MSc THESES OVERVIEW LANDSCAPE ARCHITECTURE GROUP

2018 2019

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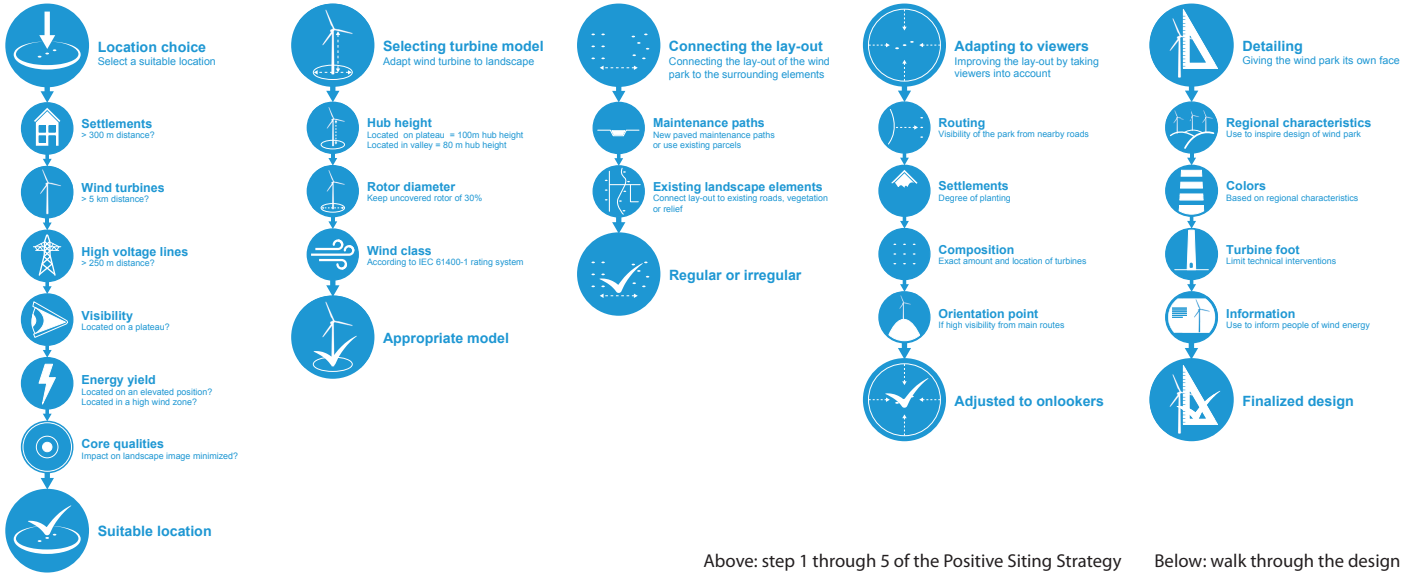
Maarten Plooi
Supervisor: Sven Stremke

Positive Siting Strategy

A positive strategy for siting and designing wind parks in the National Landscape of South-Limburg, the Netherlands

View from the north showing the four lines of turbines that create Windpark Ransdalerveld, as well as the horizontal turbine placed in the exact center of two of these lines



Above: step 1 through 5 of the Positive Siting Strategy

Below: walk through the design

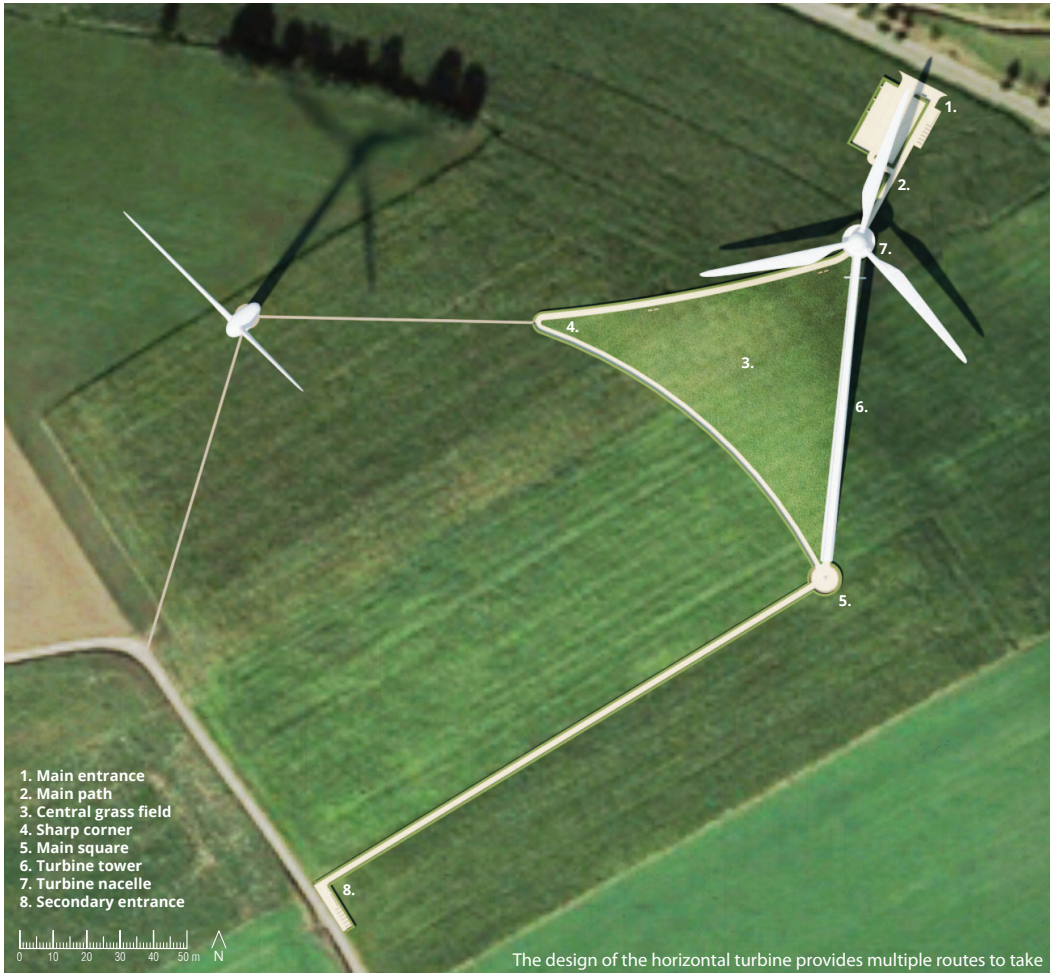
Abstract

Parkstad Limburg is a climate neutral region in the south of the Netherlands where 8 municipalities work together with the goal of becoming energy neutral by 2040. As a part of this program 1 PJ of wind energy is needed.
By using a negative siting strategy the region removed the entirety of National Landscape South-Limburg present within its borders from consideration for the siting of wind turbines; roughly half of the surface area of Parkstad. This restriction reduces overall efficiency of turbines while also forcing all turbines into a small part of the region, where they are likely to dominate the horizon and transform it into a wind landscape.

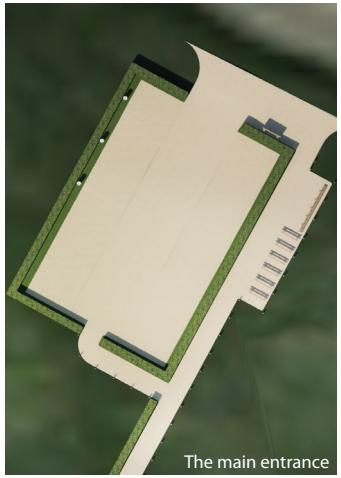
To avoid these problems turbines will have to be sited in the vulnerable National Landscape South-Limburg. The negative strategies used by Parkstad are not suitable for this task. In this thesis an alternative strategy is thus created; the Positive Siting Strategy. It seeks to, instead of removing areas deemed unsuitable, select areas that are most positive to site wind turbines in. It is based on the existing Landscape Based strategy, which was created for a flat landscape and had similar goals in mind. The created strategy consists of 5 steps: location choice, selecting turbine model, connecting the lay-out, adapting to viewers and detailing.

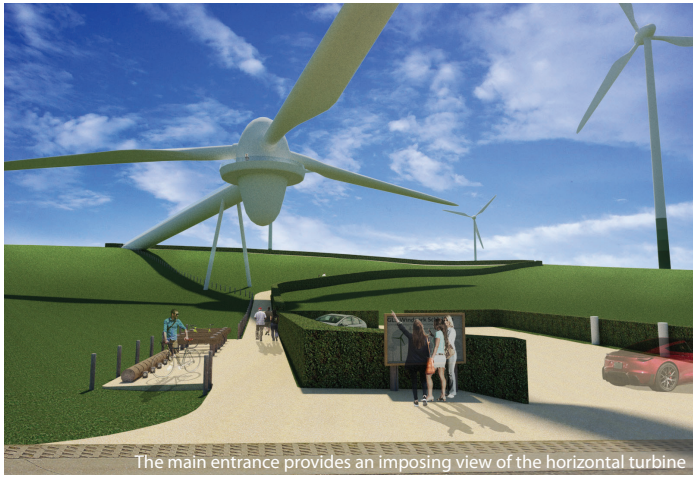
This strategy is used in Parkstad to site the required 1 PJ of wind energy. Out of 28 different models a single large park with multiple smaller parks is selected as most appropriate for the region. The large park, called Windpark Ransdalerveld, is further designed and sites a total of 14 turbines in a regular lay-out. It features a unique horizontal turbine which allows visitors to get close to the nacelle while simultaneously offering an elevated vantage point, and also attracting tourists to the region.

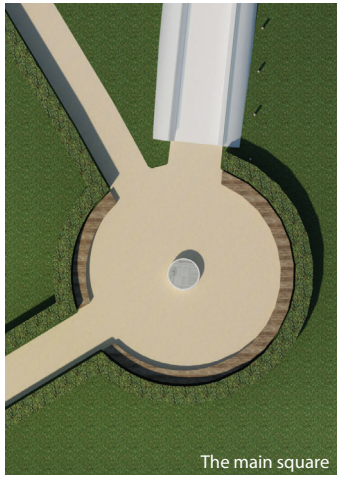
The created strategy avoids the described problems while also minimizing impact on core qualities of the landscape, mainly due to low visibility. It is usable in the entirety of South-Limburg and likely in many other landscapes.



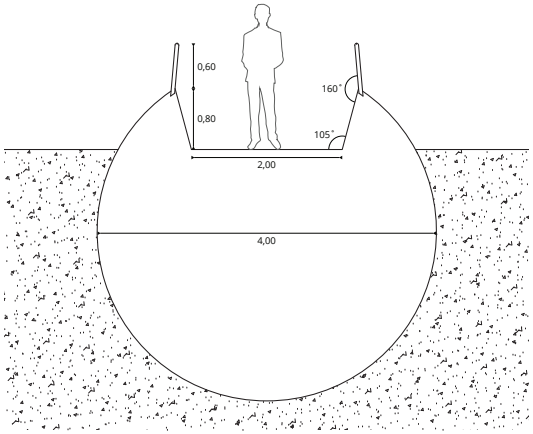
The design of the horizontal turbine provides multiple routes to take


The main entrance

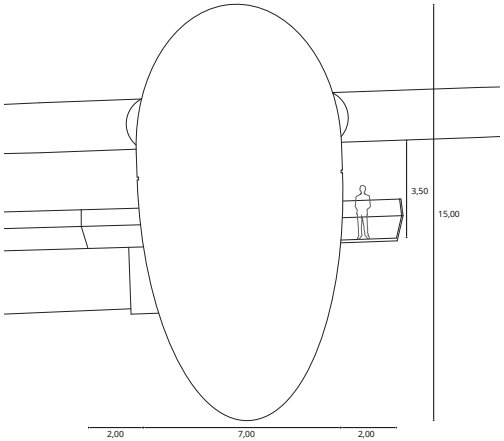

The main entrance provides an imposing view of the horizontal turbine


The main square


The main square is sheltered from the wind by the surrounding hawthorn hedge



Section of the path cut from the turbine tower (m)



Section of the turbine nacelle and surrounding platform (m)


The turbine nacelle


The platform surrounding the nacelle offers a 360° view over the landscape

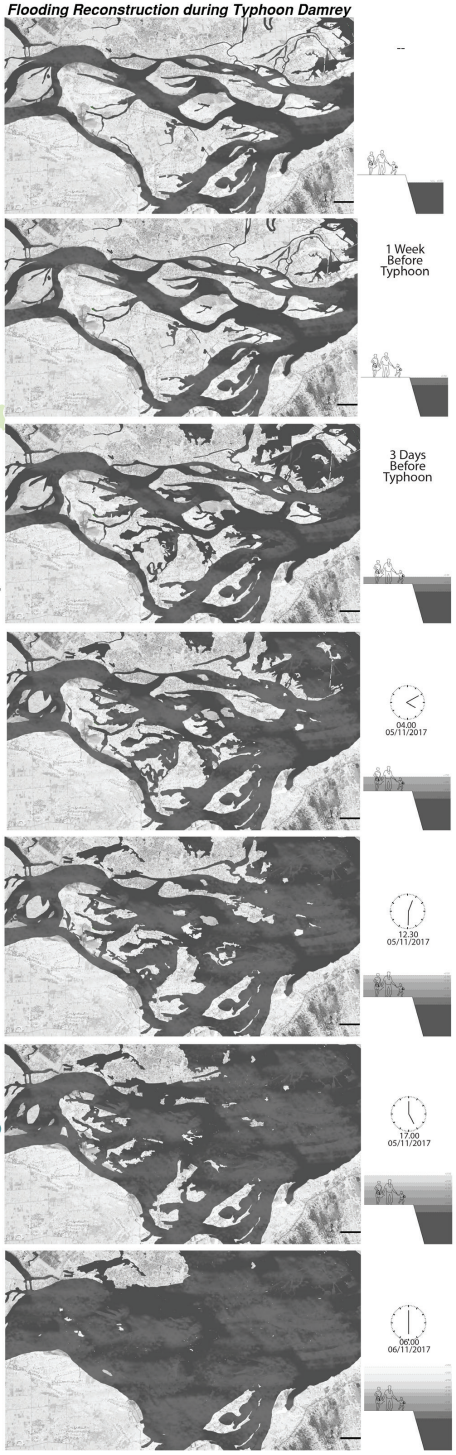
Oktaviana Miffatulani
Name supervisors: dr. ir R (Rudi) van Etteger MA

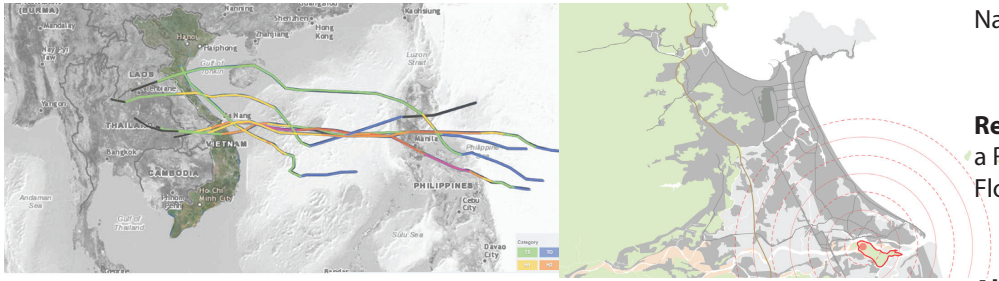
Revert!

