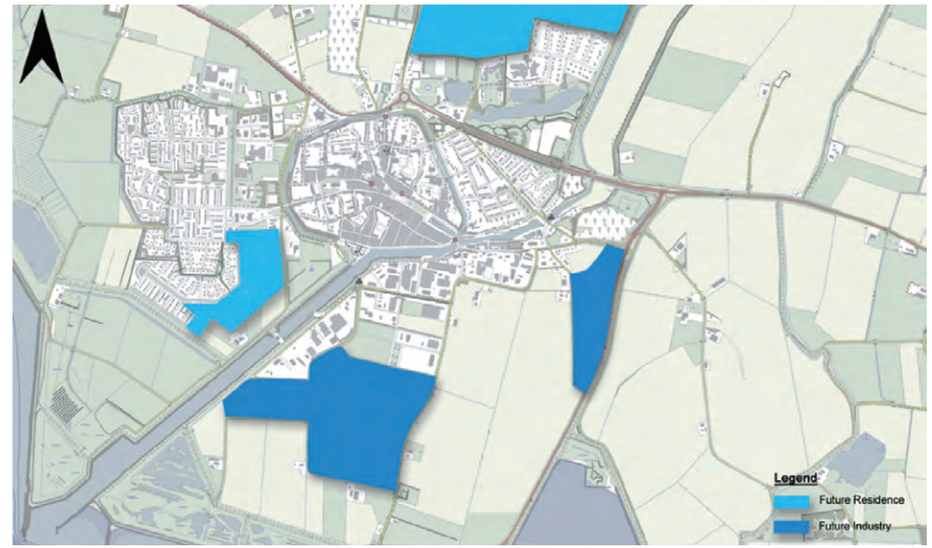


Figure 3.30 Future developments on Zierikzee

STEP 3: POSSIBLE FUTURE SCENARIO 1 - STRONG EUROPE

In the 'European Island scenario', the prices of fossil fuels rise and the interest in renewable energy therefore increases. Globalization is causing the rapid depletion of fossil fuels; we expect them to be depleted by 2050. The strong government will foresee this problem and stimulate the implementation of renewable energy. Preceding this date, a transition to renewable energy sources has to be made.

In the near future, several developments are likely to happen on Schouwen-Duiveland. Climate change and the approaching fossil fuel crisis have already determined ongoing and future changes on the island. The near-future developments are visualized in figure 3.33.

Schouwen-Duiveland is going to meet its own energy demand and produce a surplus, which will help the Netherlands achieve the goal of being an energy-exporting county. The island occupies 0.7% of the total land surface of the Netherlands. In this scenario, it provides 0.7% of the country's total energy provision. This means that Schouwen-Duiveland will have to generate 24,900,000 GJ. The island's energy consumption in 2040 will be 5,246,00 GJ, which is 21% of the island's total energy provision, meaning that 79% will be exported.

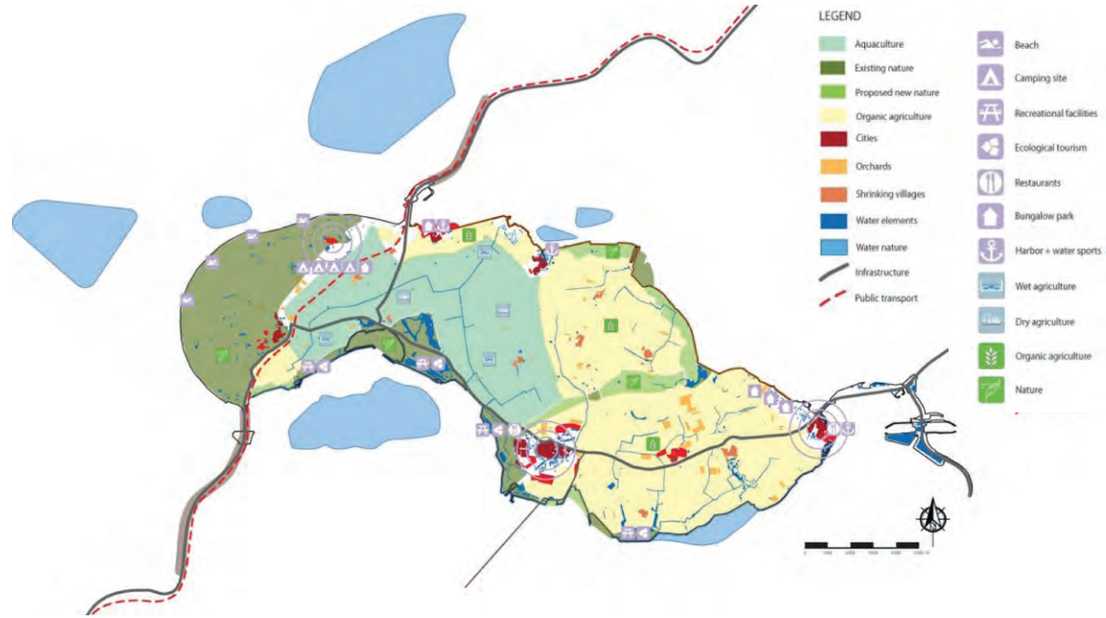


Figure 3.31 Scenario map

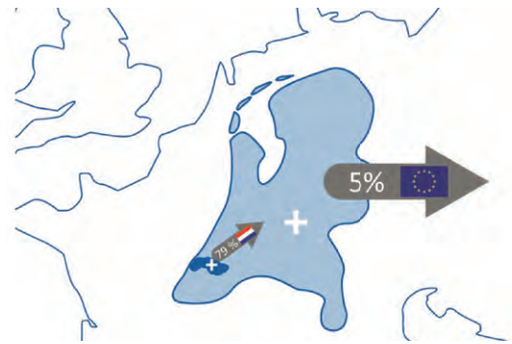


Figure 3.32 Energy export

GROUP 5
Jentse Hoekstra
Xiao Hu
Xin Hua
Zuzana Jančovičová
Melanie Koning
Irina-Alexandra Panait
Niek Stokkingreef
Anna Veltman

Figure 3.33 Future developments

The energy will be produced from various types of renewable resources. Wind energy is an important renewable resource. In this scenario, almost all wind energy is produced offshore because this is the most efficient method. The total amount of wind energy produced for the Netherlands in the North Sea is 219,600,000 GJ; of this, approximately 4,575,000 GJ can be assigned to the island.

Figure 3.34 Aquaculture

Figure 3.35 The beach

Figure 3.36 Organic agriculture

STEP 3: POSSIBLE FUTURE SCENARIO 2 - GLOBAL ECONOMY

In this 'Global Economy scenario', the economic activities on Schouwen-Duiveland are regulated by the market and are characterized by a high level of competitiveness. The government has hardly any influence and the regulations and the spatial restrictions are very limited, so that private actors take actions based on economic interests.

The economy demands investments and must attract national and international investors. Initiatives emanate from civil society, which, even if it does not come together in organizations as such, creates networks and supports local entrepreneurs. The market dynamics and the flux of exchange are engines that set things in motion on Schouwen-Duiveland. Developments that take place are driven by the unique local qualities. This economic interest counterbalances the decreasing solidarity on the island, which is a consequence of the growing population density and the tendency towards individualization. Although there is a very weak sense of community, the society works together due to the high level of interest in profit, and investors organize themselves in order to achieve a high level of competitiveness on the global market.

The desirable future for Schouwen-Duiveland in the Global Market scenario is based on a sustainable energy economy that is both profitable and socially reliable and has minimal negative environmental and social impacts. This can be looked at as being the common transition goal for the entire range of stakeholders when implementing new developments. In order to realize this vision, a number of actions were developed in order to:

- increase people's awareness of sustainability and involve them in developments on the island,

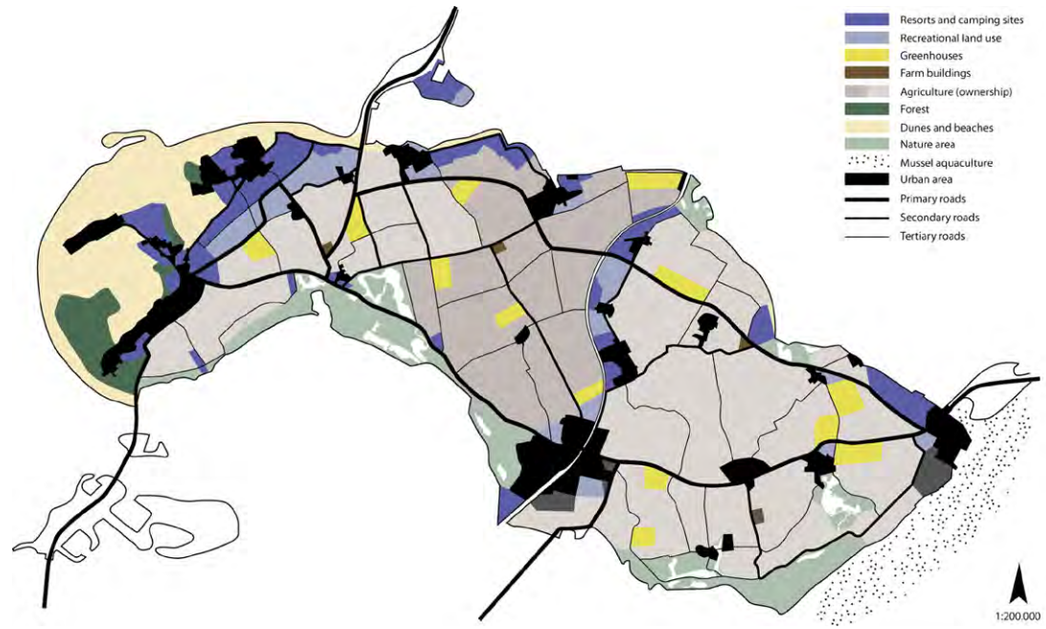


Figure 3.37 Scenario base map

Type of Energy user	Current (GJ)	% increase	2050 GE (GJ)
Coastal	724	100	1447
Recreation	154814	50	232222
Agriculture	140789	100	281578
Greenhouses	913339	700	7306712
Industry	869159	32	1145709
Households	928987	-6	874341
Commercial and public services	840355	24	1042961
Transport	749	64	1231
Total	3848167		**10886201**

Figure 3.38 Current energy demand and the estimated energy demand for 2050

GROUP 6
Dolf Derks
Minmin Gao
Dirk Harden
Elisabetha Ilie
Hjordis Sigurdardottir
Ruud Tak
Roel Theunissen
Chunhui Zhou

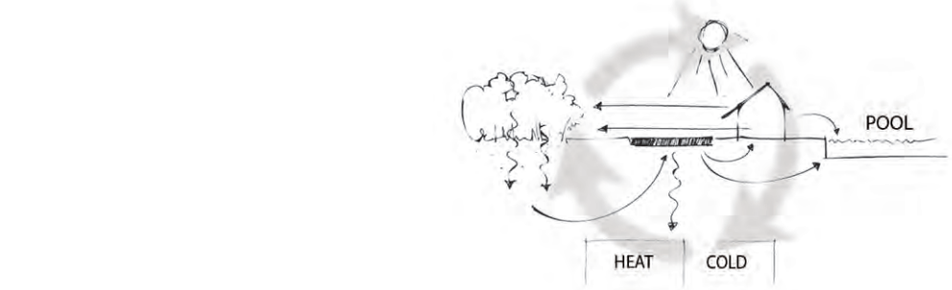


Figure 3.39 Principles for recreation clusters

Figure 3.40 Principle for the wind park cluster

Figure 3.41 Principles for energy clusters

- develop pathways of transition to renewable energy sources,
- develop sustainably the island's major economic sectors (recreation, agriculture, industry and energy), and
- attract investors and developers that can profit from economic activities on the island.

In this vision, a renewable energy island is created in the Global Economy scenario, characterized by a free market economy that lacks guidance or steering from governmental regulations. The development of renewable energy is therefore driven by the markets' demand for sustainably produced goods and services, as well as private initiatives (that are based on personal beliefs and values) to create sustainable enterprises. The island needs to be competitive on the global market. As a result, large-scale developments are expected to take place, which will severely restrict business opportunities for local entrepreneurs, who do not have the resources to compete in such a large market.

The most significant intervention suggested is the forming of energy clusters, whereby the largest energy sinks (i.e. greenhouses and farms) are clustered together in order to combine energy demands, supplies and waste re-usage in the most efficient manner. These clusters will be determinative of the island's identity because of their size and economic importance. As educational institutions, they can contribute to the local tourism industry, which remains the most important economic sector on the island.

STEP 3: POSSIBLE FUTURE SCENARIO 3 - REGIONAL GOVERNMENT

Due to the expansion of the European Union and the global agricultural competition, the EU transformed its subsidy system. In this new system, the EU only supports regions that want to become sustainable and self-sufficient by using local products. The Dutch national government stimulates local regions to adopt new endogenous development and to strengthen their regional identities by means of local products, in order to be competitive.

As a consequence of the shift towards a regional community, the economy is mainly oriented towards the own region. Inhabitants work on the island and shops sell locally produced products. No new industrial areas are developed, but old areas are redeveloped. Because of this regional-oriented economy, the possibilities for economic growth are limited. Being self-sufficient is a part of the regional identity of the island. The government stimulates the inhabitants to reduce energy demand and generate renewable energy.

Tourism is still the main economic sector, but because of the developments on the island, different types of tourists come to the island the whole year round and visit the entire island. They no longer come only for the sun, sea and beach, but also for the regional, rural identity of the island. These eco-tourists are often elderly people, who are retired and have different interests. The recreational activities are integrated with the different land use types on the island, for instance visiting organic farms.

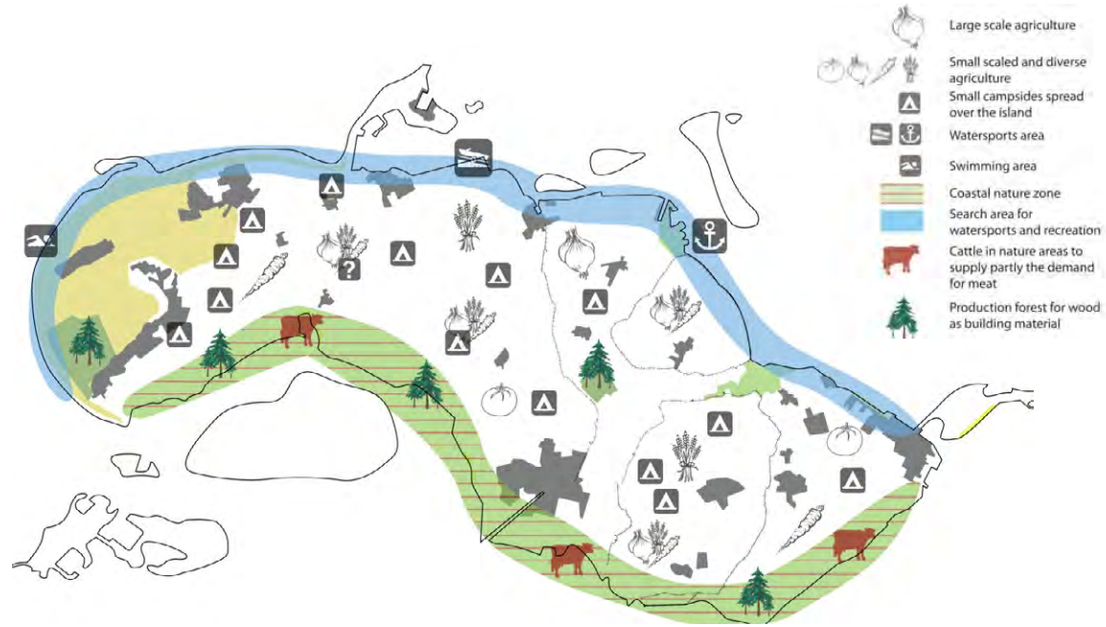


Figure 3.42 Scenario base map

GROUP 7
Roxana Florescu
Teun Schuwer
Yi Shan
Halida Sukmala Sudarmo
Eefke van Weperen
Matthijs Willeboer
Romy Zwiers

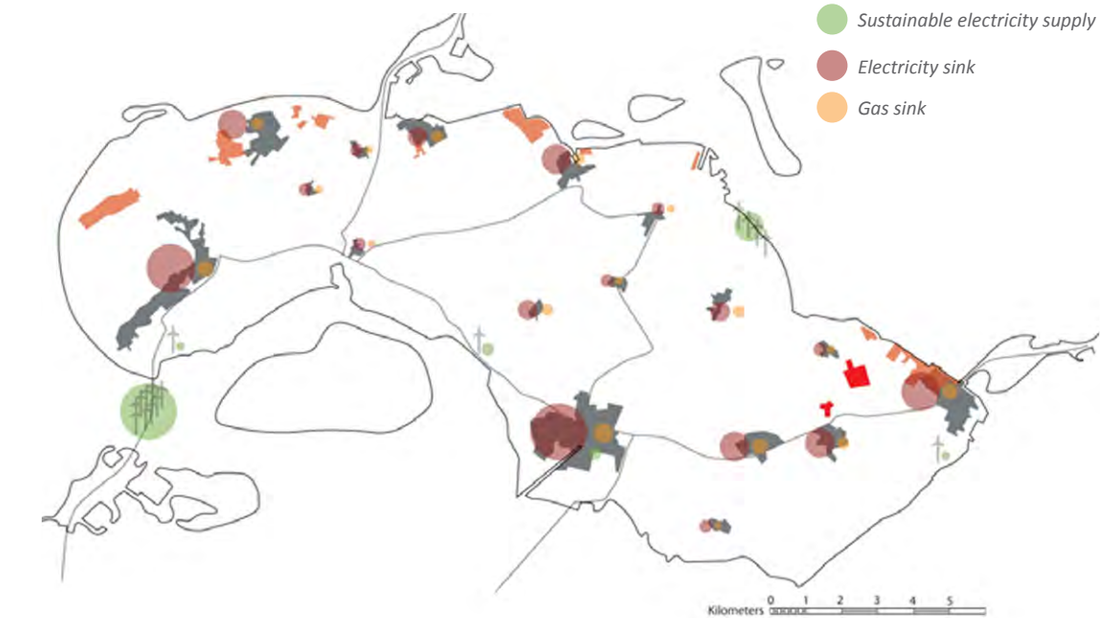


Figure 3.43 Present sink and source map

The island has become self-sufficient as much as possible within the municipality borders. Self-sufficiency must be the aim for all aspects, including energy. This means that energy must be provided on the island and that it has to be sufficient to supply the demand of the island in order to become a regional energy market. It is clear from the scenario that it is not possible to produce all needed products on the island; products like coffee, computers and other high-tech goods have to be imported. Transporting these products to the island is an energy-consuming affair. To ensure a sustainable island, not only the island's demand for energy, but also these external demands should be taken into account. It is assumed that 125% of the island's energy demand should be provided in order to become a sustainable island.

