



A new
**dynamic
landscape**
for the
Haringvliet

Landscape architecture explorations for Delta 21

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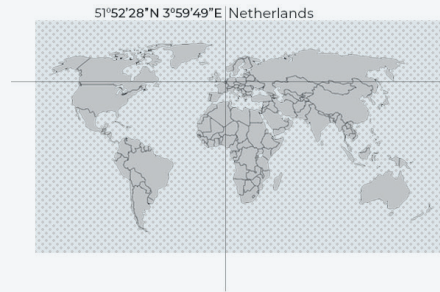
Presentation

Introduction	Analysis	Design principles	Design exploration	Conclusion
Design brief	Region	Conceptual principles	Technical requirements	Conclusion
Fascination	6 landscape types	Tools	Natural processes	Reflection
Problem statement	6 landscape transitions	Case studies	Exploration of the proposed Delta 21 layout	
Objective	Challenges and opportunities		Transition zones at Delta 21	
			Results and implementation	



Introduction

Location

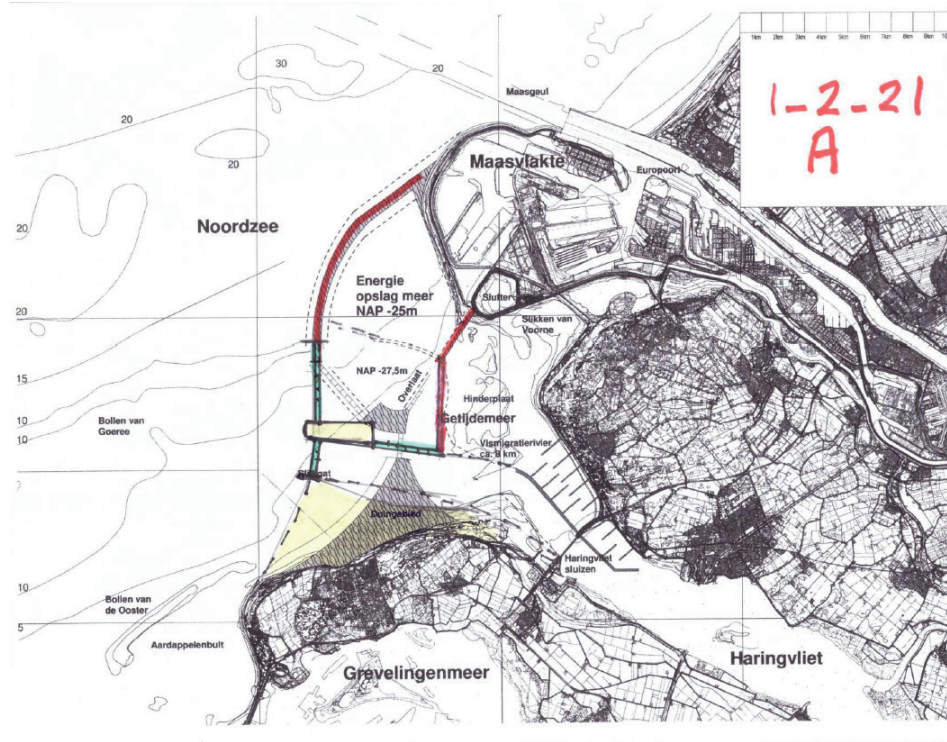


Design brief

Delta 21 plan

A new initiative to realize:

- Open river/sea connection
- New tidal nature park
- An energy lake as hydro power battery
- Enhance flood protection
- Pump-turbine station, spillway and storm surge barrier



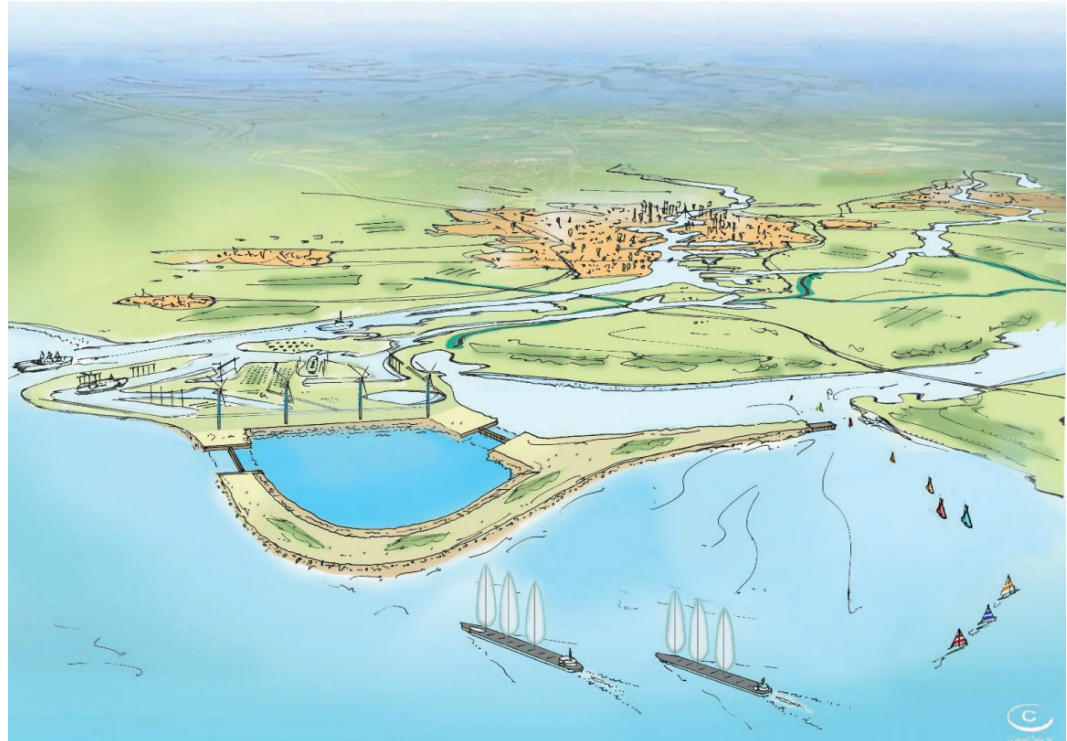
DELTA
21

Source: Delta21.nl

Design brief

Delta 21 plan

This graduation project I incorporated Delta 21 into the design exploration and approaches this initiative from a landscape architectural view.



Fascination

Image of a delta



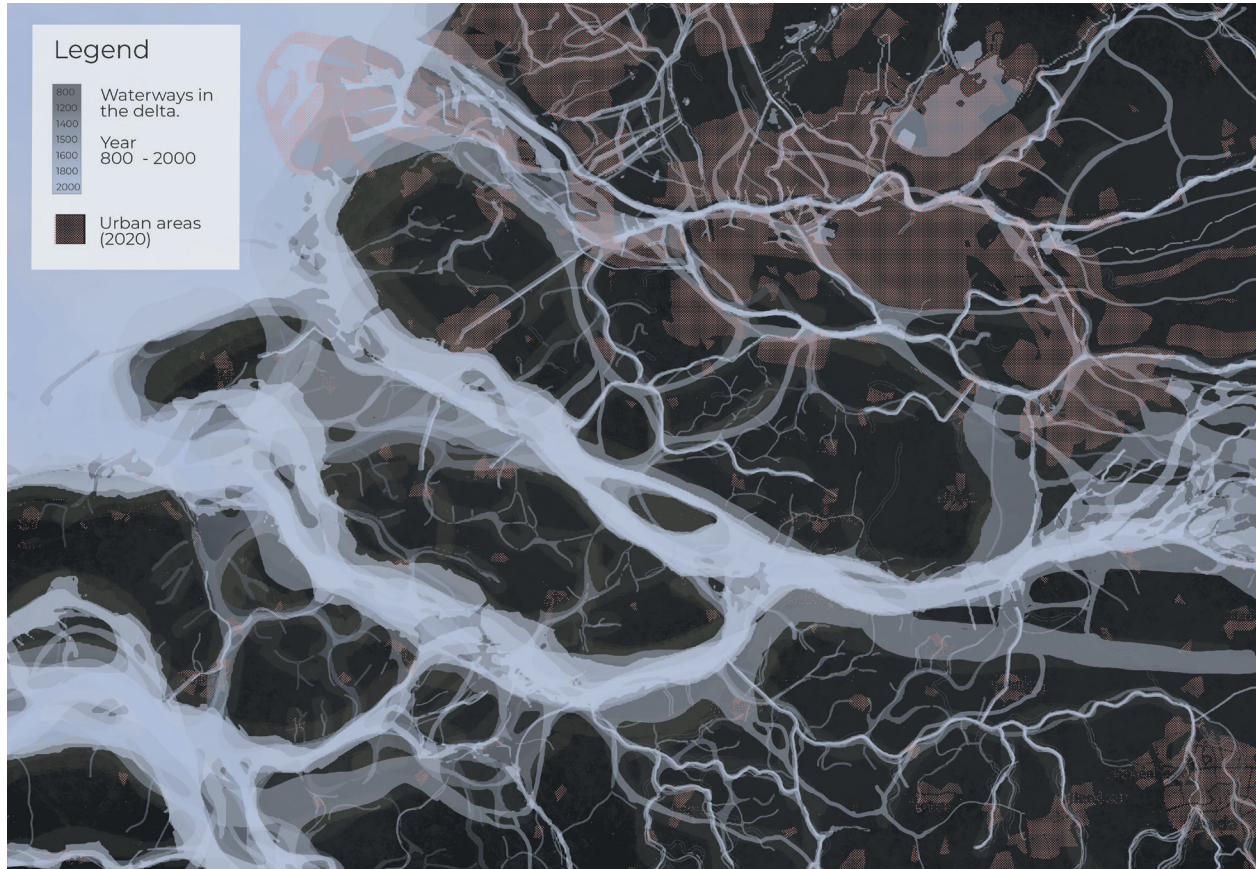
→ Rich interface between land and water for nature and economies

The Dutch Delta



→ Single line interface

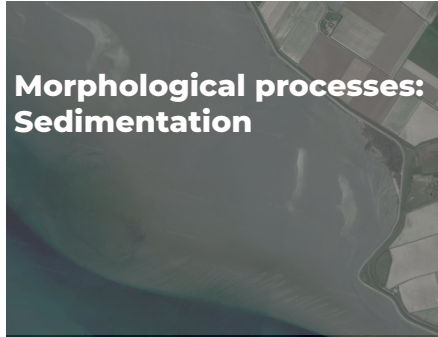
Fascination



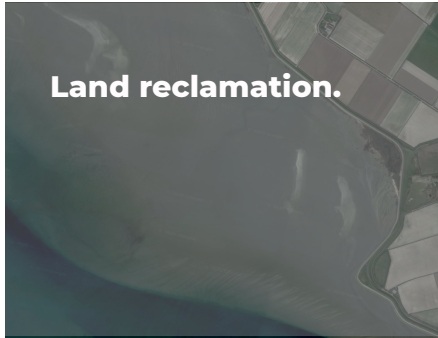
Dutch interface: Open river/sea



Dutch interface: Open river/sea with processes



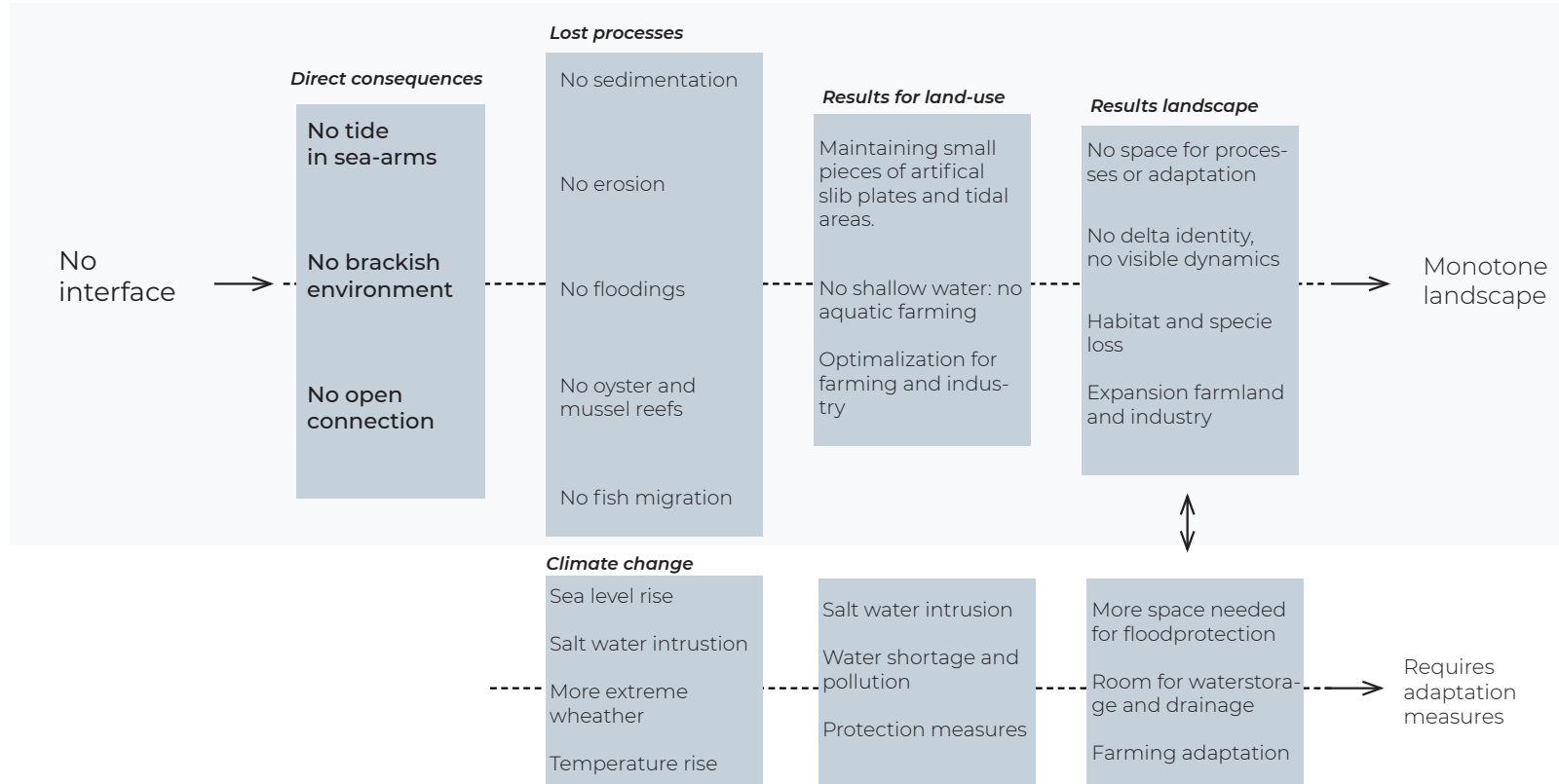
Dutch interface: Open river/sea with processes resulting in



Dutch interface: Open river/sea with processes resulting in the following landscapes:



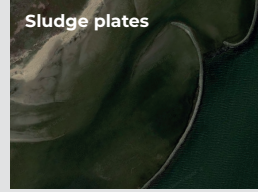
The damming resulted in no interface between sea and river, the consequences are:



Problem statement

The disappearance of the **dynamic interface** and the corresponding **natural processes** resulted in a more **monotone landscape** with **habitat losses**, no space for **dynamics** or **adaptation** and a loss in the **identity of the delta**.

Sludge plates



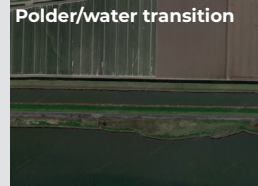
Tidal nature



Old creeks



Polder/water transition



Research Question

How can socio-ecological inclusive design be used to create new dynamic estuarine landscape interfaces that integrates flood protection, ecology, sustainable economies and recreation?

Sub-questions

How did the delta landscape evolved to its current state and what landscape shaping processes were involved in this?

In what way can natural processes be introduced in the design of land/water interfaces?

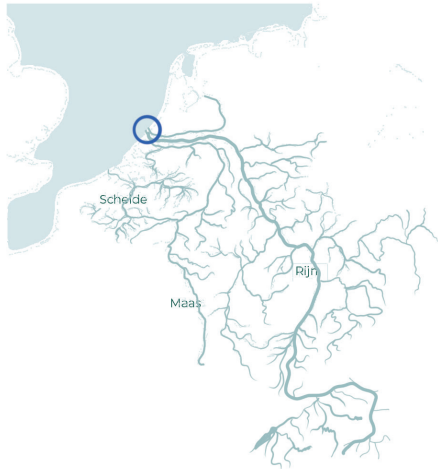
How can I developed a landscape interface in which the occurrence of natural processes create a dynamic delta landscape and which facilitates flood protection, ecology, recreation and sustainable economies.

An aerial photograph of a coastal landscape. A wide, light-colored beach runs horizontally across the middle of the frame. To the left, the ocean waves are visible. To the right, a river or stream flows through a wetland area, characterized by various shades of green and brown. The background shows more land with sparse vegetation and a few small structures.

Analysis

Haringvliet region

Delta



Ecology



Port Rotterdam



Target species

Name (scientific): *Alopecurus bulbosus* (foxtail grass)
Origin: Indigenous
Endangered: Red list
Representative for: Salt water presence in groundwater
Habitat: Dry salt marsh, absence soil disturbance like mowing, intense grazing, fertilizing. (reason for decreasing)



Name (scientific): *Anarhynchus alexandrinus* (kentish plover)
Origin: Europe
Endangered: On red list
Representative for: Insects, shrimps, crabs, snails
Habitat: Dynamic coastal areas with little vegetation, young sandbanks/beaches



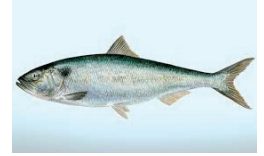
Name (scientific): Haematopodidae (oystercatcher)
Origin: Europe Afrika (winter)
Endangered: Decreases (decrease in habitat and food)
Representative for: Insects, shrimps, oysters, snails, worms
Habitat: Sandbanks and mud plates, diverse and wet grasland.



Name (scientific): *Phoca vitulina* (harbour seal)
Origin: Coast Northern Hemisphere
Endangered: No
Representative for: Disturbance (noise, light), fish stock
Habitat: Tidal areas, rocky coast, sand banks, cliffs, deeper water (for hunting).



Name (scientific): *Alosa fallax* (twaite shad)
Origin: East atlantic ocean
Endangered: No, but extinct in the Netherlands
Representative for: Gradual fresh/salt water transition
Habitat: Fresh water for breeding, estuaria to grow up (important), sea as adult fish



Name (scientific): *Zostera* (seagrass)
Origin: Shorelines Northern Hemisphere
Endangered: Red list, rare in the Netherlands
Representative for: Biodiversity of fish and birds
Habitat: Lives in saline and brackish water and settles in the soil.



Name (scientific): *Lacerta agilis* (sand lizard)
Origin: Northern Hemisphere, Europe and Asia
Endangered: Red list
Representative for: Dynamic dunes, in first states of succession
Habitat: Sun orientated sand dunes with a combination between open land and shrubs.