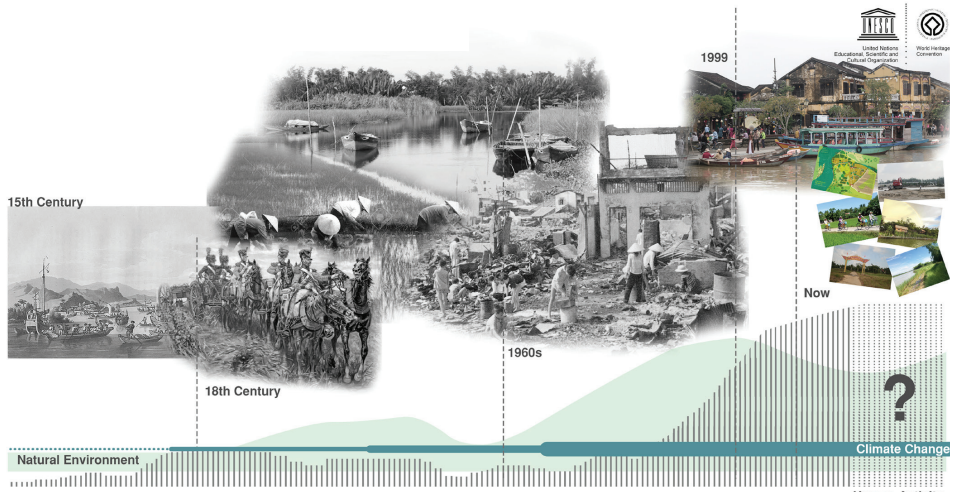
a Resilient Landscape Design Process Towards Typhoon and Flooding in Cam Kim Island, Hoi An Vietnam

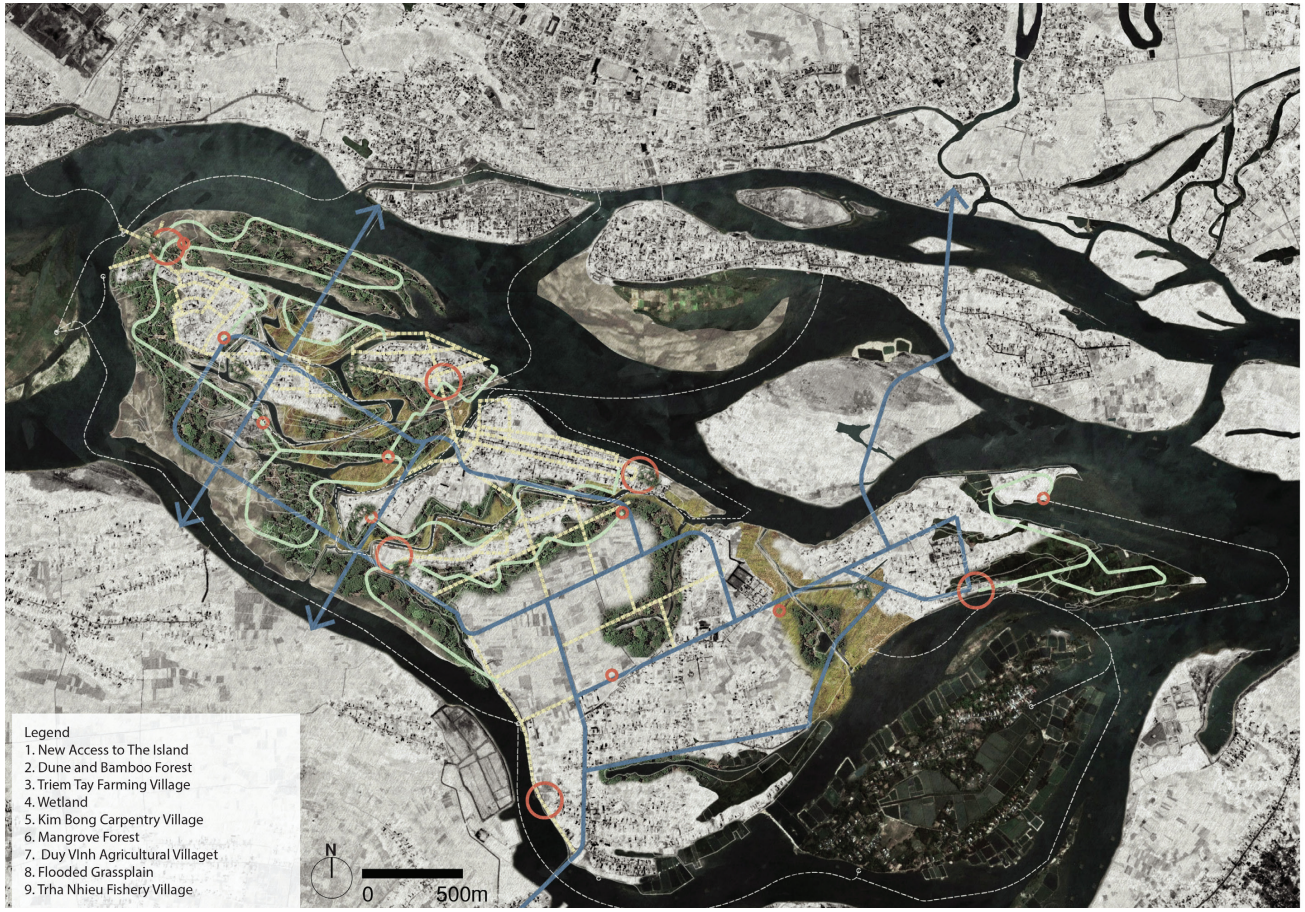
Abstract

The extreme dynamics of estuary makes this specific landscape type vulnerable towards risks of natural disaster and climate change impact which is affecting human habitat. Those exposure had driven the landscape type into an unfavorable place to settle in terms of spatial planning. However, the bond between human and their habitat had been nurtured spiritually and manifested in their daily life. The research aimed to study a reciprocal relation between landscape layers, local coping mechanism, and current landscape situation to reduce the risk of typhoon and floods in Cam Kim Island, Vietnam. This study was started by finding the literature to give a better understanding in resilience landscape meaning and identified resilience principles that was possibly used in this study, which are modularity, redundancy, managing variables and feedback, and diversity. As a landscape architect, the usage of layer approach was used to identify the most important landscape characteristics of the island. Interview activity was conducted to verify landscape dynamics of the island. After finding those information based on science and local knowledge, new 14 principles were obtained. Later, those principles were cultivated into three different conceptual design and re-identified through theory of resilience to see design possibilities. At last, a new conceptual design that managed to compile and enhance resilience principles - called Revert! - was manifested into the final design that is focused on improving soft elements and created a new landscape infrastructure.

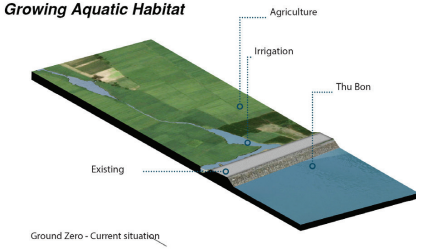




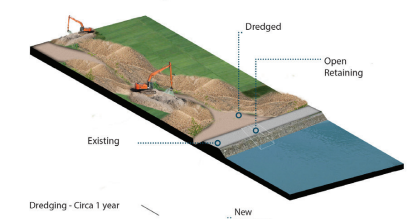




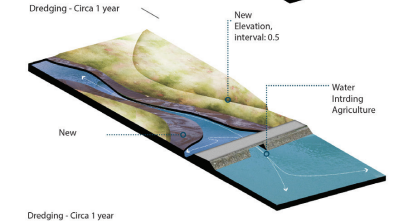
Growing Aquatic Habitat



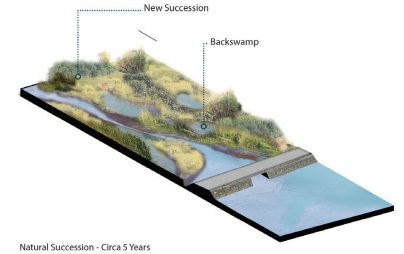
Ground Zero - Current situation



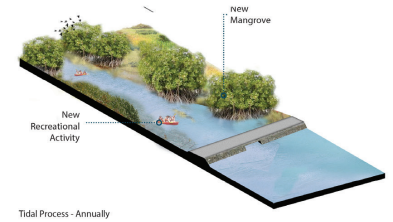
Dredging - Circa 1 year



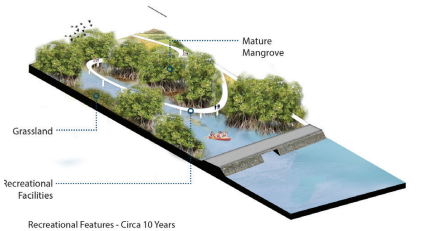
Dredging - Circa 1 year



Natural Succession - Circa 5 Years

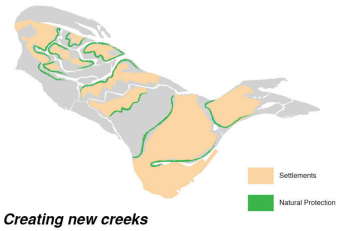


Tidal Process - Annually



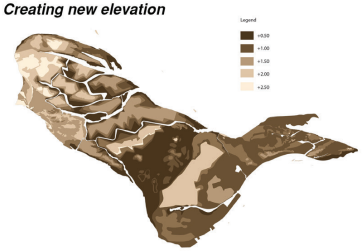
Recreational Features - Circa 10 Years

Preserve the settlement

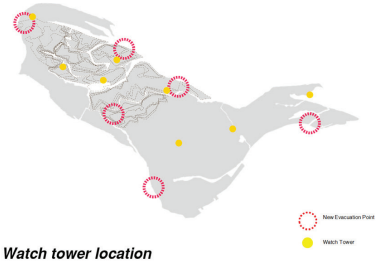


Creating new creeks

Creating new elevation



Evacuation point



Watch tower location

Maarten Vermeer
Supervisors: Rudi van Etteger and Sven Stremke

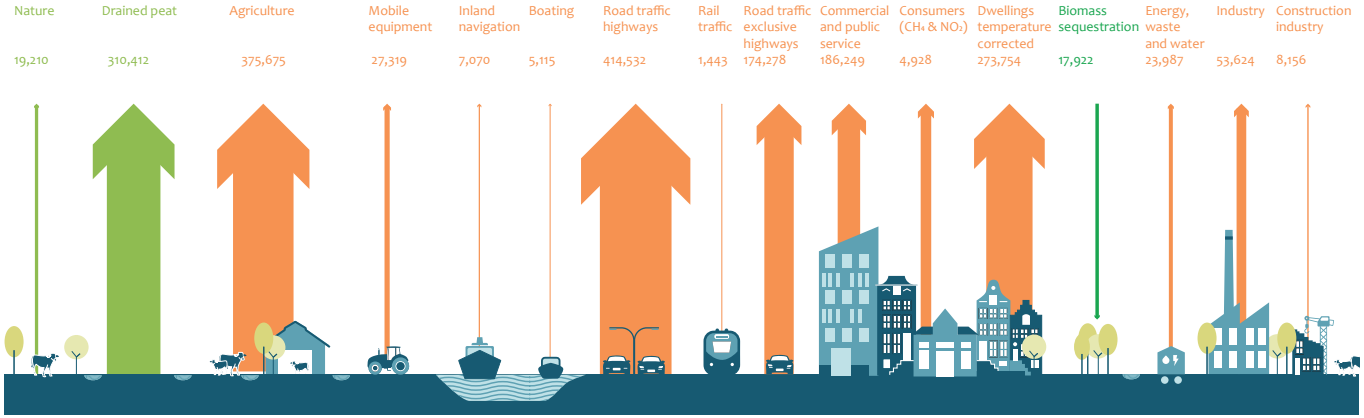
Back in Balance

Towards a carbon neutral peat meadow landscape.
The western peat meadow landscape of the province of Utrecht, the Netherlands.

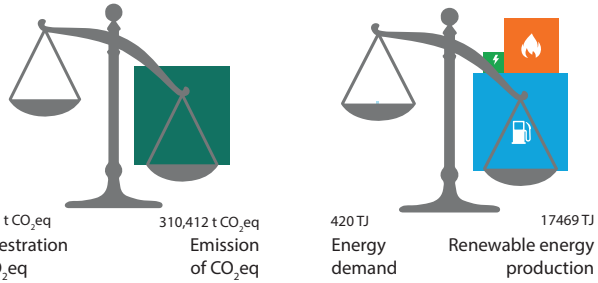
Abstract

Climate change is a global threat, therefore there are (inter) national agreements to decrease the global CO_2 equivalence (CO_2eq) emissions. The reduction of CO_2eq emissions, becomes a new landscape change driver in the western peat meadow landscape in the province of Utrecht. This, highly valued, landscape currently emits 104 times more CO_2eq than it sequestrates. Main contributors to these CO_2 emissions are energy provision by fossil fuels and the drainage of peatlands.

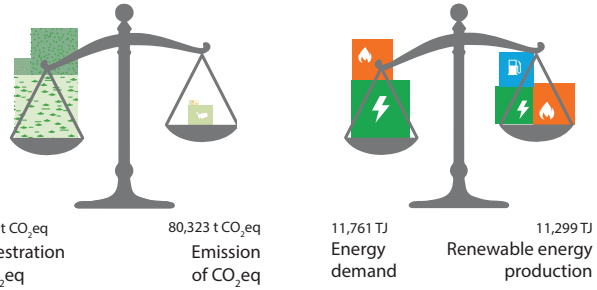
This master thesis focuses on the envisioning of a carbon neutral peat meadow landscape. As first the renewable energy potential of the project area was determined by energy potential mapping (EPM). Secondly, greenhouse gas Emission Site Types (GESTs) were used to research the influence of land use changes on the CO_2eq balance of the region. Current landscape change drivers were studied to derive at four different future scenarios of the peat meadow landscape: Global agriculture, Nature, Fragmented and Global and local farming. In these scenarios were the potential CO_2eq emissions and the renewable energy production calculated. The scenario study was used to envision a design where CO_2eq emissions and sequestration are in balance. To gain these balance, 85 percent of the land use should change to different land use (forest, cattail, reed and fen), while only 15 percent of the land is used for dairy farming with submerged drainage. At the same time, the entire electricity and heat demand is provided by renewable sources in the envisioned design.