Figure 3.44 Dune and beach recreation

Figure 3.45 Diverse recreation

Figure 3.46 Local food

STEP 3: POSSIBLE FUTURE SCENARIO 4 - REGIONAL CIVIL SOCIETY

This report predicts the possible far-future in which the economy has become a regional economy in combination with a strong civil society. Combining the two ends of our axis we get a possible far-future development in which the planning policy domain is controlled purely by local associations, actors, entrepreneurs and visionaries. These parties negotiate between the various actors in and outside the region and mobilize local stakeholders to support their cause. The government has only a supervising (for instance, safety and health regulations) and a facilitating role.

Most of the existing villages in the municipality are historic sites; thus, no expansion or new housing developments are possible. The construction sector therefore decreases, as the development of new houses is insignificant.

The agricultural landscape accommodates farmland and greenhouses. There is a more diversified production to meet the demand of local people and tourists. Hence, agriculture is aimed at satisfying the local demand in order to ensure the island's self-sufficiency. Compared to the future demand, the area of existing agricultural land is smaller and it needs additional provision. Because of this, it is necessary to import some products. The area of greenhouses is increased mainly to produce vegetables for the winter season. In the scenario map, the need for extra agricultural land is represented as a new island. This is just to show the need for more arable land than is currently available.

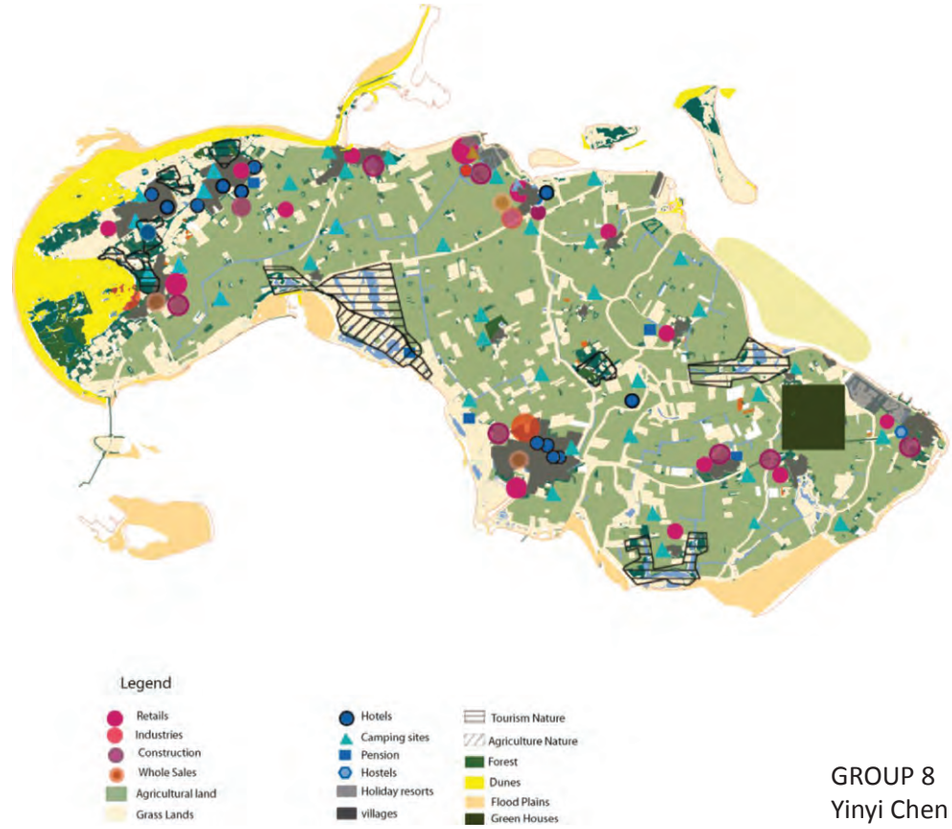


Figure 3.47 Scenario base map

GROUP 8
Yinyi Chen
Maarten Haisma
Irina Hotkevica
Yinan Ji
Maarten Kool
Wondifraw Tessema
Freek van Tongeren
Luc Verain

Figure 3.48 Present tourism map

Figure 3.49 Future tourism map

There are three types of nature areas, namely tourism, agriculture and preserved nature areas. The basis of this classification is the physical proximity to and juxtaposition of the nature areas with other functions. The integration of these functions creates the new typologies of nature landscape that have their own identities.

Concerning tourism, there is currently a high concentration of accommodation facilities in certain areas. In our vision, the accommodation is spread evenly across villages and farms; however, the urban centres still have the lion's share because of the number of hotels, pensions, hostels and other facilities on the island. There is no increase in the number of second homes, as the houses that became empty in the urban areas due to the ageing of the population now accommodate tourists. The other point is that tourism can be incorporated within agricultural and nature functions as a secondary business activity. It also gives the local farmers the opportunity to generate more income. To increase the accessibility of the island and to provide tourists with variety of experiences, the system of bicycle paths and walkways is expanded. In general there is more decentralized and diversified tourism in different parts of the island to provide tourists with as many options as possible.

STEP 4: DESIRED FUTURE - ENERGY VISION # 1

Recharge

As shown in the energy potentials map (fig. 3.50), there are several potential renewable energy sources on the island. Although it is possible to implement renewable energy technologies all over the island, it is important to know which places are the most suitable. There are five main energy sources available on the island: wind, solar, biomass, geothermal and tidal. On Schouwen-Duiveland, the most suitable places for wind energy are in the sea to the west of the island, and inland, in the middle part, where there is a sufficient wind speed and a higher ground level.

The western part is also the most suitable area for large solar energy developments. Urban developments anywhere on the island also have a potential for solar panels (on roofs), as long they are placed facing south. As far as the tidal energy potential is concerned, the Brouwersdam between the Greveligen lake and the North Sea is an advantage, because it serves as a barrage, maintaining the differing high water tables of the lake and the sea (Programmabureau Zuidwestelijke Delta, 2009). Biomass production is possible mostly in the agricultural and nature areas, because waste products from agricultural production and nature management can be processed as biomass. In the cities, a combination of solar and biomass energy (from municipal waste) is also possible. Geothermal energy potential is also present on the island.

Energy sinks are defined as those areas where energy demand exceeds supply, while energy sources are regarded as those areas where supply exceeds demand. The map of energy sinks and sources shows that the area for energy sources is greater than that for sinks. Among the significant energy sinks we find the dykes, cities, dunes and northern coastal areas, because of the large energy demand of the water defence systems, inhabitants

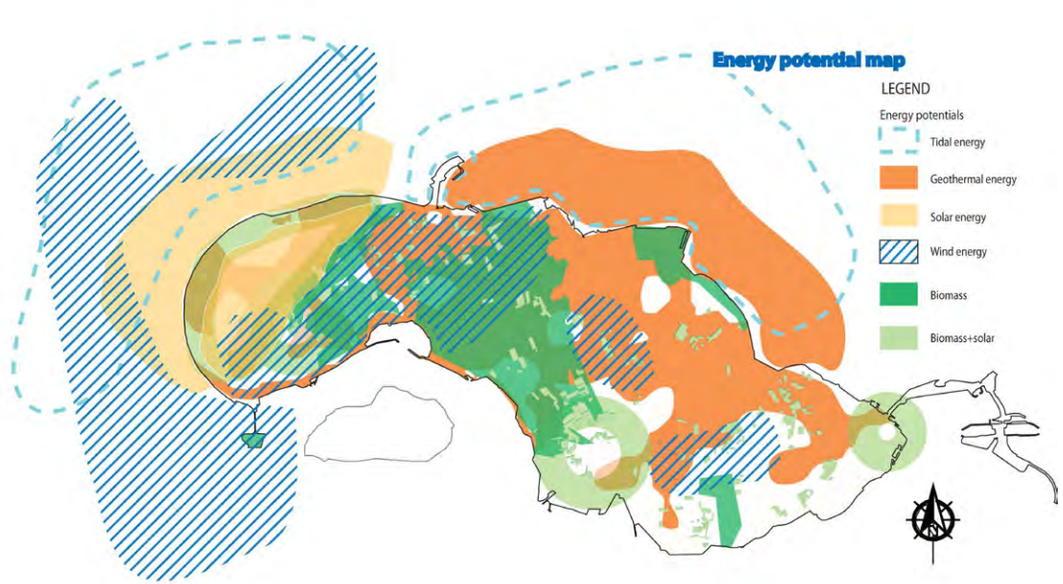


Figure 3.50 Energy potential

GROUP 5
Jentse Hoekstra
Xiao Hu
Xin Hua
Zuzana Jančovičová
Melanie Koning
Irina-Alexandra Panait
Niek Stokkingreef
Anna Veltman

Figure 3.51 Energy sinks and sources

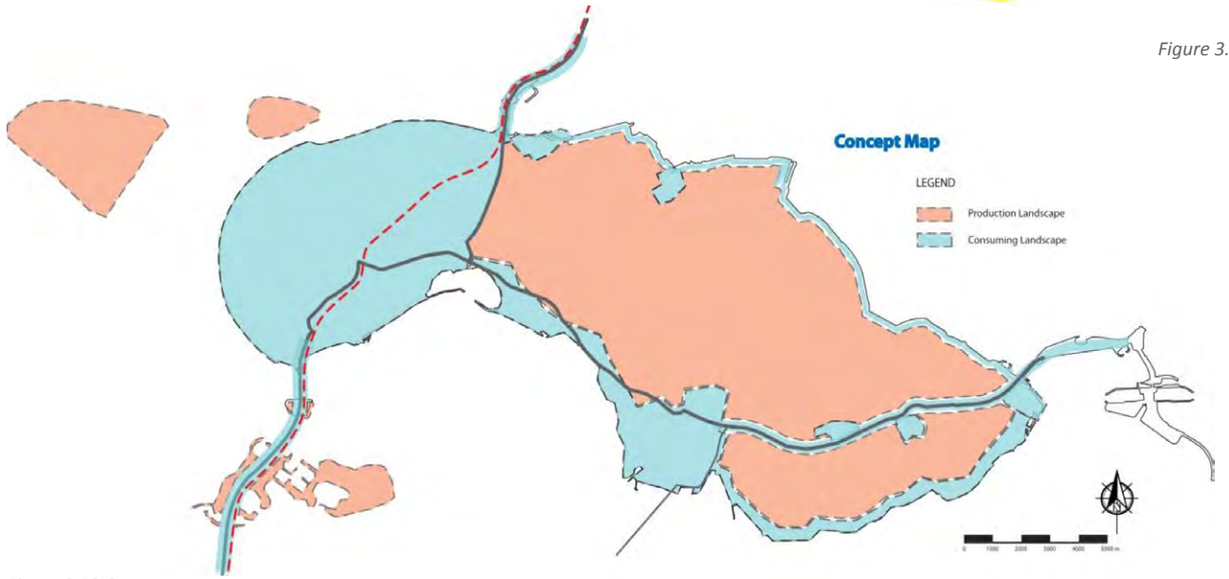


Figure 3.52 Concept map

and tourists. The source areas are mainly placed in the farmland, which produces biomass and biofuels (using algae). Wind turbines along the south dam and those on the sandbank generate lots of electricity for the island (figure 3.52).

The central notion and concept of the vision is ‘recharge’. This concept has various meanings in the vision. Recharge stands for the transition to sustainable energy on Schouwen-Duiveland and its provision of energy to the Netherlands. The use of solar energy, for example, will provide the island with energy. Recharge also refers to a social aspect: in the vision, the island has a recreational function for the inhabitants of nearby cities. Schouwen-Duiveland offers the possibility for people from the metropolitan areas to retreat to the island and recharge their mental batteries. The concept map (figure 3.53) features the general consumption and production landscapes of the island. Some landscapes will provide energy and goods for other landscapes where consumption exceeds the provision. Some landscapes are also to be ‘consumed’ by tourists in terms of recreation and leisure.

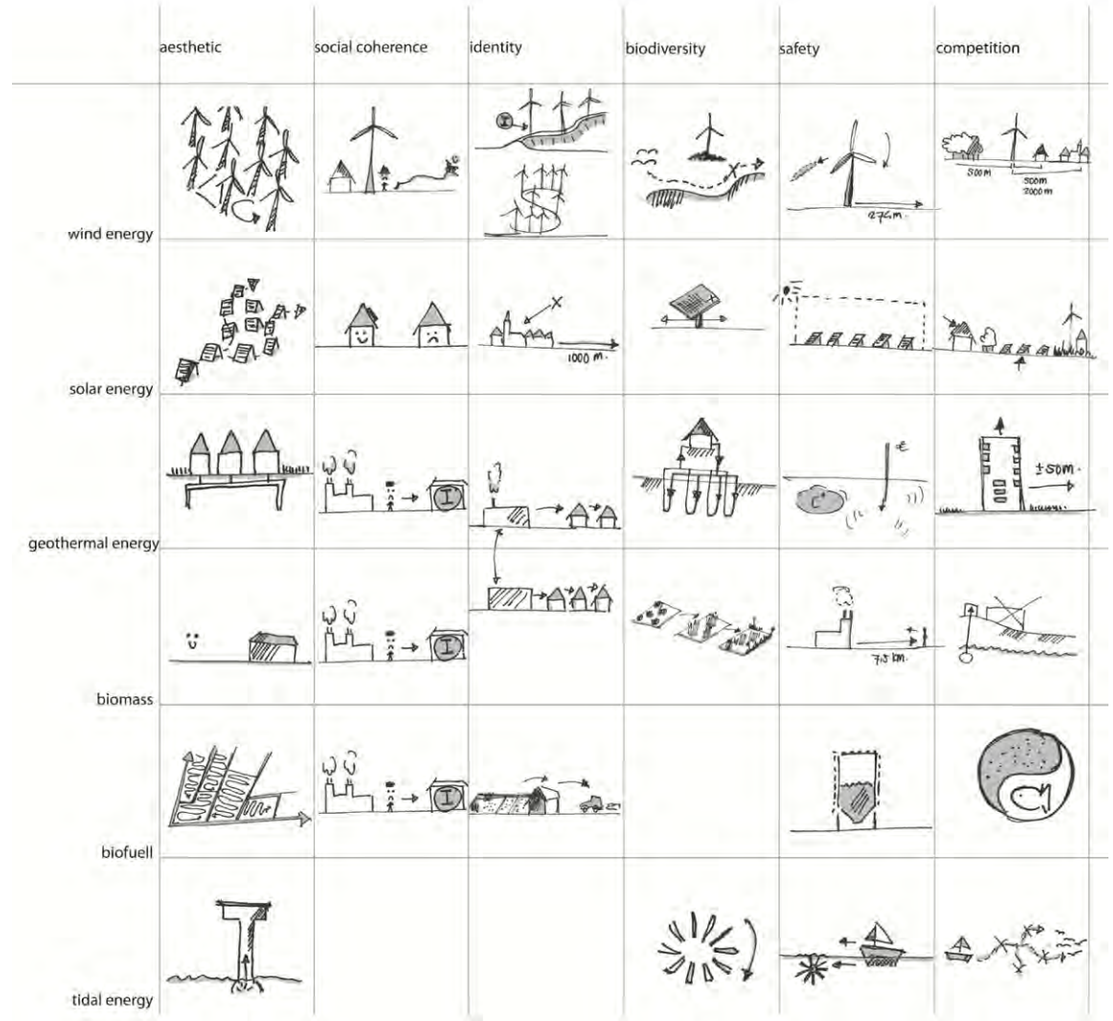


Figure 3.53 Design principles

Figure 3.54 Sections & visualizations

STEP 4: DESIRED FUTURE - ENERGY VISION # 2

Island on Demand

Based on the available technologies, energy saving, storage and generation are implemented into the urban and rural landscapes. The proposed technologies are wind turbines, standard and transparent solar panels, heat/cold extraction and storage systems, biomass plants and water filtering. Where possible, for example in areas where urban and industrial areas meet, the method of energy cascading is applied. The following explains the vision's proposed implementations, with a focus on the three major combinations of the proposed energy technologies: greenhouse clusters, recreation areas and off shore wind park.

The energy clusters are corporations that group greenhouses with farms for the following reasons: energy efficiency, minimal impact on the landscape and social acceptance. There are three types of cluster combinations: greenhouses with nature areas (Tureluur cluster), greenhouses with agriculture (Bruinisse) and greenhouses with recreation (Gouwe Canal). The layouts and the illustrations that accompany these designs are examples of potential developments through time.