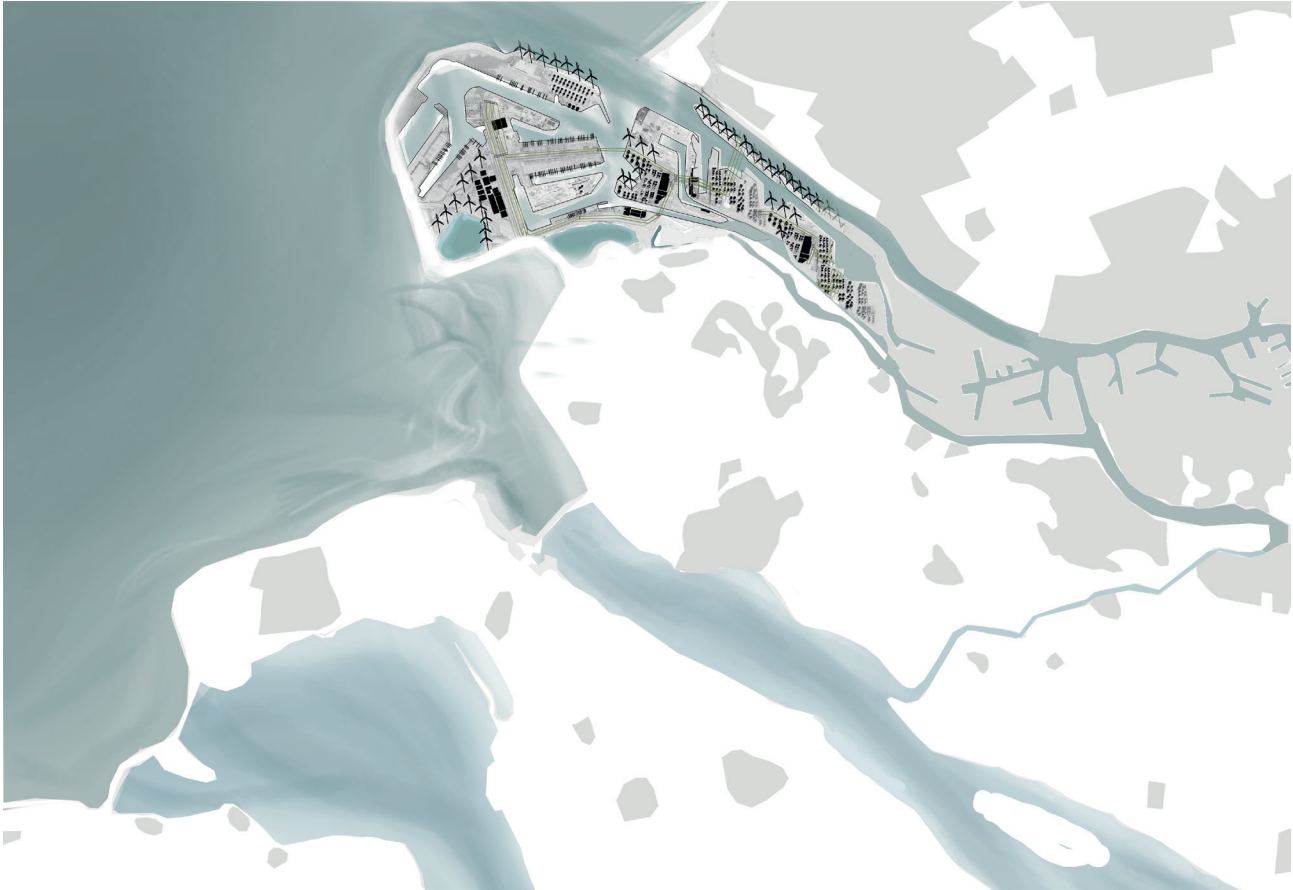


Analysis

Landscape types



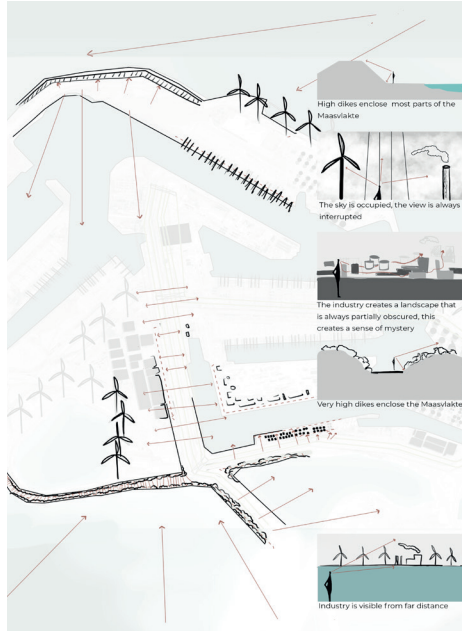
Analysis



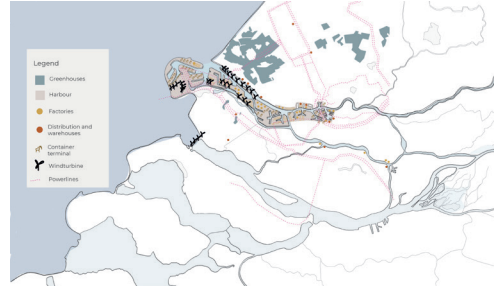
Utilitarian



Landscape experience



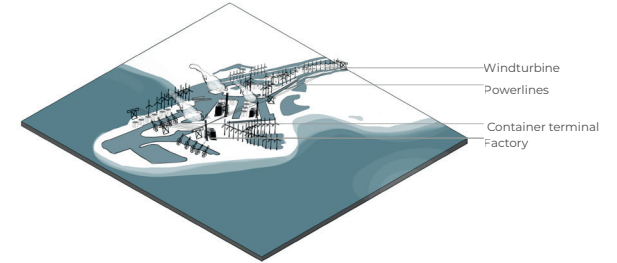
Utilitarian landscape



Landscape structure



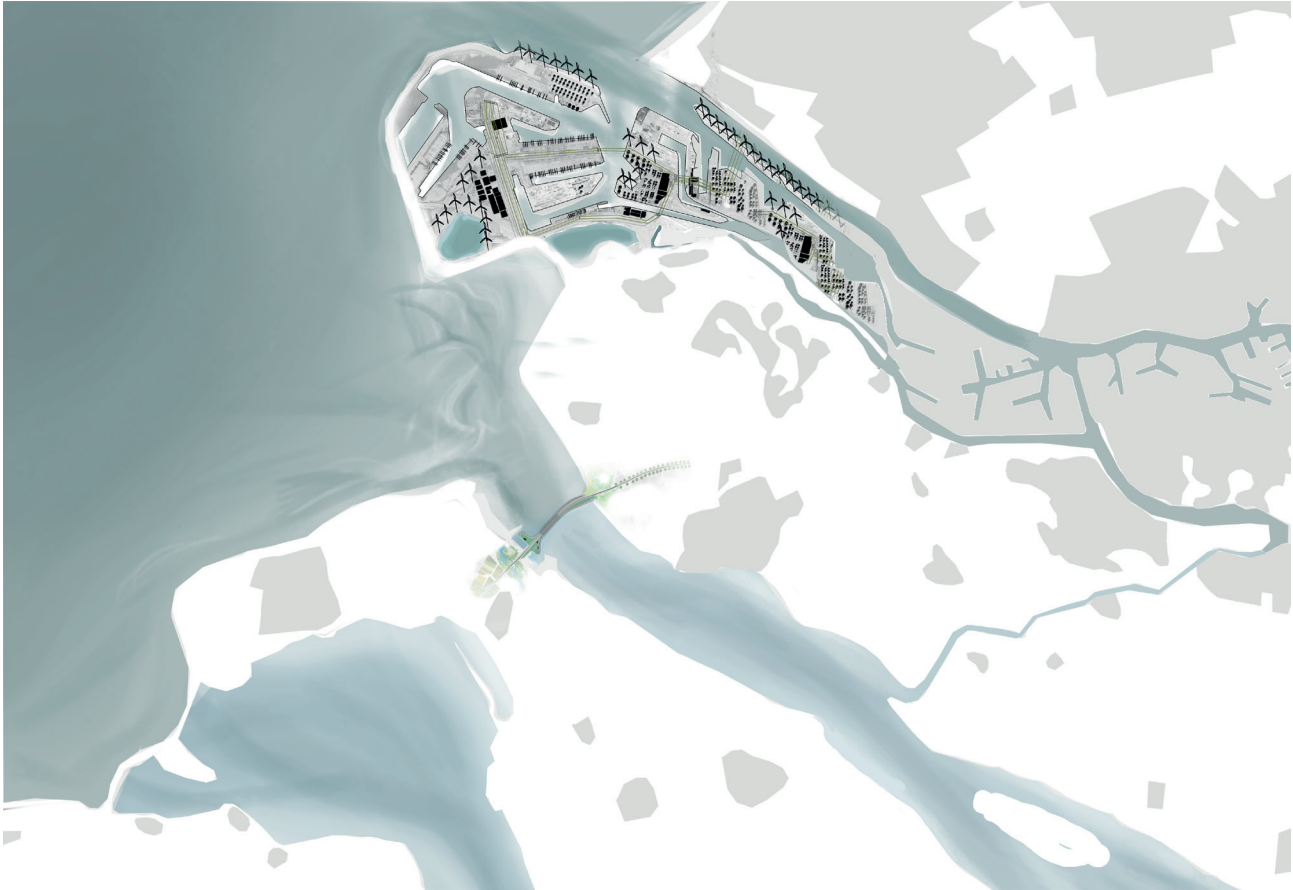
Elements of the utilitarian landscape



Landscape shapers

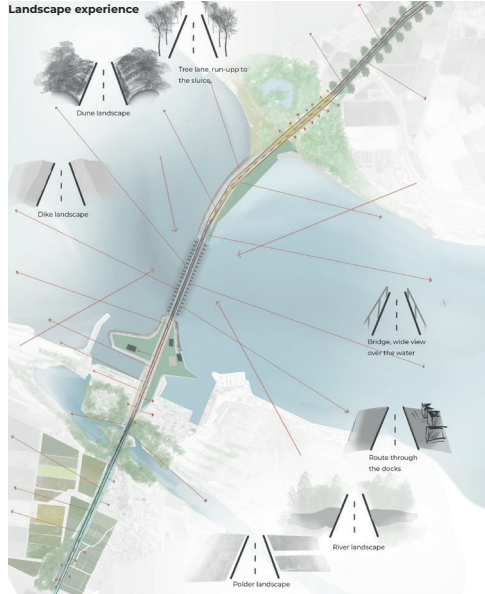


Analysis



Dike and Sluices





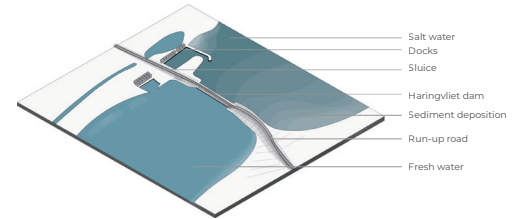
Dikes and sluices landscape



Landscape structure



Elements of the dike and sluice landscape



Landscape shapers



Flood defence structures



Cultural movements



Fishery and trade

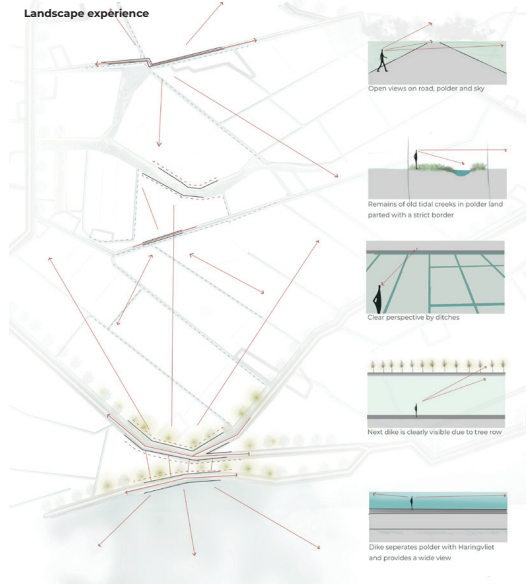
Analysis



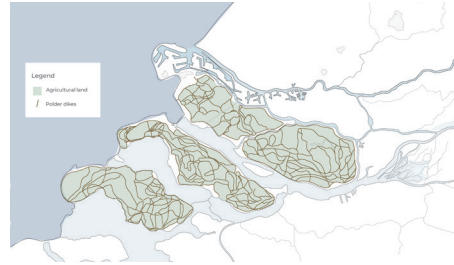
Polder



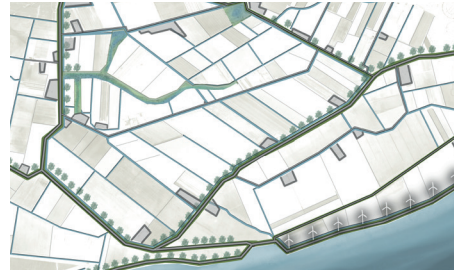
Landscape experience



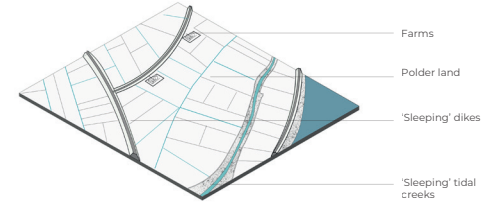
Delta polder landscape



Landscape structure

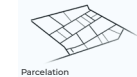


Elements of the polder landscape

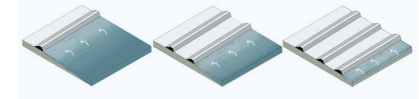


Landscape shapers

Production and efficiency



Land reclamation by sediment accumulation and dikes



Analysis



Urban



Delta polder landscape



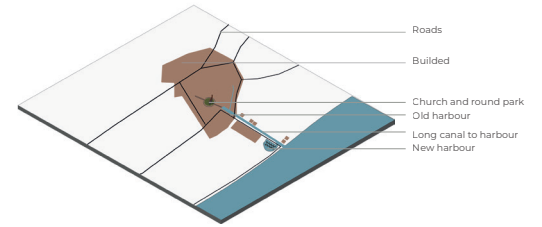
Landscape experience in 1953



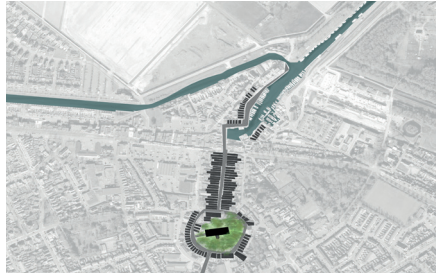
Landscape experience in 1953



Elements of the urban landscape



Landscape structure



Landscape shapers



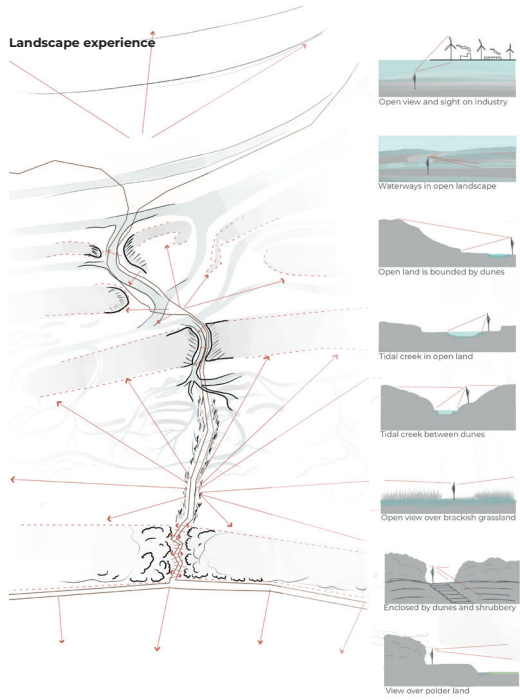
Analysis



Coast



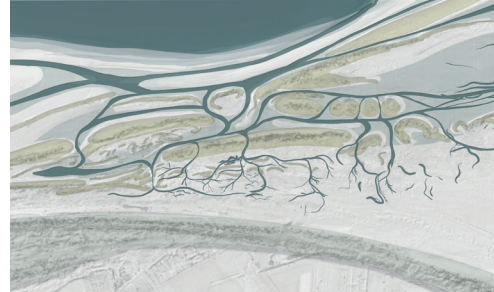
Landscape experience



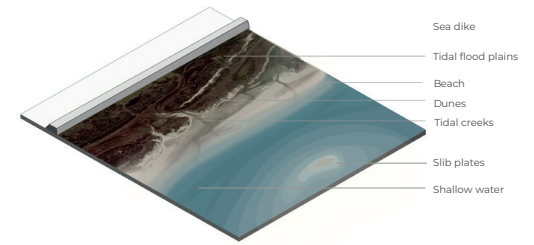
Coastal landscape



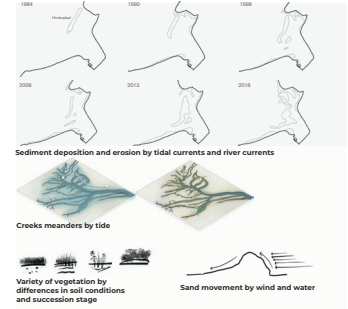
Landscape structure



Elements of the coastal landscape



Landscape shapers



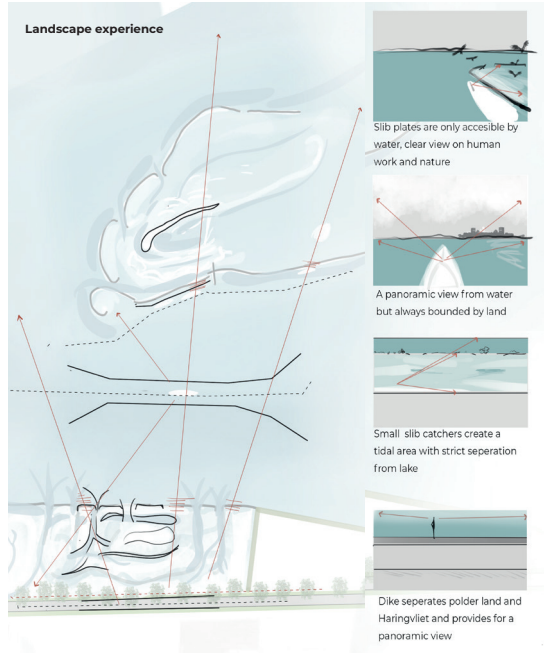
Analysis



Sea-arm



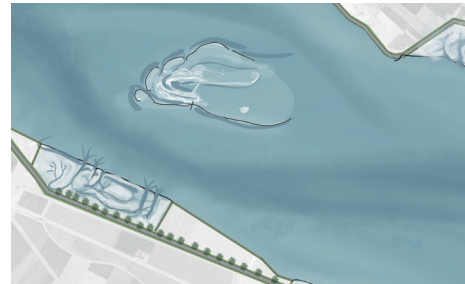
Landscape experience



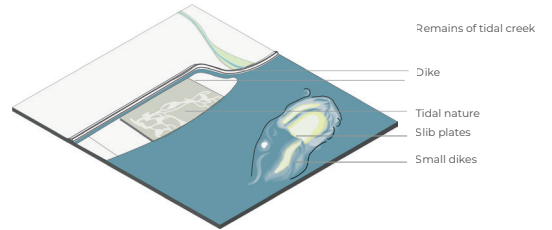
Sea-arm landscape



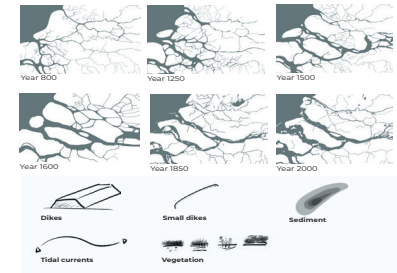
Landscape structure



Elements of the sea-arm landscape



Landscape shapers



Analysis - First conclusions



The Haringvliet Delta is very **rich in structures and experiences**. Each landscape type **adds value** to this delta landscape in different ways. However, each landscape type **stands on its own**, with their own systems and experiences. **The delta is a fragmented landscape.**

Analysis - Landscape transitions



Analysis - Landscape transitions



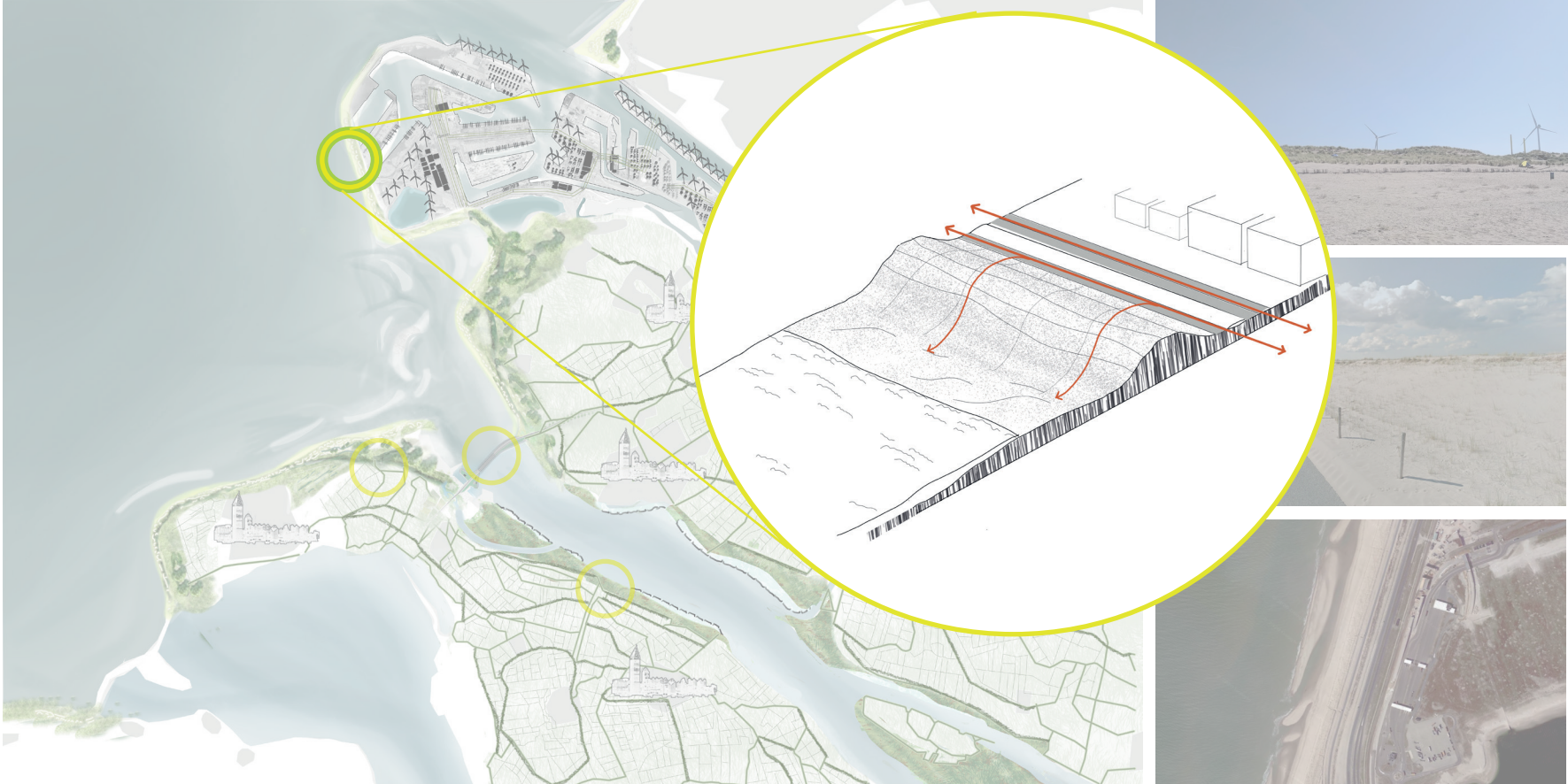
Analysis - Landscape transitions



Analysis - Landscape transitions



Analysis - Landscape transitions



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Analysis - Landscape transitions



Analysis - Landscape transitions



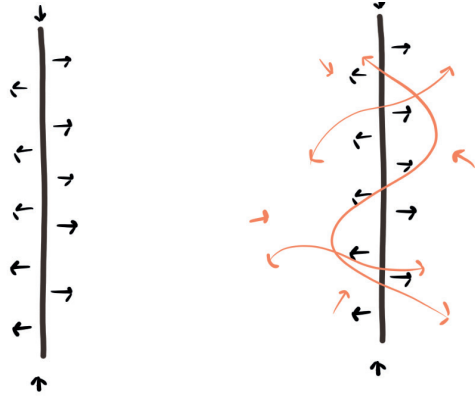
Analysis - Landscape transitions



Analysis - Conclusion- Dikes extracted the interface and experience of the estuarine landscape

Connection

The character of the interface defines the area as being experienceable as a whole or in enclosure. It can work as an edge or be part of the regional infrastructure.