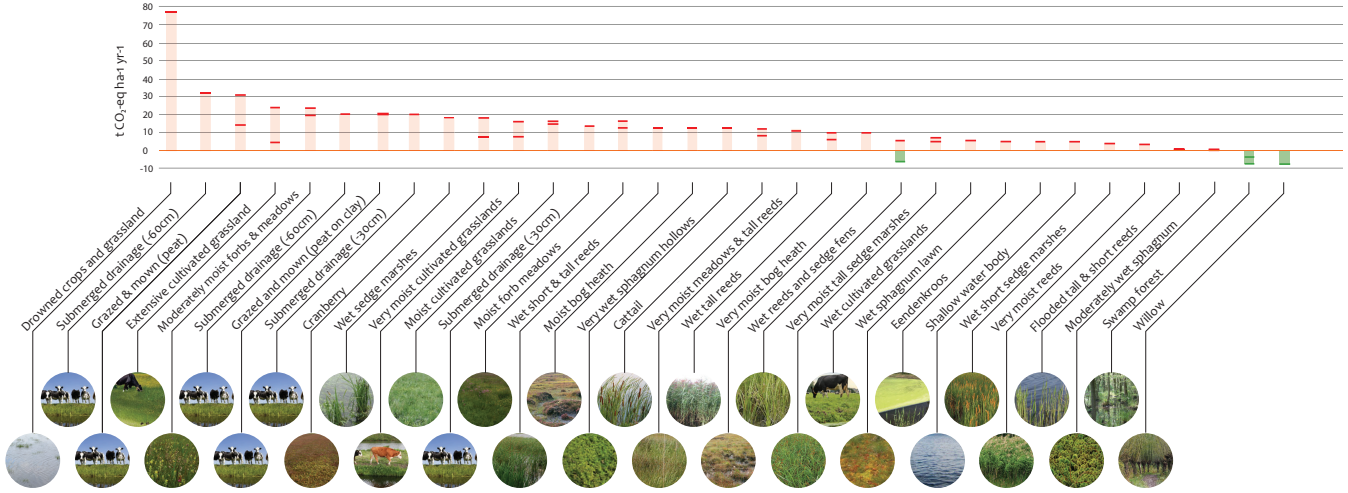
The carbon cycle of the municipalities of Woerden, Stichtse Vecht and de Ronde Venen.



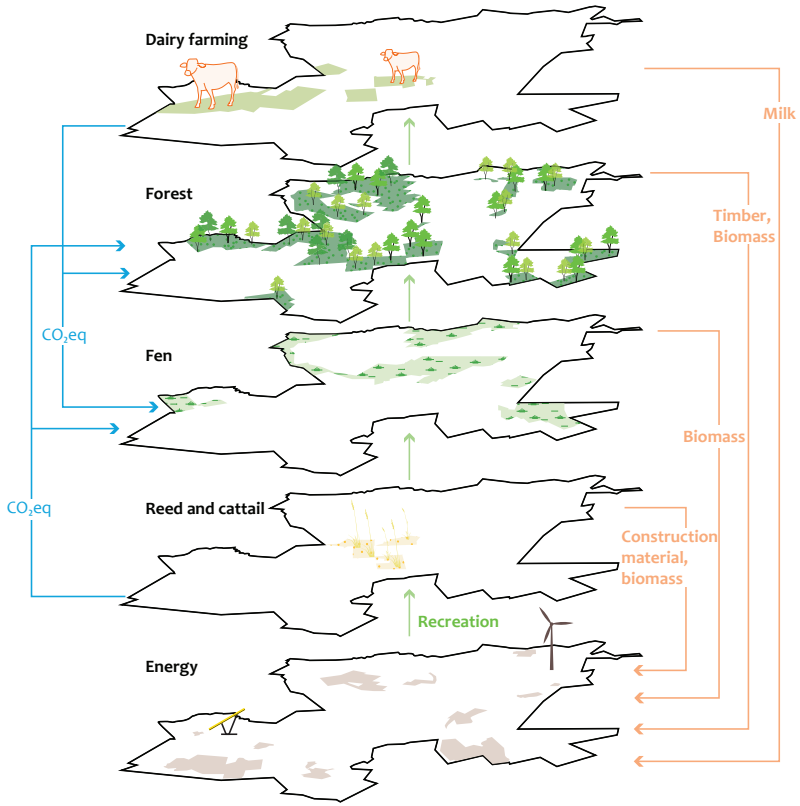
There is currently no balance in CO_2 sequestration and emission. The same counts for renewable energy generation (left) and demand.



In the proposed design is the ratio between CO_2 emission and energy demand back in balance with respectively sequestration and energy production.

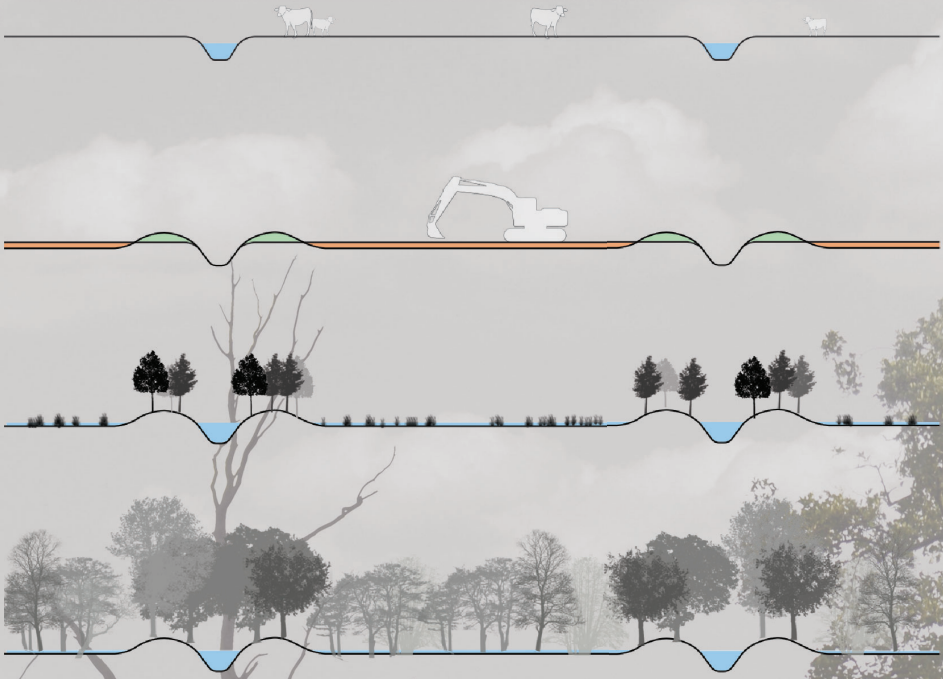


The CO_2eq emission of different land-use types.



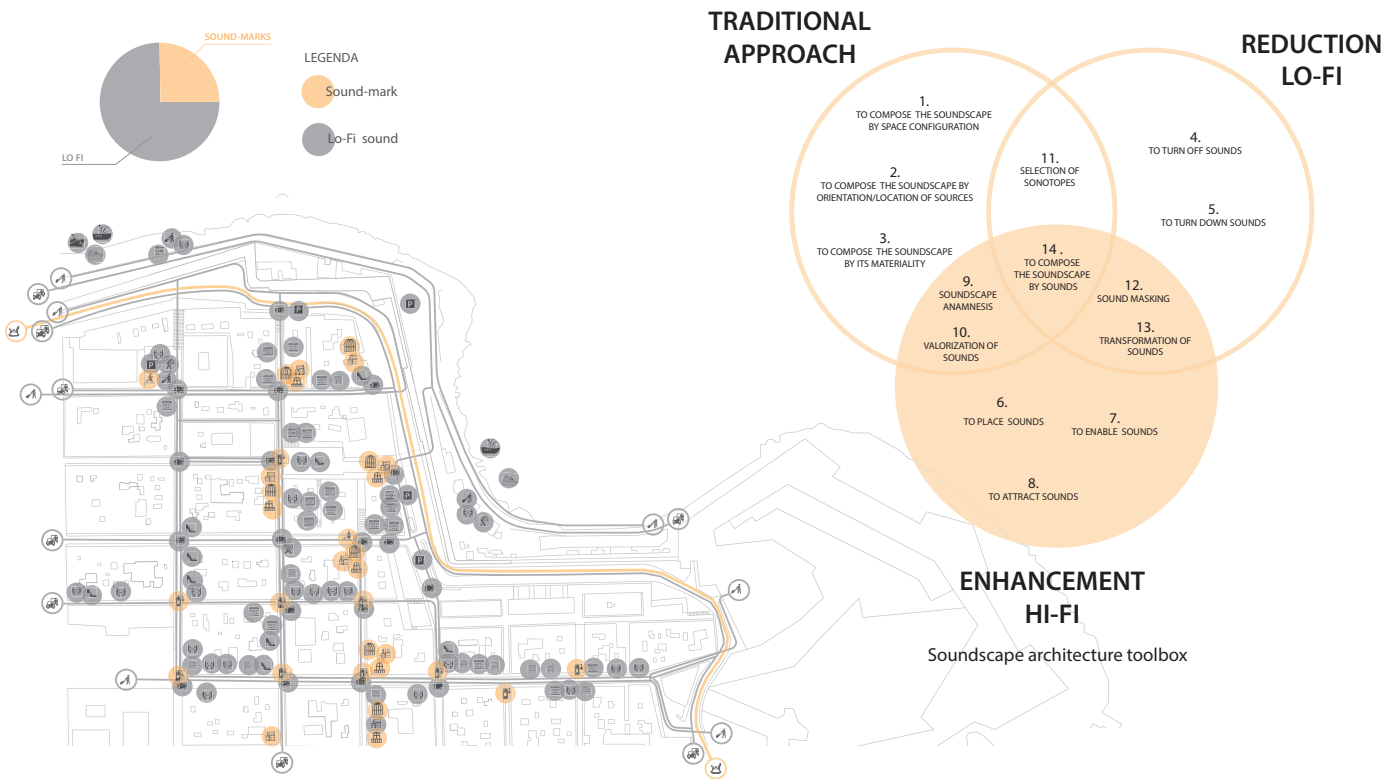
The proposed concept for the project area to bring the carbon cycle back in balance.

Impression of the forest.

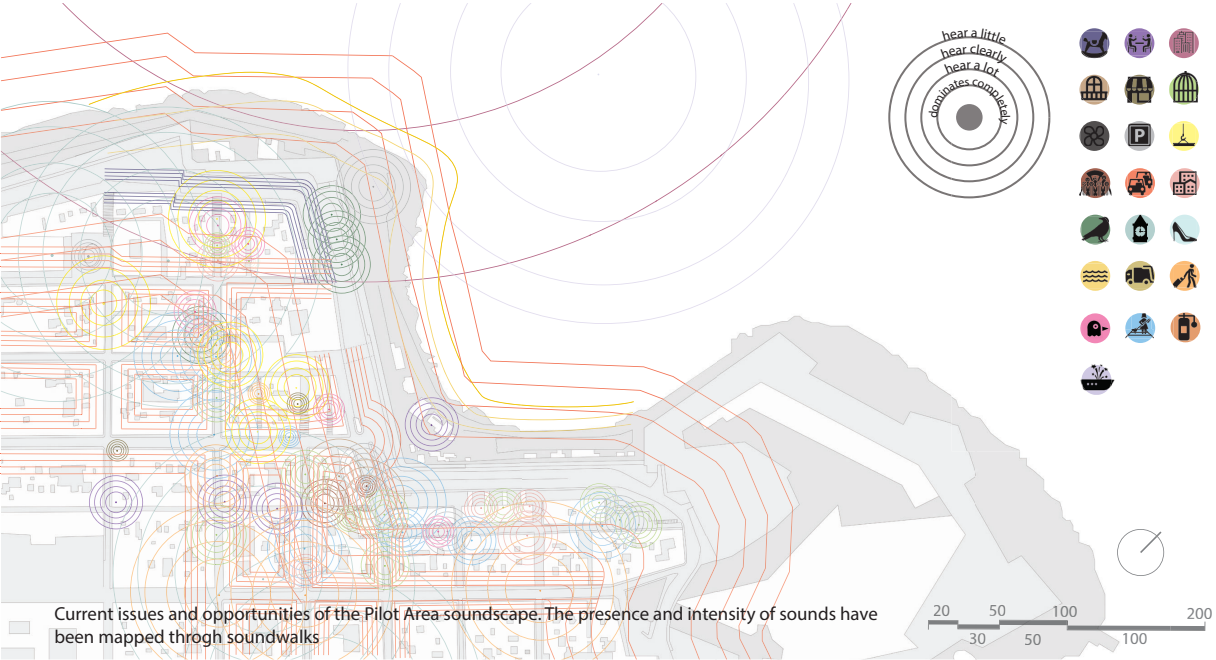


Concept of the development of the current polders towards a forest landscape.

Section of the tupelo/bald cypres forest and the oak forest.