The Tureluur cluster is located near the Tureluur nature area and the village of Serooskerke. To keep the transport distance for energy, food or waste short, the cluster is located near a main road and close to the villages of Serooskerke and Scharendijke. One possible threat emerging from this cluster is that it could conflict with the nearby nature area. To prevent this from happening, it is necessary to integrate the cluster and the nature area visually but keep nat-

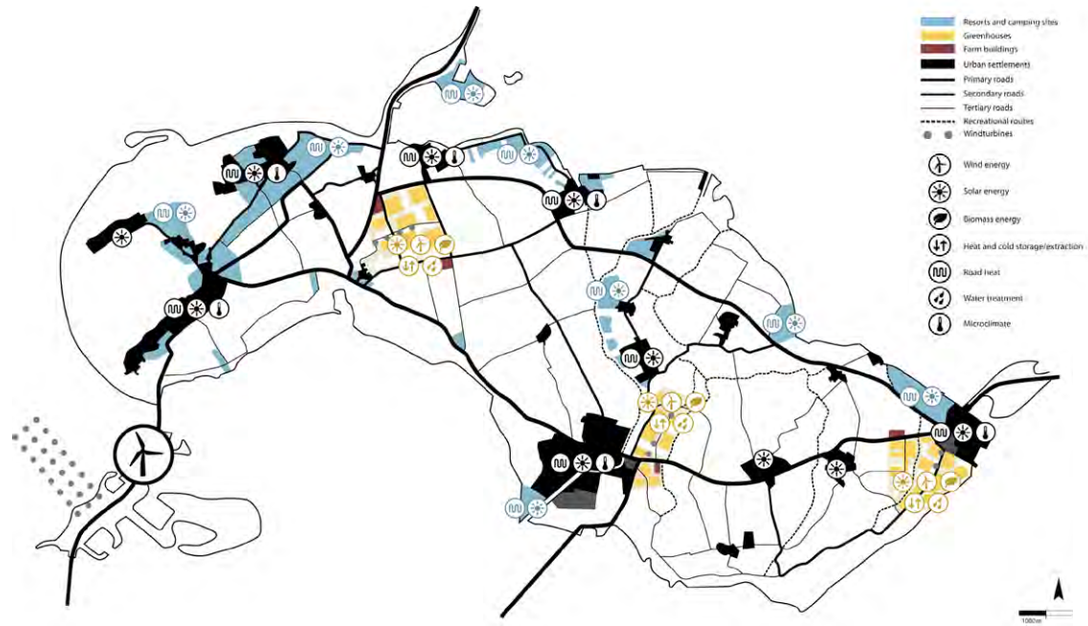


Figure 3.55 Vision map

GROUP 6
Dolf Derks
Minmin Gao
Dirk Harden
Elisabetha Ilie
Hjordis Sigurdardottir
Ruud Tak
Roel Theunissen
Chunhui Zhou

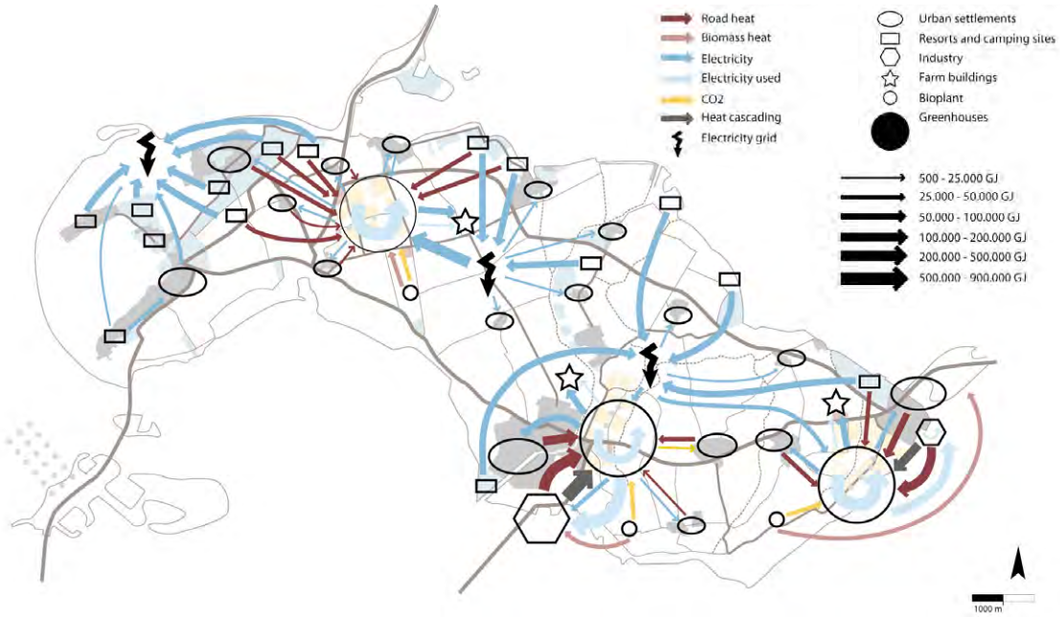


Figure 3.56 Energy flows

ural waters and greenhouse fresh water basins separated.

Regarding the Bruinisse cluster, both the agricultural landscape and the water are important. New industry is located to the south of Bruinisse, which means that the design has to take this into account. The new industrial areas use renewable energy sources, fitting the island's sustainable image. In order to avoid having a too monotonous agricultural landscape and a lack of biodiversity, islands of green are developed throughout the island; this leads to slightly differentiated landscape patterns.

The Gouwe canal, which runs from Zierikzee to the north side of the island, is one of the new recreational attractions. This cluster is located to the north of Zierikzee and is therefore close to the canal. Because of this, the cluster must be positively experienced from the canal; it must not put off tourists who are sailing on or enjoying another form of recreation along the canal. Apart from the touristic point of view, the cluster is also next to the industry area of Zierikzee. This means that it has to fit in with the large-scale image that is present over there.

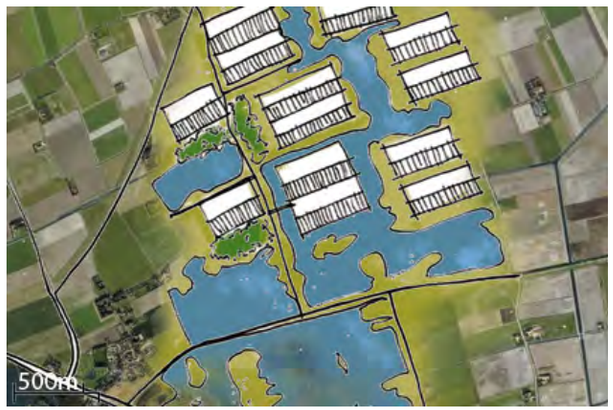


Figure 3.57 Cluster Tureluur

Figure 3.58 Cluster Bruinisse

Figure 3.59 Gouwe Canal

In this vision, the island is energy neutral as a result of the various renewable energy resources that are used in various combinations. The island's total energy demand (108x106 GJ) is entirely met by renewable energy resources on the island itself. This total energy demand is divided between heat and electricity. The island needs more heat than electricity; the estimated percentages are 80% heat and 20% electricity. The island therefore needs 87x106 GJ of heat and 21x106 GJ of electricity.

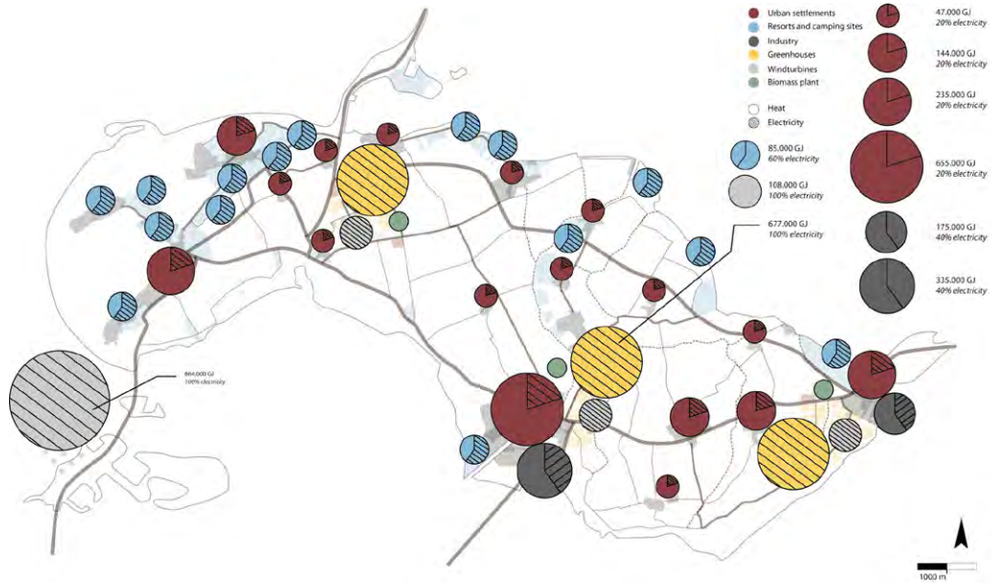


Figure 3.60 Energy Sources

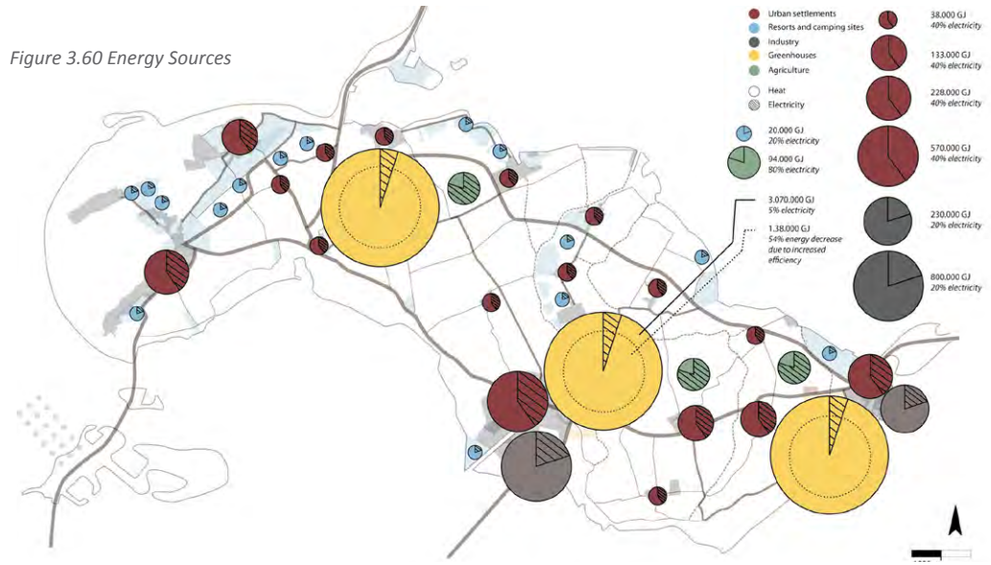


Figure 3.61 Energy Sinks map

Figure 3.62 View along the Gouwe canal

Figure 3.63 Recreation area and wind park

Figure 3.64 Visualisation urban area

Figure 3.65 Modern green houses and agricultural land

STEP 4: DESIRED FUTURE - ENERGY VISION # 3

Uniform Diversity

In the scenario, the island develops a regional uniform identity. To emphasize the idea of being on an island, the island's four access roads will be developed into gateways. The storyline of the scenario tells about a mixed landscape of large- and small-scale plots of land that are used for extensive agriculture. In the vision, this idea is transformed in such a way that it strengthens the island's identity even more. Three 'islands' of small-scale agriculture are created, based on the island's historical development . These islands are separated by a 'sea' of large-scale agricultural plots. The three islands develop into a more enclosed landscape, with rows of hedges, and refer to the identity of the landscape as it was before 1953. The situation of the three islands is shown in figure 3.66.

The three 'islands' and the 'sea' play an important role in the identity of the island for tourists. Through this division, which will be combined with sustainable energy, people will learn about the history of the island. Each 'island' has a theme in sustainable energy: the island of Schouwen will be themed as 'reuse of waste', Duiveland as 'energy storage' and Dreischor as 'underground heat storage'. The theme of the 'sea' combines wind and solar energy to emphasize the historical creek. The gateways at the entrances to the island will also contain sustainable energy sources to link the identity of the island with sustainable energy. These projects will show visitors how energy can be produced and stored in a sustainable and attractive way.

Besides these specific themes of the various 'islands' and the 'sea', energy saving is emphasized on every 'island' by solar energy systems installed on industrial and certain agricultural and residential roofs.

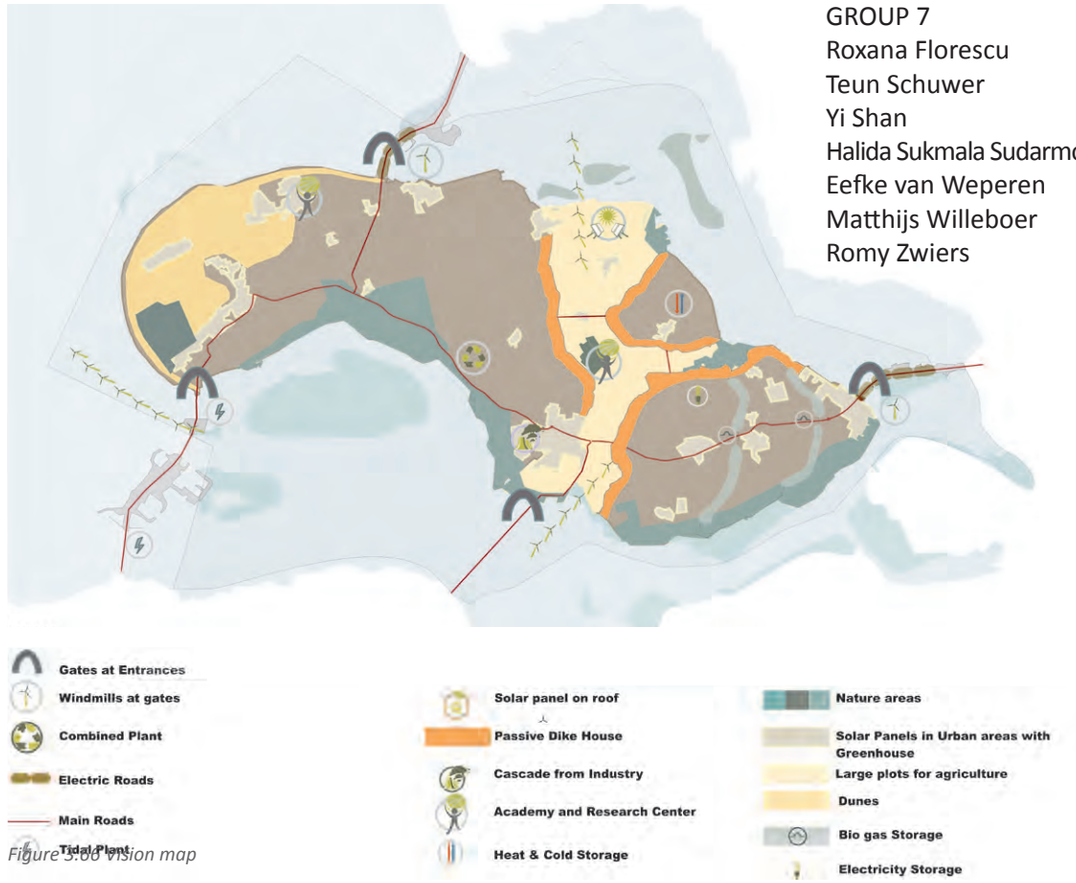


Figure 3.66 Vision map

GROUP 7
Roxana Florescu
Teun Schuwer
Yi Shan
Halida Sukmala Sudarmo
Eefke van Weperen
Matthijs Willeboer
Romy Zwiers

Figure 3.67 Gate to the island

Figure 3.68 Windmills along the gate to the island

Figure 3.69 Greenhouses near village

Figure 3.70 Agriculture

Wind turbines will be erected at the two northern gateways. The entrance at Zeelandbrug in the south will be marked by the southern row of wind turbines that connects the Oosterschelde with the island. The entrance at Oosterscheldekering will be marked by an offshore row of wind turbines, which will strengthen the southern coastline. Furthermore, all the roads on the bridges will contain a kinetic energy system, whereby a tidal energy system will be integrated in the Oosterscheldekering. Upon their arrival, tourists will see that they play an active role in the provision of sustainable energy.

By generating its own energy, the island will be able to meet its own energy demand. This will create a closed financial cycle, in which the money earned is invested in the sustainable energy system. The same phenomenon occurs by becoming self-sufficient in food production. These developments lead to an island economy that can sustain itself. The tourists' money will be added to the cycle and used to compensate for the outlay on imports.