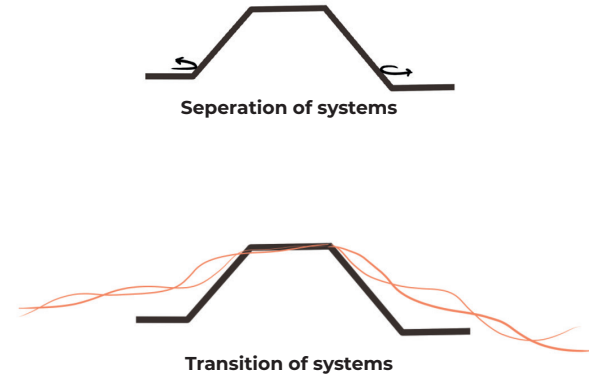


Boundary element

Binding element

Gradient

The character of the interface in the delta is too often the monotonous shape of the hard edge. There is no space for natural formation of biotopes, ecology gets little chance.



Seperation of systems

Transition of systems

Challenge and opportunity



Challenge:

Get rid off the hard edges and to return the estuarine environment and experience.

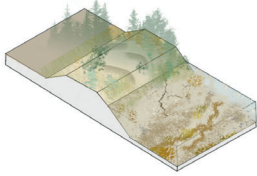
Opportunity:

Create a new estuarine landscape in front of the Haringvliet by incorporating Delta 21 with gradual land/water transition and river/sea transitions and by that restore the estuarine experience of the dynamics and the estuarine ecological habitats and corridors.

An aerial photograph of a coastal landscape. A wide, sandy beach runs horizontally across the middle of the frame. To the left, the ocean waves gently wash onto the shore. To the right, a winding river or stream flows through a marshy area, eventually curving back towards the beach. The background is filled with green marshland and some small ponds. The overall scene is a natural, undeveloped coastal environment.

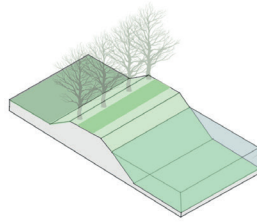
**Design principles
and
case studies**

The land/water transition, the flood defence structure, in different contexts



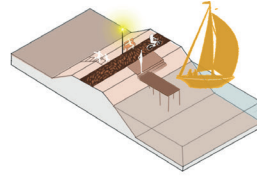
Dynamic dike

- Sediment accretion by tide
- Sediment accretion by river silt
- Toplayer movement by wind
- Erosion by tide
- Erosion by river discharge
- Ecological succession
- Sensible to water forces



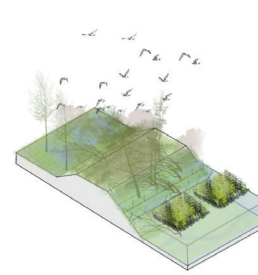
Spatial dike

- Profile (view towards and view top)
- Material and arrangement (view towards and view top)
- Movement and trace
- Width dike
- Height dike



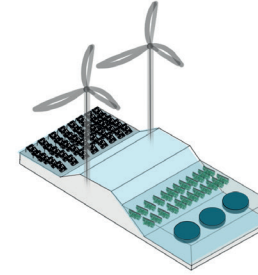
Social dike

- Dike as infrastructure
- Dike for recreation
- Dike as landmark
- Dike as heritage and storyteller
- Orientation
- Playing



Ecological dike

- Wetness
- Sun/shadow
- Slope
- Material
- Maintenance
- Wind/water/gravity force



Economical dike

- Electricity generator: windturbine, waterturbine
- Silt winning
- Aquaculture
- Saline agriculture
- Waterpurification
- Housing or holiday cabins

Case studies

Land van Saefethinge - gradient, dimensions, type of nature (salt and fresh)



Coastal zone Katwijk (by OKRA) - open transition with hidden dike



Slufter Texel - gradient, dimensions, type of nature (salt)



Noorwijke duinen, dynamic dunes - notches within dunes



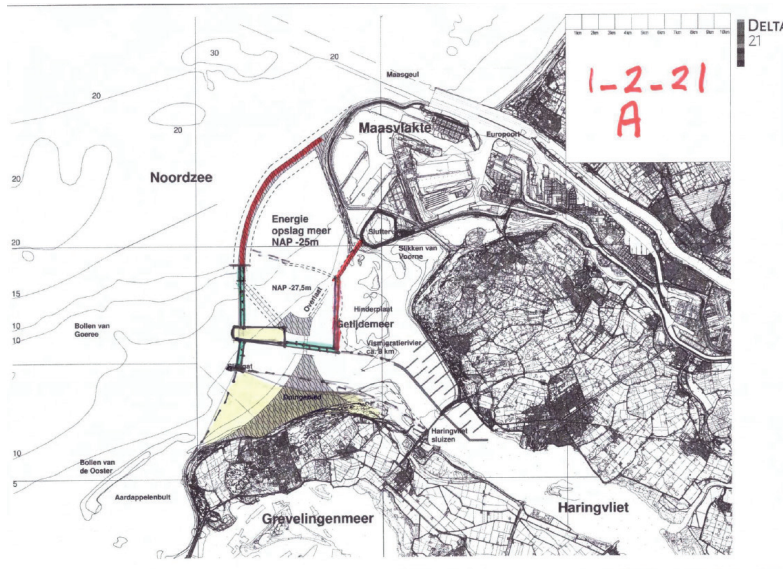
An aerial photograph of a coastal landscape. In the foreground, there is a wide, sandy beach with a shallow, winding channel of water. The middle ground shows a large, flat area of wetlands or marshland with a mix of green and brown vegetation. A small, irregularly shaped pond is visible in the upper left. The background consists of more dense, green vegetation. The overall scene is a natural, undeveloped coastal environment.

Design exploration



Technical requirements & natural processes

Delta 21 plan- technical requirements



Pump-turbine station, storm surge barrier and spillway must not be trapped with sediments.

Water fluctuations energylake 20 meters

(-5 NAP to -25 NAP)

Slope energylake minimum slope 1:10

Open connection Haringvliet - Sea

Dunes at least 400 meters (width)

Energylake surface minimum of 24 km²

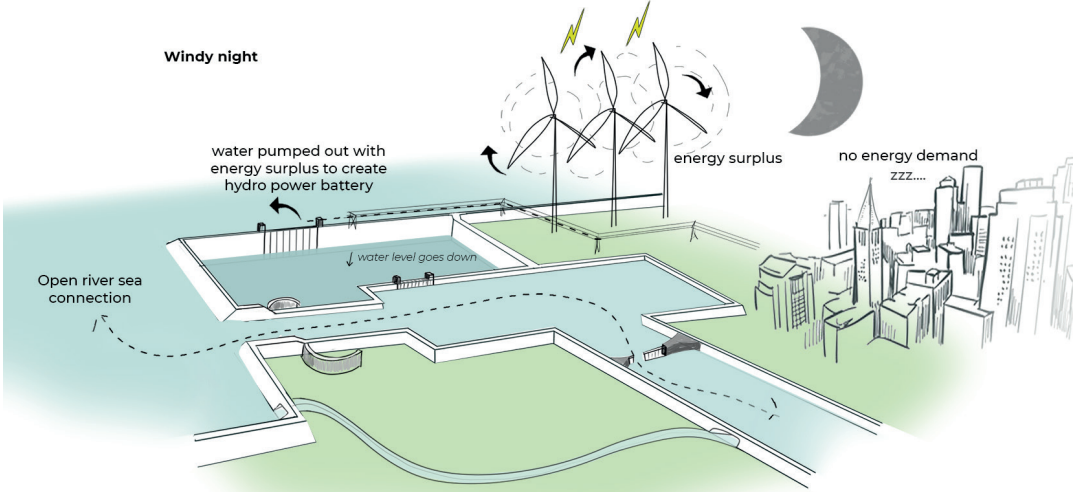
Pumps sea-energylake 2 km long

Pumps tidal-sea 1 km long

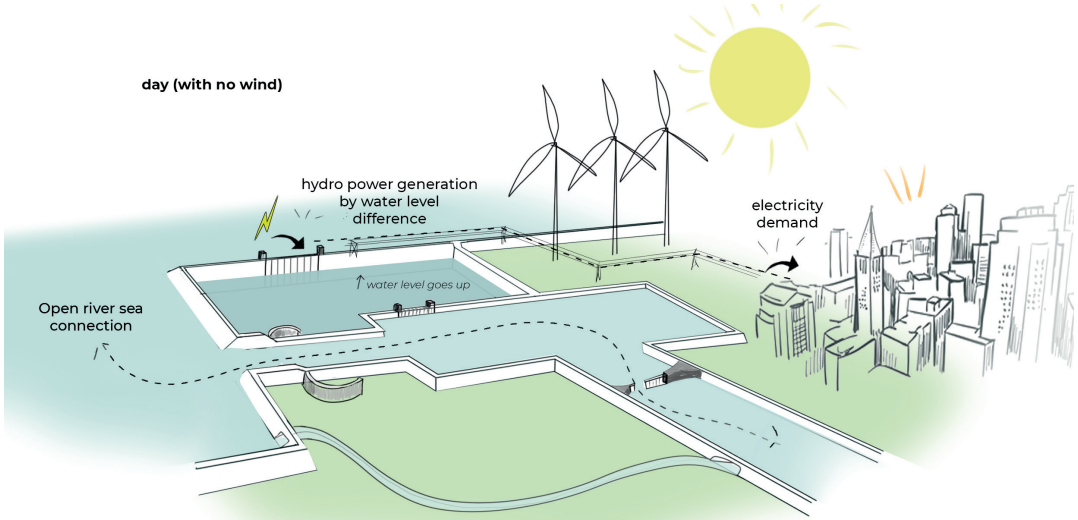
Tidal lake is a natural area

Fish migration river

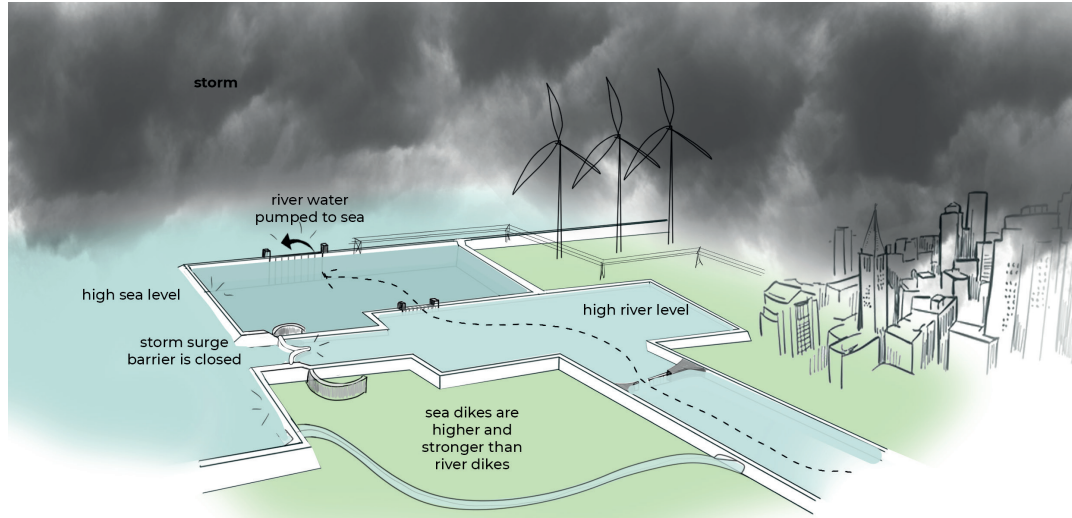
Watersystem



Watersystem

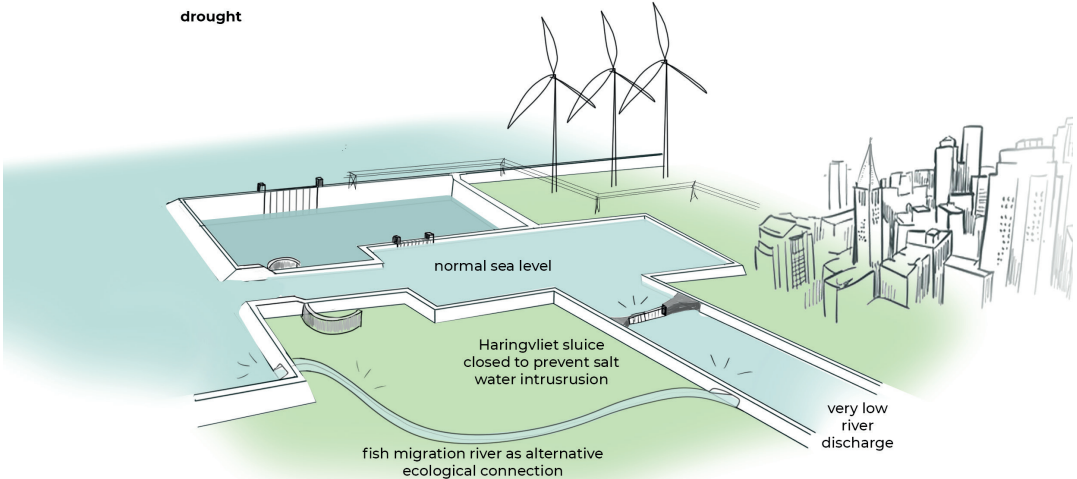


Watersystem



Watersystem

drought

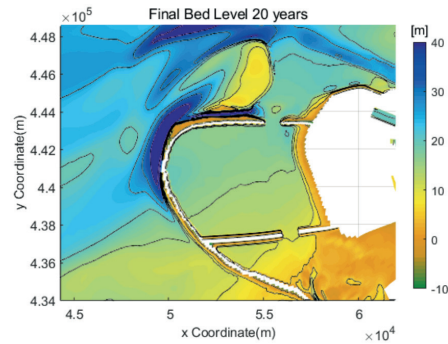
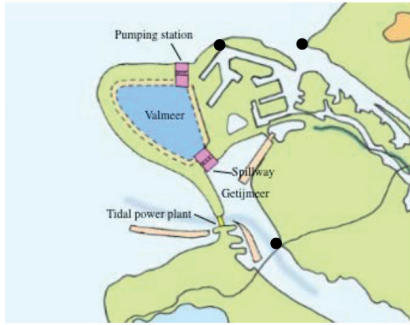


Explorations for design - Morphological research Delta 21 by students

Important findings:

West edge is erosive

Direction and width tidal channel



(d) Bed level after 20 years

Master thesis:

Zhaoyi Li (2020), Large-scale and local morphological impact along the northern side of DELTA 21, TU Delft.

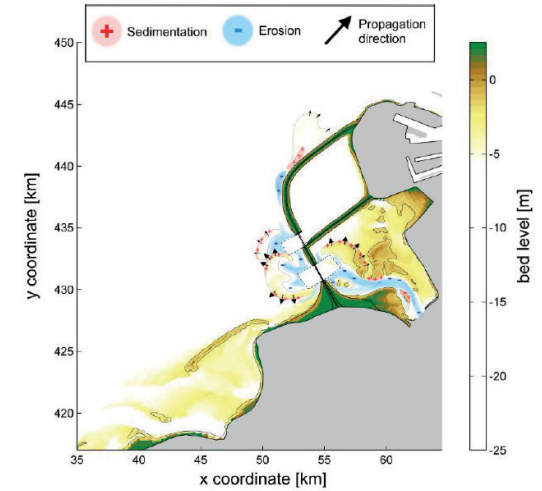


FIGURE 51: CONCEPTUALIZED MORPHODYNAMICS AFTER 5 YEARS

Master thesis:

J.R. Ijntema (2021), Initial morphodynamic changes in the Voordelta in response to the Delta21 interventions, TU Delft.

Explorations for design - Natural shape of the Southwest delta

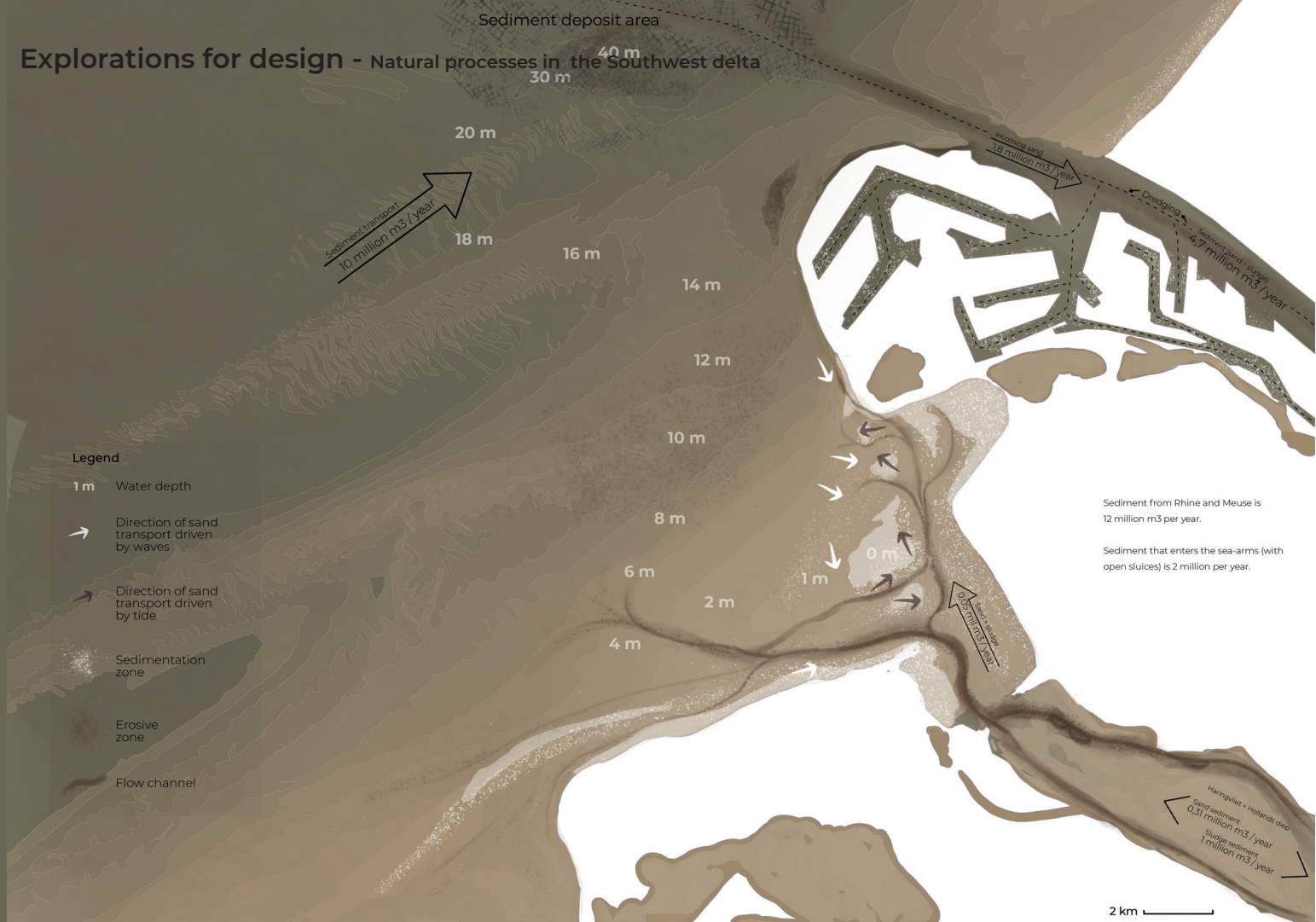
Dutch delta was an area full of islands and creeks due to waves and tide.

The sand ridges are now below the sea level, the sand bars near the main islands are reclaimed.

The sand bars/mud flats still present at the Haringvliet are very valuable ecological habitats and need to be preserved.