Future soundscape scenario for the Pilot Area: sound-marks will be replaced by Lo-Fi related sounds



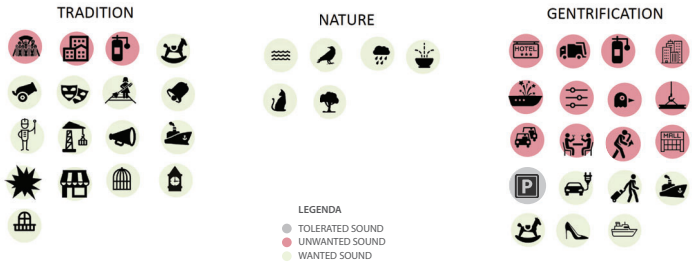
Current issues and opportunities of the Pilot Area soundscape. The presence and intensity of sounds have been mapped throgh soundwalks

Eleonora Fiorin
ir. P.A. (Paul) Roncken

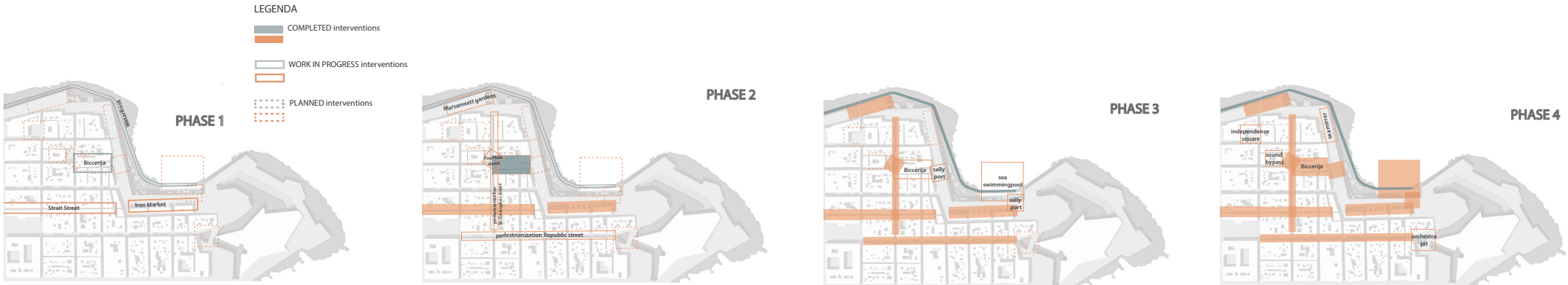
Valletta Soundscape Regeneration

Exploring the Soundscape Approach in designing urban landscape

The recent definition of "Soundscape" has been developed into a theory that determined a change of perspective in understanding and shaping the world in relation to different disciplines.
The implementation of the soundscape theory within the landscape architecture practice is the object of a number of current researches. These studies focus on overcoming the former approach, based on noise abatement, and exploring the new perspectives introduced by the soundscape theoretical shift. Within this context, there is the necessity to broaden the designers' view in addressing the sonic environment through landscape architecture interventions on the basis of the new Soundscape Approach. This thesis aims to contribute to these researches exploring the soundscape design process in relation to Valletta urban soundscape.
Within the European scene, the Maltese population resulted to be the most distressed by the urban sound environment. This sound issue becomes particularly interesting in Valletta, the city of "Yells, smells and bells" (Lord Byron), where the eclectic Mediterranean soundscape and the noise of the modernization coexist within a dynamic urban scene.
Within this research, the Soundscape of Valletta is qualitatively defined through the perception of local people. In this context, the issue related to the decreasing acoustic quality of the city is introduced as a consequence of the gentrification process that causes the shift of Valletta soundscape from a Hi-Fi to a Lo-Fi condition.
Besides these results, the design process takes into account the sound preferences of residents as well as preconditions and difficulties related to the implementation of a soundscape intervention within the city landscape.
The resulting design consists of multiple soundscape interventions aiming to improve the overall city sound environment along with the city's economic development and urban regeneration.. This design solution also aims to show the benefits and conveniences of designerly addressing the soundscape dimension within urban contexts.

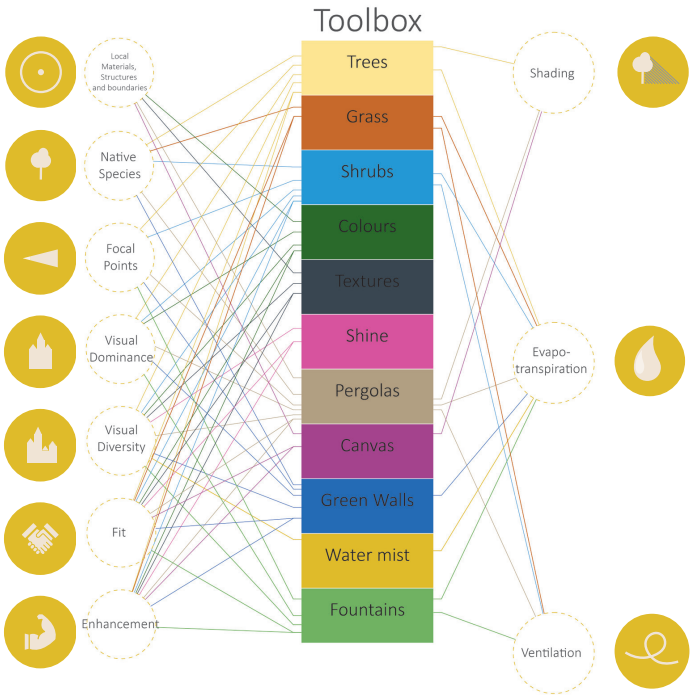


Valletta Soundscape's elements categorized according to the perception of residents

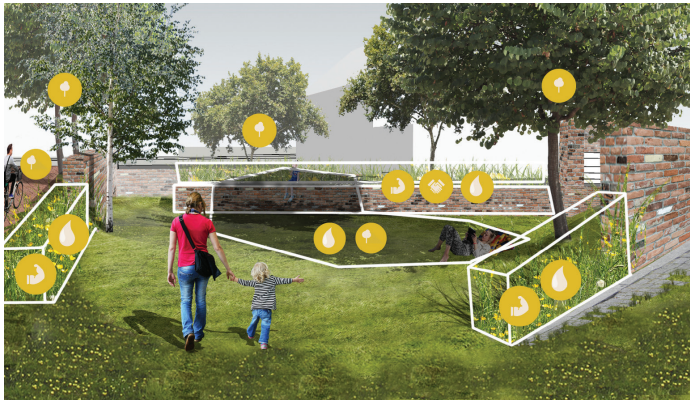


Phases of the Implementation Strategy for the ten soundscape interventions within the Pilot area. The implementation strategy is based on convenience, flexibility and complementarity to local plans.

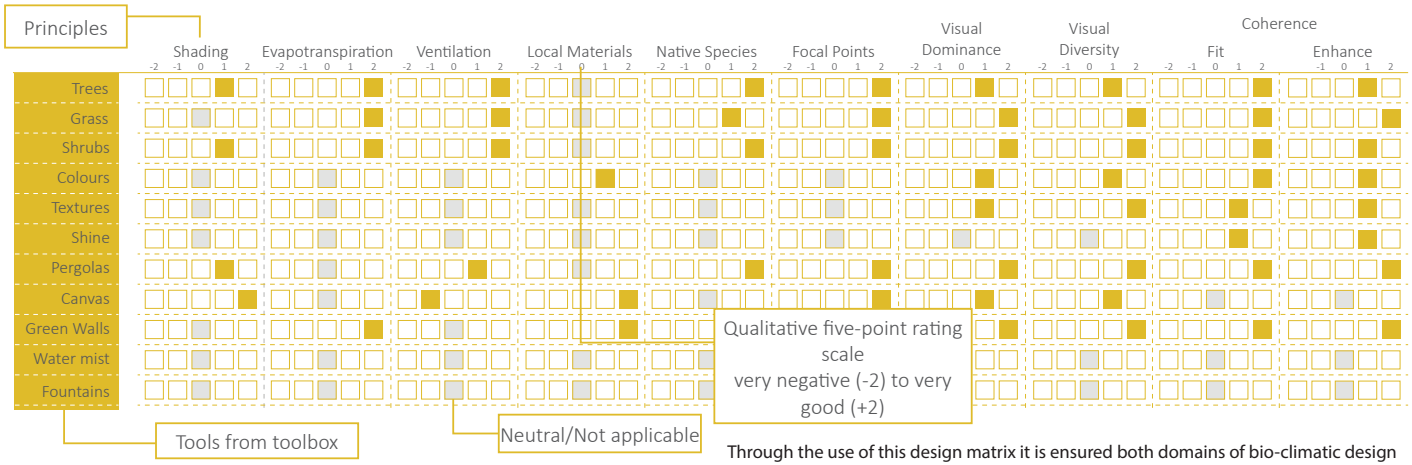
Marsamxett Gardens. Visual + audio representation of one of the ten soundscape interventions (scan the QR code with your smartphone to hear the sound).



Toolbox where the two domains of bio-climatic design and built cultural heritage are combined through spatial design elements.



Principles are implemented in the design for the Herman Moerkerkplein in 's Hertogenbosch.



Through the use of this design matrix it is ensured both domains of bio-climatic design and built cultural heritage are considered during designing. This leads to a design with an optimal bio-climatic design in a built cultural heritage valued landscape.

Freek de Bruijn
Supervisor: Assistant professor João Cortesão PhD

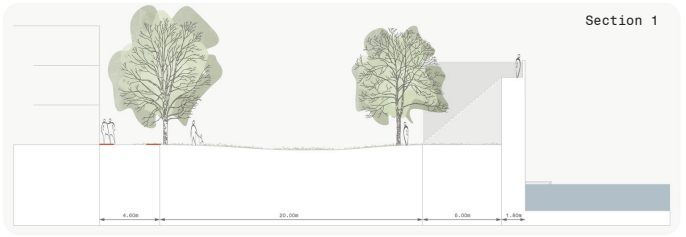
*Cool*Heritage

Guidelines for combining bio-climatic design and built cultural heritage.
's Hertogenbosch, The Netherlands

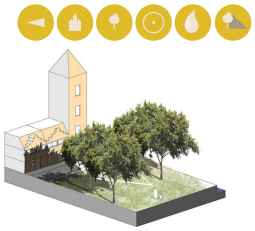
Abstract

Due to climate change cities suffer increasingly from urban heat stress during hot summer peak hours. Severe urban heat stress affects the everyday life and decreases urban comfort and a healthy living in a city. Cities need to adapt for mitigating urban heat stress. Climate responsive design answers to the need of adaptation for a thermally comfortable city. With climate change ahead and increasing urban heat stress, climate responsive designing is important and a highly urgent aspect for creating future-proof city centres.
However, adaptation of urban environments often conflicts with the built cultural heritage valued landscape, because it is often approached with a traditional perspective of preserving and maintaining. These two domains, bio-climatic design and built cultural heritage, interfere evidently in urban environments.
To help urban designers and landscape architects with climate responsive design in a built cultural heritage valued landscape, design guidelines are generated during this research.
In order to combine the two domains, they need a different approach. Therefore, three basic bio-climatic design principles are defined: shading, ventilation and evapotranspiration. For built cultural heritage, seven fundamental principles are defined that affect environmental urban experience: visual dominance, focal points, visual diversity, local materials, native species, fitting and enhancement of coherence and context.
Every design decision made during designing is assessed on three basic bio-climatic design principles and seven built cultural heritage principles. This resulted in a cooler urban environment in a built cultural heritage valued landscape: the Herman Moerkerkplein in 's Hertogenbosch.
This informed design guidelines that help urban designers and landscape architects make cities containing built cultural heritage future-proof and thermally comfortable.

The final design derived from the design process with the design matrix. In this design bio-climatic design is used to fit or even enhance built cultural heritage. Design guidelines are retrieved from the design process and showed below. They are built upon opportunities and difficutlies I, as the designer, faced during the process

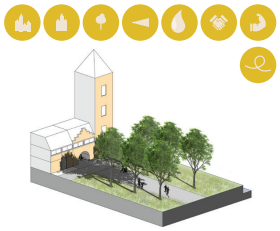


Sections of the Herman Moerkerkplein show different elevation heights and principles of bio-climatic design applied at the design, such as increase of vegetation and a variety of vegetation heights.. In these sections it is clearly shown how the old structure of the city wall is revealed by using vegetation and elevation.

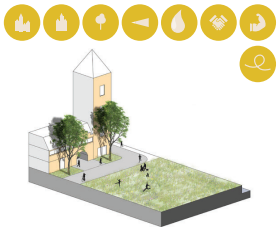


Create views

Camouflage dissonant structures



Framing typical elements



Accentuate typical elements

Highlight (hidden) structures

Intervene ‘hard’ and ‘soft’ texture

Use of different vegetation heights

Irene G. Curulli
Prof. Dr. ir. Adri van den Brink ; Dr. ir. Rudi van Etteger MA; Roel Dijksma (Department of Environmental Sciences, Hydrology and Quantitative Water Management)

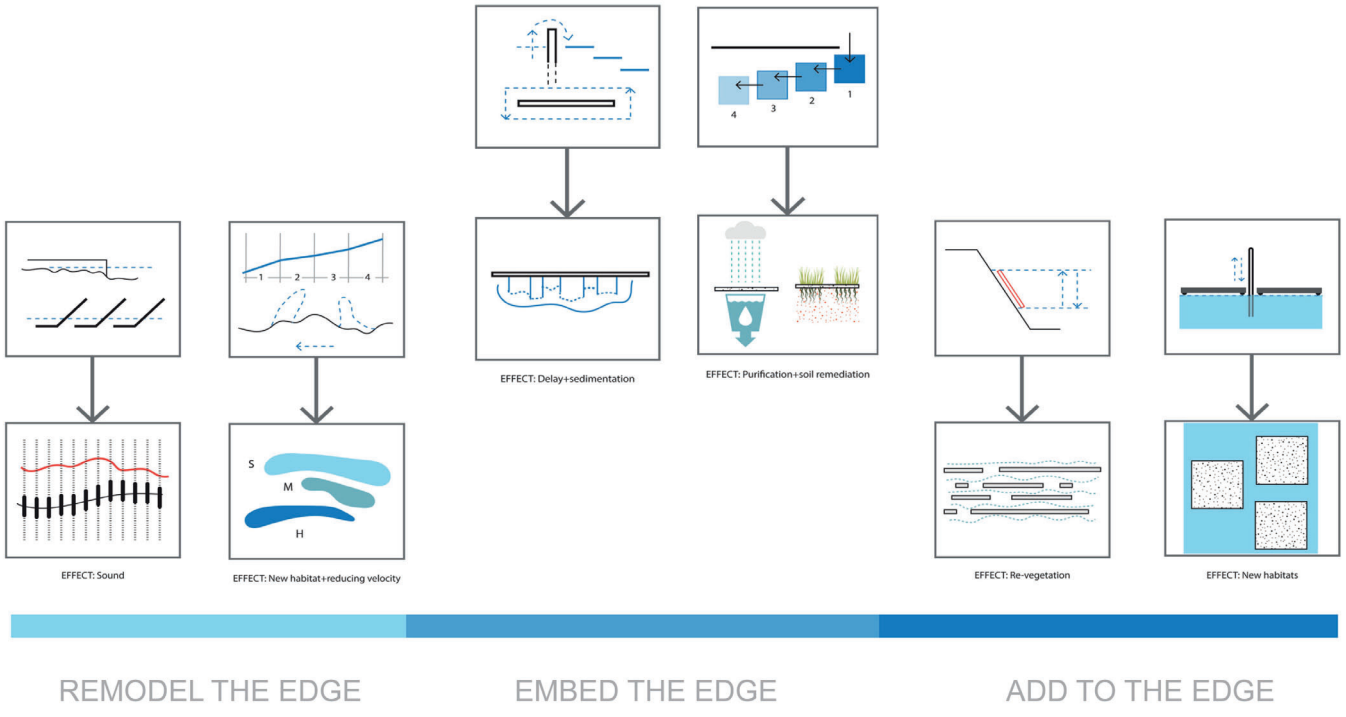
Wastelands on the edge

Exploring the land-water edge so as to integrate wastelands into green-blue infrastructures