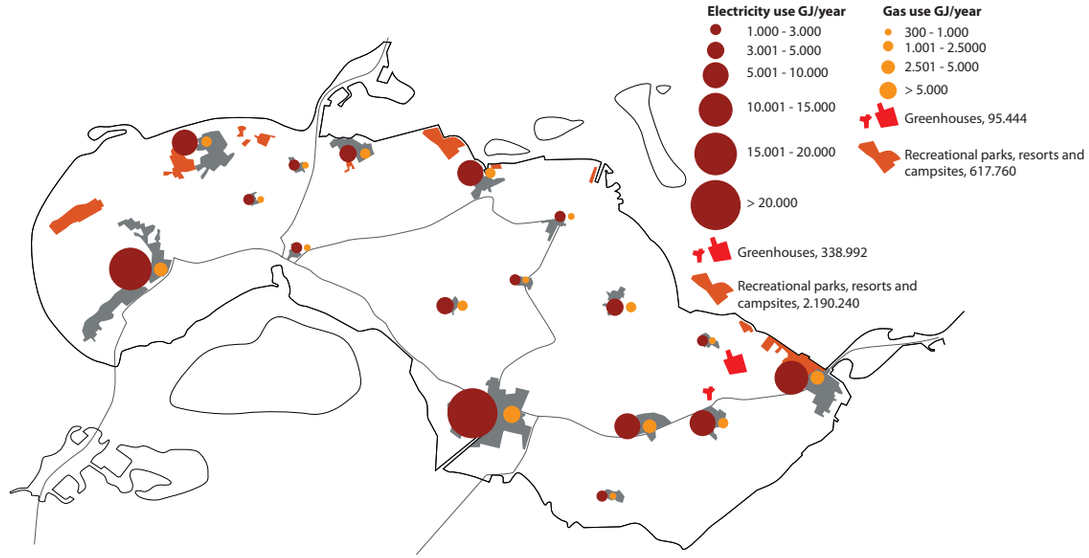


Figure 3.71 Current sinks

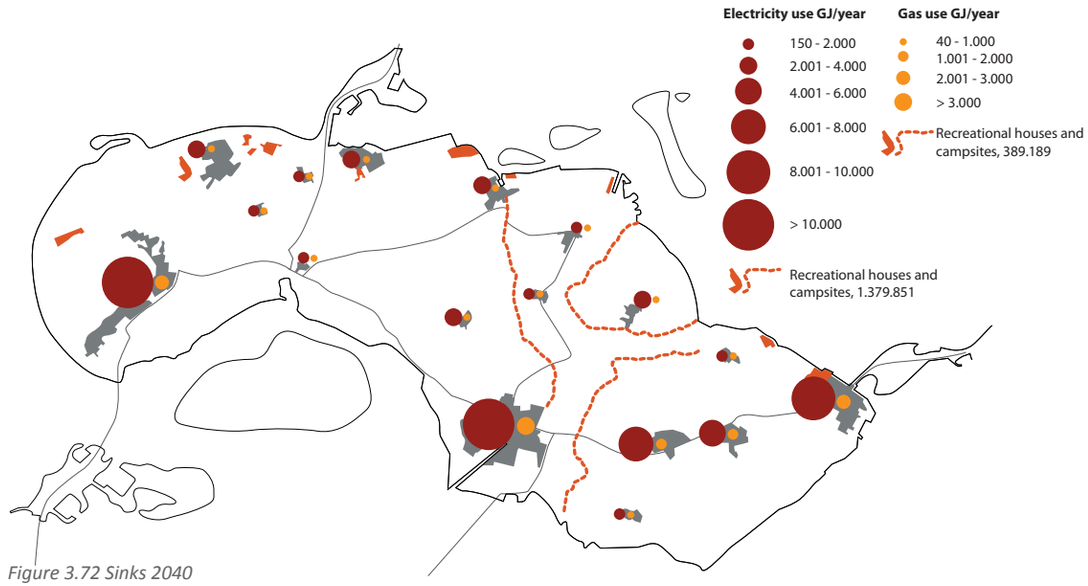


Figure 3.72 Sinks 2040

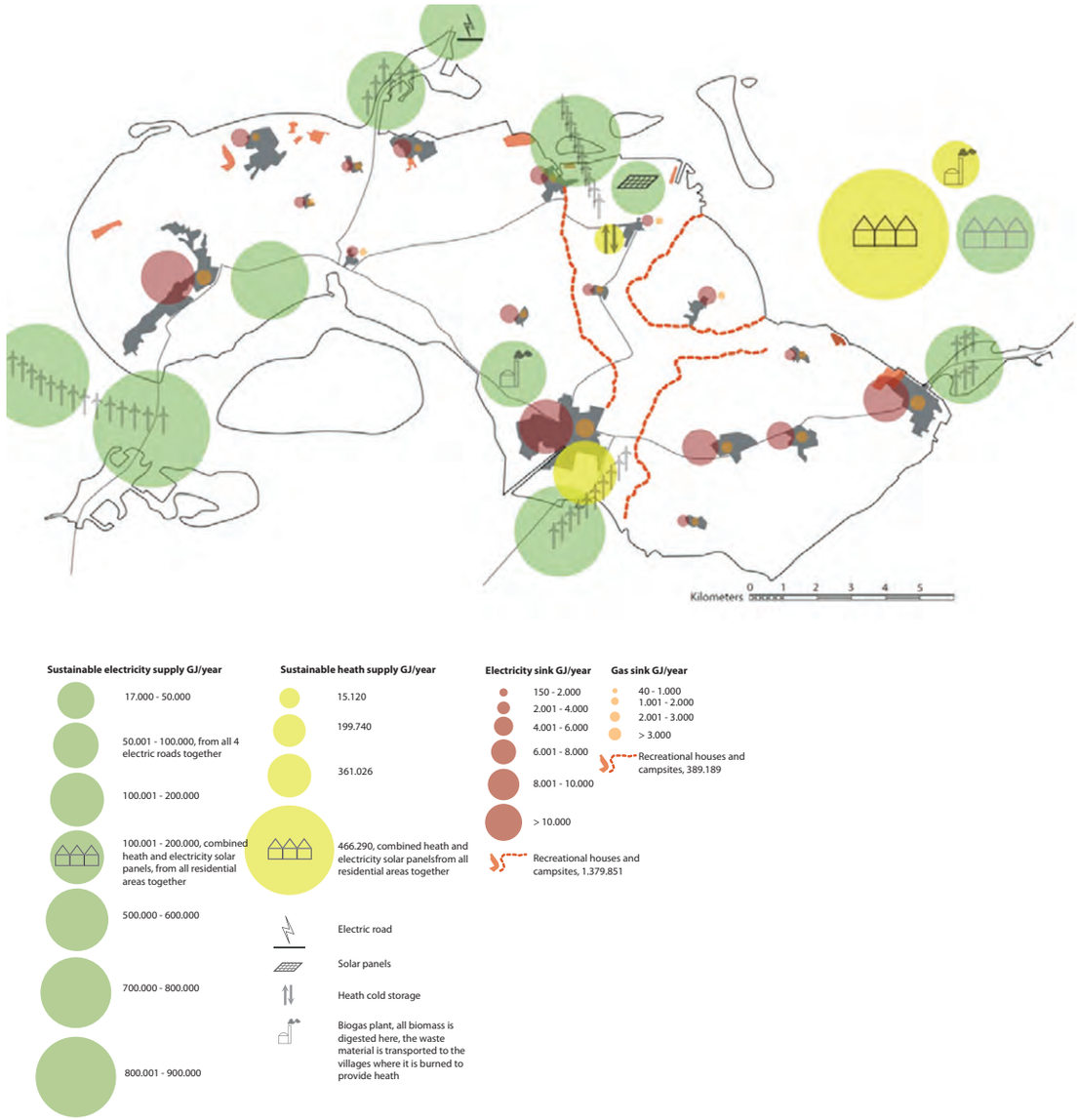


Figure 3.73 Sinks & Sources map 2040

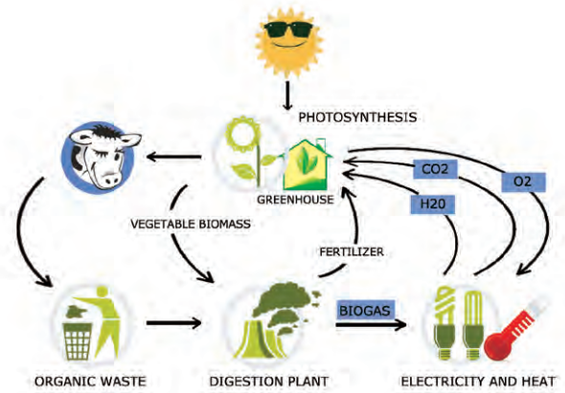


Figure 3.74 The process from biomaterials to energy

STEP 4: DESIRED FUTURE - ENERGY VISION # 4

Schouwen-Duiveland on its own

In this vision, 'Schouwen-Duiveland on its own', the island works towards self-sufficiency in the main production sectors. The agricultural sector will have to support a necessary reduction in meat consumption. The urban areas will face a declining population. Tourists will arrive all year round in order to experience Schouwen-Duiveland's way of life. This means the island must provide excellent products, special experiences and unique landscapes.

The island's diversity will be further developed, because the regional/civil scenario sees the development of local communities resulting from the changes in identity and aesthetics. The typical features of mass tourism will disappear from the landscape, to be replaced by a diversity of new characteristics. Local communities will produce local goods, local landscapes and local experiences. The need for 'foreign' energy will be reduced, because the local communities will generate their own energy. This can be achieved by creating local energy companies, either for the entire island or individually for the towns and villages.

Energy self-sufficiency is the main aspect that will be explored in this vision, because the trends and developments that are in our scenario will also take place in our vision. This is because the development of local interests is what we see as having a good potential for energy provision, as well as for the desired energy transition. The development in the scenario means that people will become more aware of the consequences of consumerism, which will allow for a sustainable development of a local market. This also means that an integrated land use will arise. Land will be used for various purposes at the same time. Competition between land uses may occur, but using the energy goal of self-sufficiency means that actors will investigate how to combine this with the desired land-

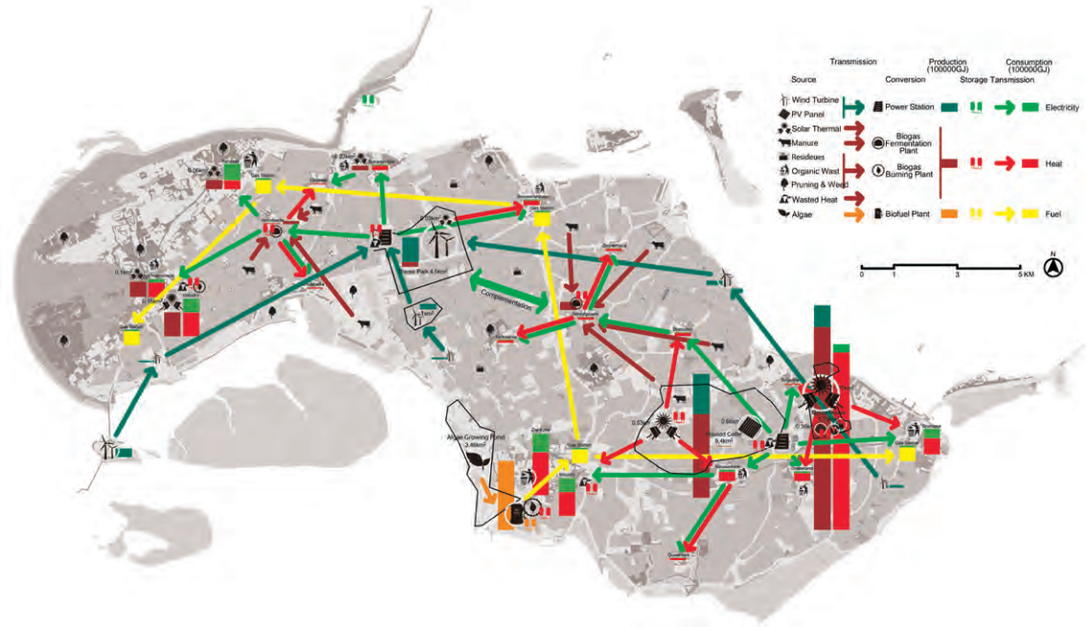


Figure 3.75 Energy flow map

GROUP 8
Yinyi Chen
Maarten Haisma
Irina Hotkevica
Yinan Ji
Maarten Kool
Wondifraw Tessema
Freek van Tongeren
Luc Verain

Figure 3.76 Concept of organic farming

Figure 3.77 Concept of edutainment

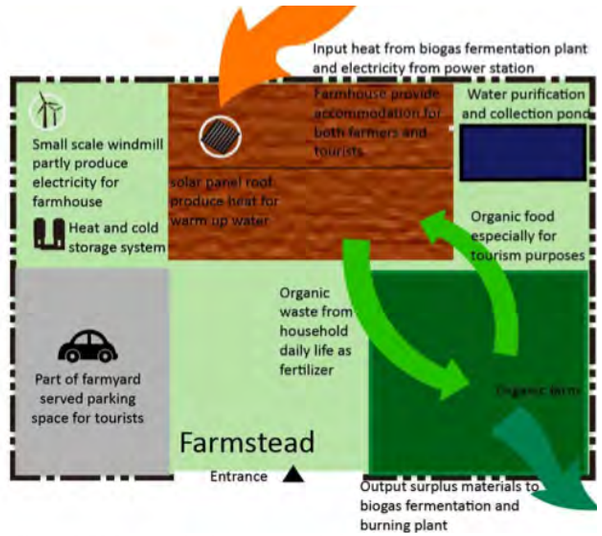


Figure 3.78 Schematic view on organic farming landscape

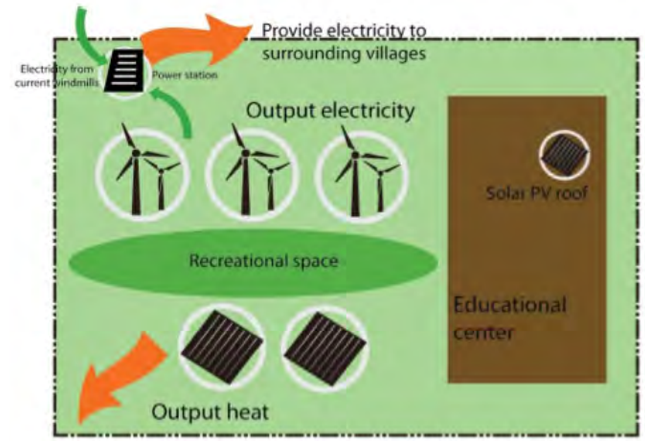


Figure 3.79 Schematic view on edutainment landscape

use function.

In 2040, 5,321,104 GJ of energy will be needed. Of this, the urban landscape will consume 48.5%, the agricultural landscape 40.5% and tourism nearly 11%. It is forecast that the future energy demand of the agricultural landscape will remain the same. The required amount can be provided by generating solar, wind and biomass energy. There will be a large energy demand in the urban landscape. Energy in the urban areas will be provided by solar panels, wind turbines and heat extraction (from asphalt). The energy produced in urban centres will not meet the demand; these centres are therefore considered as energy sinks.

The tourism landscape is also an energy sink. The main energy sources in this landscape include the theme park, which integrates a wind park, a solar park and waste recycling from the information centre. There are also possibilities for producing energy from indoor human activities in gymnasiums and discotheques. Transport, being the major energy-consuming sector, is given an emphasis by the use of electric cars on the island, which reduces the need for fossil fuel. In the coastal landscape, energy is needed mainly for the pumping of water; it is possible to produce sufficient energy from wind, solar, biogas and geothermal sources. Being under the mandate of the central government, it will also use a tidal plant within the Oosterscheldekering. In this case, the coastal defence is energy neutral. In all types of landscapes, energy will be stored by heat/cold storage technologies. The various wastes that are produced on the island are transformed into energy, recycled or reused, depending on the nature of the waste.

Figure 3.80 Concept of green housing

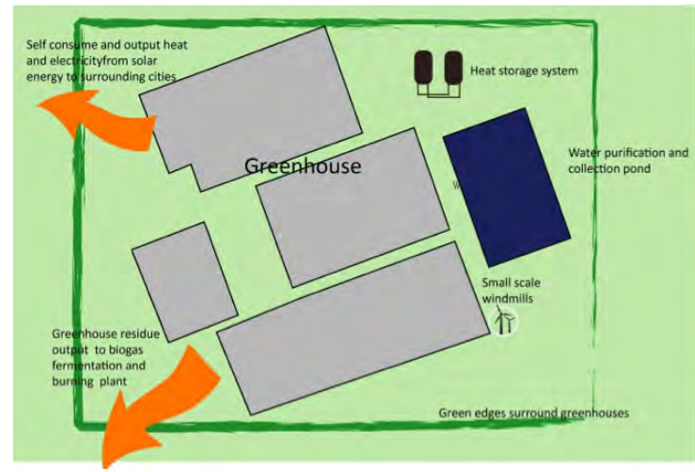


Figure 3.81 Schematic view on green housing landscape

Figure 3.82 Concept eco-camping

Figure 3.83 Concept multifunctional area

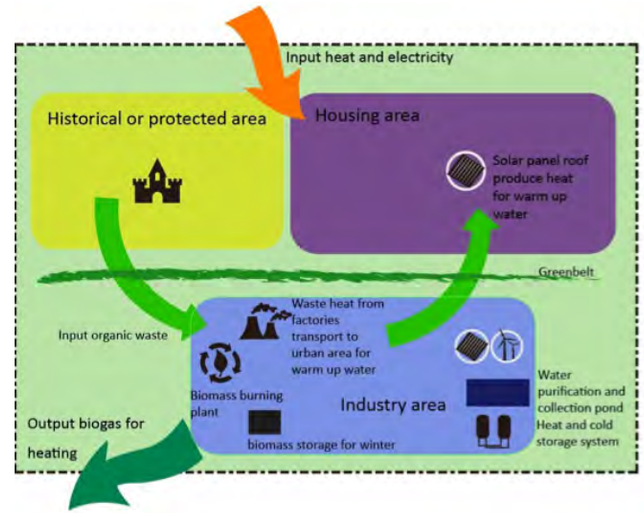
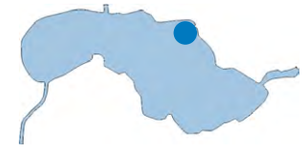


Figure 3.84 Schematic view on multifunctional landscape



STEP 5: ENERGY-CONSCIOUS INTERVENTIONS

Energy storage and mussel hatchery in the harbour of Bommenede

When renewable electricity production exceeds the demand, the surplus energy needs to be stored. A Kaplan turbine can pump water to a higher reservoir when there is plenty of electricity, and when energy is needed it can generate electricity for the grid. It is a profitable way of storing energy. The Kaplan turbine proposed for the harbour of Bommende creates flows of nutrient-rich water containing all kinds of tiny organisms that can feed mussels, which then can then be eaten by humans. The idea is to use all flows in the new harbour to make it both renewable and sustainable. The old harbour of Bommenede becomes the Battery & Battery – an energy 'battery' and a mussel 'battery' (hatchery).

Battery & Battery is the new design for Bommenede harbour. In the design, the dykes are 2.5 metres higher but still fit within the landscape. Both dykes are accessible. The old docks in the west of the harbour will become aquaculture fields, producing seaweed. These fields will be square in order to maintain the appearance of the harbour, as it is a part of Bommenede's history. The fields are relatively small; larger ones would not suit the harbour. Therefore, the fields are trial fields and each has slightly different conditions. This will allow tests to be carried out to see how well the seaweeds grow in the various conditions. The mussel hatchery will be in the southern part of the harbour and be supplied with algae from the algae canal on top of the slope.