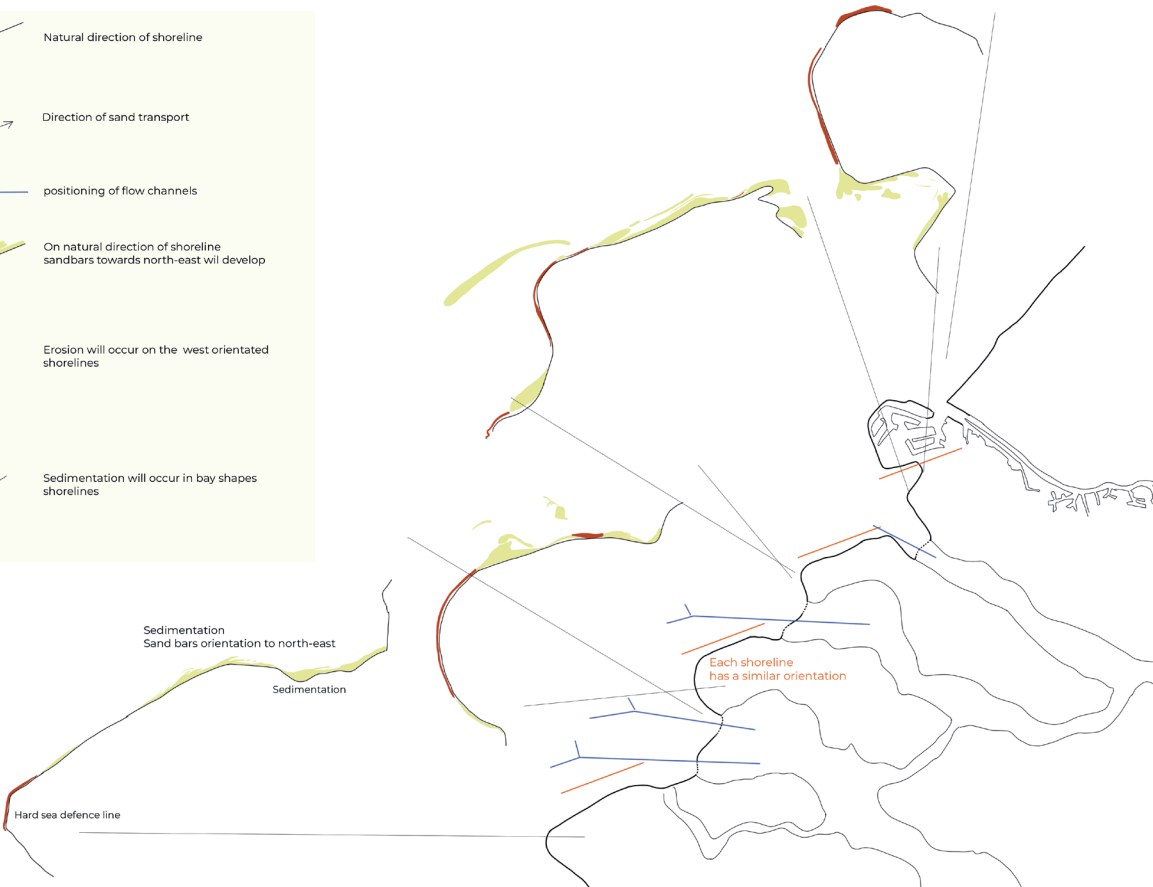
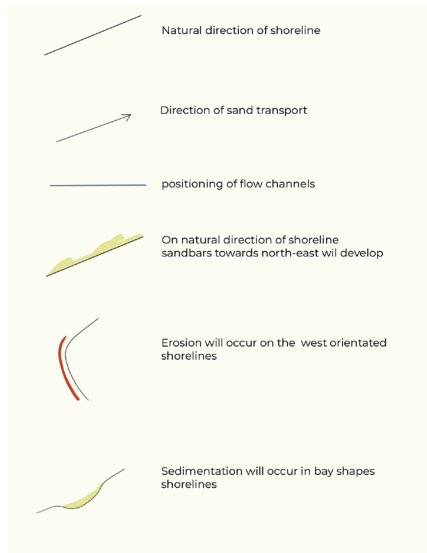


Explorations for design - Natural processes in the Southwest delta

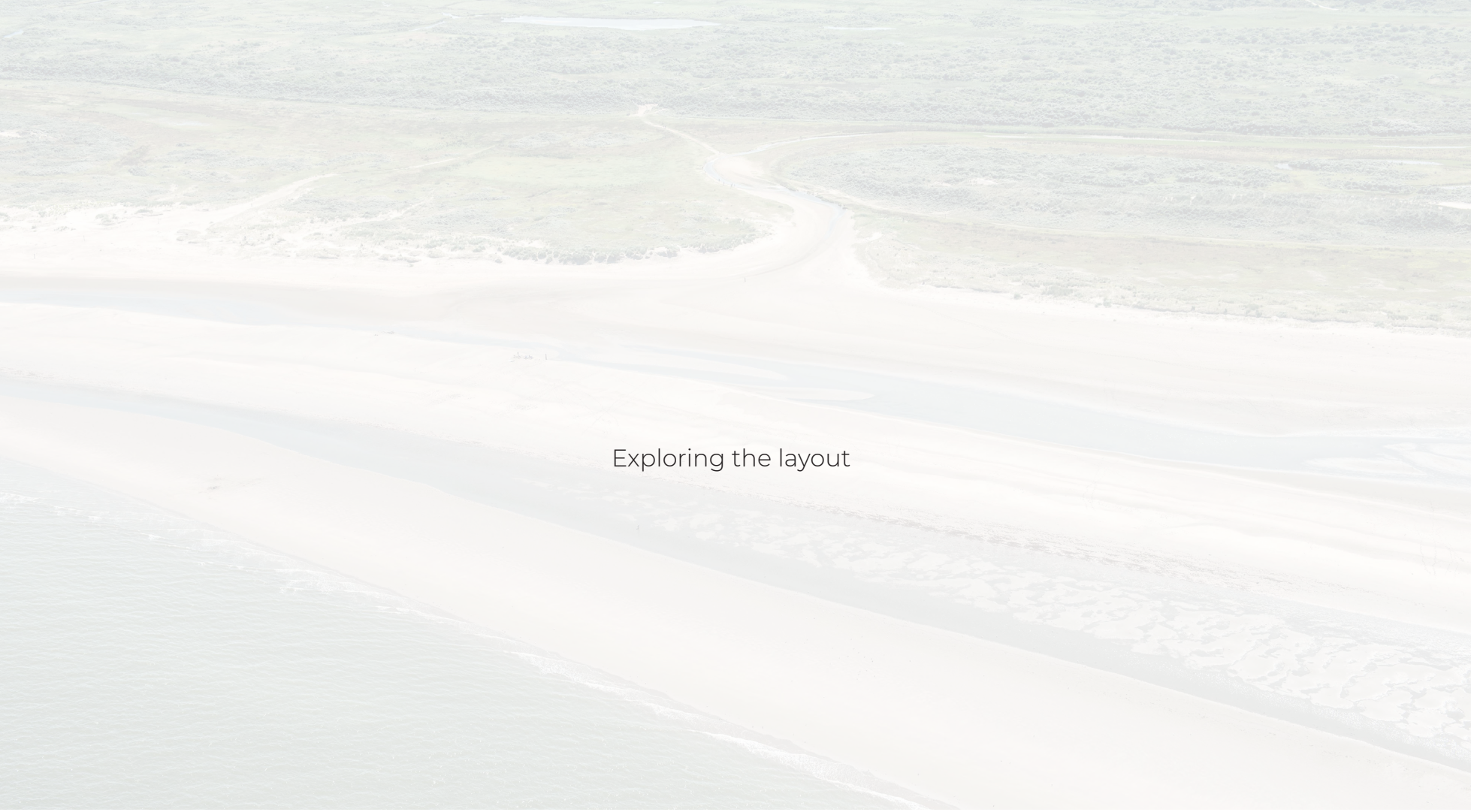


The dominant direction of the main sea current and the sand ridges on the seabed is from southwest to northeast. This dominant force and natural direction is something to take into account for the delta21 layout. Second, the area just outside the haringvlietdam is very dynamic in terms of tidal currents and sediment movement. This is an opportunity for dynamic nature.

Explorations for design - Natural processes in the Southwest delta

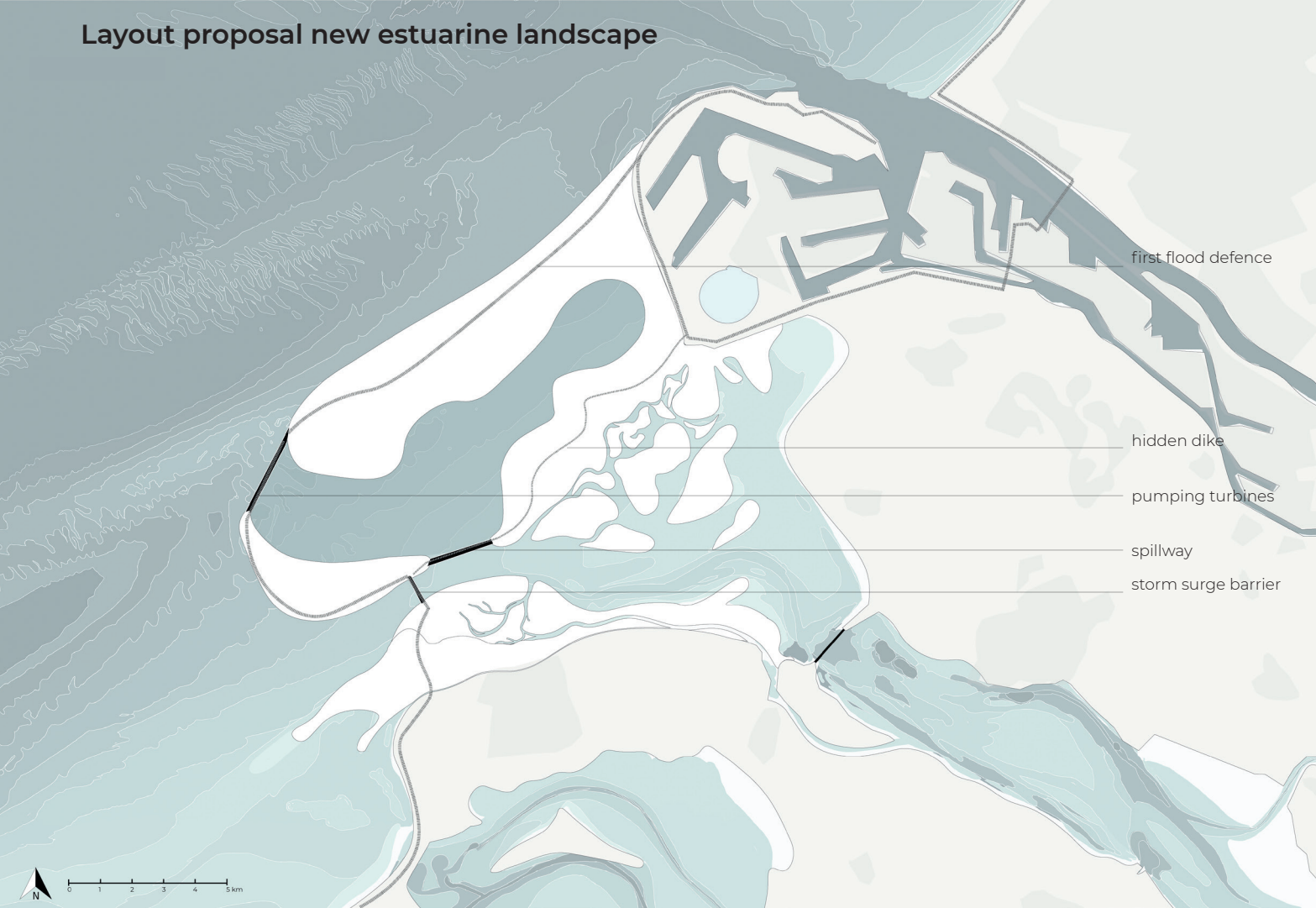


The outer edges of the island heads are erosive. The dominant direction is southwest to northeast, which is shaped by the dominant flow current of the sea. Designing the Delta 21 layout with this direction in mind will create less resistance from natural forces.



Exploring the layout

Layout proposal new estuarine landscape



The morphology of the seabed

Sedimentation and erosion processes

Direction and open connection sea/Haringvliet

Much more new land to create more space for recreation, nature and softer transitions.

Existing mudflats connected to new implemented island and marshland to preserve and expand the nature reserve.

Fish migration river implemented by use of existing water structures and coastline.

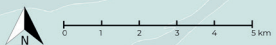
first flood defence

hidden dike


pumping turbines

spillway


storm surge barrier

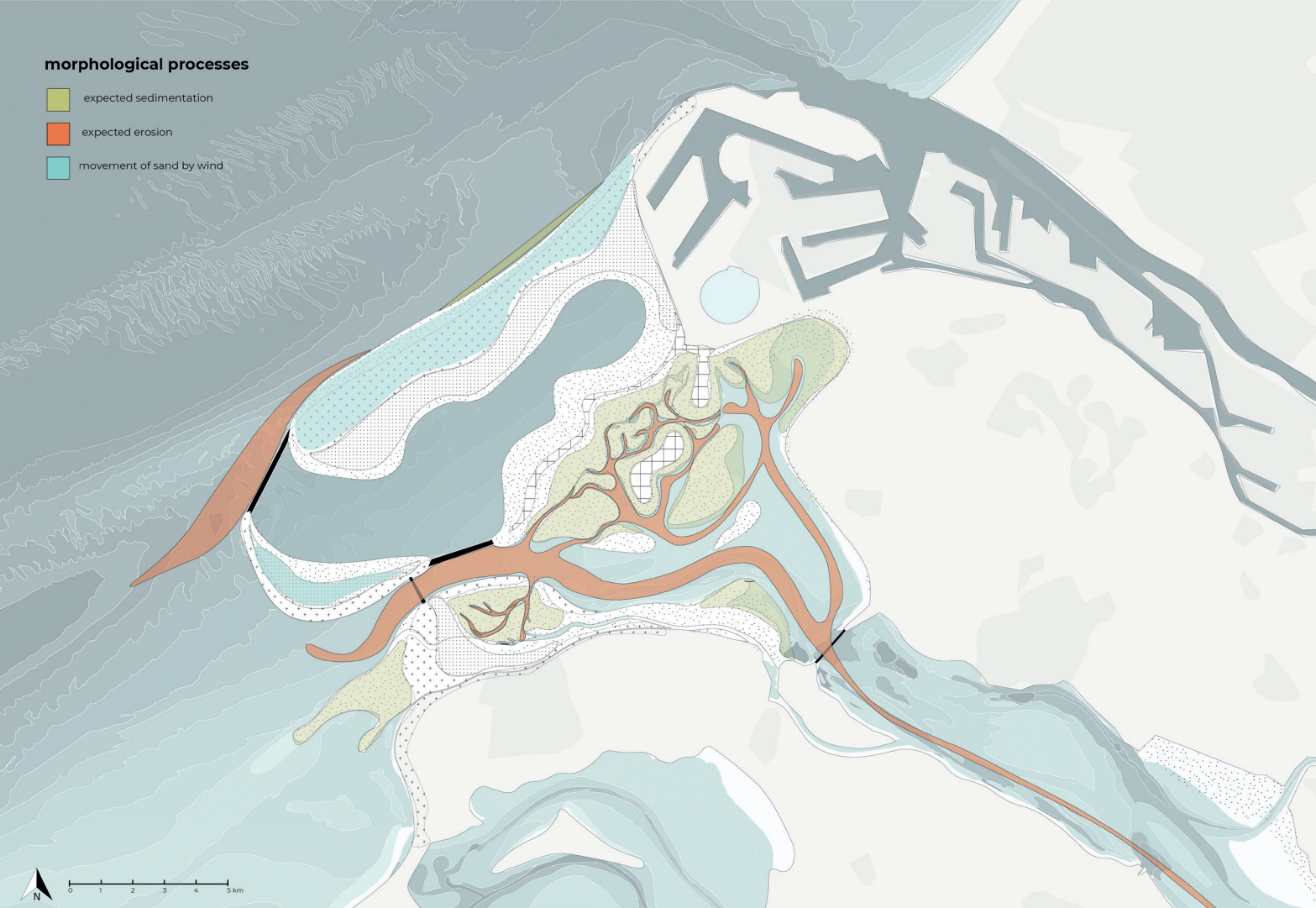


morphological processes

 expected sedimentation

 expected erosion

 movement of sand by wind



Pumping station is situated on the west outer edge and stays clear from sedimentation due to the dominant erosive forces.

Storm surge barrier and spillway stay clear from sediments due to the erosive forces achieved by the width of the in/outflow channel.

Watersystem

- normal situation
- situation during droughts
- situation during storms

pump
pumps water from energy lake out when there is access of energy

pump
pumps river water to sea during storm

water level changes
high during energy demands (mostly day), low level during energy surplus (mostly night)

tidal islands
tidal range 1 / 1.5 m

pumps
open during storm

storm surge barrier
only closed during storm

creek
tidal range

Haringvlietsluisce
only closed with low river discharges

outlet for high water levels during storms

river in- and outlet

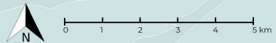
fish migration river
only necessary with low river discharges

Water level difference in tidal lake is 1.5 meters.

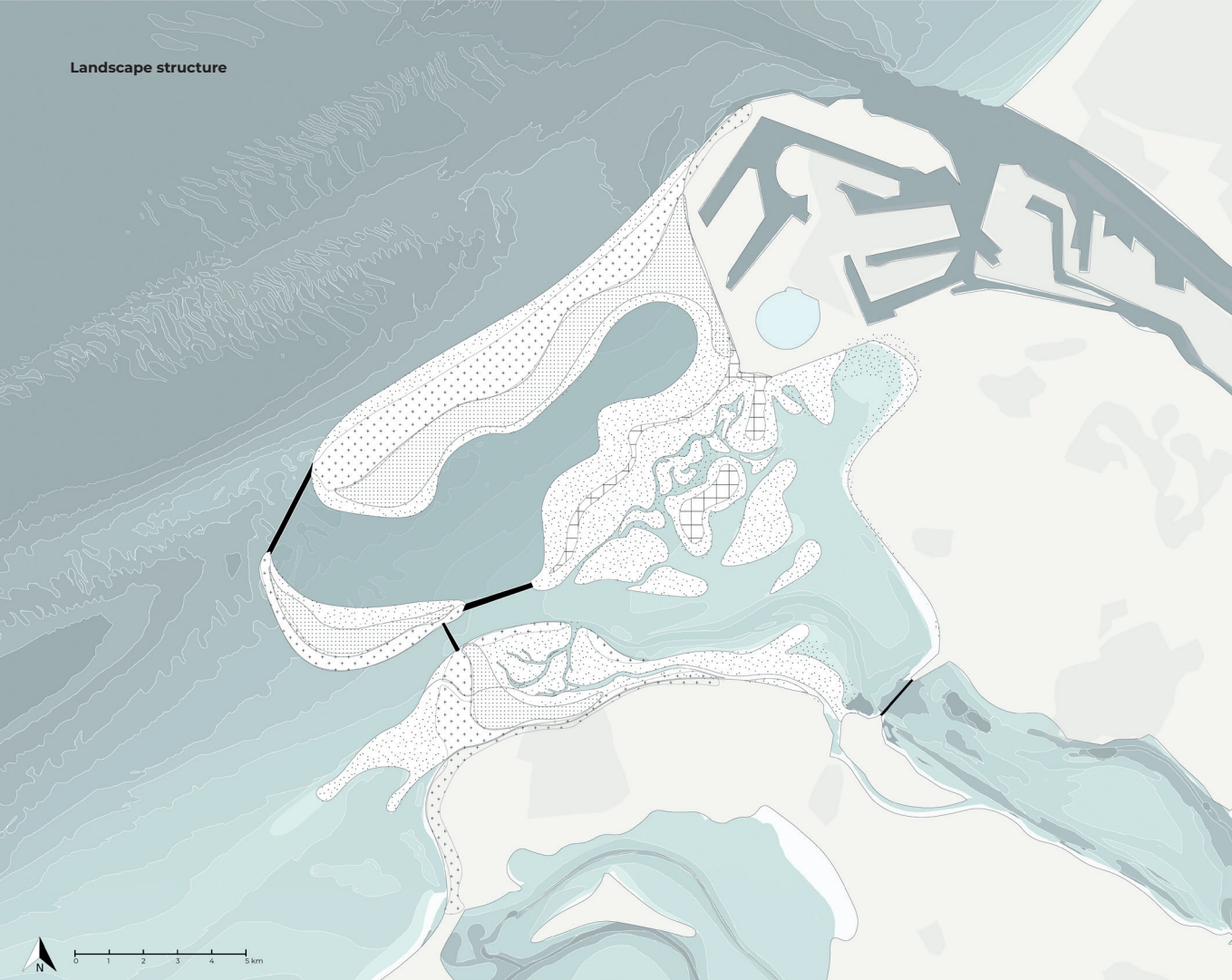
Water level difference energy lake is 20 m.

At the north edge of energy lake the slope is 1:10 to experience the water level differences.