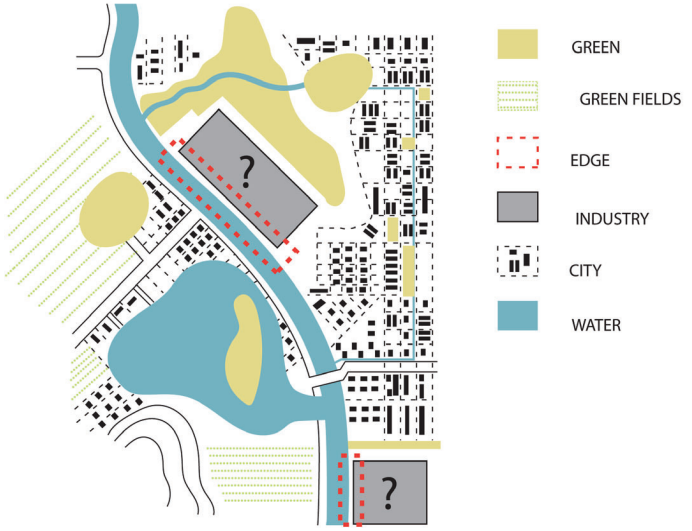
Abstract

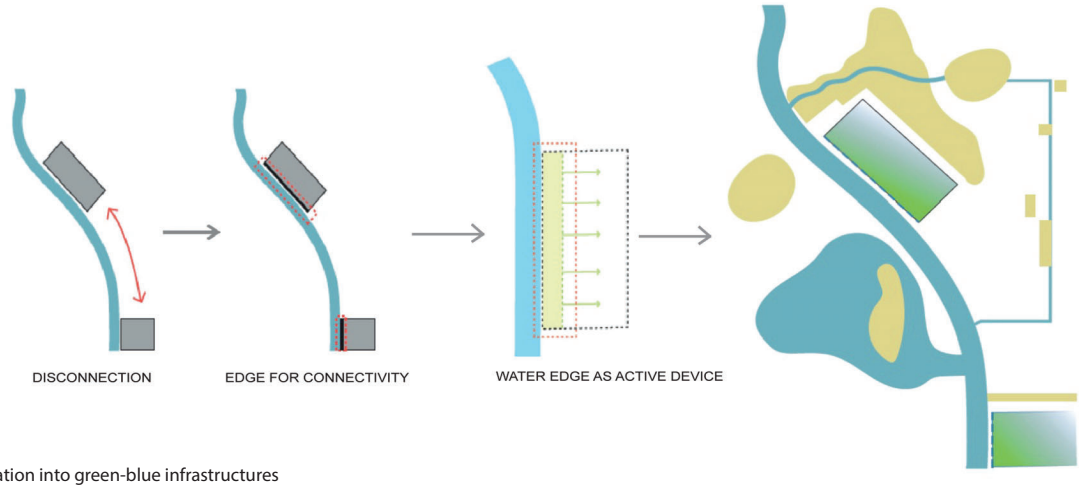
The world is still rife with wastelands, i.e. old textile factories, gas plants, dismissed industrial waterfronts etc. They represent a rift in the contemporary landscape. Together with a fast-growing urbanization, new land uses, and infrastructures development, wastelands seem to have exacerbated the landscape fragmentation.

This master thesis develops a set of design tools and a supportive framework for the development of adaptive design solutions able to enhance landscape connectivity at the land-water edge of inert wastelands. By working together with the water dynamics occurring at such edges, these design solutions support ecological functions so as to enable the integration of wastelands into the spatial network of green-blue infrastructures. As a matter of fact, the framework does not provide final solutions: it serves the purpose to inspire and guide landscape designers in the design process of implementing solutions suitable for the various site-specific situations. This framework helps in unravelling the complexity of the land-water edges and provides a way to systematically understand related problems taking a different perspective.
This study is based on four study cases: Blue Heron (Oregon, USA), Stormpolder (The Netherlands), Petroelum Zuid and Ile Monsin (Belgium). These sites extend along three national rivers, respectively the Willamette River, the Meuse/Nieuwe Maas and the Scheldt.



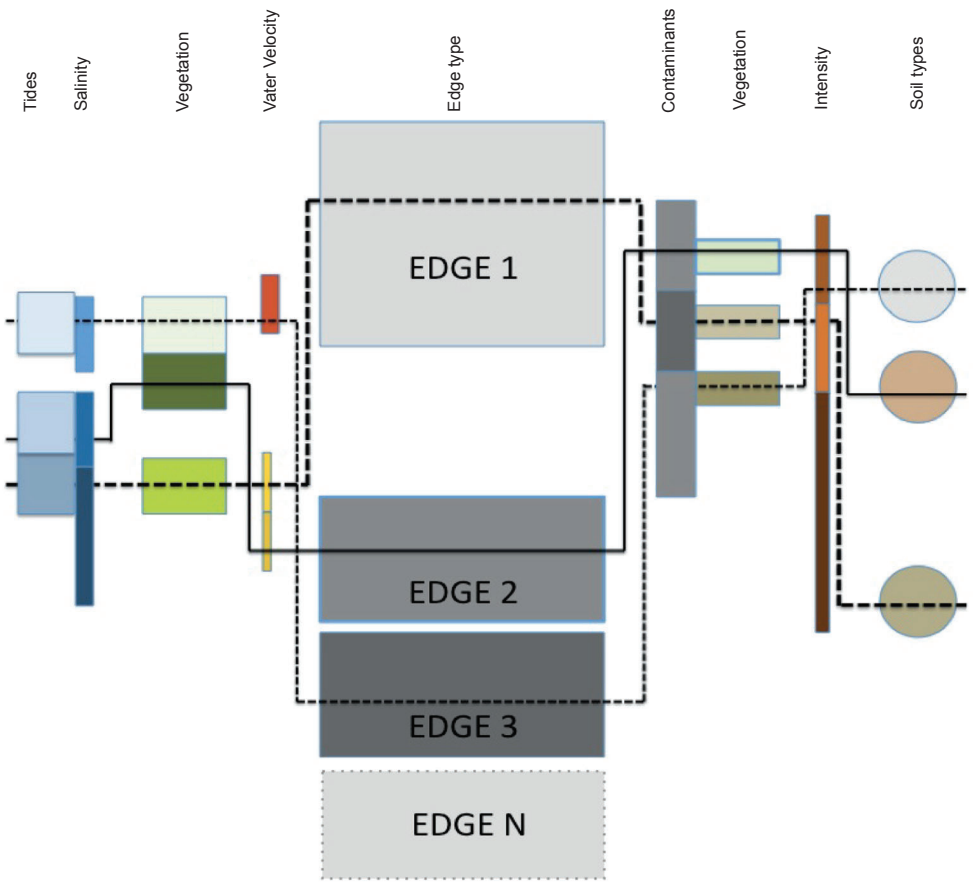
Edges design for integration



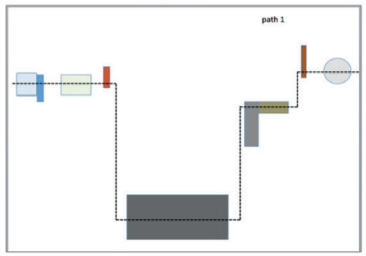


Wastelands integration into green-blue infrastructures

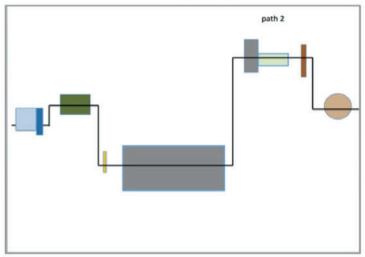
Framework: various pathways for action_n edges



PATH 1



PATH 2



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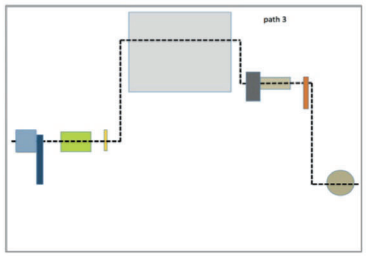
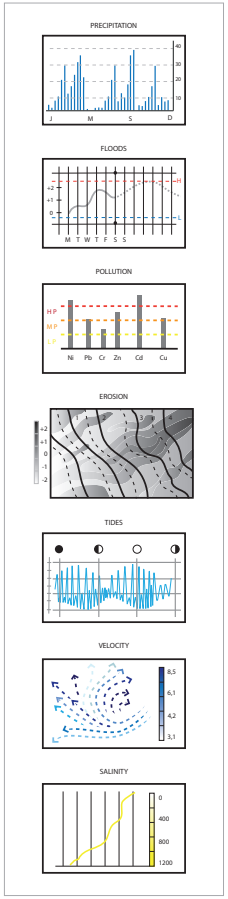
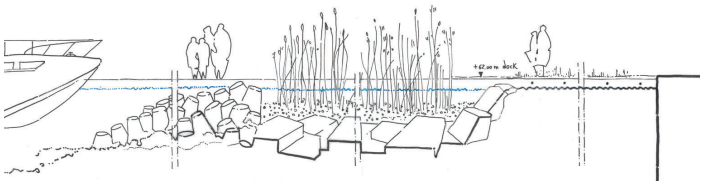


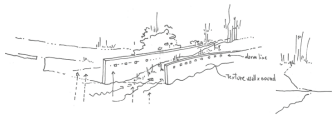
Context variables

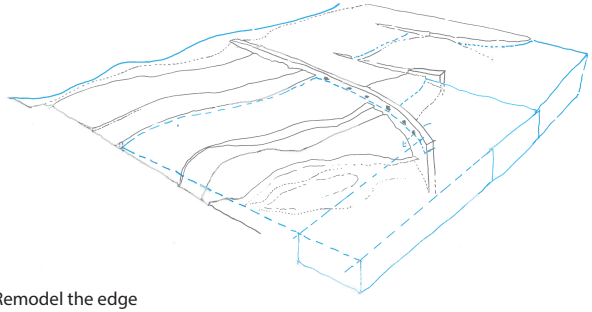


Sketch designs of land-water edges for landscape integration

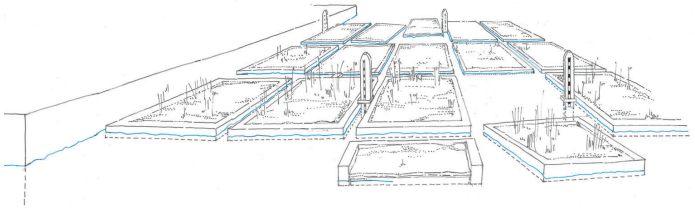


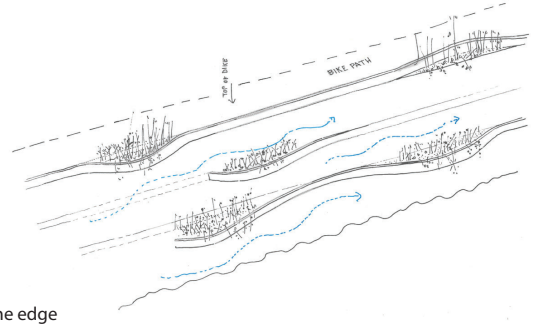
Embedd the edge



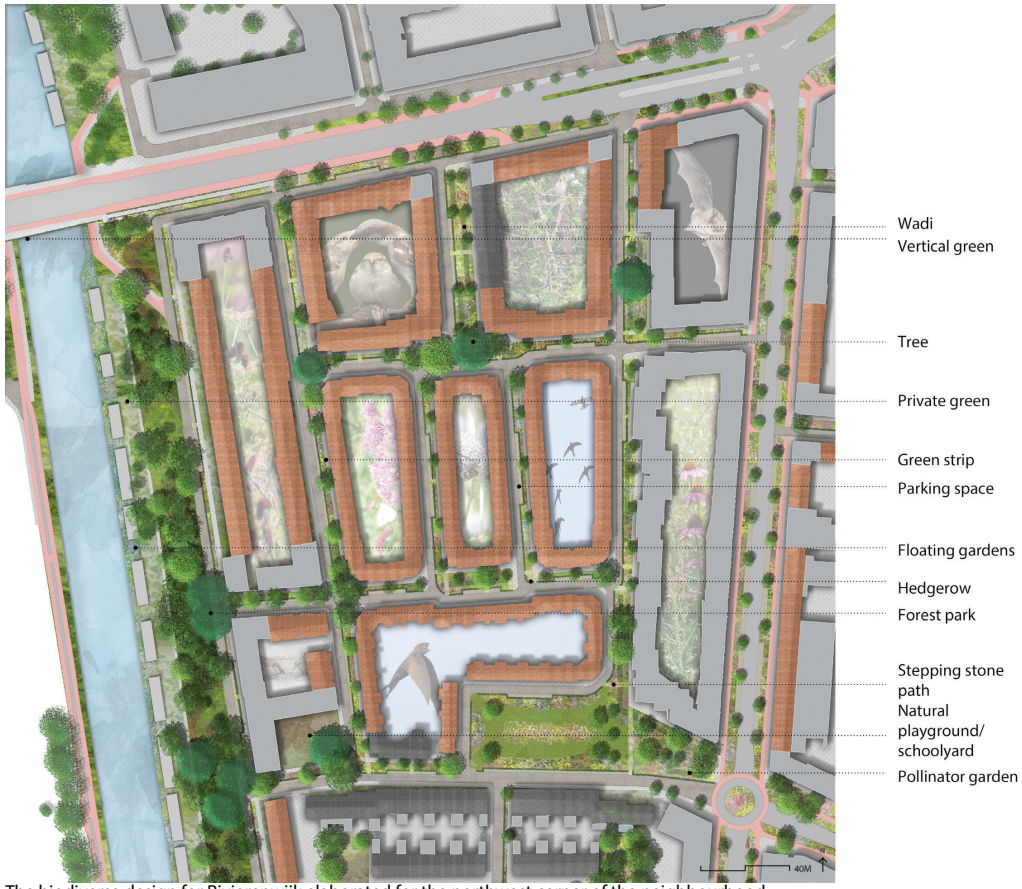


Remodel the edge

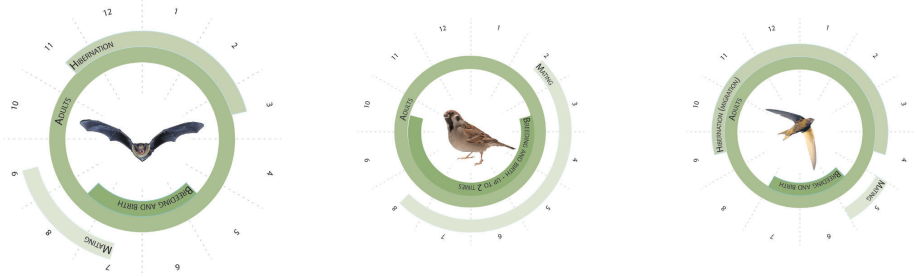




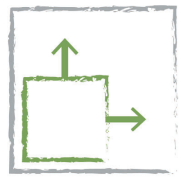
Add to the edge



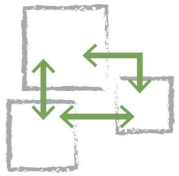
The biodiverse design for Rivierenwijk elaborated for the northwest corner of the neighbourhood.