In this concept, the energy needed for pumping (about 20% energy loss) results in benefits for humans and nature. More then 1.2 billion litres of nutrient and algae-rich water are refreshed each day in the harbour. Most of the energy losses within the system are due to friction. As mussels need this movement and refreshing of the water, the by-product 'moving water' could be used for

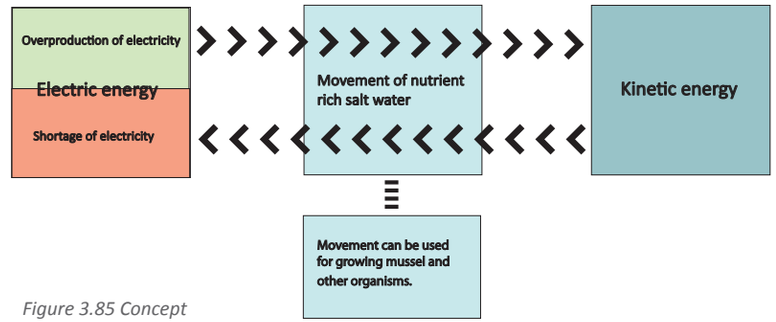


Figure 3.85 Concept

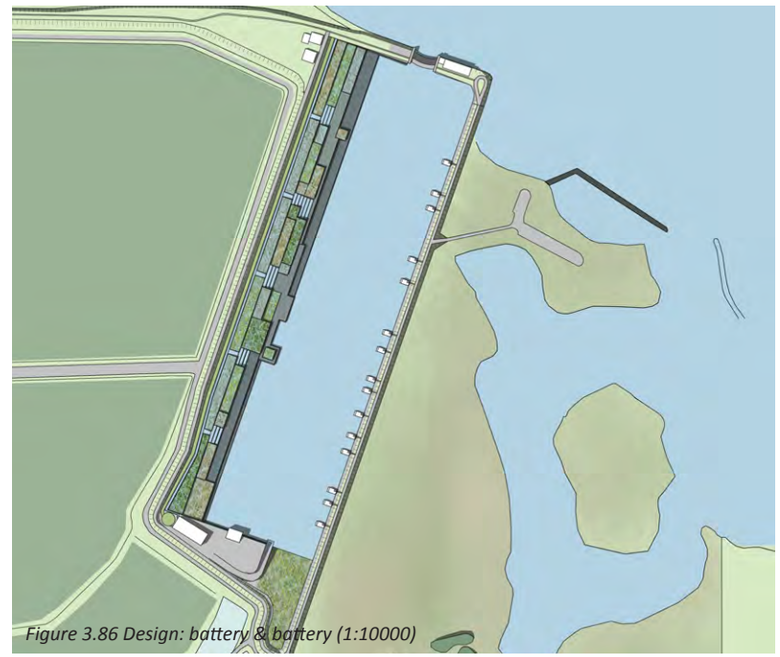


Figure 3.86 Design: battery & battery (1:10000)

Dirk Harden

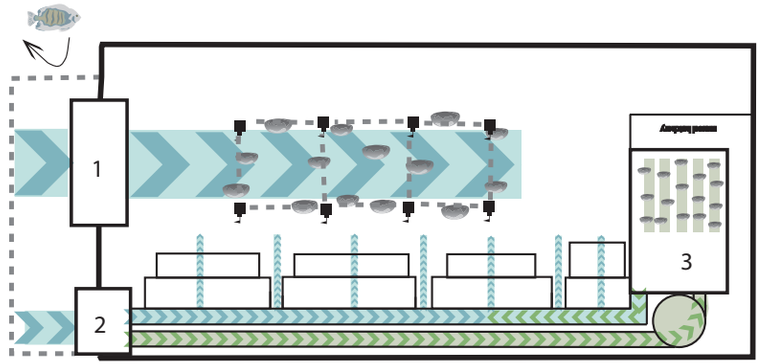


Figure 3.87 System status: water in

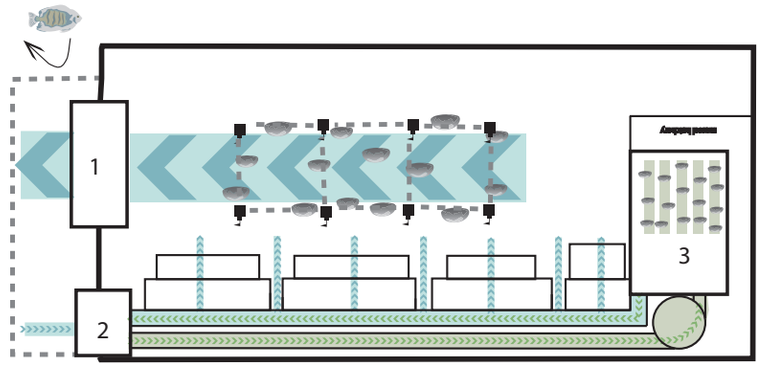


Figure 3.88 System status: water out

growing mussels. Bommenede harbour has enough room for the relatively new technique of suspended cultivation of mussels. Nets with mussels can be placed in the middle of the harbour and do not interfere with energy storage.

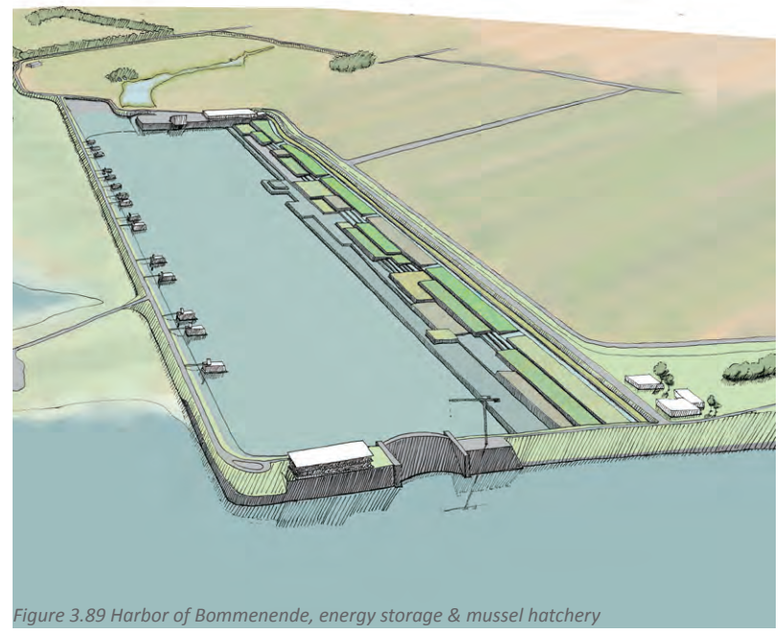


Figure 3.89 Harbor of Bommenende, energy storage & mussel hatchery

STEP 5: ENERGY-CONSCIOUS INTERVENTIONS

Energy-saving in the historic town of Zierikzee

The city of Zierikzee is located in the southern part of Schouwen-Duiveland. Its well-preserved city centre makes it a touristic focal point. The main problem related to energy in this city is that there exist no strict policies related to energy savings for any of the land use categories (households, commercial, public, industrial). In addition, more and more buildings are becoming vacant, due to the population shrinkage.

Considering the existing situation in the area, the question is which energy-saving solutions can be applied in the households inside the protected centre of Zierikzee. How much energy can be saved, and how can the solutions be implemented?

Research was done on four types of energy-saving solutions, namely technological, educational, regulatory and economic. The rational theory was used to choose from the multitude of available variants. The main aspect of this theory that was used was a logical framework for choosing between several possibilities: a multi-criteria assessment.

When it comes to implementing energy-saving solutions in existing households, especially in historic buildings, special attention has to be paid to researching energy efficiency through solutions that are as 'light' as possible; that is, solutions that will not change the structure or appearance of the buildings. It is important to use several methods to undertake energy transition when planning in a top-down approach. These approaches can be technological, educational, regulatory and economic (UNEP – DTIE International Environmental Technology Centre, 2002).

Concerning the technological approach, energy saving in protected buildings has to deal primarily with the age and the structural

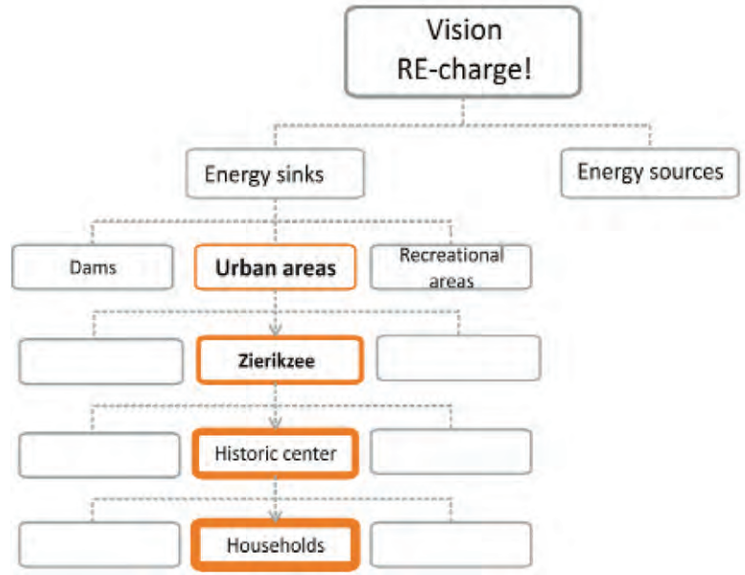


Figure 3.90 Choice of topic

Figure 3.91 Current situation

condition of the buildings and their components. It is important that houses are refurbished and retrofitted, that existing insulation, windows, etc. are improved, and that new innovative technologies are applied.

Energy saving in households would be considerably more successful were people made more aware of the issue through information campaigns. Many national and local governments have started disseminating to the public information about the great importance of energy conservation (EU, 2008). Dwellers' attitudes are crucial, especially in protected historical areas, where radical technological changes cannot be made. Numerous basic lifestyle or behavioural measures can achieve considerable energy and cost savings.

Regulatory approaches are often the easiest way for local governments to implement new schemes. They involve a top-down, rational planning approach and do not require substantial financing or a prolonged implementation period (depending on the local municipality making use of it).

In an economic approach, councils provide incentives to encourage domestic users to use energy-efficient appliances or to retrofit their homes. Incentives can be in the form of pricing policies, grants for the purchase of energy-efficient appliances or retrofitting homes, providing assistance to low-income households to finance retrofits, or rebates on the purchase of approved energy-efficient appliances or retrofits.

Household energy consumption can be greatly reduced in the historic centre of Zierikzee; however, the planning must pay attention to the conservation of the area's identity. In order to benefit from the positive outcomes of the various implementation methods, an integrative approach is the most efficient way to introduce e-saving solutions in households. This integrative approach could include regulatory, economic or educational measures to implement the described technologies.

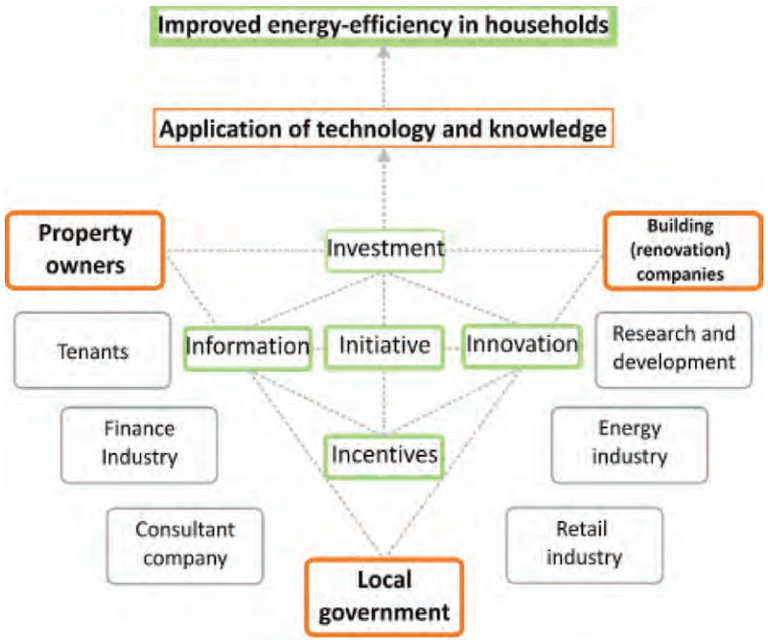


Figure 3.92 Stakeholder analysis

EU. (2008) Action Plan for Energy Efficiency (2007 – 2012) Retrieved May 15, 2011, from Europa-Summaries of EU legislation: http://europa.eu/legislation_summaries/energy/energy_efficiency/l27064_en.html

UNEP – DTIE International Environmental Technology Centre. (2002) Energy Saving in Cities – Issues, Strategies and Options for Local Governments. Osaka:UNEP

STEP 5: ENERGY-CONSCIOUS INTERVENTIONS

The Green Grocery near Bruinisse

The concept of food = industry emphasizes the fact that food production today has little to do with nature and lots to do with industrial processes, and this will apply even more so to the food production of the future. If we look at the latest greenhouse developments, all environmental factors have been ruled out: crops are grown in containers, natural sunlight is replaced by assimilation lighting (now also possible using energy-efficient LED technology), and atmospheric conditions such as temperature, humidity and CO2 level are controlled. These technical innovations make 'stacked food', as suggested earlier, a viable option.

The first conceptual element of this proposal is to use state-of-the-art technologies that enable stacked food production with high yields. Meanwhile, the gap between food producers and consumers has increased significantly both spatially and socially (Renting et al. 2003, p. 398). Consumers have little understanding of where their food comes from and how it was produced. The second conceptual element of the proposal is therefore to reconnect consumers with their food by integrating education and recreation in the greenhouse.

The first design principle is visualizing energy, because energy is key in technology-driven food production. By visualizing energy sinks, sources and flows, the site becomes an experiential landscape with an educational value. The second principle is contrasting landscape. As food production is industrial and non-place specific, a contrast arises with nature and the local. This contrast is enhanced by placing the buildings in a meadow with naturally occurring species of wild flowers and grasses, functioning as a subtle reminder to visitors that this type of food production has little to do with nature. The choice was for a biannually mowed meadow

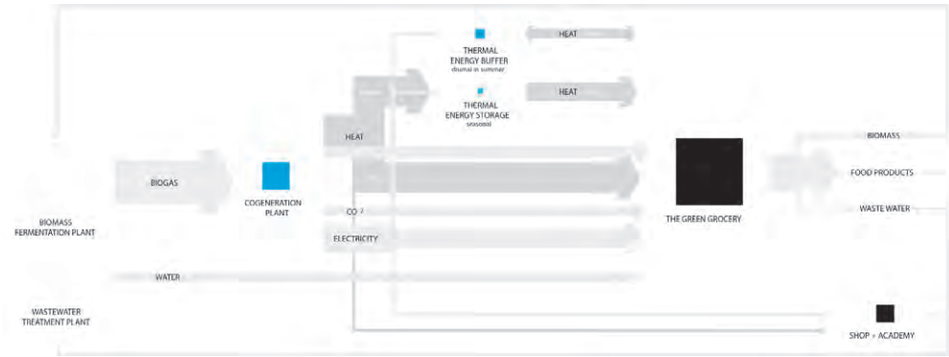


Figure 3.93 Flowchart of materials and energy

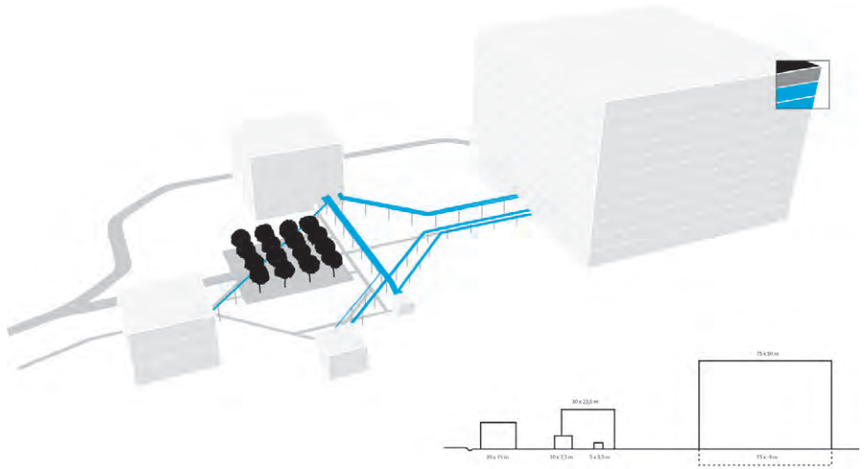


Figure 3.94 The green grocery

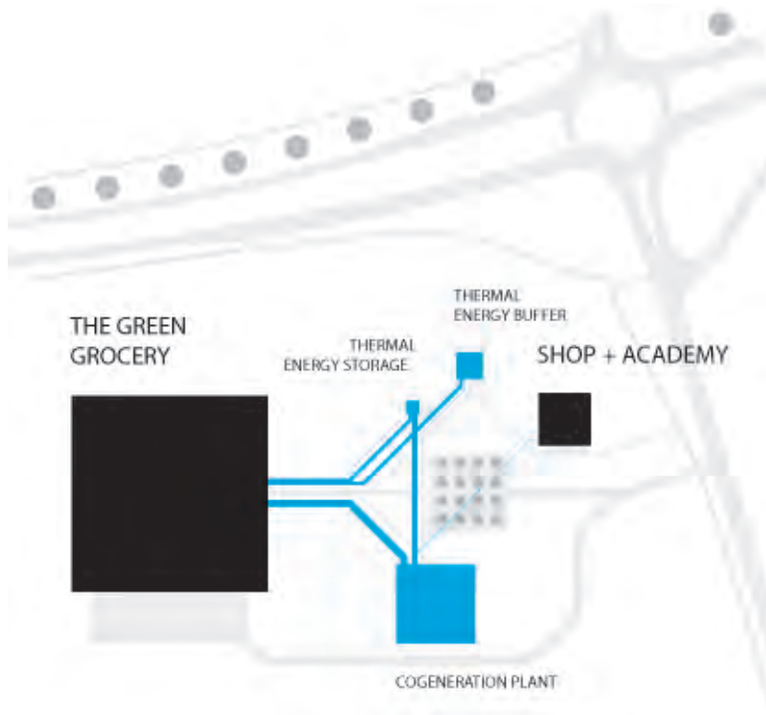


Figure 3.95 Plan (1:2500)

without any woody vegetation because of: maximal flowering, minimal maintenance and best fit in the contextual landscape.

The Green Grocery is a 'statement design', requiring significant amounts of willpower and financial means. In return, Schouwen-Duiveland will have a unique, identity-defining and year-round tourist attraction that also produces greenhouse vegetables for the whole of Zeeland.

Renting, Henk, Marsden, Terry & Banks, Jo (2003) understanding alternative food networks: exploring the role of short food supply chains in rural development, Environment and Planning Vol.35: 393-411.

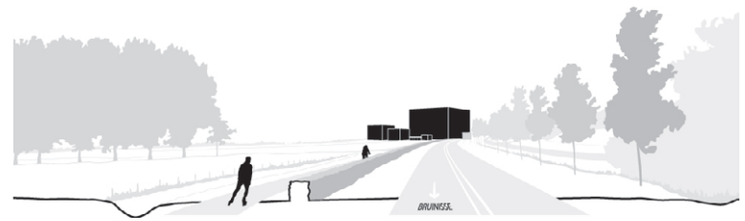


Figure 3.100 Green grocery as a landmark

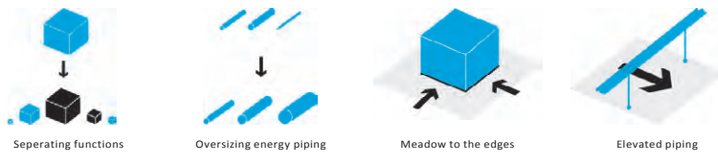


Figure 3.96 - 3.99 Design Principles

Figure 3.101 Entrance with energy piping

STEP 5: ENERGY-CONSCIOUS INTERVENTIONS

Farmer's identity and energy transition

The way a farmer sees himself influences the way he runs his farm. It also works the other way round: the farming style determines the farmers' identity. Identity is unconsciously developed though interaction with other individuals and groups; it can be said that identity is formed by culture. Peer pressure and commitment are other important factors related to identity, and are very important in a farmer's decision making. Identity is expressed in cultural scripts, called scripting; a kind of unconscious behaviour (actions, words, responses, arguments and expressions) that allow an individual to express his or her social accepted identity.