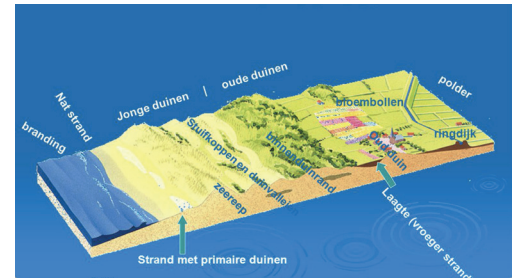
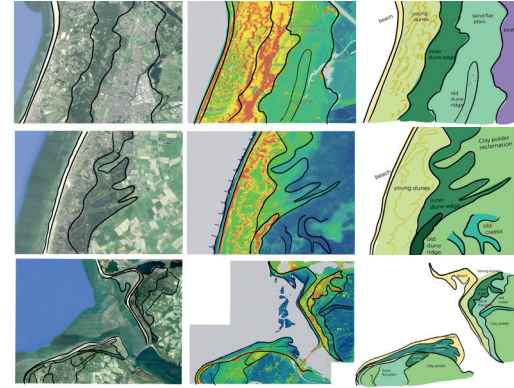
Southeast edge of the energy lake the slope is 1:50 to establish a very gradual transition between the energy lake en the tidal lake.



Landscape structure



Landscape structure is based on the coastal landscape structure which is present along the dutch coastline.

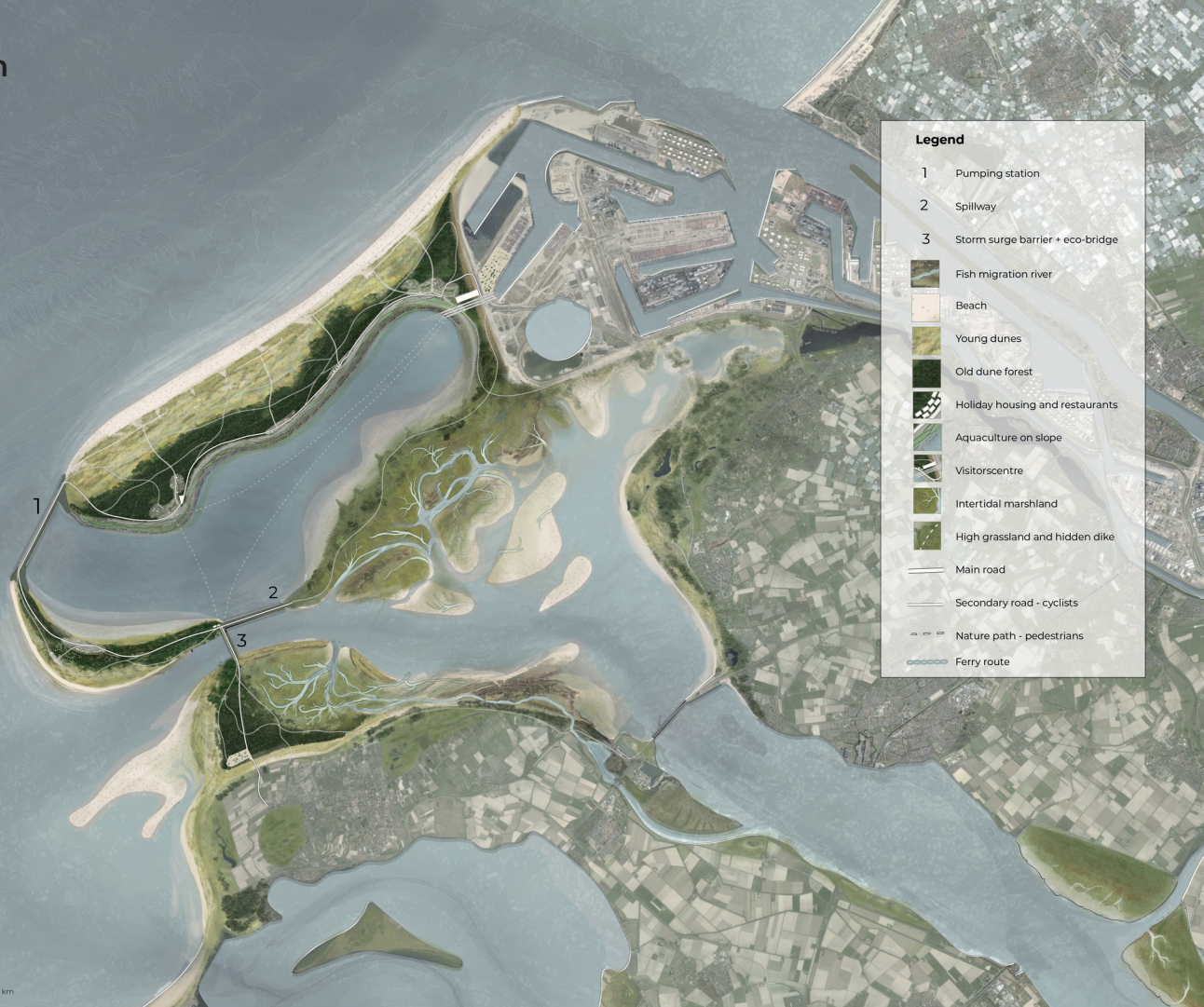


Source: Hans van Lierdonk, <https://www.landgenimages.com/3968882-ogelengang-eev-duinen>

An aerial photograph of a coastal wetland. A wide, winding river or estuary flows from the top center towards the bottom left, eventually meeting a larger body of water. The surrounding land is a mix of green marshland and sandy areas. The word "masterplan" is overlaid in the center of the image.

masterplan

masterplan



Layout as result of designing with natural processes, technical requirements, local conditions and case study research.

Valuable intertidal habitats are preserved and expanded by the island and creek landscape

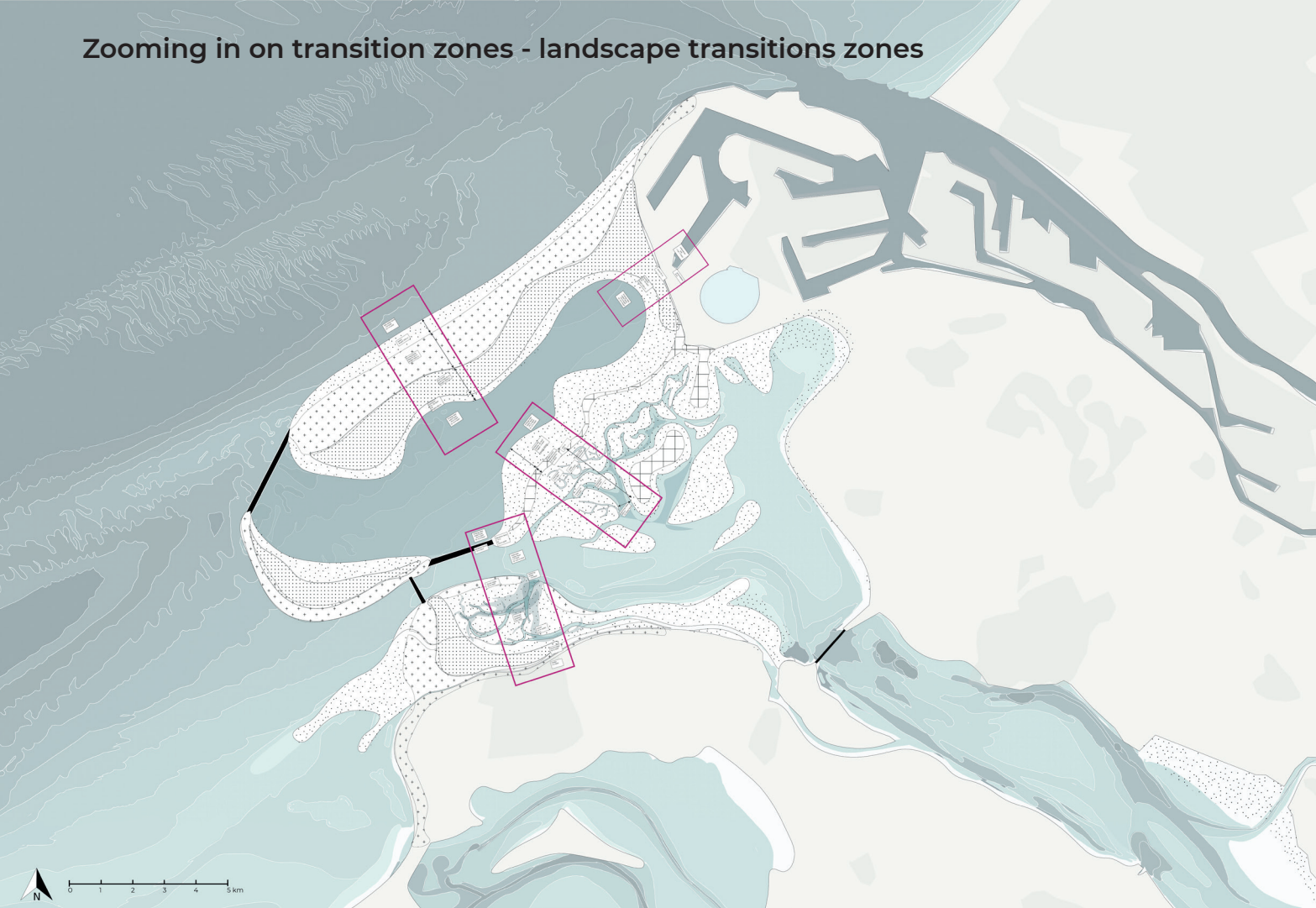
Dynamic gradual transitions are dominant and create space for ecology and recreation.

Soft transitions are alternated with harder edges with recreational focus: inner dune area and northeast slope energy lake to implement a recreational hub where the waterlevel changes can be experienced by the steep slope with aquaculture, holiday housing, a visitors centre with watercascade and restaurants and shops.

The spillway and bridge provide an ecological and infrastructural connection between Voorne en Goeree.

Zooming in on transition zones

Zooming in on transition zones - landscape transitions zones



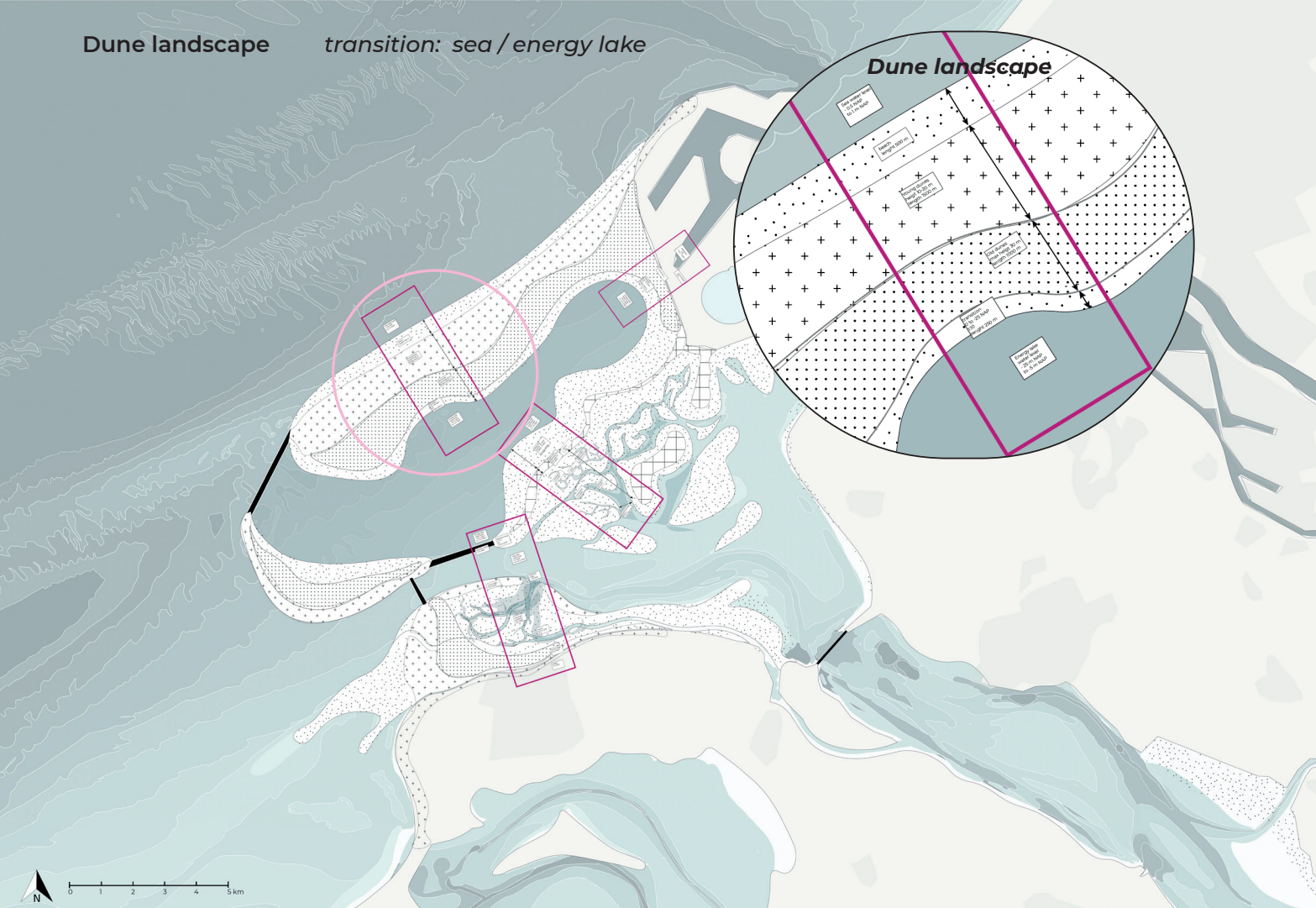
Within the new estuarine landscape gradual transitions are designed with a lot of space for nature and recreation.

For each transition zone a design exploration is done to investigate what role the character of a transition can play in the program and experience and connections of the new estuarine landscape.

Dune landscape transition

Dune landscape

transition: sea / energy lake



Land/water transition and flood protection as a large dynamic dune landscape.

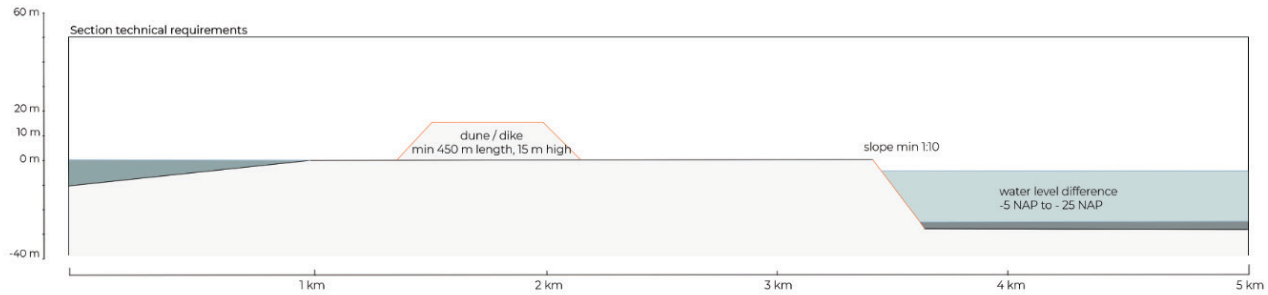
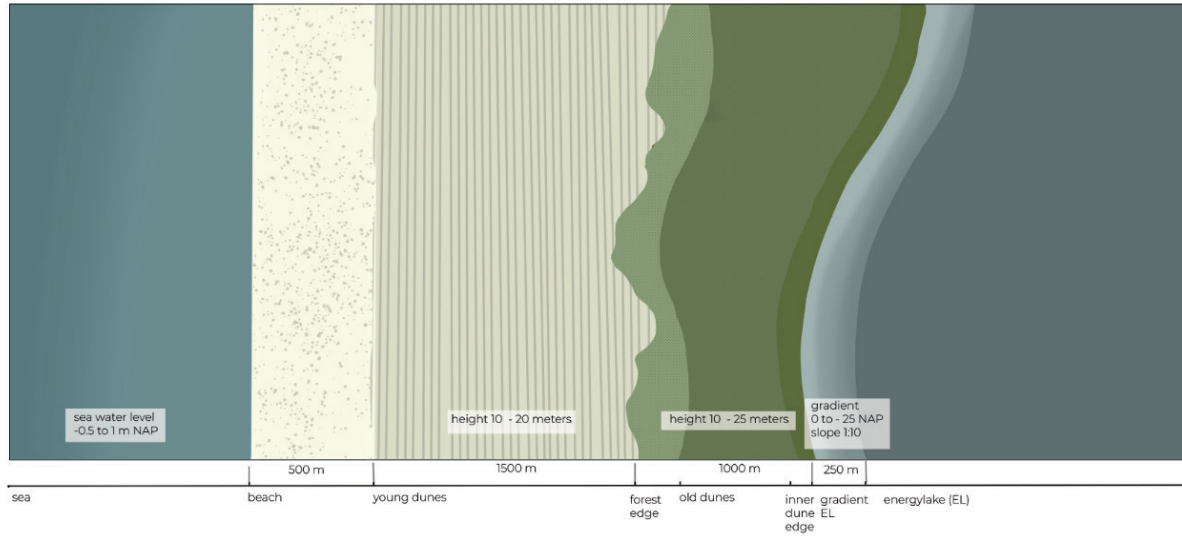
Wind and succession as dominant shaping forces at the dune area.

Steep slope with aquaculture at the energy lake and a waterlevel difference of 20 m provides a new landscape experience.

Characteristic of landscape transition is based on the sensation of differences in elevations by the dune landscape and the slope of the energy lake.

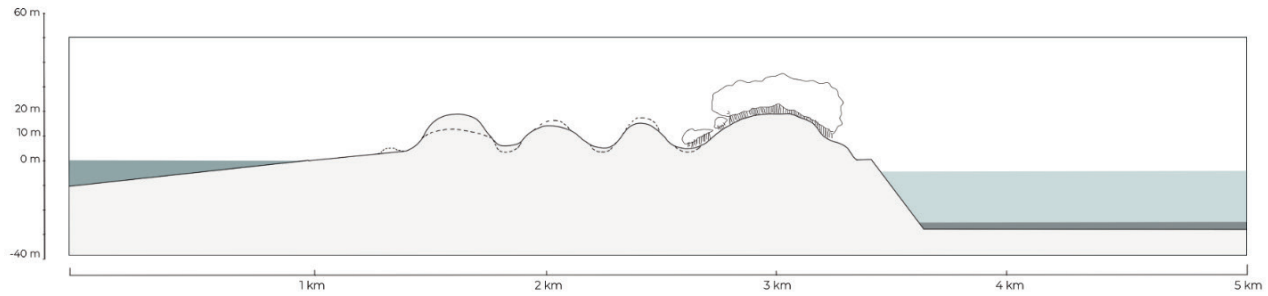
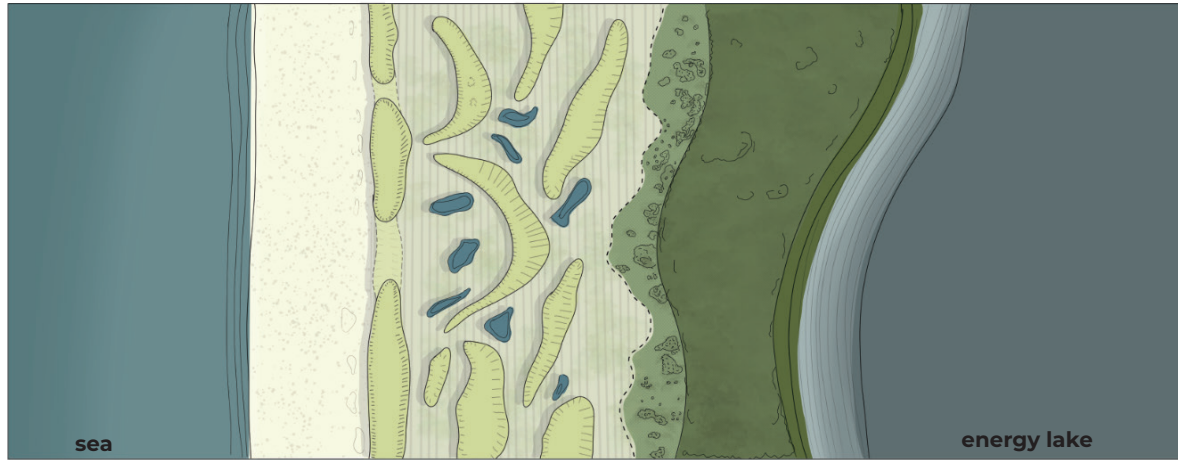
Dune landscape