The target species of the biodiverse design, top common pipistrelle, house sparrow, common swift; bottom: pollinators.



Area



Connectivity

Diversity

Structure

Composition

The biodiversity principles

Petra Severijnen
Dr. Ir. R. (Rudi) van Etteger
Dr. J. (Juul) Limpens (Plant Ecology and Nature Conservation)

Biodiversity by Design

Maximising the biodiversity potential of Rivierenwijk, Utrecht by landscape architecture design
Rivierenwijk, Utrecht, the Netherlands

Abstract

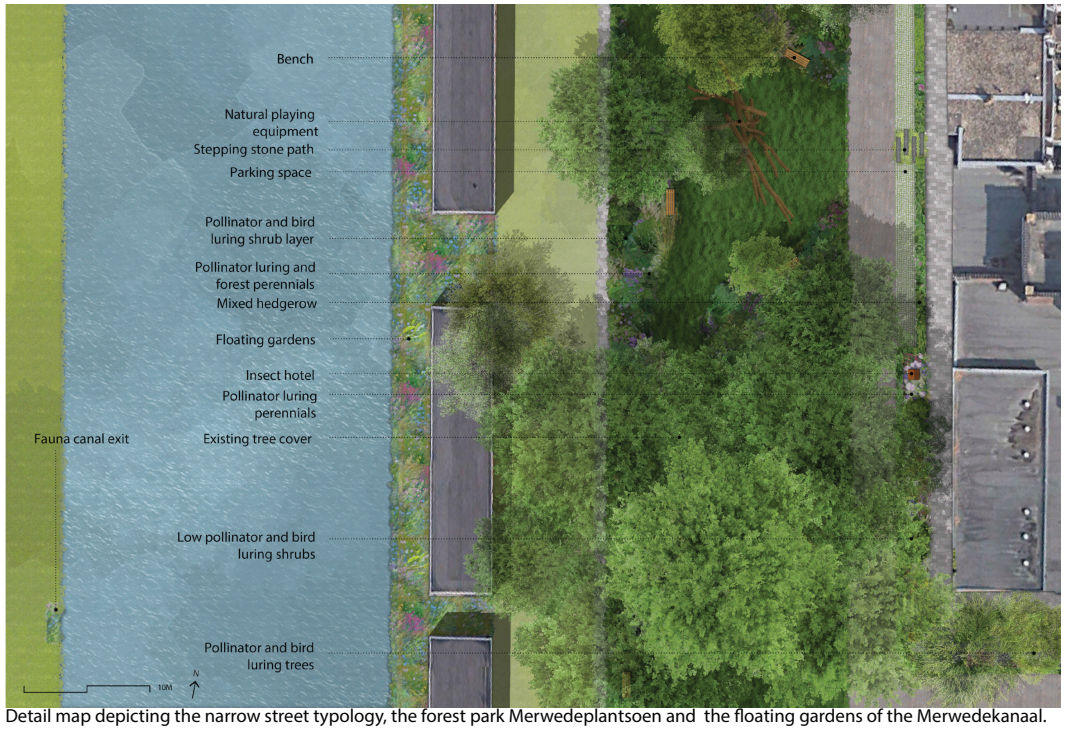
Fragmentation, degradation, and loss of habitats have caused serious loss of biodiversity. The main drivers behind these processes are of human origin: urbanisation and agriculture. While traditionally, conservation efforts have focussed on large natural areas, a shift towards urban areas is now clearly noticeable. It has become evident that urbanisation is one of the greatest threats to biodiversity. While at the same time, urbanisation poses great opportunities for the promotion of biodiversity. This is an opportunity to be grasped by landscape architects, as design will be essential in the conservation, protection or management of landscapes and habitats.

At the same time, current landscape architecture theory and practice does not suffice in providing landscape architects with the knowledge and tools to meet the biodiversity challenge. Current developments call for a new way of integrating ecological knowledge that is focussed more on ecological and biodiverse content in order to substantively address the loss of biodiversity in landscape designs, and thereby accommodate biodiversity conservation and strengthening.

This thesis expands the knowledge on designing for biodiversity by exploring how biodiversity can be integrated in urban landscape architecture. Thereby it addresses the overarching knowledge gap of how to design for biodiversity, specifically in urban areas. Related questions are answered in the process: which ecological knowledge is needed and/or relevant?; how can this knowledge be made applicable?; and what could that look like?

These questions are answered by developing biodiversity principles and guidelines that are accordingly applied on the case of Rivierenwijk in Utrecht to illustrate biodiversity by design. Thereby providing landscape architects with the knowledge and tools to maximise the biodiversity potential of their designs.

Section through the narrow street typology, forest park Merwedeplantsoen and the Merwedekanaal.

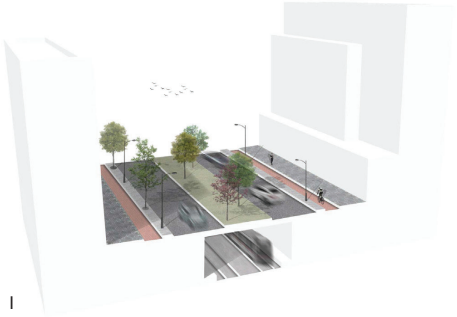


Detail map depicting the narrow street typology, the forest park Merwedeplantsoen and the floating gardens of the Merwedekanaal.

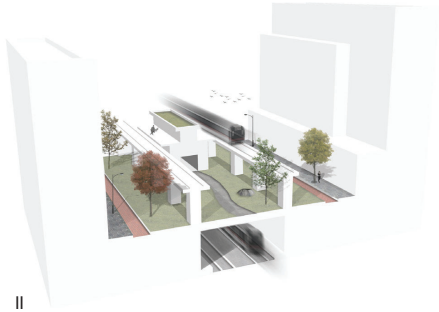
Detail map depicting the medium street typology.

Detail map depicting the wide street typology.

Visualisation of the wide street typology.



I

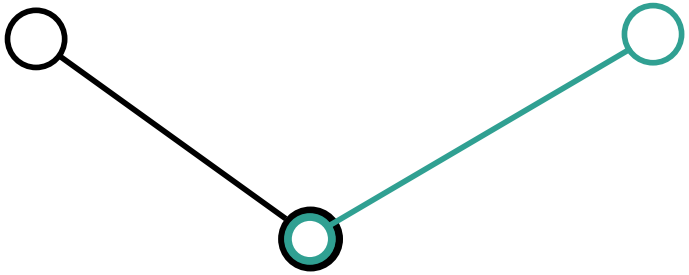


II

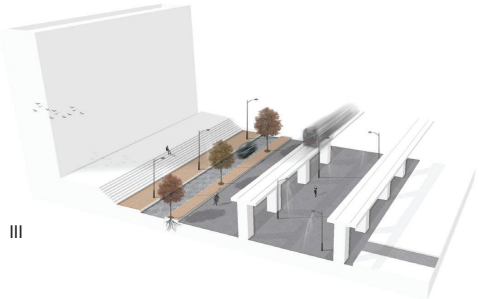
#1 TOD strategy
Mobility

#3 Sustainable road rating system
Green space

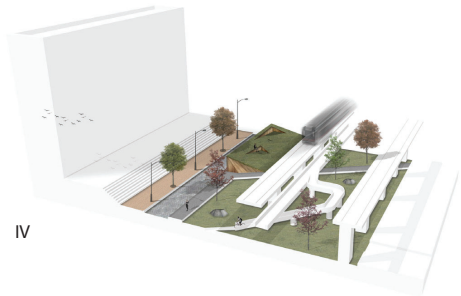
V



#2 Mixed land use approach
Elevated level & connect



III



IV

Tohid Korse
Supervisor & Examiner: dr. G.B.M. (Bas) Pedroli.
2nd Examiner: dr.ir. W.W.Y. (Wendy) Tan.

The effects of innovative modes of transport infrastructure on green space in urban areas.
A case study of elevated transport infrastructure in Amsterdam.

Abstract
Extension of urban areas and population growth lead to an increase of surfaces, covered by infrastructure and a decrease of urban green space, which contribute to the urban heat island effect. However, both infrastructure and green space are needed to serve the well-being of the urban population. Elevated infrastructure seems an ideal solution for this paradox, providing both transport capacity and green space. This thesis, main question is: Do elevated transport infrastructures have characteristics to secure or create urban green space, resulting in a balance between infrastructure and green space? The city of Amsterdam is used as a case study. The research design consists of a literature, reference and baseline study. Finally, a research by design, provides spatial recommendations for elevated infrastructure and green space development in Amsterdam. This thesis shows that an elevated construction can indeed benefit the urban green space, thanks to its space creating construction. The extent to which the elevated infrastructure may benefit the urban green space is determined by the spatial context, construction type, mobility form and social or economic functions.

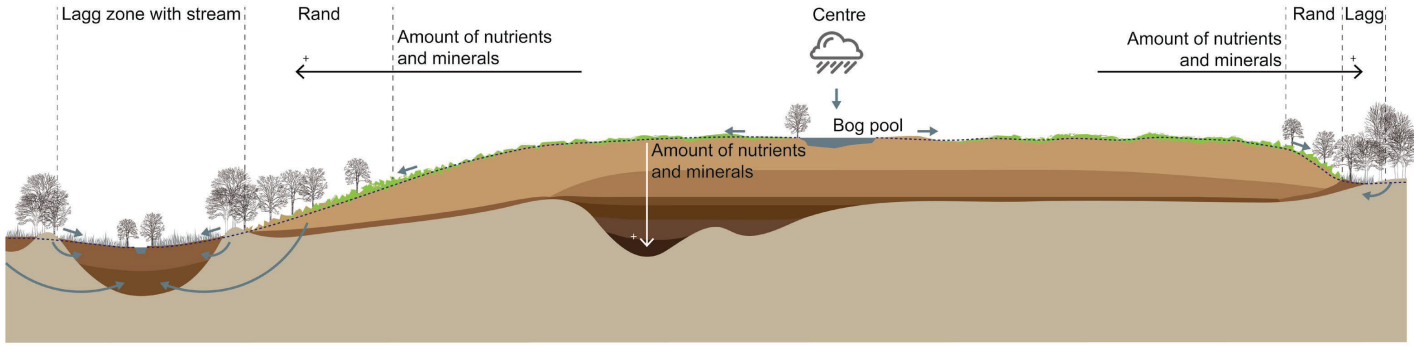
Key words: Urban green space, elevated transport infrastructure, urban heat island effect, mixed land use, transit orientated development.

I Current situation at the Wibautstraat, City centre (Author, 2018).
II Proposed elevated tram track at the Wibautstraat, City centre (Author,2018).
III Current situation at the Kraaiennest station, Urban lobes (Author,2018).
IV Proposed elevated bicycle track the Kraaiennest station, Urban lobes (Author,2018).
V Three main theories to benefit urban green space and mobility (Author,2018).
VI Impression of the proposed tram track at the Wibautstraat (Author, 2018).
VII Impression of the proposed bicycle track at the Kraaiennest station (Author, 2018).
VIII Impression of the proposed Hyperloop track at the Green Wedges (Author, 2018).