The fit between the farmers' identity and the daily reality of being a farmer is called pride. Thus, pride determines how farmers perceive their profession and what is most important to them. Farmers are conscious of their pride, as pride expresses how they feel about their profession and their ideal farming style. When farmers consciously communicate their identity and their pride, it is called a discourse. Discourses are particular ways of using language in particular situations. They exist at the level of a social group and serve to transmit and construct culture, to pass on traditions and question the world, and are important in the way we construct our identities. The scheme below shows the relations between the various concepts related to farmers' identity.

Agriculture plays a very important role in the economy of Schouwen-Duiveland. It is the island's biggest land user, occupying 78% of the land surface. There are almost 300 farms and the total agrarian sector provides 1455 jobs. This means that it is responsible for 10% of total employment, which is more than industry, transport or construction. The average farm size is 42 ha, which is slightly larger than the average Dutch farm (group 6, Atelier). The big farms (larger than 150 ha) had a bigger growth than in the rest of the Netherlands and the smaller farms did not decrease as much as they did in the rest of the Netherlands. The scaling of the farms on Schouwen-Duiveland is behind the Dutch average (Oevering, 2004).

The clay soil, in combination with the present groundwater tables is ideal for growing crops. Soil-based agriculture is therefore most important for the agriculture on the island. Around 55% of the agricultural companies are arable farms (compared to the Dutch average of 15%). Almost 15% of the farms on Schouwen-Duiveland are active in horticulture. Around 12% are dairy farms, while only 2% are involved in intensive livestock farming (Oevering, 2004). Schouwen-Duiveland, along with Flevoland and North Holland, is an interesting place for farmers to settle (for example farmers coming from the Randstad).

Secondary business activities are increasingly important in Zeeland. The agricultural sector there undertakes twice as many secondary business activities than is the case in the rest of the Netherlands. This is primarily due to the tourist sector. The municipality wants to increase the productivity of the existing soil-based agriculture and to stimulate secondary activities (Gemeente Schouwen-Duiveland, 2009). Although energy generation on farms is still a marginal activity, the province wants to stimulate this in the future (Province Zeeland, 2006). Salinization is one of the biggest threats to traditional agriculture on Schouwen-Duiveland. Aquaculture is seen as one of the solutions.

Farm management decisions are heavily influenced by the farmer's identity. Decisions are made in such a way that the farming style supports the way the farmer sees himself. The identity of the farmers on Schouwen-Duiveland is based on

Anna Veltman

traditional farming values. Craftsmanship, autonomy, working with the soil and attuning to the cycle of nature are mentioned as the most important aspects of farming. Most farmers are quite conservative and are not keen on taking risks. On the other hand, some farmers, and especially the young farmers, describe themselves as 'entrepreneurs in the rural sphere'. Although most farmers run on-farm campsites, do some nature management or provide recreational activities, their desired farming style is focused on purely agrarian activities. Most farmers have secondary business activities for financial reasons, although most farmers also mention the connection with society as an important reason. The farmers on Schouwen-Duiveland understand energy transition as a necessity, but interviews have revealed that they do not think that agriculture has a social responsibility to contribute to the transition.

The farming community on Schouwen-Duiveland is diverse. The way the farmers talk about themselves and their desired farming style is different from what was expected by many. The farmers are not the homogeneous, economic, rational thinking people as expected thirty years ago. Instead, their feelings, values and traditional farming style are very important. If renewable energy has to be provided by agriculture (as described in several energy visions), it will be realized by farmers only if it does not conflict with their self-image and their desired farming style. This is why today's farmers are positive about generating electricity based on solar and wind energy: once installed, the technology hardly affects their daily routine or farming style. Although biomass production would not conflict with their identity and desired farming style, energy crops are not yet produced in large quantities on the island. This decision is mostly based on financial arguments and ethical issues. Besides, an important condition for realizing renewable energy based on devoted energy crops is a system of production and processing. It remains to be seen if farmers, in the future, will grow energy crops and if so, whether they will also transform them into electricity, heat and fuels or leave the conversion to others.

Gemeente Schouwen-Duiveland 2009. Structuurvisie Buitengebied, buitengebied in Beweging. Zierikzee.

Oevering, J.J., 2004. Schouwen-Duiveland, hom of kuit? Rabobank Nederland, Stafgroep Economisch Onderzoek. Utrecht.

Province of Zeeland (2006). Omgevingsplan Zeeland 2006-2012. Middelburg.

Figure 3.102 Farmers identity

STEP 5: ENERGY-CONSCIOUS INTERVENTIONS

A wetland machine for Haamstede

The main aim of the design is to change the water cycle from its current linear form to a more closed circular water loop (figure 3.104). Some water will be imported for drinking and cooking purposes, but primarily treated waste water from sewage treatment plants will run through a bioremediation process, which will improve the water quality. The treated water that is to be drained into the Oosterschelde will first be mineralized as much as possible in order to keep fresh water on the island and to provide fresh water to farmers and for recreational purposes.

The main concept of the proposal is the 'landscape machine' where certain qualities can be produced given a particular material and energy input. The landscape machine is an interesting new design type that triggers a lot of innovative functionality, aesthetic appeal and ethical issues (Roncken et al. 2011). The natural processes within the landscape machine interfere with each other and therefore affect the type, form size and position of the resulting landscape components. The landscape machine evolves due to the interaction with physical, chemical and ecological processes (ibid).

Input for the wetland machine is pre-treated wastewater that has a certain level of nitrates and phosphates, which are nutritious for reed plants. The fuel is sun energy, which promotes the photosynthesis that causes biomass growth. Another fuel is water flow, which brings nutrients and oxygen to the plants. The interaction between living components and an artificially introduced material input will result in a cleaning process (ibid). The main output of this wetland machine is high quality fresh water, biomass energy, nature development and additional recreational functions.

A sustainable landscape can be created by using landscape fields and incorporating natural elements and a natural system, and

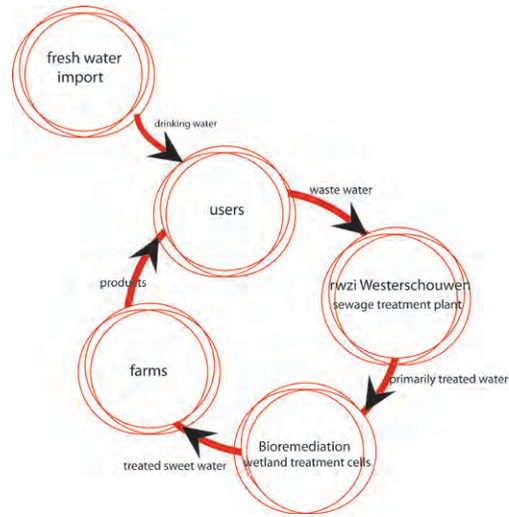


Figure 3.104 Future water flow

Figure 3.103 Wetland machine

Zuzana Jančovičová,

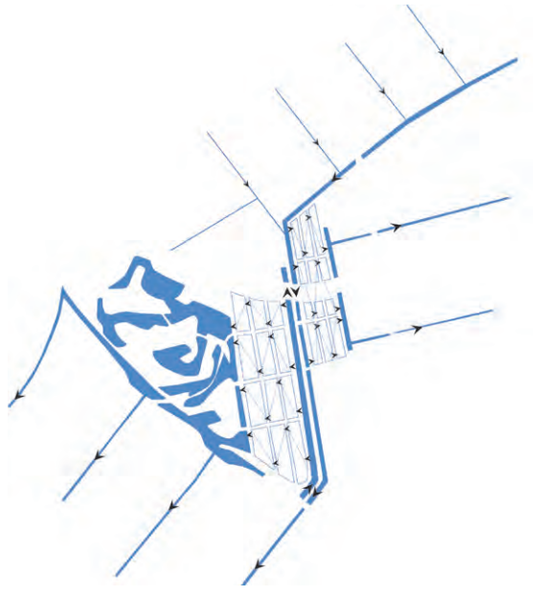


Figure 3.105 Water loop

by adapting them to the inherent function of nature. The project is an attempt to reconnect the historically disturbed relation between Schouwen-Duiveland inhabitants and water caused by the terrible flood of 1953. People should no longer be afraid of water but try to live with, use and reuse water, a substance with which they are directly linked as inhabitants of an island. The proposed method of reusing water reduces the energy and financial costs related to water import and export.

Reference: Roncken, P.A., Stremke, S., and Paulissen, M.P.C.P. (2011), Landscape Machine: Productive nature and the future sublime, Journal of Landscape Architecture, 6 (1), 6-19.

Figure 3.106 Impression of the wetland machine

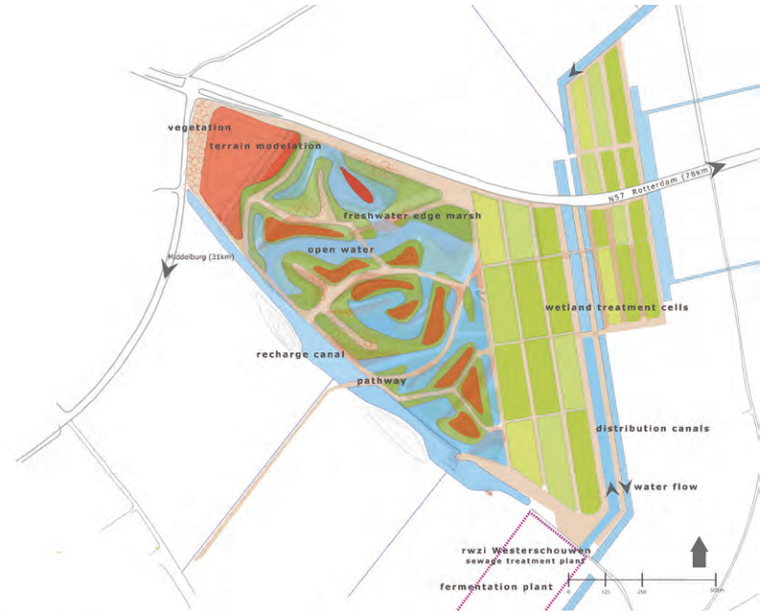


Figure 3.107 Master plan

STEP 5: ENERGY-CONSCIOUS INTERVENTIONS

Altered Landscapes and Local character

The present paper looks into the issue of how to spatially integrate renewable energy technologies so that they fit into the existing character of the landscape. The impact that the transition to renewable energy technologies has on the local landscape's character reveals a set of related issues that need to be considered prior to any development.

The existing landscape of Schouwen-Duiveland is assessed according to two principles, these are Enache's (2008) landscape analysis criteria for studying the structure of the landscape and, following to this, the principles of evaluating landscape character used by Tveit et al. (2006). The landscapes chosen for analysis are examples of landscape types selected on the base of Brabyn's (2009) landcover classes. As a result, seven types of landscape will be assessed. These are: Agricultural landscape; Dune landscape; Sea front; Marine; Lake front; Wetland and City edge. The seven chosen types of landscape are the most representative for the island. For each of the seven types, only one landscape example is chosen and

Figure 3.108 Panorama dune landscape

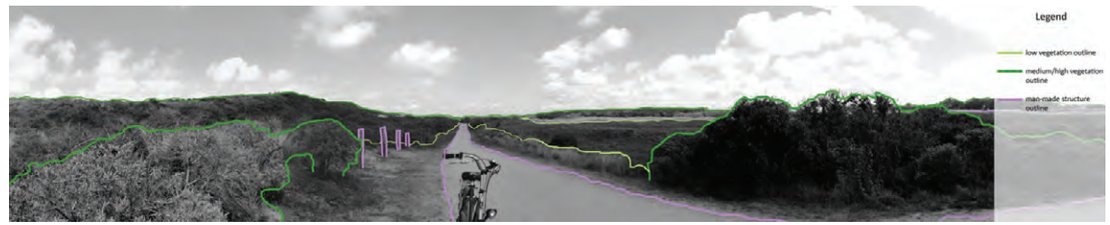


Figure 3.109 Objective base dune landscape

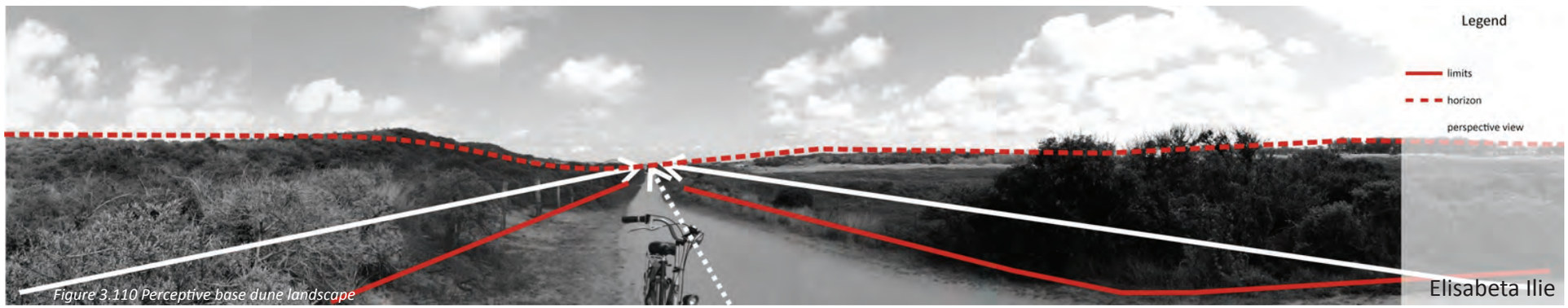


Figure 3.110 Perceptive base dune landscape

Figure 3.111 Panorama lake front

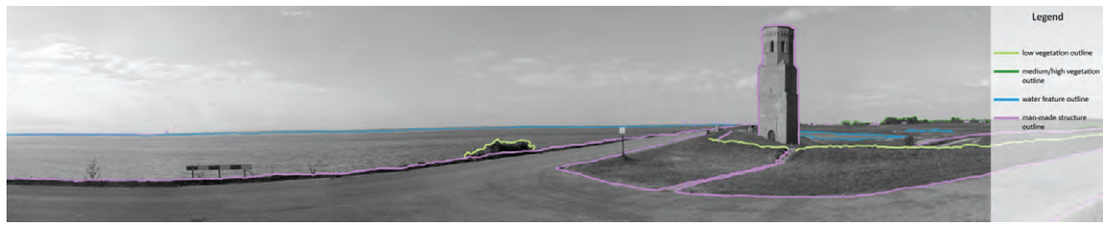


Figure 3.112 Objective base lake front

Figure 3.113 Perceptive base lake front

assessed. The examples incorporate the most often encountered scenery attributes on the island. In other words, they include the most commonly met landscape based features on Schowuen-Duiveland.

The weather during the time spent on the island was sunny with high temperatures and moderate wind, which affects the evaluation of certain assessment concepts: Coherence, Disturbance, Imageability, Complexity and Ephemera.

The robustness of the landscape's character and its possibilities to integrate and assimilate change are evaluated. The study of the visual impact is exemplified in two transition exercises based on two of the major landscape interventions proposed in the Atelier's Phase 2 vision plan. Both initial and altered landscapes are compared in terms of values taken by the nine assessment concepts and the various changes that the scenery goes through can be assessed in relation to the existing landscape character and to what is added or not to it. The overall outcome of the paper can be used not only as a tool to pre-evaluate design and planning solutions, but also as a determining factor in decision making.

Brabyn, L. (June 2009) "Classifying Landscape Character." Landscape Research 34, no. 3: 299-321. http://www.informaworld.com (accessed April 19, 2011).

Enache, C. (2008) Course: "Analiza peisajului" *Lecture to BA Landscape Architecture Year 2+. Trans. made by myself. February-June at University of Architecture and Urbanism "Ion Mincu"

Tveit, M., Åsa, O. and Fry, G. (July, 2006) "Key concepts in a framework for analysing visual landscape character". Landscape Research 31, no. 3: 229-255 . http://www.informaworld.com (accessed March 18, 2011).




SCHOUWEN-DUIVELAND WORKSHOP AND EXCURSION



APRIL & MAY 2011, WAGENINGEN UNIVERSITY



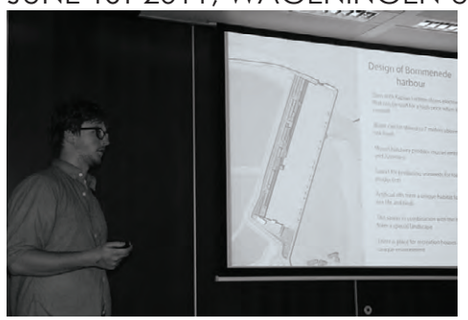



SCHOUWEN-DUIVELAND FINAL RESULTS AND PRESENTATIONS




all photographs without reference by Wageningen University

JUNE 1ST 2011, WAGENINGEN UNIVERSITY





ATELIER 2011: CONCLUSION AND REFLECTIONS

Sven Stremke, Rudi van Etteger, Renée de Waal

We use the last chapter of this book to reflect on the methodological approach of the 2011 atelier and the way we taught the design/planning of and research on sustainable energy landscapes. As it has been stressed, energy transition is not 'just' a challenge to one or another discipline; instead, it requires an interdisciplinary approach, one that we pursued by inviting graduate students in landscape architecture, spatial planning and cultural geography to collaborate and envision alternative futures for two islands in the Dutch delta region.

To enable the students to compose innovative and yet comparable proposals for the development of sustainable energy islands, we offered them the -step approach (Stremke, 2010). In the first step, students worked in groups to analyse current landscapes and energy systems. Meanwhile, the potentials for renewable energy were assessed. Near-future plans were then inventoried. These plans had to be taken into account when envisioning long-term transformation. Step three comprised the exploration of possible far-futures in the form of scenarios. For this, students concretized existing scenarios for the Netherlands to the situation on Goeree-Overflakkee and Schouwen-Duiveland. In step four, the students envisioned a set of desired futures for the two islands, that is, one energy vision for each scenario. The fifth and last step was to identify and elaborate concrete energy-conscious interventions.

Because the majority of the students had no knowledge of renewable energy, we organized a series of lectures by invited experts, researchers and landscape architects who have experience with energy landscapes. Two books (i.e. MacKay, 2010; Twidell and Weir, 2006) were offered to the students to help them with, for instance, energy calculations. The majority of the students had already taken the MSc course Theory and Aesthetics. In the atelier, we approached the subject of aesthetics in a quite experiential way: we positioned aesthetics as being related to landscape, multi-sensory experiences, perceptions and feelings, referring to well-known concepts such as 'landscape character' and 'identity'.