landscape structure and technical requirements



Dune landscape

landscape structure and technical requirements



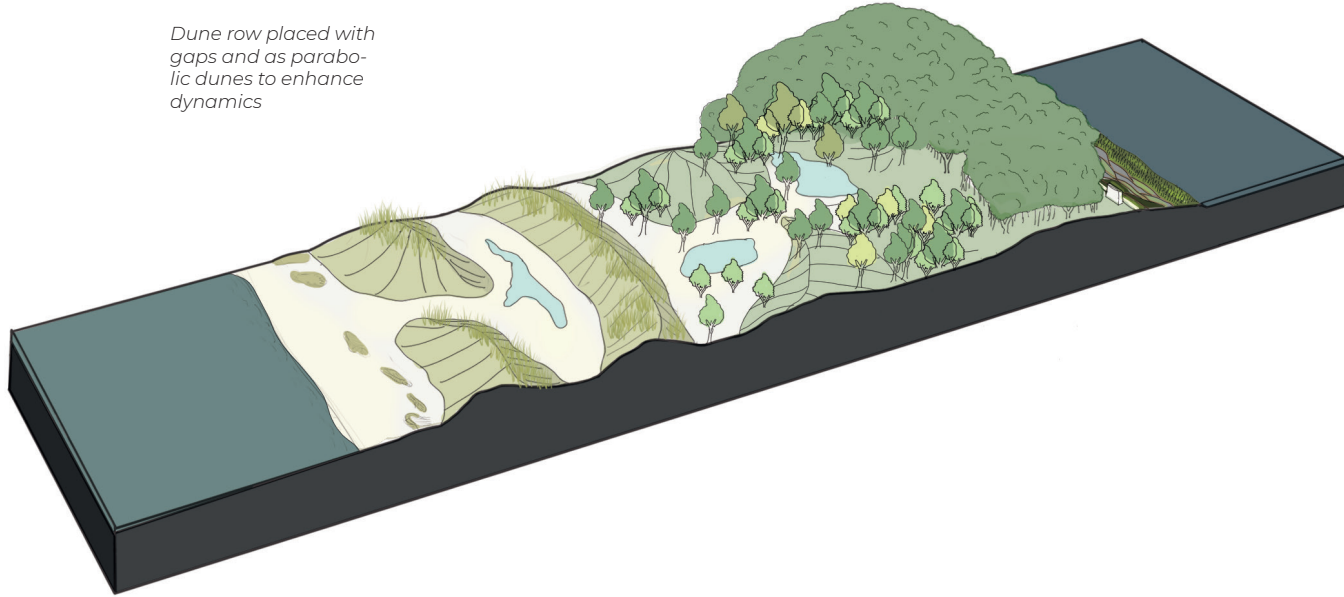
Dune landscape

structure

Dune row placed with gaps and as parabolic dunes to enhance dynamics

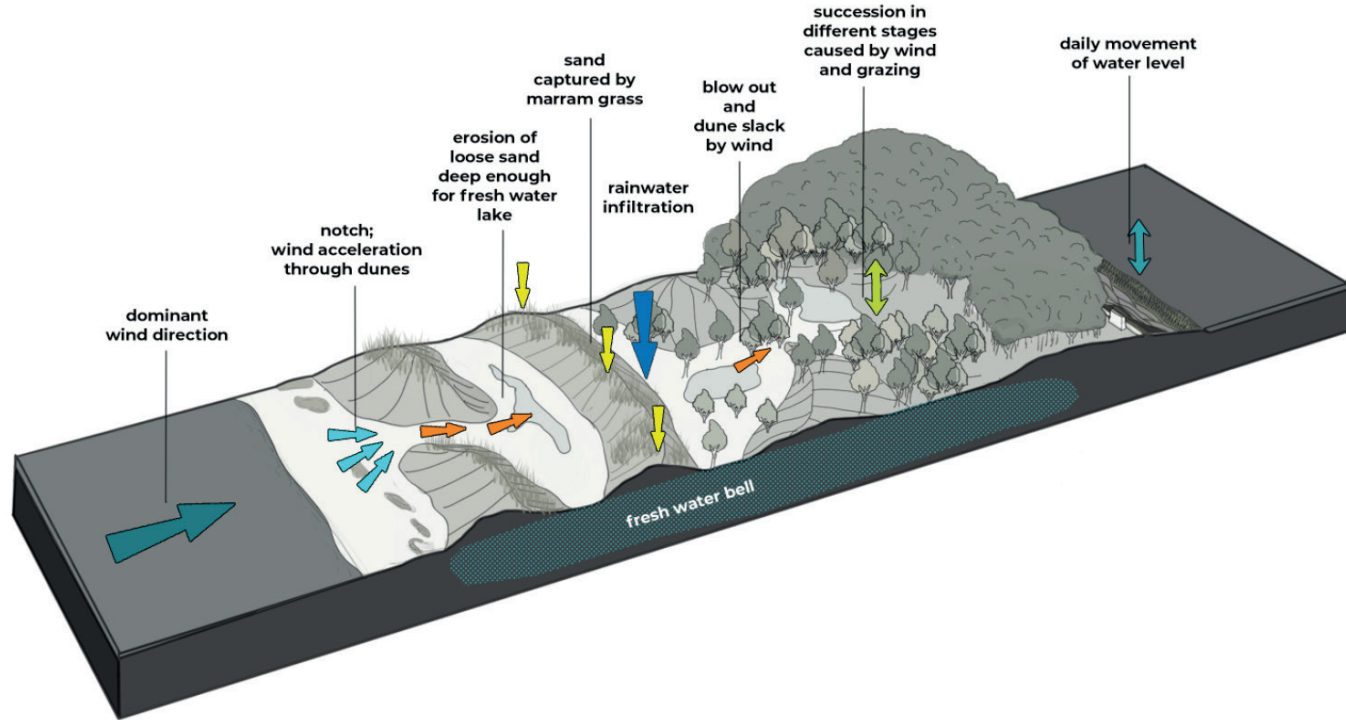
Old dune row as forest

Steep recreational dune edge and steep aquacultural energy lake slope creates a very interesting new landscape experience.



Dune landscape

natural shaping processes



Dune landscape

natural shaping processes - stages of development



Dune landscape

ecology

embryo dunes



Elymus farctus



Sonchus arvensis



Cakile maritima



Anarhynchus alexandrinus
(kentisch plover)

white dunes



Spartina Maritima



Platycleis albopunctata



Carex Gaudin



Ammophila arenaria



Parapholis strigosa



Lacerta agilis
(sand lizard)



Atriplex laciniata



Viola tricolor
subsp. *curtisii*

grey dunes / forest edge



Microtus oeconomus arenicola



Dactylorhiza incarnata
subsp. *coccinea*



Lullula arborea

dune forest



Asio flammeus



Quercus



Favonius quercus

energylake



Homarus gammarus



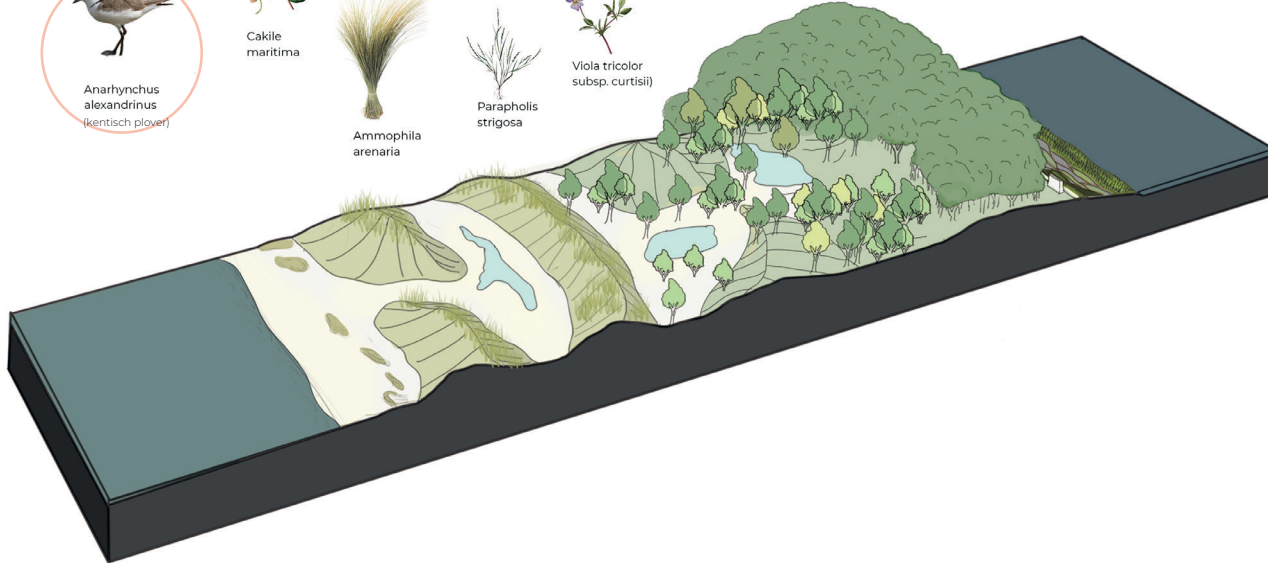
Suaeda Maritima



Cancer pagurus



Caridea



Dune landscape

program

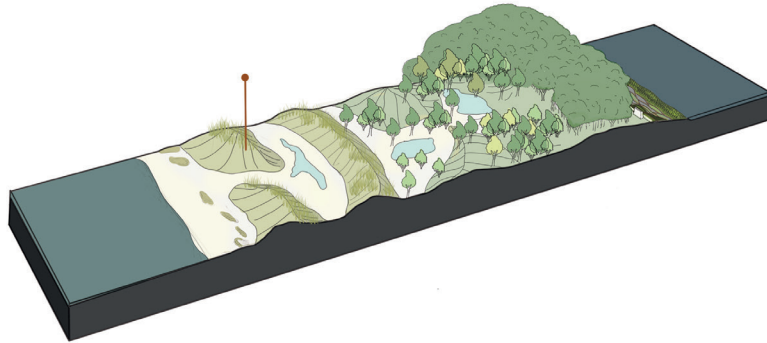
Program



Dune landscape

experiencing the transition

A climbing dune that captures sand to increase the experience of dynamics and elevation differences.



Dune landscape

program

Pathways over and through the dune landscape



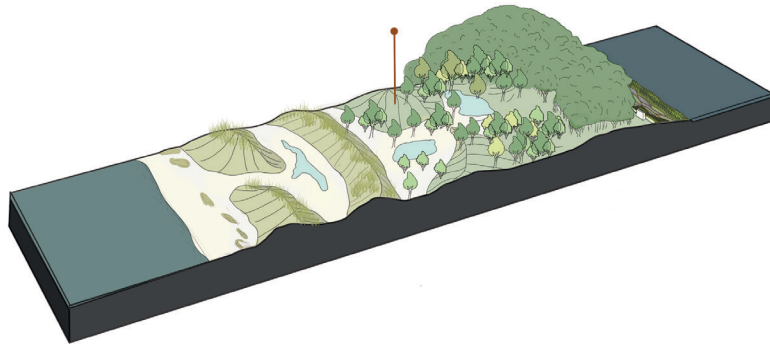
Pathways over hilltop and a choice for one adventurous path and a concrete path



Overview of the transitions and how the path leads you through it.



Secret side pathways that leads the visitor to more intimate spots.

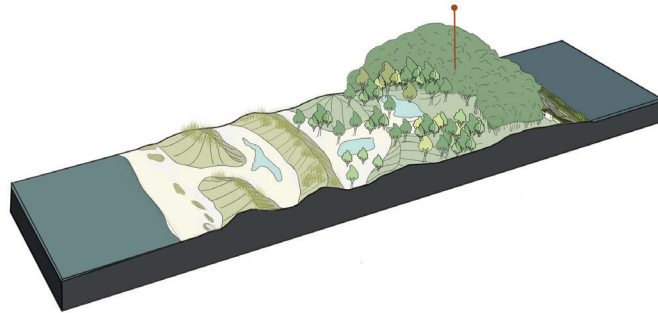
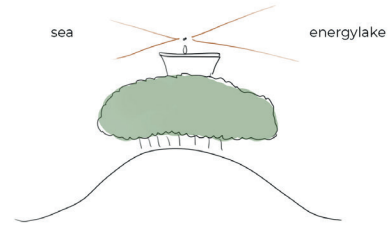


Dune landscape program

Viewing tower to visually connect the sea, dune area and energy lake.

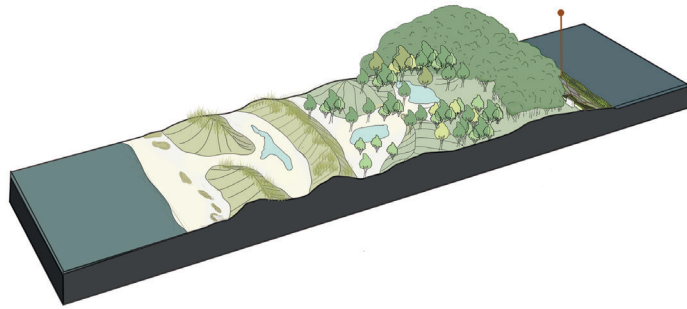
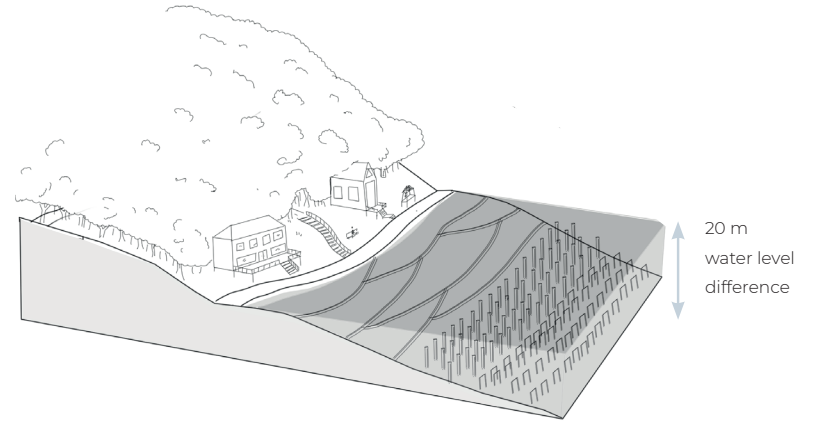
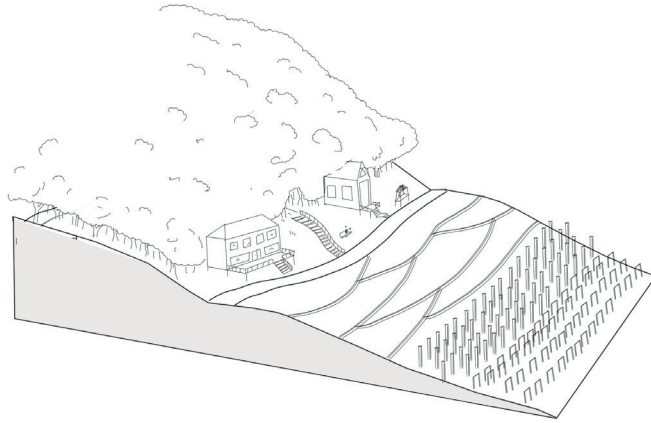


Viewing tower



Dune landscape

program and structure



Dune landscape

aquaculture

Location of the crops and animals depends on the desired overflow time

Samphire



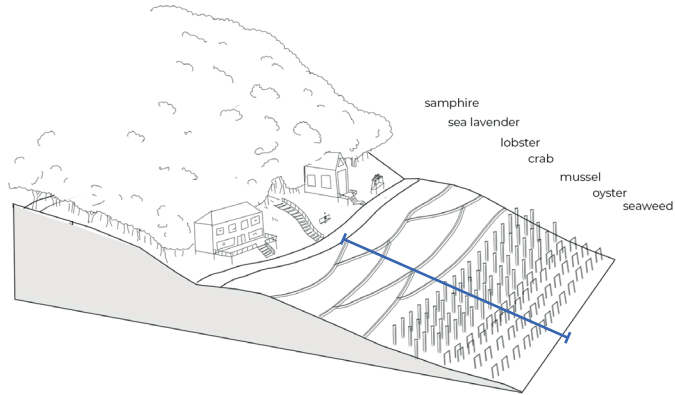
Sea Lavender



Lobster



Slope up



Crab



Mussel



Oyster



Seaweed



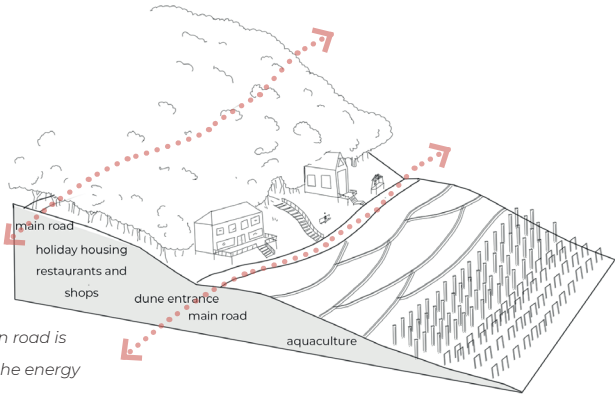
Slope down



Dune landscape

recreational hub

Houses, shops and restaurants with the dune forest in the back and a view towards the energy lake.



Sometimes main road is located next to the energy lake at other places the main road goes through the dune area.

References holiday housing and restaurants energy lake



Sea side restaurant (Source: Rocksalt Folkstone)



Holiday homes on dune slope with a view



Holiday cabin (design by: Lendager Groupne)



Boulevard on lake side (via: Eco Inn Warners Bay)

Dune landscape *impression transition*

During daytime energy is needed which means that the energy lake is filled.



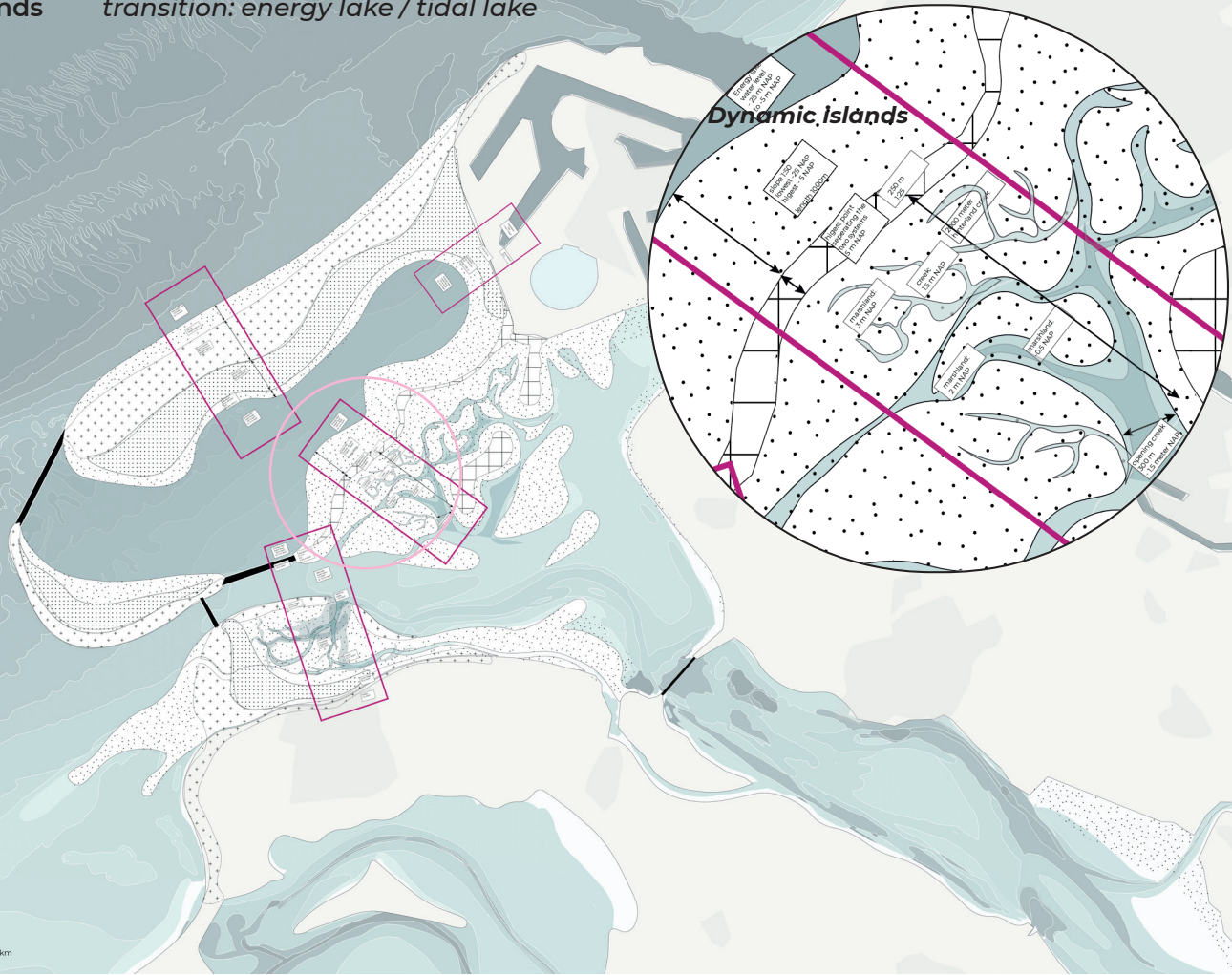
During night and morning energy is stored which means the water in the lake is pumped out. This is the moment to harvest the crops and shellfishes.