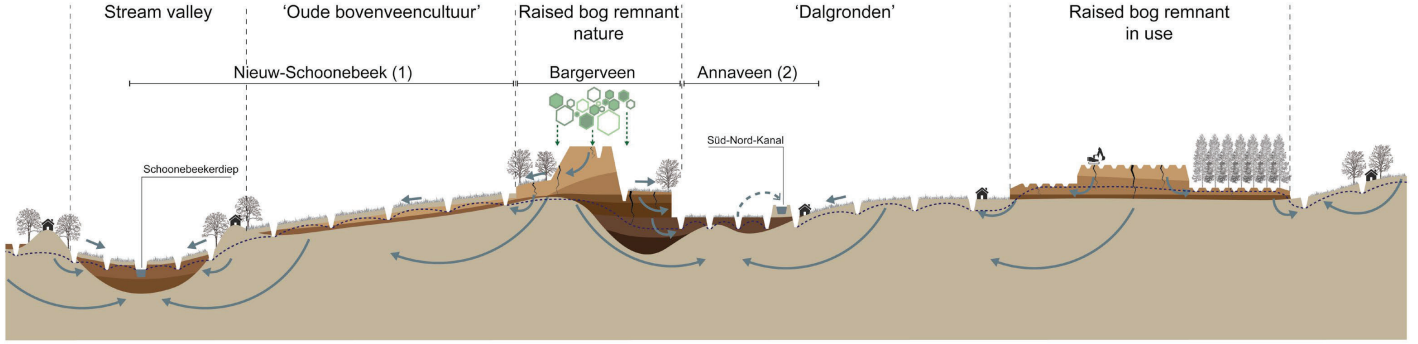
VI

VII

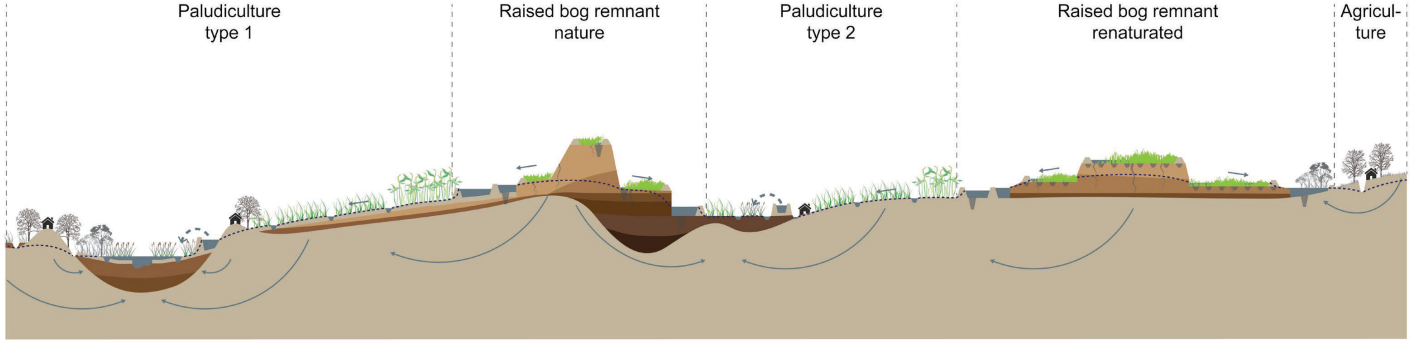
VIII



Intact raised bog ecosystem



Degraded raised bog landscape



Regenerated raised bog landscape

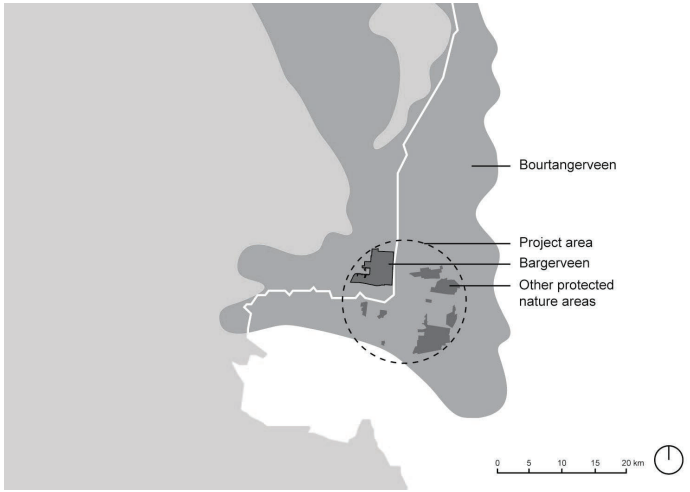
Ruud Hesselink
Name supervisor: Michaël van Buuren

Paludiculture Landscape Machine

Regeneration of the raised bog landscape
Bargerveen landscape system, The Netherlands and Germany

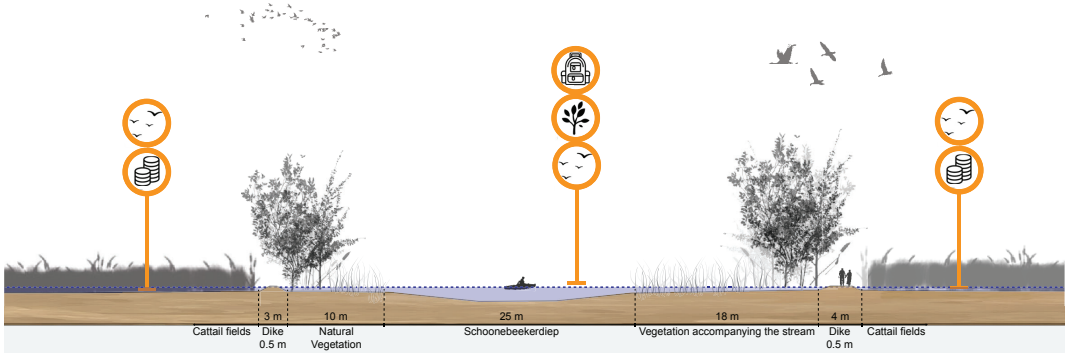
Abstract

The current agricultural land use and drainage of peatlands causes peat oxidation which results in CO_2(-eq) emissions, soil subsidence, lowering of water- and soil quality and a lesser biodiversity. This degradation of peatlands is especially problematic around raised bog nature reserves such as Bargerveen because they require wet conditions for their conservation. To restore this valuable raised bog ecosystem and its services, surrounding lands need to be rewetted and the problem of nutrient overloading needs to be solved. This thesis explores the implementation of large-scale paludiculture, the productive use of wet peatlands by agriculture, to support the restoration of the raised bog ecosystem and to create a regenerative raised bog landscape. This is done by using the design theory of Landscape Machines in which the landscape is envisioned as a living system. Analysis revealed how the raised bog landscape functions, how it is degrading and what interventions can be taken to regenerate it. The most promising paludiculture crops for the raised bog landscape were cattail, reed, willow and peat moss. With the proposed interventions in the designs and the simulation of a *Moorausbruch*, the hydrology can be improved and the problem of nutrient overloading solved. With the designs, a landscape can arise in which agriculture and nature complement each other and where new possibilities and opportunities arise. The results are two models for two landscape types that can regenerate the raised bog landscape with paludiculture.

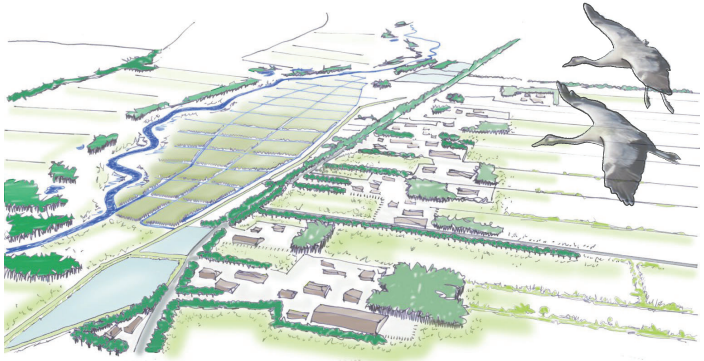


Project area: cluster of nature reserves including Bargerveen

Paludiculture landscape near Nieuw-Schoonebeek



Section A-A': Impression of remeandering of the Schoonebeekerdiep



Bird's eye perspective of the stream valley of Schoonebeekerdiep

Impression of the stream valley in winter

Paludiculture landscape in the polder of Annaveen

Polder Annaveen in summer

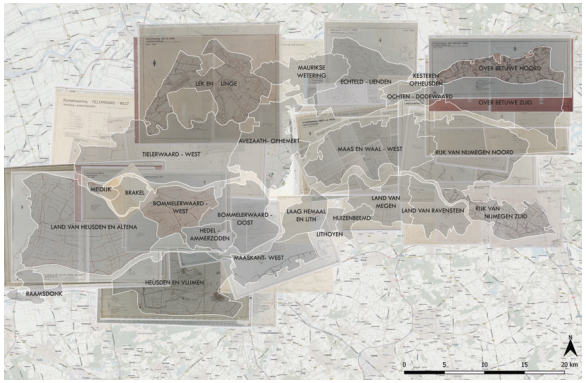
Francine Kronenberg
Supervisor: Marlies Brinkhuijsen

Tielerwaard-West 2..0

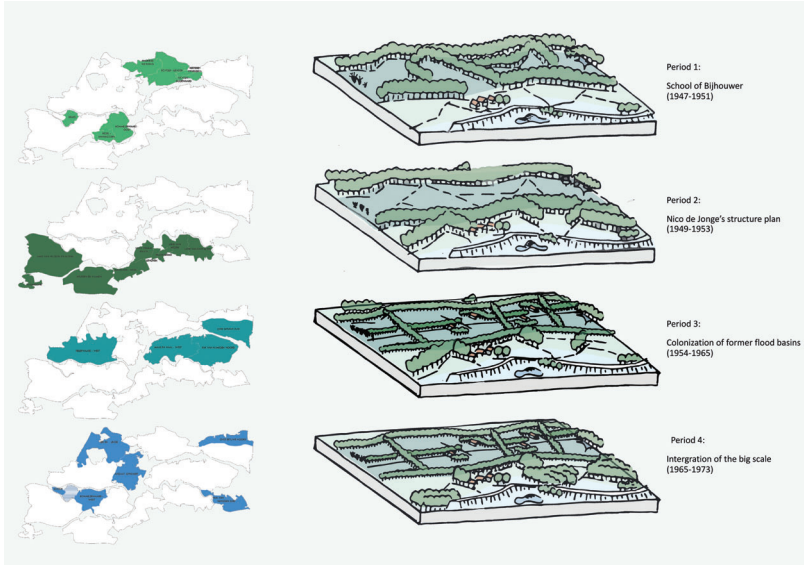
The legacy of the design language in 20th century Dutch landscape plans and its significance in terms of the present and future landscape of Tielerwaard-West.

Abstract

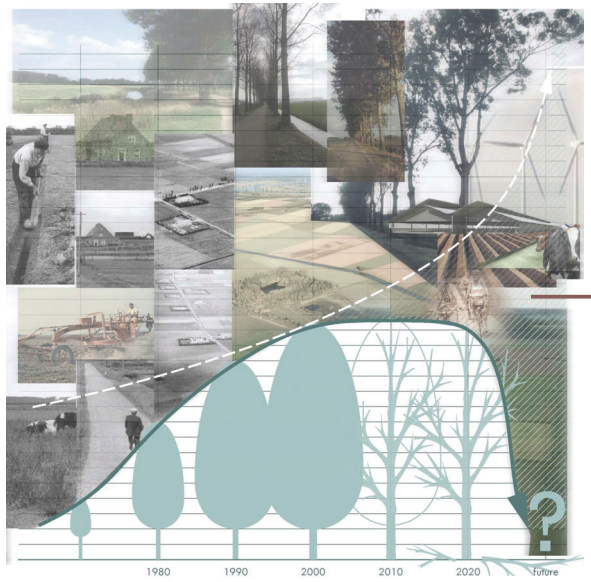
In the 20th century (1920-1970), land consolidation programmes drastically transformed the Dutch landscape to modernize the agricultural production. With the instrument of a landscape plan, landscape architects contributed to this by designing planting structures to improve the aesthetic quality of the landscape. Now, half a century later the planting structures of the landscape plans have fully grown and gain identity to the Dutch landscape. The existing societal problem of the vulnerability of the plantings from the landscape plans are described in the thesis. In relation to that a challenge for local authorities and landscape architects is addressed to anticipate to climatic, social and economic wishes and demands of the future. The argument of the thesis is to explore to what extent the design language of the former landscape plans could persist those new demands of society and serve as useful guidance for future re-design of the landscape plan landscapes. The focus is on the former landscape plan of Tielerwaard-West in the context of the whole Rivierenland region in the Netherlands. In this thesis, design language includes design ideas (national scale), designconcepts (regional scale) and design tools (local scale) that can be considered as the building blocks of the landscape plan from 70 years ago. This design language was used in the original designs of the landscape plans and was found through research on design, by analysing maps, drawings and literature of the landscape plans. Together with an evaluation of the current situation and inventarisation of the future developments, the landscape plan design language constitutes the basis for a new conceptual design for the Tielerwaard-West (design concept, design rules and street profiles). The landscape plan of Tielerwaard-West became a layer in the cultural biography of the landscape and with the notion of 'preservation by development' the legacy of the 20th century landscape plan retains significance in the future landscape.



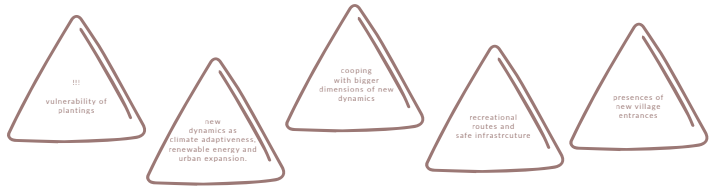
collection of landscape plan region Rivierenland



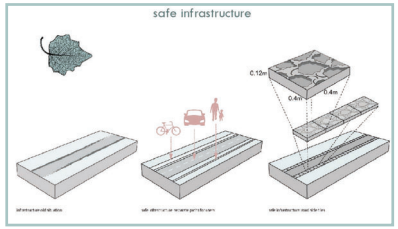
development of a designconcept region Rivierenland

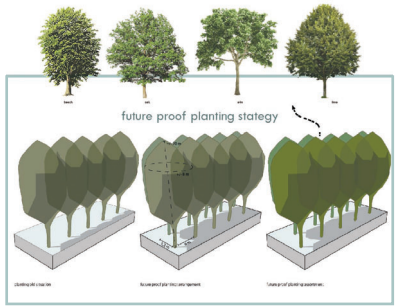


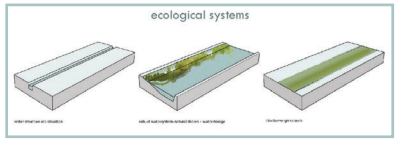
Collage showing the vulnerability of the plantings (growing curve plantings) of the landscape plan vs the spatial challenge of society

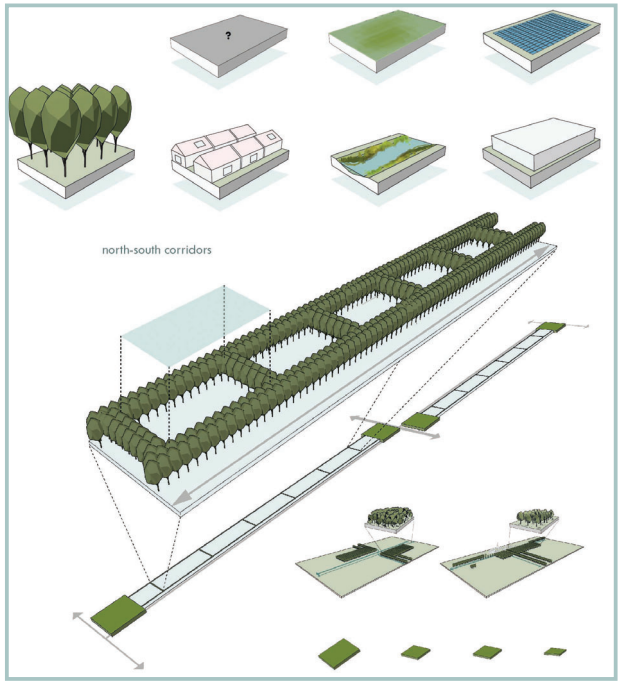


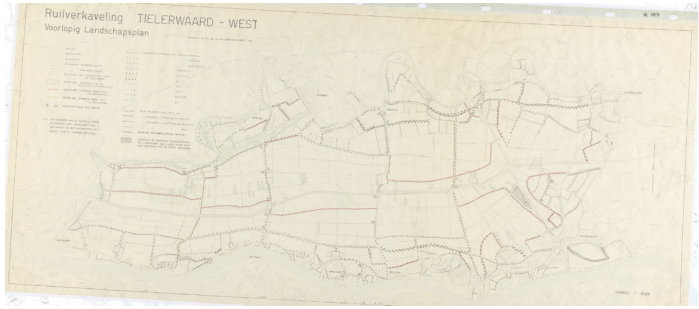
Design rules (Tielerwaard-West):