During a number of field trips, the students literally experienced the power of natural forces in the landscape – how wave power erodes the coast, how wind shapes dunes and how powerfully the sun shines (see photographs in earlier chapters). These experiences helped the students to develop their sensitivity with respect to renewables and a kind of 'landscape approach' to the assignment. On site, we discussed how energy transition might influence the existing identity and sense of place. We visited the islands twice and stayed for a total of four days.

We also took the students to Denmark and Sweden to visit the island of Samsø, the Louisiana Museum of Modern Art and the Western Harbour area in Malmö. Over the past 10 years, the inhabitants of Samsø have managed to become energy self-sufficient by making use of locally available renewable energy sources. Although the island has a far lower population density than the two Dutch islands (36 inhabitants/km2 compared to 184 on Goeree-Overflakkee and 148 on Schouwen-Duiveland), the example of successful energy transition in a similar situation inspired us all. In the Louisiana Museum we asked the students to select one piece of art that is both landscape and energy oriented, in order to get them thinking about energy from an artistic perspective. The Western Harbour area in Malmö provided a reference for the more urban parts of the two Dutch islands.

4

In order not to overlook scientific and philosophical contributions on the planning and design of sustainable energy landscapes, a two-day plenary literature study had been organized with a special focus on aesthetics. Working in groups, the students sought relevant publications and then analysed, summarized and presented them to each other, in order to efficiently disclose the body of existing knowledge.

APPLYING THE FIVE-STEP APPROACH

In a time of increasingly rapid political change and technological innovation, we need to find means to incorporate both near-future (and therefore quite likely) change and critical uncertainties in planning and design processes at the regional scale. The regional scale is of key importance to sustainable energy transition, partly for thermodynamic reasons (see e.g. Stremke, van den Dobbelsteen and Koh, 2011), partly because it offers great potentials to establish effective policies, and partly because it allows fruitful collaboration between stakeholders (see e.g. Stremke, van Kann and Koh, 2010).

Methodological frameworks from strategic spatial planning, design-oriented planning and landscape planning provided the key building blocks for a new approach to the composition of integrated visions. In recent years, the five-step approach has been applied and refined in several energy studies. The five-step framework aims to facilitate the composition of long-term visions while identifying robust energy-conscious interventions.

Employing the five-step framework in the 2011 atelier did not lead to a regional plan in the conventional sense. Rather, it resulted in a set of four visions for each of the islands and a total of 60 individual student projects, each featuring numerous energy-conscious interventions. The framework was flexible for several reasons. First, the five questions that accompany it were adapted to the focal issues of the atelier. Second, there was much freedom for the students to determine their activities, depending on, for example, the physical characteristics of their study area. Third, the framework was complemented by other methods, such as questionnaires and photo essays. One much discussed drawback of integrating critical uncertainties into regional design is that they introduce a certain degree of 'vagueness' (Faludi and Valk, 1994). Working with a range of possible futures, however, has proven to facilitate strategic inquiry. Composing a set of visions helped to identify a multiplicity of possible energy-conscious interventions (compared to conventional planning and design processes, which result in a single plan).

We must admit that, primarily due to time constraints, we did not succeed in conducting a comprehensive analysis of all energy-conscious interventions. Only some of the students discussed the extent to which their proposals are feasible in scenarios other than in the one that had been given to them. Methods such as 'robustness analysis' (see e.g. Rosenhead, 2001) can help actors to choose from the many proposed interventions. Another challenge that emerged over the course of the atelier is how to enable the active participation of stakeholders in the planning and design process (also see figure 4.1). Some of the students collaborated closely with inhabitants and local experts, whereas other proposals relied exclusively on the student's intuition, creativity and expertise. Despite these challenges – which certainly deserve further attention in future research and teaching – we are convinced that the five-step approach facilitates the development of commitment to and strategic policies for the two islands. Furthermore, the atelier has revealed alternative futures that can both motivate inhabitants and provide directions for the sustainable transformation of their island.

TEACHING DESIGN AND PLANNING OF ENERGY LANDSCAPES

About six years ago, the landscape architecture chair group at Wageningen University took up the subject of sustainable energy landscapes. In 2007 and 2009, we ran MSc atelier courses on sustainable energy landscapes, in which students studied how to transform the regions of South Limburg and Arnhem–Nijmegen (both in the Netherlands) so that they become 100% energy self-sufficient by means of locally available renewable sources. Based on

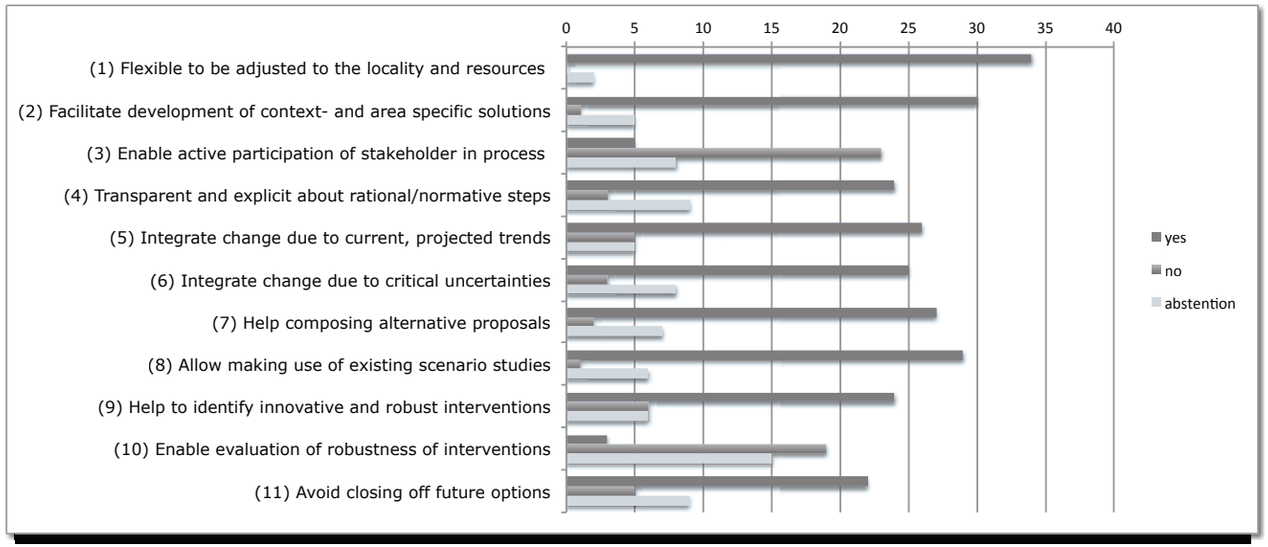


Figure 4.1: At the end of the Atelier, we asked students their opinion about the five-step approach with respect to the prerequisites for such methodological framework stated in the literature (Stremke, 2011, p.121). Overview of key prerequisites and student votes.

these ateliers and on fundamental research and contract research, we conclude that sustainable energy transition is technically feasible, especially in rural areas.

However, the Netherlands is still far from realizing EU renewable energy targets. This indicates that despite the great renewable energy potentials, difficulties occur in implementation. The remaining problems are of economic, political and social natures (see also Pasqualetti, 2011). 'How can we afford to invest in renewable energy?' and 'Which policy instruments are available for the implementation of renewable energy?' are questions often heard from politicians and policy makers who are confronted with energy transition. Aesthetics present another key concern with respect to renewable energy that clearly belongs to the realm of landscape architecture and planning. For wind energy, these concerns are discussed extensively in the literature (see e.g. Schöne 2007, Brittan Jr. 2001). For other renewable energy sources and conversion techniques, it is less clear whether and, if so, what kind of aesthetic concerns have arisen or will arise.

During the atelier, we worked together with national, provincial and local governments. At the time, the Ministry of Infrastructure and Environment was running the Mooi Nederland ('Beautiful Netherlands') innovation programme, which aimed to, for example, enhance the spatial quality of renewable energy landscapes. Through the authors' participation in the jury of the Mooi Nederland competition, we got into contact with representatives of Goeree-Overflakkee. ISGO (Intergemeentelijk Samenwerkingsverband Goeree-Overflakkee) – a collaboration comprising the island's four

municipalities – wants to increase renewable energy production to counteract economic and population decline, and to mitigate the negative effects of climate change in the long run. Goeree-Overflakkee offered our students a case to study the perception of renewable energy among tourists and inhabitants, and to develop visions, scenarios, policy recommendations and designs for energy transition within a real-world context. To stimulate this 'real-life' experience even more, representatives of ISGO and the municipality of Schouwen-Duiveland acted as commissioners to the project.

The differences in location (i.e. different provinces), institutional setting, historical development and physical characteristics resulted in the students coming up with different planning and design proposals for the two islands. Whereas Goeree-Overflakkee has been designated the area for wind energy within the province of South Holland, there is much less pressure to realize wind turbines on Schouwen-Duiveland. The potentials for wind energy are similar across the province of Zeeland, a fact that influenced the type and number of turbines proposed for Schouwen-Duiveland. Another difference is the institutional organization and type of key actors. Goeree-Overflakkee comprises four municipalities that govern the island via a so-called inter-municipal collaboration (ISGO), while Schouwen-Duiveland comprises only one municipality. Although that may seem to facilitate energy transition, most actors are in the non-governmental sector (e.g. entrepreneurs, NGOs and individual citizens).

The two islands have also developed differently over time. Goeree-Overflakkee is much younger and the landscapes are rather large scale, which is why the majority of larger and perhaps more visible energy-conscious interventions have been proposed for Goeree-Overflakkee. The proposals for Schouwen-Duiveland with its small-scale landscapes (at least until the 1950s) differ significantly in scale. A final aspect that can be discussed within the constraints of this chapter is the difference in the islands' water systems. The estuaries around Schouwen-Duiveland hold salt water. The degree of saltiness may increase in the near future but changes are much more imminent for Goeree-Overflakkee, where the northern estuary (the Haringvliet) will change from fresh water to salt water in the future. This change represents one of the greatest interventions in the Dutch delta region to adapt to climate change and to improve the water quality. Salt water in the Haringvliet, in turn, will affect the soil quality on Goeree-Overflakkee and thus affect local agriculture. The students have put forward several proposals to cultivate salt-resistant energy crops and to use the difference between salt and fresh water in a 'blue energy' plant.

The above described dissimilarities between the two islands and the subsequent proposals show that there is no such thing as the solution for energy transition. Instead, for each specific time and each specific location, the number of possible energy-conscious interventions has to be narrowed down by means of research, planning and design – a process that is referred to as 'heuristic', to use the words of Newell and colleagues (1962). In addition, landscape architects, planners and geographers can contribute to energy transition, which is what the atelier participants did by:

- speaking with people, interviewing stakeholders and conducting surveys, and thus making the inhabitants aware of energy transition;
- visualizing ideas and plans for and the consequences of energy transition in understandable and imaginative ways, thus making the topic more accessible to lay-people; and
- studying both the process and the findings of the atelier in follow-up research projects and disseminating the results (e.g. this book).

We believe that above all it is critical to continue carrying out thorough research in order to close knowledge gaps and to create a sound theoretical basis for landscape architects, planners and geographers who are working on sustainable energy transition. How else can we study, plan and design landscapes that are functional, beautiful and sustainable?

References

Brittan Jr. G. G. 2001. Wind, energy, landscape: reconciling nature and technology. Philosophy & Geography, 4(2), pp. 169-184.

Ghosn, R. (ed.), 2009. Landscapes of Energy. Cambridge Massachusetts: Harvard University Press.

Faludi A., A. van der Valk, 1994. Rule and order: Dutch planning doctrine in the twentieth century. Dordrecht and Boston: Kluwer Academic Publishers.

Janssen, L., V.R. Okker, J. Schuur, 2006. Welvaart en leefomgeving: Een scenariostudie voor Nederland in 2040 [Prosperity and environment: a scenario study for the Netherlands in 2040] Den Haag: RPB CPB MNP.

Koh, J. 2005. The energetic strategy of ecosystem development and urban/ regional spatial restructuring and regeneration. In: Grounds for Change: Bridging Energy Planning and Spatial Design Strategies. F. van Dam, K. J. Noorman (eds). Groningen: Grounds for Change, pp. 29-37.

MacKay, D. J. C. 2009. Sustainable energy without the hot air. Cambridge: UIT Cambridge Ltd.

Newell, A., Shaw, J. C., Simon, H.A. 1962. The processes of creative thinking, in: Contemporary Approaches to Creative Thinking. H.E. Gruber, G. Terrell, M. Wertheimer (eds) New York: Atherton Press, pp. 63-119.

Pasqualetti, M. J. 2011. Social Barriers to Renewable Energy Landscapes. The Geographical Review, 101(2), pp. 201-223.

Rosenhead, J. 2001. Robustness analysis: Keeping your options open, In: Rational analysis for a problematic world revisited. J. Rosenhead, J. Mingers (eds). Chichester: Wiley, pp. 181-207.

Schöbel, S. 2009. Windenergie, Gesellschaft und Landschaft [Wind energy, society and landscape]. Garten + Landschaft, 3, pp. 15-19.

Schöne, M., 2007. Windturbines in het Landschap. Wageningen: Digigrafie. Alterra rapport 1501.

Stremke, S. 2010. Designing sustainable energy landscapes: concepts, principles and procedures. Wageningen: PhD thesis, Wageningen University.

Stremke, S., A. van den Dobbelsteen, J. Koh. 2011. Exergy landscapes: Exploration of second-law thinking towards sustainable spatial planning and landscape design, International Journal of Exergy, 8 (2), pp. 148–74.

Stremke, S., F. Van Kann, J. Koh, 2010. Energy and the regional scale. In: Designing sustainable energy landscapes: concepts, principles and procedures. Wageningen: PhD thesis, Wageningen University, pp. 97-108.

Twidell, J. and A. D. Weir, 2006. Renewable energy resources. London: Taylor and Francis.

REFLECTION ON THE ATELIER FROM THE PERSPECTIVE OF ISGO

Lennard Seriese

It's now midsummer and I'm looking back on the atelier on behalf of ISGO on Goeree-Overflakkee. I presume that most of the students are now enjoying their holidays, having finishing the intensive project in the spring. The result of the atelier – 4 visions and 27 individual reports – represents three months of hard work, two field trips to Goeree-Overflakkee and a journey to Sweden and Denmark. It was a very intensive period not only for the students, but also for me as a commissioner.

In my opinion, the atelier was a huge success. ISGO, the municipalities and the other involved parties received lots of information and ideas about and interesting visions on how Goeree-Overflakkee could develop into a sustainable island. It also generated a lot of positive attention and mental energy on the island itself, which is the first result of the hard work of the students, involved teachers and participating stakeholders. At the moment we are trying to secure more results offered by the various ideas and concepts that were presented to us – ideas and concepts that could not have been foreseen when, at the beginning of 2011, we agreed to work together in this atelier.

On the first day of the atelier, I introduced the island and presented our presumed sustainable chances and challenges as described in my introduction. The visit Wageningen University paid Goeree-Overflakkee in the same week was the first contact between the island and most of the students. After a warm welcome from one of the aldermen of the region, I took the students round the island to see what kind of history, villages, landscapes and nature are present. The gathering of information marked phase 1 of the atelier. Besides the inventory, the students sifted feasible options from the available ones. After some weeks, they presented their work and I, as commissioner, had the opportunity to reflect on the spot – which was not easy to do! Very detailed calculations were sometimes presented, and led to arguments. I was utterly surprised by all the maps, charts and illustrations the students had already made. But it was a pleasant surprise, because it provided an insight into the possibilities and reach of the atelier. However, it was impossible for me to predict what would come next.

Phase 2 of the atelier comprised working with scenarios to outline the desirable future of Goeree-Overflakkee based on the information gathered in phase 1. There were four scenarios in which the students needed to make assumptions about, for instance, the population, the economy, technology and political influence. The Dutch WLO (Welvaart en Leefomgeving) scenarios – which range from global and public to local and private – were the basis for the scenario development on Goeree-Overflakkee.In this phase, the students were free to make any assumptions and take any paths they desired; it was also the phase in which some of the requested preconditions disappeared in the working out of scenarios. This might be a logical decision from a university's point of view, but from that of a local government official it is difficult to understand why, for instance, the population would double by 2040 while we foresee a population decline. The scientific way of working with scenarios differs from our governmental way of working, and resulted in wild and ambitious plans and visions from which it is hard to distil feasible, desired developments.

But then again, this way of working opened doors for the students that we, public servants, cannot open because of political or policy restrictions. It also provided us with plenty of possible futures within the scenarios; especially appealing was the way the

students worked with various possibilities for energy production. The final reports of this phase delivered several spectacular future scenarios, illustrations and well thought out principles to be taken into consideration when planning and thinking about becoming a self-sufficient and sustainable region. It was also entertaining to see the differences and similarities between the two islands. This might well be the start of a closer relation between us in working towards a more sustainable delta.

In phase 3, the students had the freedom to take on a specific subject within the context of their group vision from phase 2. We as a region had the pleasure of welcoming the students back; we provided them with a large working area in the ISGO building for three days. These three days were especially intensive for me as a commissioner. Lots of questions on very specific topics were asked, and a lot of the students were interested in talking with stakeholders or farmers in order to find answers to their questions. It was also the phase in which the students had to decide what possible future or plan they had in mind for the island. The results concerned virtually everywhere on the island and varied from huge spatial plans to small developments near one of the small towns. This variety is a fruitful basis for policy makers and entrepreneurs on the island. The plans shown in this book deserve to be taken seriously into account in order to discover the realistic potential. At the same time, the results show the range of possibilities and ideas that can be generated in rethinking landscapes as potential sources of energy. The transition to a more sustainable society and economy is a national assignment, not one only for Goeree-Overflakkee or Schouwen-Duiveland. I hope that the results of the atelier can help in that search and provide insight into how to do so. I also hope that we can successfully take proposed ideas to the level of concrete measures. The current reintegration of the four municipalities into one municipality will surely complicate this process.

To briefly reflect upon my role as commissioner, I can say that it was not always an easy task. I refer here not only to arranging speakers, obtaining information and providing feedback on the spot: I had truly underestimated the number of difficult questions there were to be answered about Goeree-Overflakkee and the diversity of future paths developed in the students' (and teachers') minds.