Dynamic islands transition

Dynamic islands

transition: energy lake / tidal lake



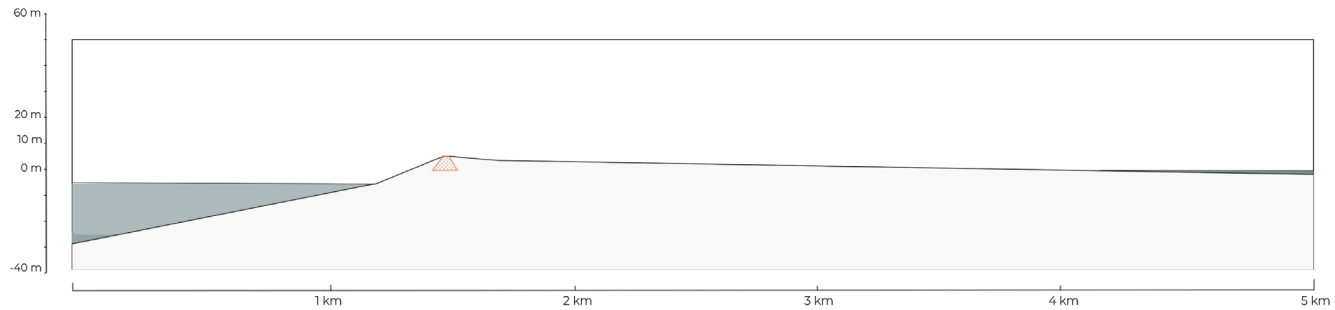
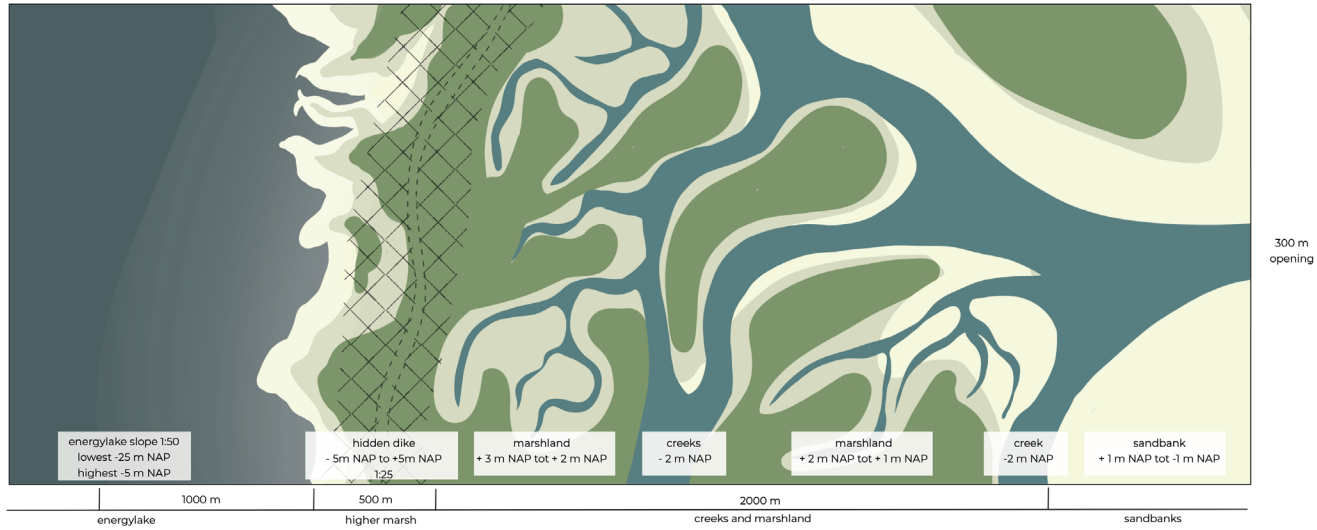
Land/water transition is very gradual, flood protection is obtained by a hidden dike, slope of energy lake is 1:50, ground level islands from 1 to 3 m +NAP.

Entire area is a nature reserve to preserve and expand the valuable ecological mudflats like the Hinderplaat.

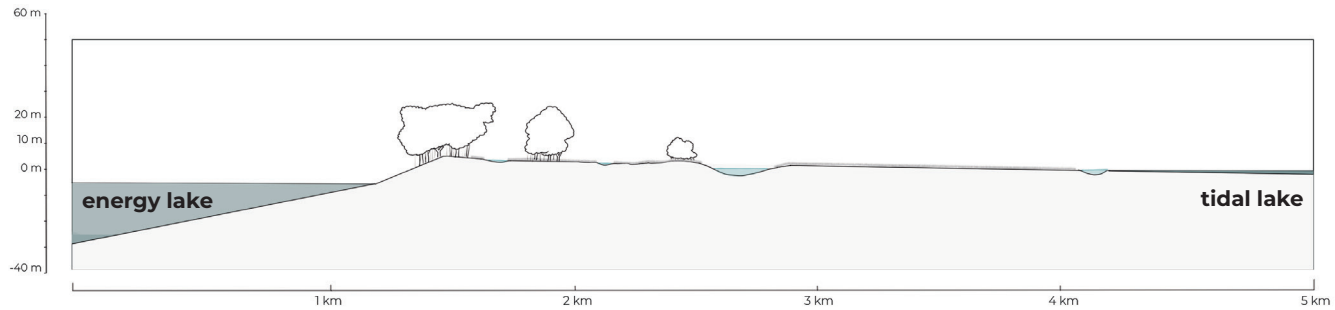
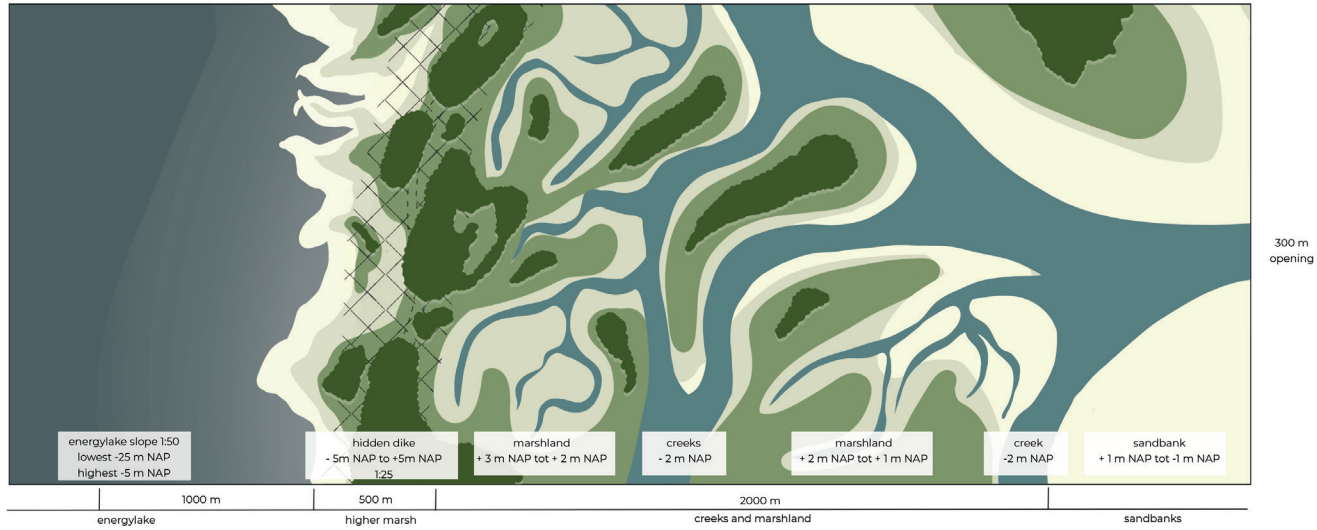
Ground level and water level differences (energy lake and tide) as dominant shaping forces which creates intertidal mudflats, creeks, low and high marshland, higher grassland and shrubbery.

Characteristic of landscape transition is based on the sensation of tidal dynamics in an open landscape.

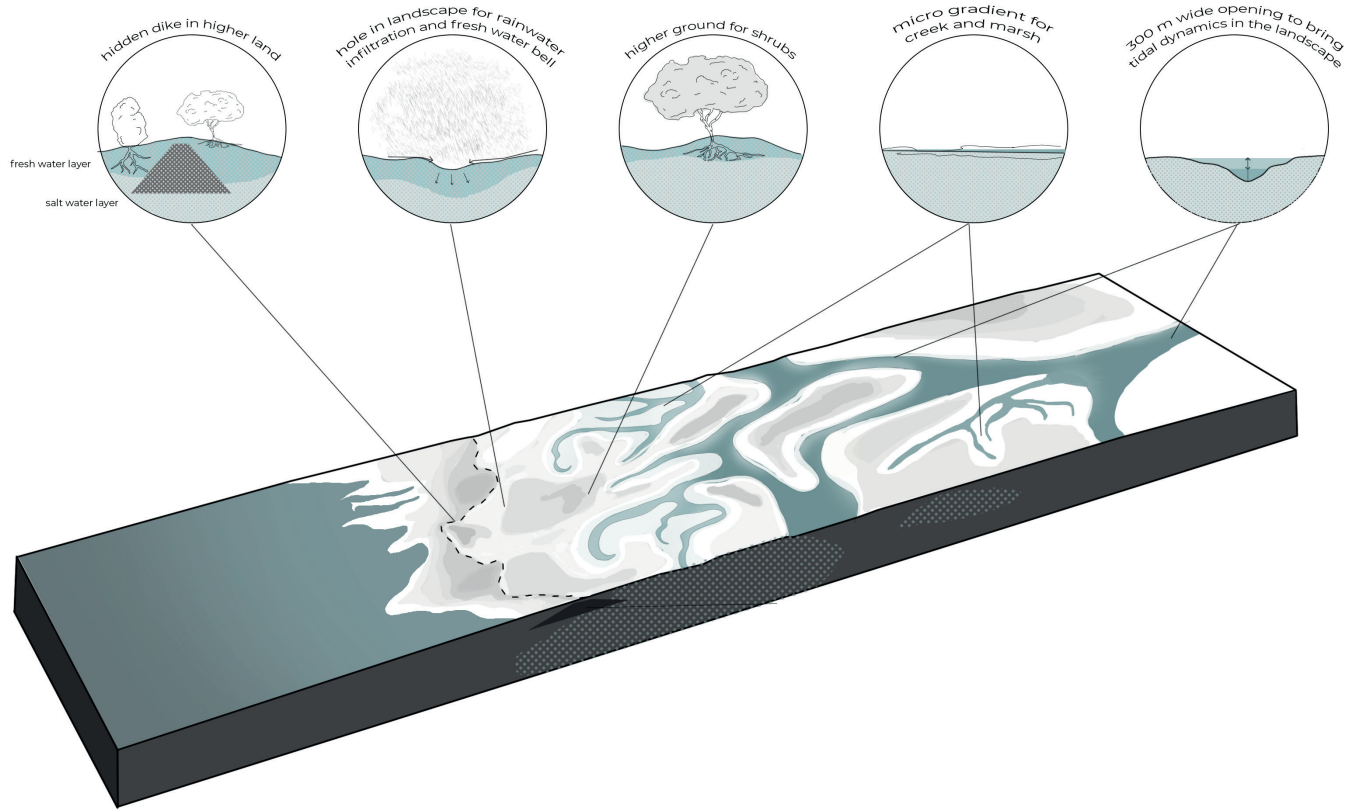
Dynamic islands *technical requirements*



Dynamic islands *structure*



Dynamic islands *gradients*

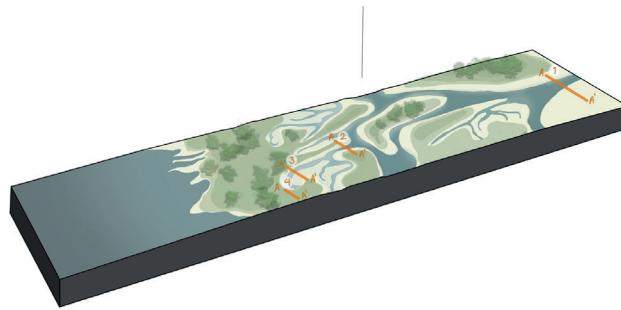
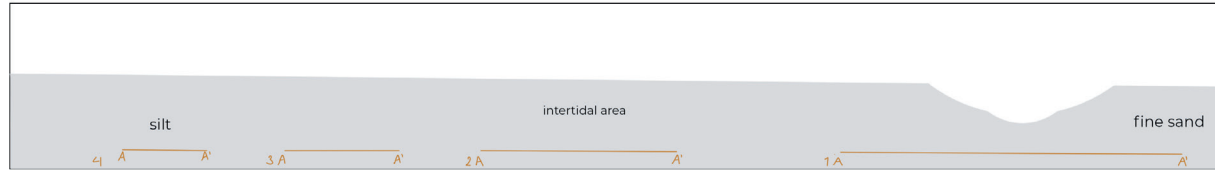


Dynamic islands

landscape development - implementation stage

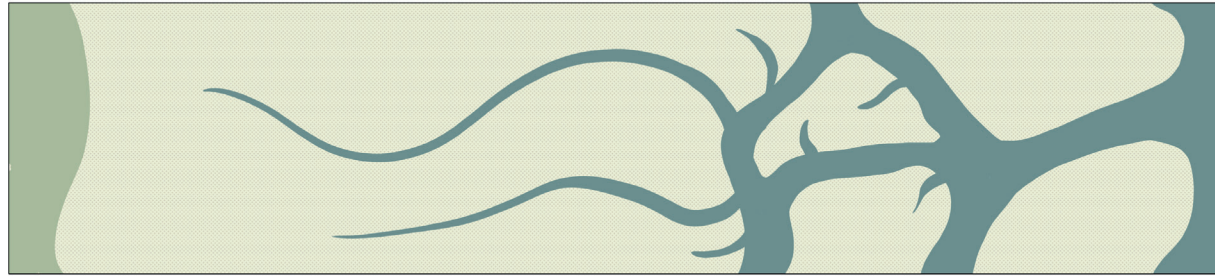


During the implementation only the islands and the first creeks are created artificially.

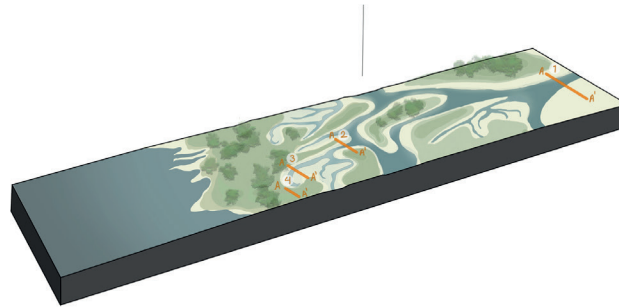
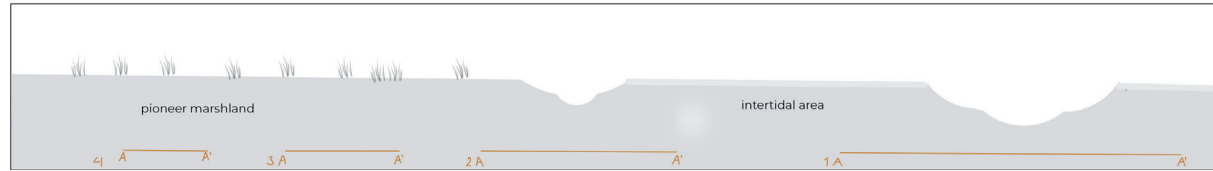


Dynamic islands

landscape development



During the next stages the tidal dynamics will create the creek system naturally.



Salicornia procumbens

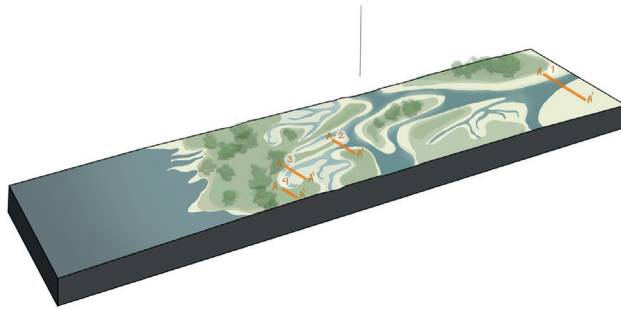
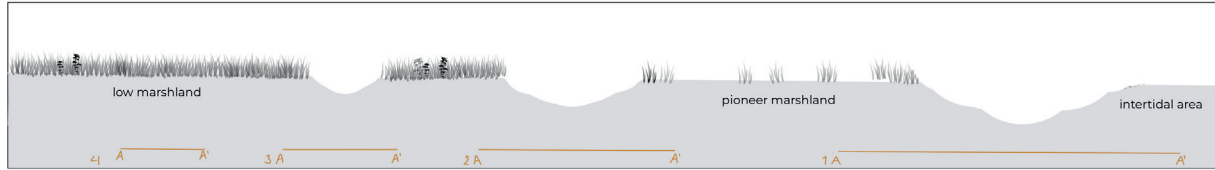


Spartina anglica



Dynamic islands

landscape development



puccinellia maritima

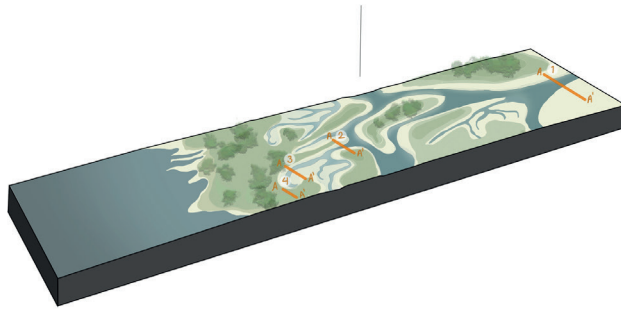
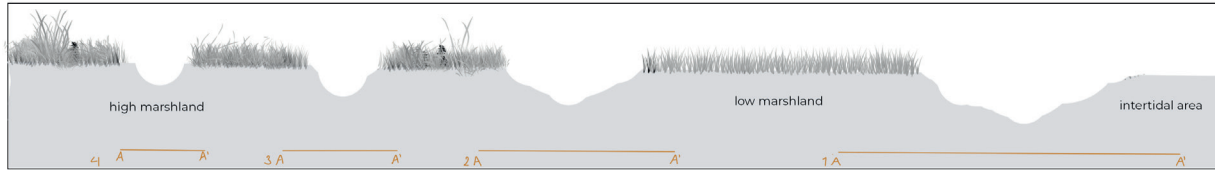


Aster tripolium



Dynamic islands

landscape development



Elytrigia atherica



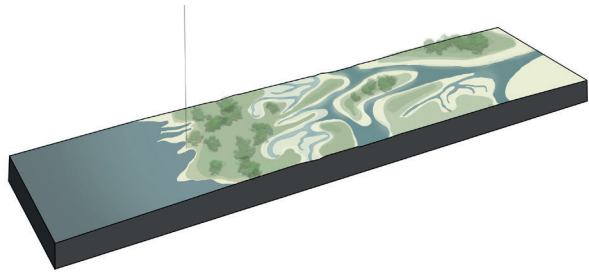
Limonium vulgare



Dynamic islands

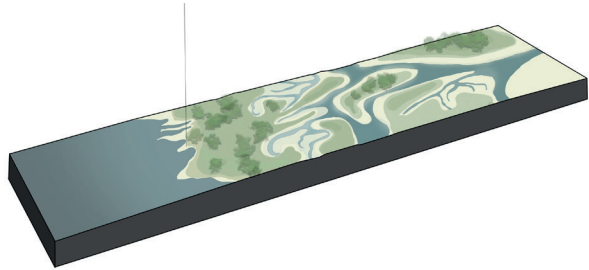
Impression transition energy lake / high grassland - high water

The energy lake edge has a soft meandering water edge which appears as a very gradual transition.



Dynamic islands *impression transition energy lake / high grassland low water*

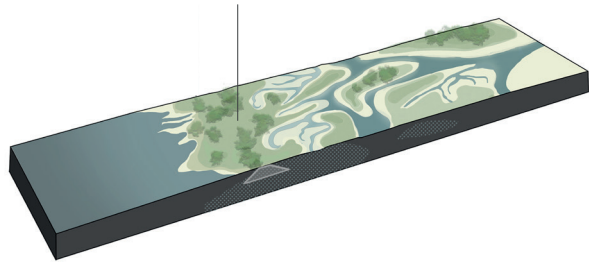
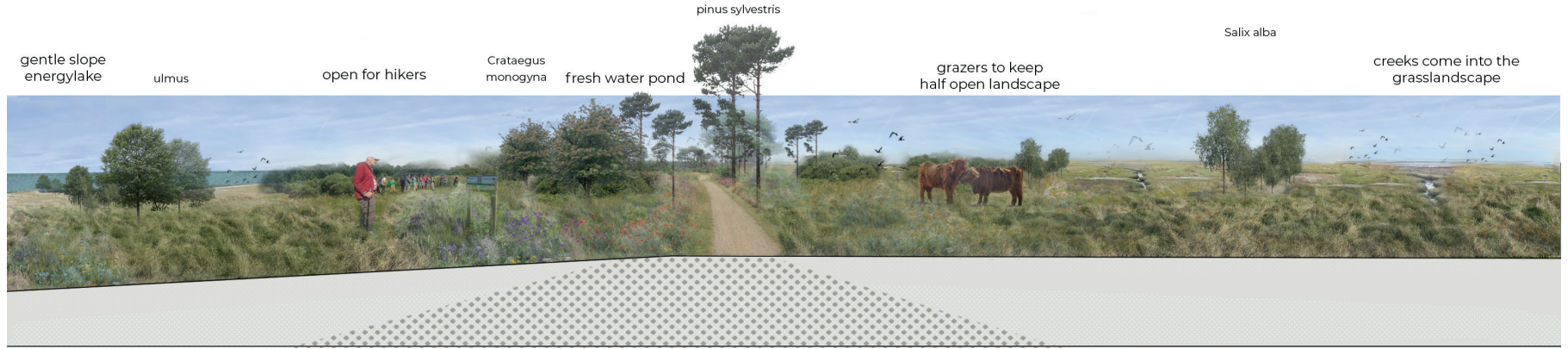
When the water is low, the lake bed is visible and appears as a mudflat.