Original landscape plan Tielerwaard-West

Designrenewal (Tielerwaard-West):

dike with highlights

small profile levee

provincial road levee-floodbasin

provincial road levee

corridor small profile flood basin

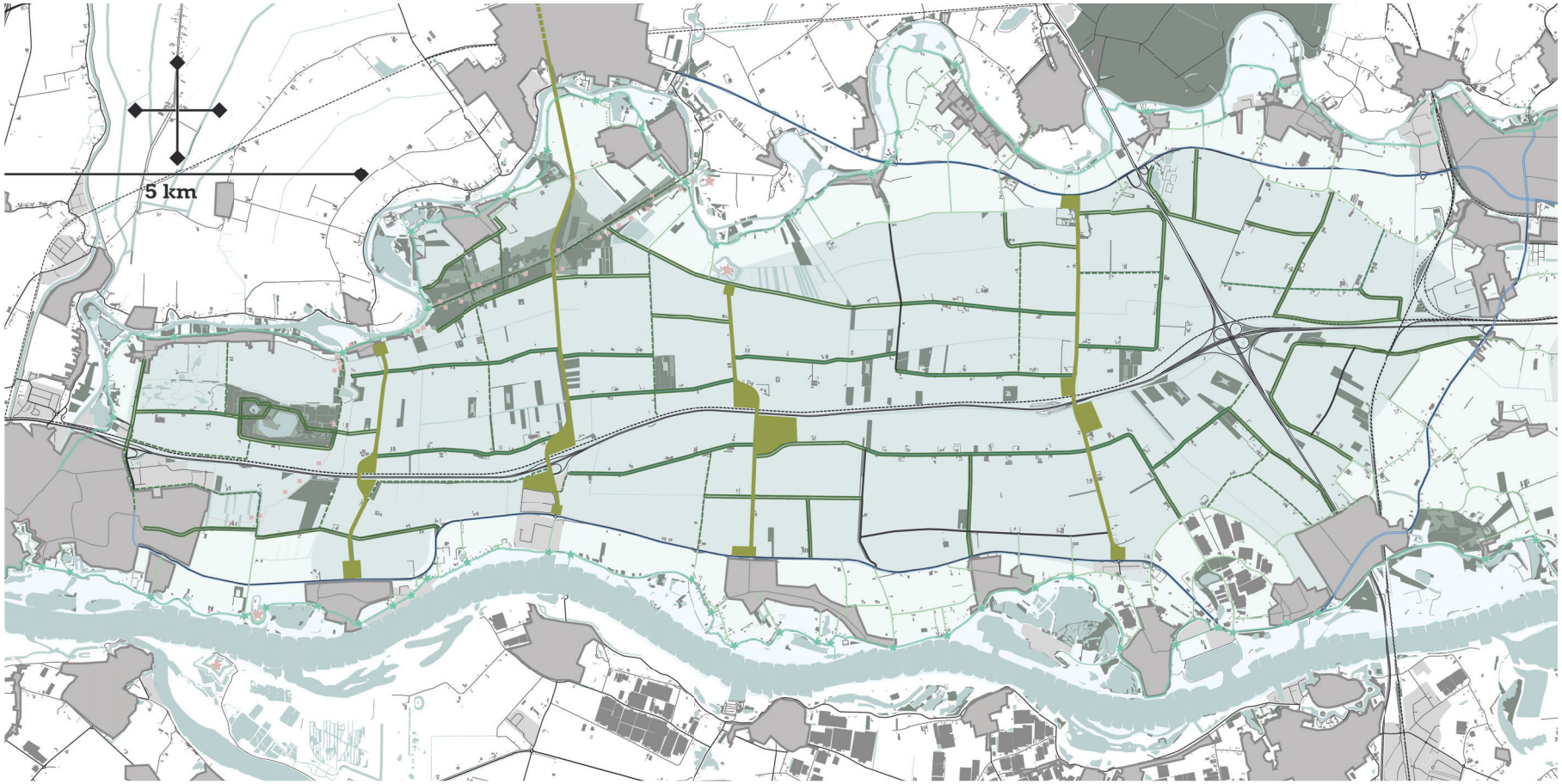
corridor wide profile flood basin

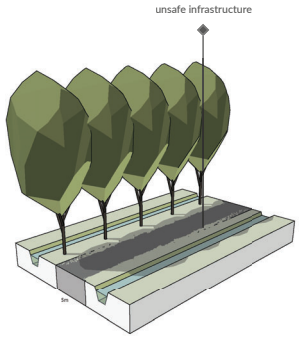
small profile no planting floodbasin

small profile double-sided planting floodbasin

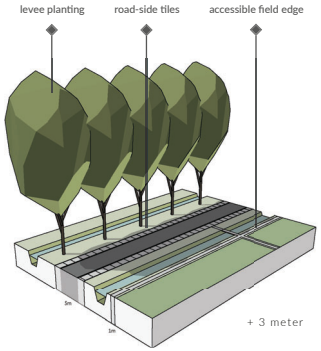
small profile hedge planting floodbasin

farmyard street profile flood basin

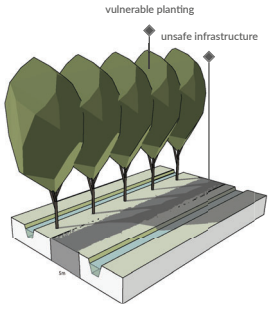




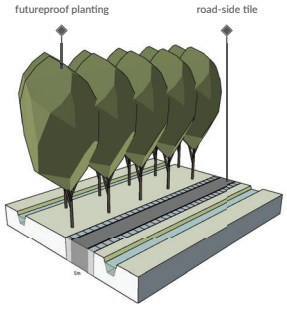
small profile (levee)
current situation



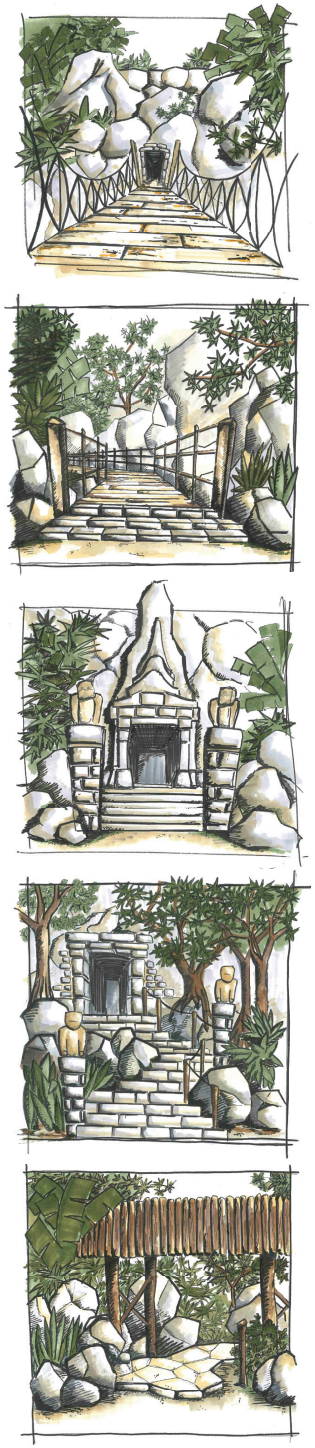
small profile (levee)
design



one sided planting
small profile (flood basin)
current situation



one- & double sided planting
small profile (flood basin)
design



Sketches of the canyon

Masterplan: Adventure canyon, parking area at Apenheul, Apeldoorn

Jack Reijnders
Rudi van Etteger

Monkey Business in Apeldoorn

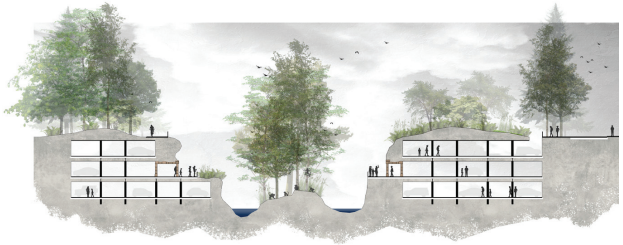
Towards an attractive parking experience at theme parks.
Apeldoorn, the Netherlands

Abstract

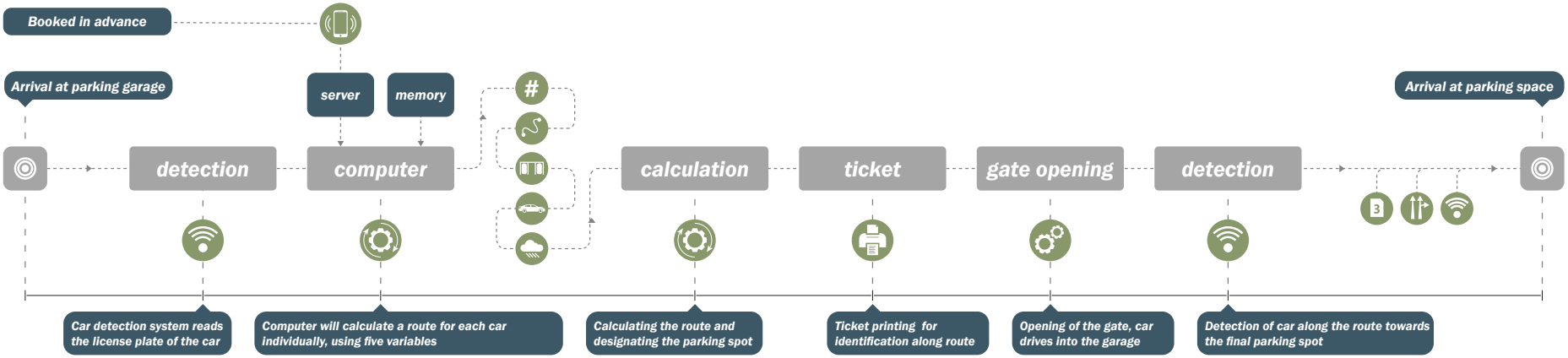
Changes in the world economic system towards experience based economies have forced businesses to review their offered service, providing quality experiences for customers instead. The theme park industry is an example within the tourist sector which is fully adapted to providing high quality experiences inside the theme park, though the supporting infrastructure outside is seriously falling behind. Especially car park landscapes have little contribution to the overall experience, however being an essential element in the leisure sector as people spend much time in these areas, they are still regarded by designers as single function spaces, where multi functional use of space is preferred.

This research offers a renewed inside in the position of car parks as a part of the combined experience for visitors of theme parks and similar tourist destinations. In contemporary theory, car parks fulfil the role of infrastructural element, but this research suggests an essential shift in the functionality of the car parks as the space might be converted into a theme park expansion.

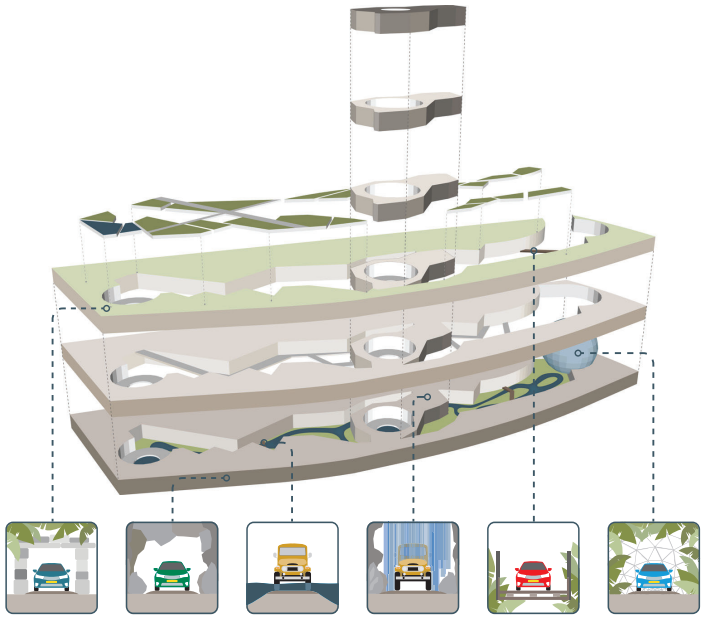
Using Imagineering design principles as guidelines to create a car park which serves as the first attraction of the theme park, the focus is on providing high quality experiences before visitors pass the park entrance. An electronic routing system is introduced to guide car drivers towards a designated parking space, by calculating unique routes for each individual car which guides them along a number of surprising adventures. The resulting insights have been implemented in a design of the car park at Apenheul, a zoological theme park and a major tourist attraction in the region, lacking possibilities for further growth resulting from pressure by the surrounding landscape. The design provides visitors with a quality experience and adventurous activity while still in their car, and minimizes the distance between parked car and theme park attractions.



Animal enclosures closely located to the parking area

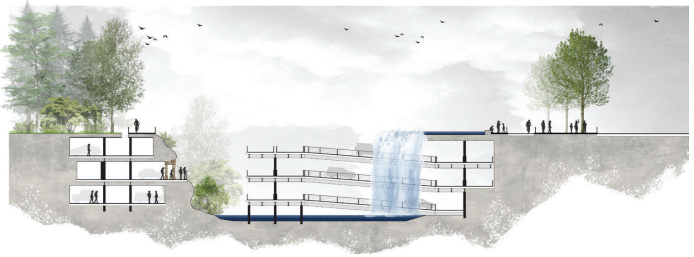


Technical flow of Parking Direction System



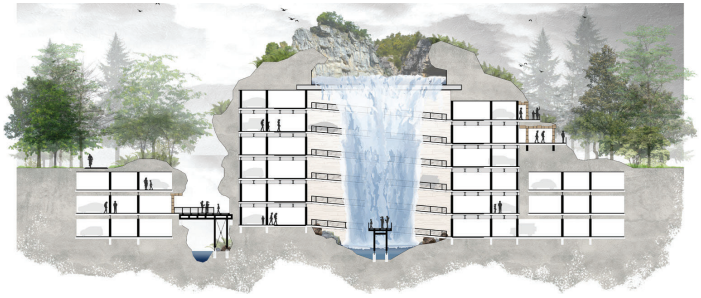
3D model of the parking area

The mountain in the centre of the canyon, including the entrance towards the caves inside.



Section of the canyon at the car park entrance.

Dome, allowing for



Mountain section, revealing the inside of parked cars around a circular waterfall.