But most of the time it was a very pleasant experience, challenging myself in improving my English and in bringing together different futures for the island. I very much enjoyed working with all the enthusiast students and teachers and regret that there was not more time to discuss the way ideas and concepts were worked out, or to discuss sustainable development in general. But above all, I am very pleased with the numerous sustainable opportunities identified and signalled for Goeree-Overflakkee, meaning that the goals that the region is aiming for are indeed within reach. Our biggest challenge is 'just' to get started, that is, to convert the desired sustainable ideas into concrete plans in order to become a vital, sustainable and living community within the Dutch delta. I should like to thank the Ministry of Infrastructure and the Environment and Wageningen University for their efforts and means in making this atelier possible.

PARTICIPATING STUDENTS

LANDSCAPE ARCHITECTURE

Bijker, Flore
Borsje, Jesper
Castricum, Jeroen
Chang, Ya-Ping
Chen, YinYi
Dobrovie, Iulia
Florescu, Roxana
Haisma, Maarten
Harden, Dirk
Heegde, Hugo ter
Hoekstra, jentse
Hotkevica, Irina
Hu, Xiao
Hua, Xin
Jančovičová, Zuzana
Koning, Melanie
Kool, Maarten
Lim, Sangwhan
Liu, Yuqiao
Liu, Ziyi
Looman, Karlijn
Lukjanska, Diana
Marques, Taícia
Nica, Ioana
Pro, Lucia
Reznek, Darius-Robert
Schie, Loes van
Shan, Yi
Schuwer, Teun
Sigurdardottir, Hjordis
Stokkingreef, Niek
Tak, Ruud
Tessema, Wondifraw
Theunissen, Roel
Tongeren, Freek van
Verbon, Lisa
Verhoeven, Koen
Winter, Hannah de
Wolters, Jessie
Zhou, Chunhui
Zwan, Christiaan van der
Zwiers, Romy

LAND USE PLANNING

Boanca, Talida
Derks, Dolf
Gent, Kim van
Georgieva, Maria
Haag, Martijn
Jong, Anhilde de
Panait, Irina-Alexandra
Plijner, Bart
Stokkingreef, Niek
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OTHER CONTRIBUTORS
Simone Verzandvoort
Roelof Kleis
Annemieke Smit
Letitia van der Merwe

Ontwerpen met energie

Hoe ziet een omgeving eruit als er zo efficiënt mogelijk met energie wordt omgesprongen? Sven Stremke kan het je zeggen. Hij ontwerpt duurzame energielandschappen.

tekst: Roelof Kleis / **illustratie :** Sven Stremke

Landschapsarchitect Stremke is een pionier. Ontwerpen op basis van energie is een nieuw vakgebied binnen de landschapsarchitectuur en ruimtelijke ordening. Van de term energielandschappen hebben maar weinig mensen ooit gehoord. 'Toch is er niks nieuws onder de zon', legt Stremke uit. 'Kijk maar naar de Kinderdijk. Dat is in feite een duurzaam energielandschap. Het is zelfs een Unesco-monument. Energieopwekking is altijd een onderdeel van het landschap geweest.'

In de ontwerpwereld van Stremke draait alles om energie. Preciezer gezegd: exergie, een begrip uit de thermodynamica dat je (vrij) kunt vertalen als 'bruikbare energie'. Energie dus waar je iets mee kunt, waar je arbeid mee kunt verrichten. Tijdens arbeid gaat exergie, die bruikbare energie dus, verloren en ontstaat entropie. 'Je gaat dus van een toestand van hoogwaardige energie naar eentje van laagwaardige energie. Dat is op zich niet erg. Alles wordt entropie. Maar de hoeveelheid en snelheid waarmee dat nu gebeurt is een probleem.'

STROOMFLOW OPTIMALISEREN

En daar zijn we bij de kern van het exergie-denken. We gooien veel te veel bruikbare energie over de balk. We gebruiken energie op de verkeerde manier. Het kan allemaal veel duurzamer. Niet alleen door het gebruik van hernieuwbare energiebronnen als zon, wind, water, geothermie en biomassa. Maar vooral ook door de beschikbare energie veel efficiënter te gebruiken. Op zo'n manier dus dat exergie zo min mogelijk verloren gaat.

Kijk maar naar de natuur, doceert Stremke. 'De stroomflow in de natuur wordt altijd geoptimaliseerd. Hoogontwikkelde ecosystemen vernietigen veel minder exergie dan laagontwikkelde ecosystemen. Een ecosysteem probeert altijd zoveel mogelijk energie vast te houden. En dat is meetbaar.'

De gangbare manier van denken over energie richt zich volgens Stremke teveel op de kwantiteit. En dat is dus fout. 'Je moet niet alleen kijken naar de totale hoeveelheid energie die in een jaar nodig is, maar ook naar wanneer je het nodig hebt, waar en hoe. Je moet dus in energiekwaliteit, in tijd en in locatie denken.' Een voorbeeld. Stremke: 'In Duitsland zie ik dat ze biogas opwekken met een vergistingsinstallatie. Daar zit dan een warmtekrachtkoppeling aan vast om stroom en warmte op te wekken. Die draait het hele jaar door. Maar in de zomer is er geen afnemer voor de warmte. Dat is dus suboptimaal. Het is veel beter om dat biogas op te slaan en te gebruiken wanneer het echt nodig is. Dan verdubbel je de efficiëntie van het systeem.'

VEENKOLONIËN ENERGIENEUTRAAL

Op kleinere schaal, in de architectuur en de industrie, wordt die slag om vraag en aanbod slim te koppelen hier en daar al gemaakt. Stremke schaalt het op naar het niveau van complete landschappen. Dat levert de al genoemde energielandschappen op. Neem bijvoorbeeld de Drentse Veenkoloniën. De streek wil binnen enkele decennia energieneutraal zijn. Dat wil zeggen: consumptie en lokaal aanbod aan energie zijn duurzaam in evenwicht. Stremke en zijn collega's werden in de arm genomen om te laten zien of en hoe dat kan.

De werkwijze is simpel. Stremke brengt eerst uitvoerig al het mogelijke aanbod in kaart. 'Ik kijk dus wat er technisch mogelijk is aan duurzame energie op gebied van wind, water, aardwarmte, zon, warmtekoudeopslag, biomassa en restwarme van industriële processen in het gebied. Daarna wordt de vraag in beeld gebracht: wie verbruikt wat, waar en op welk moment en welke netwerken (gas, elektriciteit etc.) zijn er.' In de derde stap worden vraag en aanbod slim gekoppeld, binnen de beperkingen die er altijd zijn. Je kunt nu eenmaal niet een windmolen plaatsen in een vogelbeschermingsgebied of midden in een bos.

RESTWARMTE NAAR WOONWIJKEN

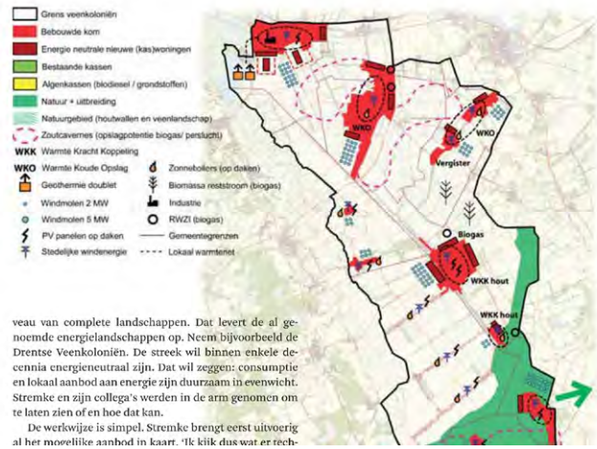
De crux zit 'm volgens Stremke in het slim koppelen. Zo ontwierp hij voor de stad Emmen een manier om grote delen van de stad te verwarmen met een en dezelfde reststroom aan warmte. 'Oude wijken vragen meer warmte dan jongere wijken, want ze zijn slechter geïsoleerd. Om een oude boerderij in de winter te verwarmen heb je water van 70-80 graden nodig. Maar voor een nieuwe Vinexwijk volstaat water van 30 graden. Door het water van oud naar nieuw te laten stromen, kun je een reststroom meerdere keren gebruiken.'

> **'Een ecosysteem probeert altijd zoveel mogelijk energie vast te houden. En dat is meetbaar'**

De Veenkoloniën staan niet op zichzelf. Stremke ontwierp op die manier ook het energielandschap van Zuid-Limburg en is bezig met een opdracht voor vier gemeenten in de kop van Overijssel. Er is volgen hem werk zat. Zijn studenten tekenen op dit moment (zie kader: energie-eilanden) de energieneutrale toekomst voor de Zuid-Hollandse eilanden. Dat dat mogelijk is, is volgens Stremke buiten kijf. 'Op het platteland kun je heel Nederland energie-neutraal maken. Daar ben ik van overtuigd. Alleen op plekken met wat meer industrie is het lastiger. Maar het kan altijd.'

ENERGIE-EILANDEN

Het Zuid-Hollandse eiland Goeree-Overflakkee en het Zeeuwse Schouwen-Duiveland willen binnen een generatie vanaf nu volledig energieneutraal zijn. Wageningse masterstudenten helpen daar een handje bij. In totaal 65 studenten zijn sinds februari in het zogeheten Atelier Landschapsarchitectuur en Planning bezig hun ideeën voor de eilanden vorm te geven. Twee weken terug presenteerden ze tussentijds in Forum hun plannen. Windmolens, zonnepanelen en biomassa moeten het in de toekomst volgens de studenten gaan doen. Naast elektrisch vervoer en een lightrailsysteem dat de Randstad met de eilanden verbindt. Opmerkelijk idee: natuurlijke zandbanken voor de eilandkust volbouwen met zonnepanelen.
Windmolens komen als het aan de studenten ligt voorál buitendijks. Zo blijven ze buiten beeld van de toerist en nemen ze op land geen ruimte in beslag. Offshore windparken zijn bovendien vanuit thermodynamisch oogpunt oké. Elektriciteit is volgens leermeester Stremke de meest hoogwaardige energiedrager die er is. Je verliest maar heel weinig energie door transport. Bij biobrandstoffen ligt dat heel anders. Stremke: 'Vervoer van bijvoorbeeld bio-ethanol over de snelweg kost veel energie.
Vanwege transportverlies moet je dat dus zo dicht mogelijk bij de bron toepassen. In zijn algemeenheid geldt: hoe laagwaardiger de energiedrager, hoe korter de afstand moet zijn om het te gebruiken. Aardwarmte bijvoorbeeld moet je ter plekke toepassen, anders heeft het geen zin.'
De studenten gaan de komende weken hun visie uitwerken in concrete projecten. Eind deze maand moet het project af zijn.



Energievisie voor de Veenkoloniën. Ondanks de aanwezigheid van veel industrie kan de streek zichzelf duurzaam van energie voorzien.

[E]

ENERGY-CONSCIOUS PLANNING

What would a landscape in which energy use was optimally efficient look like? The person to ask is Wageningen landscape architect Sven Stremke, who designs 'energy landscapes'. Nothing new in themselves, says Stremke, pointing to the windmills of the *kinderdijk*. What is new is a focus on reducing the loss of available energy through smarter linking of demand and supply. Follow nature's example, says Stemke: ecosystems retain as much energy as they can. We focus too much on quantity, and should give more thought to when, where and how energy is needed. Instead of letting a biogas fermenter generate heat all summer that nobody wants, store the biogas till winter. Or use waste hot water from industry to heat older neighbourhoods first, and then in the more efficient new housing where cooler water will still do the job. It also helps to use energy that is difficult or costly to transport, such as geothermal heat or biofuels, close to source. Sixty five MSc students of Landscape Architecture are applying this energy-conscious thinking in plans for making the South Holland islands energy-neutral. Something Stremke is confident could be done throughout the Dutch countryside.

The full story? resource.wur.nl/en

Figure: Article on 2011 atelier in Wageningen University Journal 'Resource" 12 may 2011

van het landschap en mogelijkheden voor hernieuwbare energiebronnen

zelfvoorzienend energielandschap

door **Ali Pankow**

Zierikzee omcirkeld door windmolens of driekwart van de akkers op het eiland met koolzaad beplant? „Nee dat soort schrikbeelden willen we natuurlijk niet", zegt Sven Stremke, landschapsarchitect aan de Universiteit van Wageningen. Hij is een van de zes coaches van 65 studenten die in het kader van een zogeheten Master-Atelier onderzoek doen naar duurzame energie op Schouwen-Duiveland en Goeree-Overflakkee.

„Zij komen van drie verschillende studierichtingen: Landschapsarchitectuur, Culturele Geografie en Landgebruiksplanning. Het is een internationaal gezelschap met studenten uit meer dan tien landen. Ik leid de Schouwen-Duiveland groep samen met mijn collega's Henk de Haan en Claudia Basta. De opdracht aan de studenten luidt: 'Onderzoek hoe Schouwen-Duiveland binnen 30 jaar zelfvoorzienend kan zijn in duurzame energie'. De helft van de groep houdt zich met dit gebied bezig. De andere helft wijdt zich aan dezelfde opdracht maar dan gericht op Goeree-Overflakkee", legt Stremke uit. Eilanden zijn mooie gebieden voor dit soort onderzoeken naar lange termijn transities, vindt hij. „Overzichtelijk, een afgesloten geheel, waar je snel in contact komt met de bewoners en uit de voeten kunt met het invoeren van innovatie." Volgens de studiecoach heeft dat alles te maken met het feit dat samenwerken door de eeuwen heen hier noodzaak was. Samenwerking in de strijd tegen het water noodzaak was. Dat bepaalde ook de identiteit van het gebied. Stremke constateert dat de wens voor het onderzoeken van mogelijkheden voor de transitie naar een duurzaam energiesysteem op Schouwen-Duiveland vanuit de bevolking omhoog is geborreld, terwijl op Goeree-Overflakkee het initiatief door de lokale overheid is genomen. Daar werd ingespeeld op het project *Mooi Nederland*, een prijsvraag voor innovatieve projecten. Het Ministerie van Infrastructuur en Milieu stelde 6,5 miljoen euro beschikbaar voor projecten die de ruimtelijke kwaliteit van ons land versterken. Het naburig eiland kan rekenen op een bijdrage van 60.000 euro voor het recreatieproject 'Beleef het op Goeree-Overflakkee'.

Op Schouwen-Duiveland komen de ideeën over duurzame energie met name van het vorig jaar in het leven geroepen stimuleringsplatform Transitie-Eiland met Zierikzeeënaar Eric Odinot als één van de immer ijverige voorvechters. „Met hem hebben wij regelmatig contact, naast Olaf Griffioen van de gemeente en met Richard van Bremen van de provincie Zeeland. Zij steunen ons met overleg voor dit studieproject. Het is een mooi onderzoek voor onze studenten in het kader van hun masteropleiding. Na de zomer presenteren we onze visies over Schouwen-Duiveland en hoe duurzame energie transitie kan worden aangepakt", zegt Stremke.

'Wij hebben hun gevraagd de identiteit van Schouwen-Duiveland met behulp van duurzame energie te versterken zonder met voedselproductie te concurreren'.

Volgens hem is iedereen inmiddels wel overtuigd van de noodzaak van transitie naar een duurzaam energiesysteem. „De fossiele brandstoffen en kernenergie raken op en er zal dus gezocht moeten worden naar hernieuwbare energie. Daarvoor moet goed worden bekeken hoe die in het huidige landschap ingepast kunnen worden. In een historisch beschermd stadsgezicht zoals in Zierikzee wil je bepaalde ontwikkelingen liever niet. Zoals zonnepanelen op de daken van historische gebouwen. Maar ook op het platteland moet gekeken naar de kwaliteit en de beleving van het landschap. Schouwen-Duiveland is een gebied met een hoogwaardige voedselproductie. Dat weegt mee bij de mogelijkheden die de studenten zullen schetsen. Wij hebben hun gevraagd de identiteit van het eiland met behulp van duurzame energiewinning te versterken zonder met voedselproductie te concurreren."

Het Master-Atelier bestaat uit drie delen: Inventariseren en het gebied verkennen; in vier groepen visies ontwikkelen over hoe dit eiland er in dertig jaar uit kan gaan zien en tenslotte inzoomen op details: dijken, slikken, dorpen, delen van het landschap.

Twee studenten, Dirk Harden en Ruud Tak richten zich specifiek op de haven van Bommenede en het slikkengebied in de aangrenzende omgeving. Harden onderzoekt de mogelijkheden voor opslag van energie in water in genoemde haven. Tak bestudeert de kansen voor ecologisch toerisme in de omgeving van Zonnemaire. „Mensen zullen ook behoefte krijgen aan vormen van recreatie die een oase van rust bieden", meent de jonge student.

Andere studenten richten zich op onder meer: het kassencomplex bij Sirjansland, Brouwershaven, binnenstad Zierikzee, Renesse, eiland Stampersplaat, Ouwerkerk in combinatie met het Salvatorpark, aquacultuur en op enkele rotondes. „Die zouden tot signaalposten gemaakt kunnen worden om het zelfvoorzienend energiebeleid uit te dragen ook in toeristisch opzicht", licht de studiecoach toe.

Schouwen-Duiveland als zelfvoorzienend energielandschap met behoud van kwaliteit van het landschap vergt een goed overwogen mix aan maatregelen, volgens Stremke. In zijn optiek kan energiewinning uit gft en mest daar een belangrijke rol in spelen, evenals windmolens op zee en uiteraard ook besparing, want terugdringen van de energiebehoefte vormt eveneens een belangrijk onderdeel van transitie.

Schouwen-Duiveland is vergelijkbaar met het Deense eiland Samsø. Dat is in tien jaar tijd zelfvoorzienend geworden en exporteert nu zelfs energie", zegt Stremke. Die mogelijkheden ziet hij ook voor dit eiland in het verschiet liggen. „Schouwen-Duiveland kan op termijn energie verkopen aan de randstad. Er zal dus ook een economisch belang ontstaan." Zelf wijdde Stremke destijds zijn proefschrift aan energielandschappen. Volgens hem valt er veel te leren van de energielandschappen elders. „In elk geval dat er een goede mix nodig is tussen private initiatieven, medewerking vanuit het bedrijfsleven en een overheid die steun verleent."

Dirk Harden onderzoekt de mogelijkheden voor opslag van energie in water in de haven van Bommenede. foto **Dirk-Jan Gjeltema**

Figure: Article on 2011 Atelier in Provinciale Zeeuwse Courant, 25th of May 2011

Beyond fossils; envisioning desired futures for two sustainable energy islands in the Dutch delta region
Sven Stremke, Rudi van Etteger, Renée de Waal, Henk de Haan, Claudia Basta, Maaike Andela
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