Dynamic islands

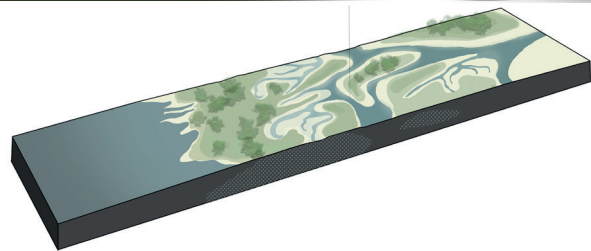
impression hidden dike

The contours of the hidden dike are not visible due to the shrubs and trees that obscure the view.



Dynamic islands *impression dynamic islands*

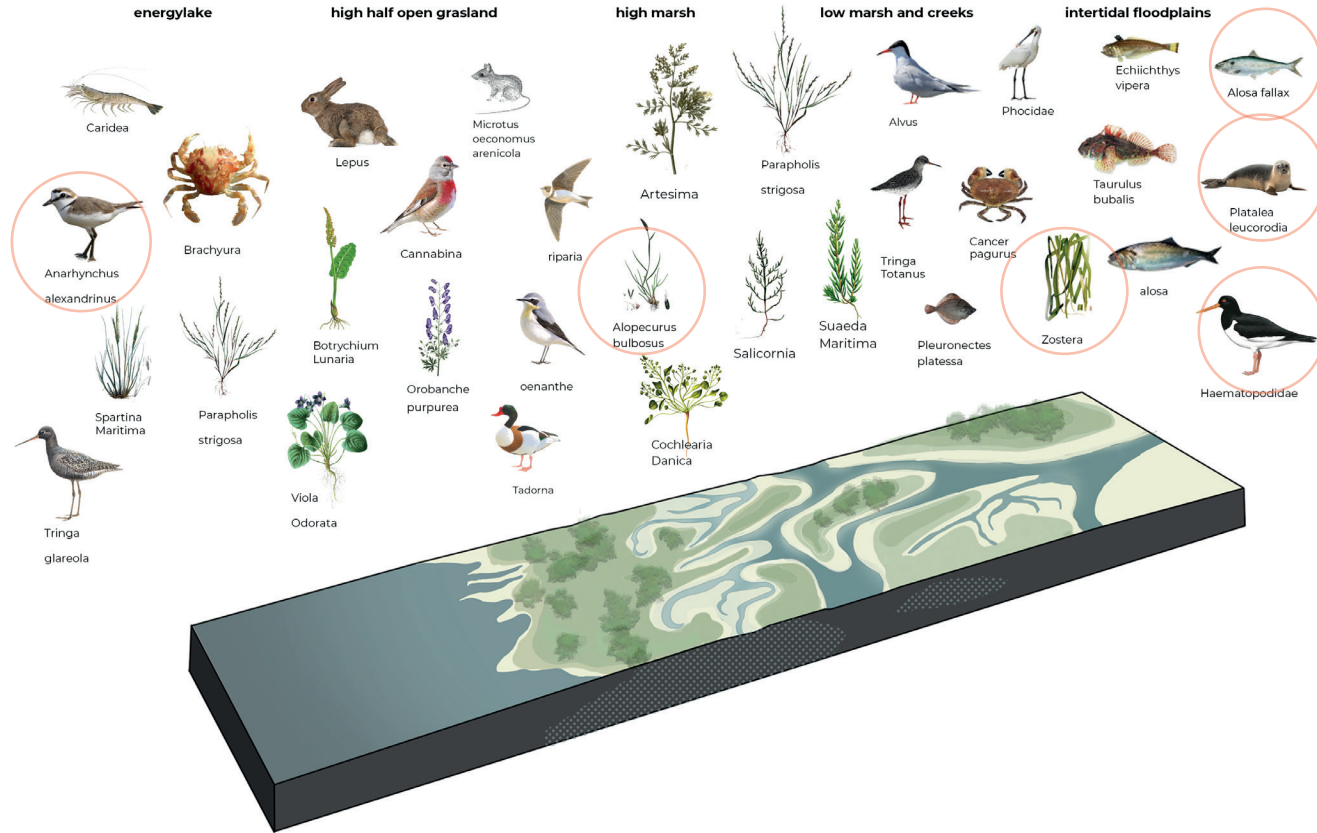
The creeks islands and larger water bodies alternate each other which creates a very dynamic landscape that is a lot of fun to explore.



Dynamic islands

ecology

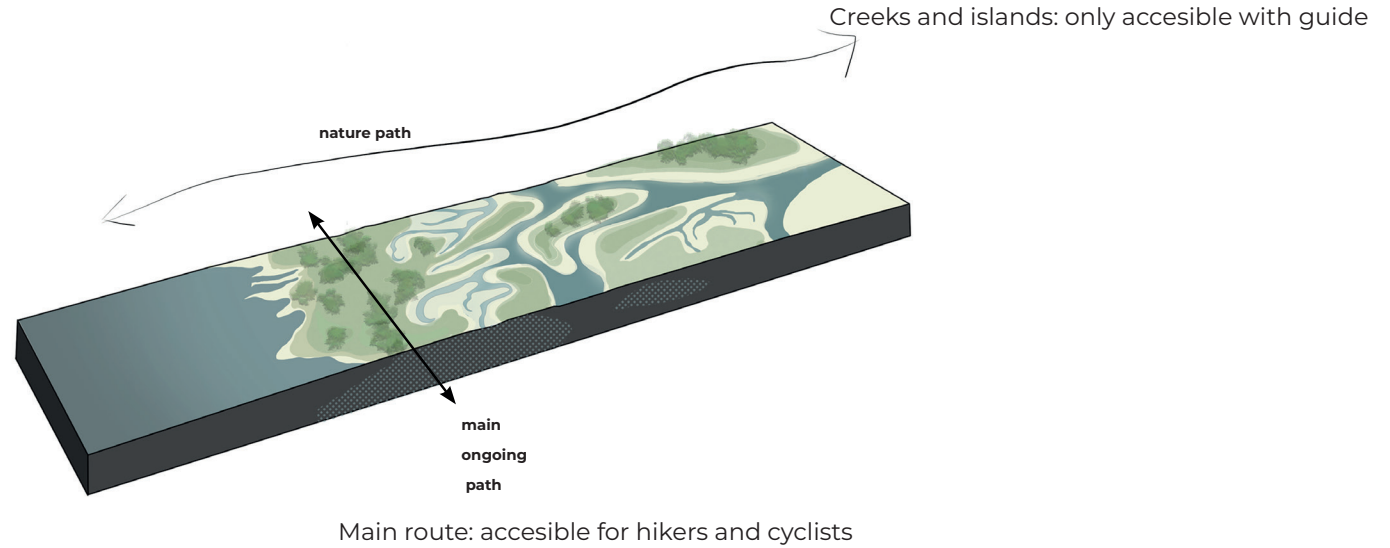
This landscape provides a suitable habitat for all 7 target species as presented at the analysis.



Dynamic islands

program

The entire transition zone is a nature reserve, the focus on recreation is based on experiencing nature.



Dynamic islands *program*

A tidal path invites the visitor to explore the lake bed and to search for sea life.

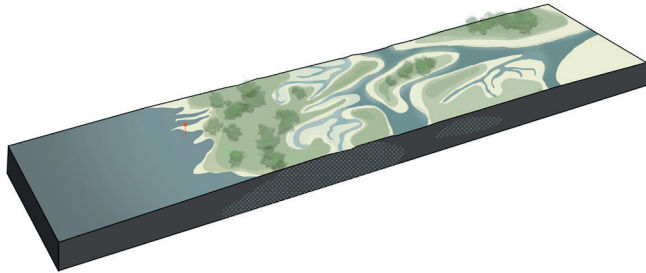
tidal path - high water



tidal path - low water



searching for sea life



Dynamic islands

program

Mowed path emphasized the natural character of this landscape and guides the visitor through the area.

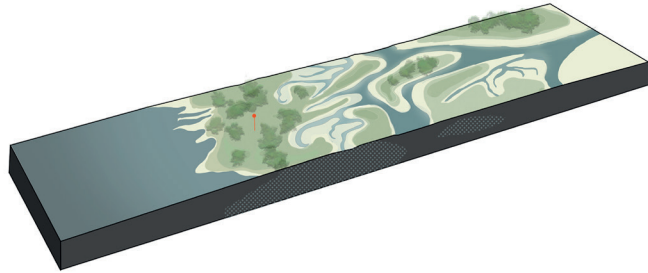
mowed path to guide visitor



natural bike lane



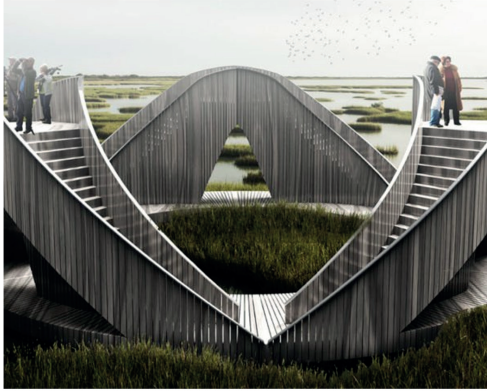
bird watching tower



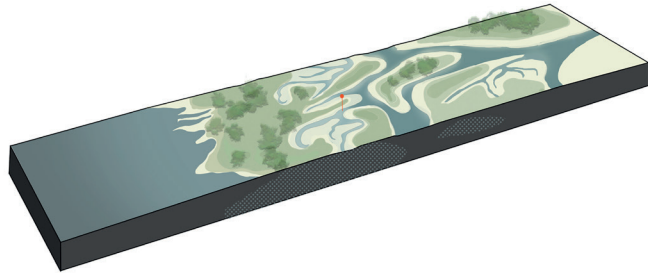
Dynamic islands

program
Exploring the creeks

bird watching tower
(Lookout Loop by Ulf Mejergrén Architects)



guided tours



Dynamic islands

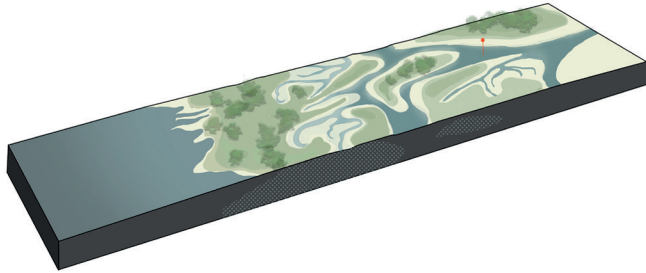
program

Kayak safari trips will not disturb nature too much but provides the opportunity to explore the extraordinary landscape.

kajak safari



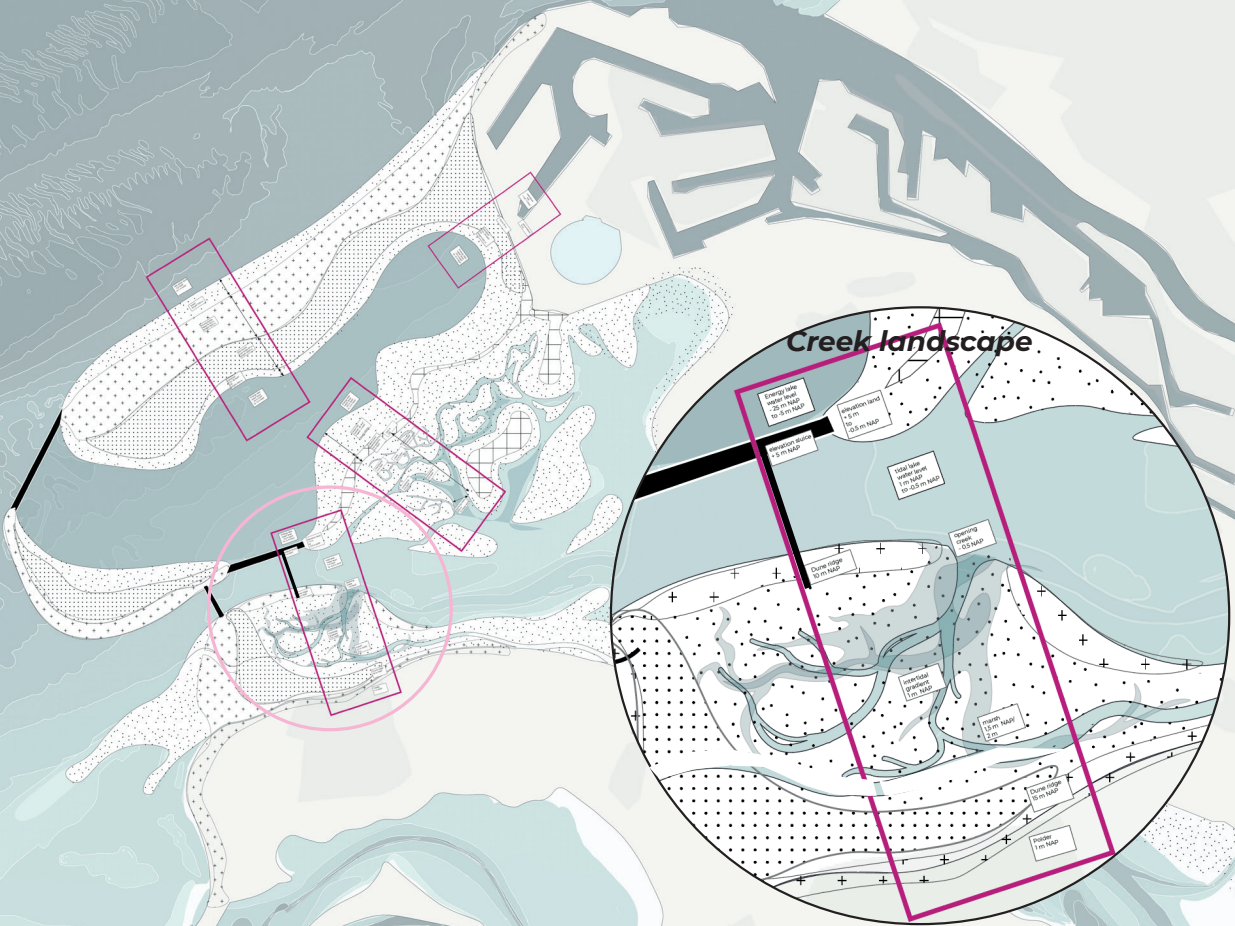
seal watching



Creek landscape transition

Creek landscape

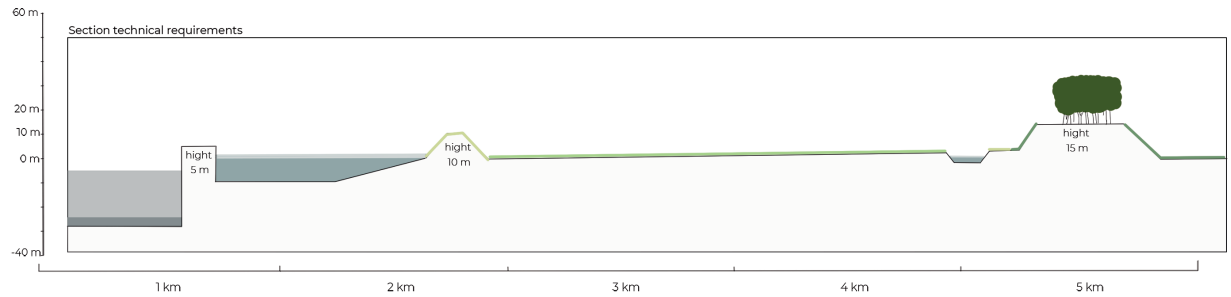
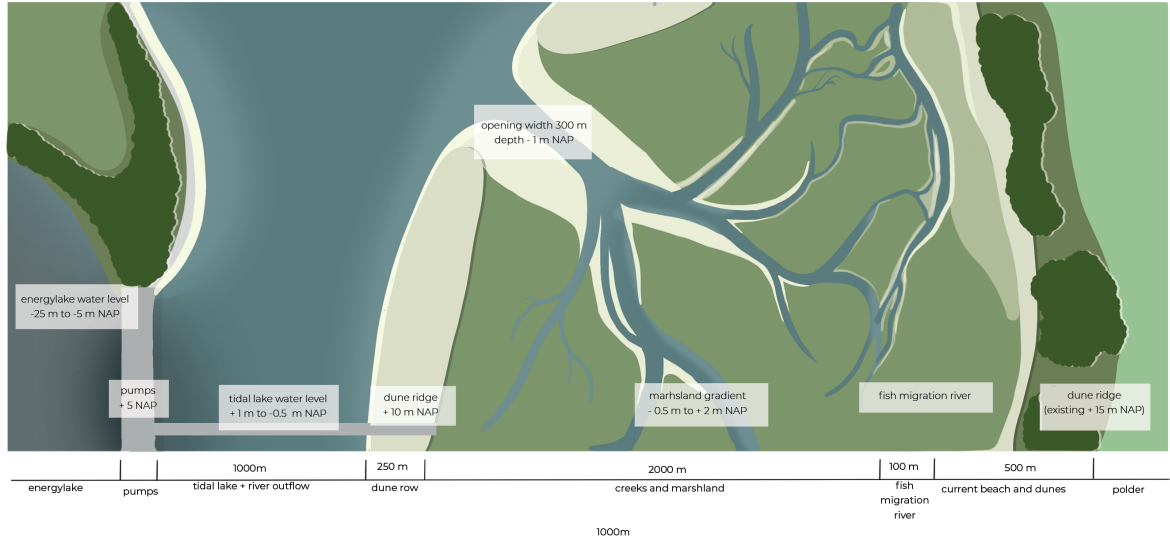
transition: energy lake / tidal lake / polder



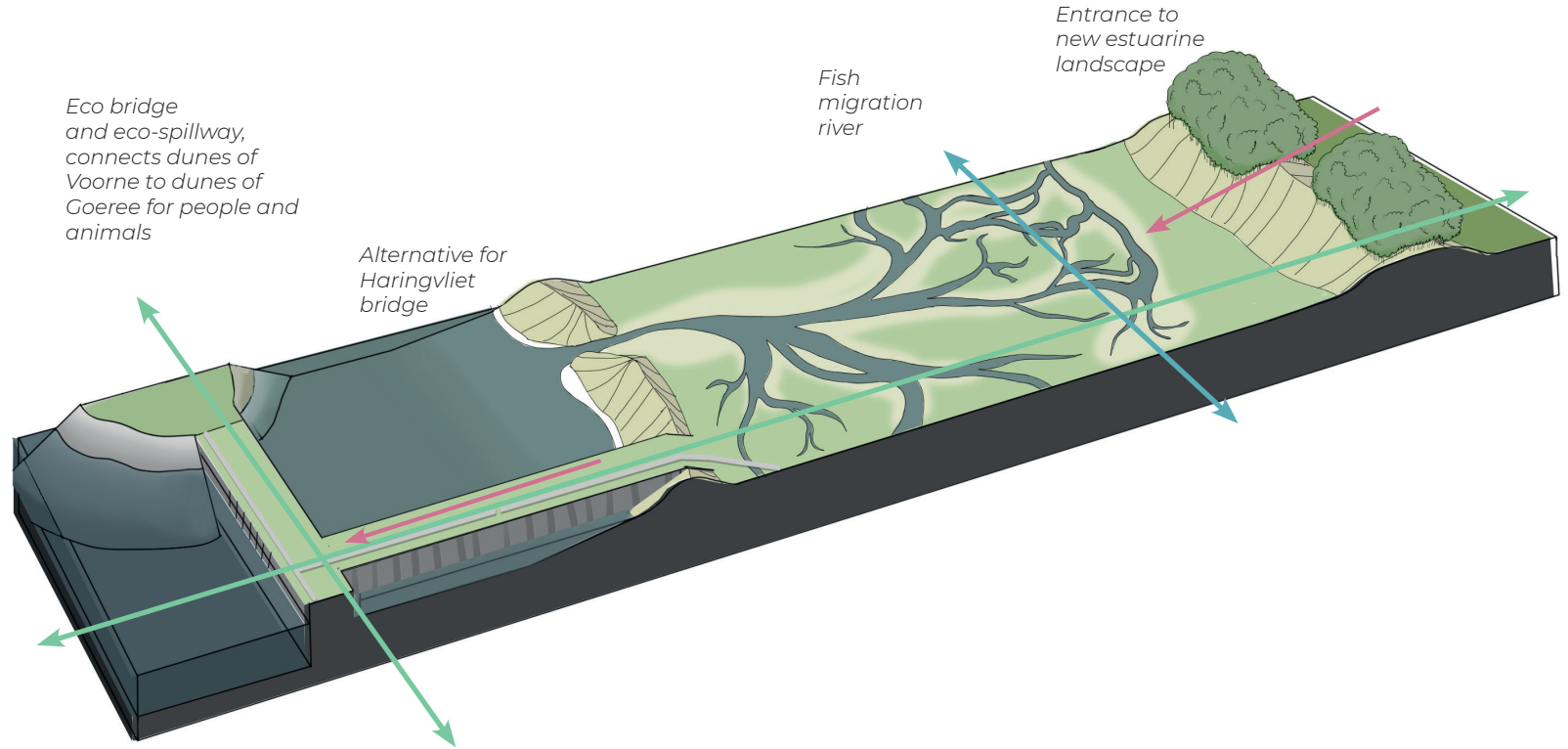
The characteristic of the land/water transitions is very diverse and contains many different flows of water, people and ecology.

The creek landscape is the dominant landscape type and embeds the system of flows into the estuarine landscape.

Creek landscape *technical requirements and structure*



Creek landscape *spatial structure and flows*



Creek landscape *impression eco-spillway and eco-bridge*

Flow of ecology combined with flow of people



Creek landscape *impression fish migration river and entrance to the area*

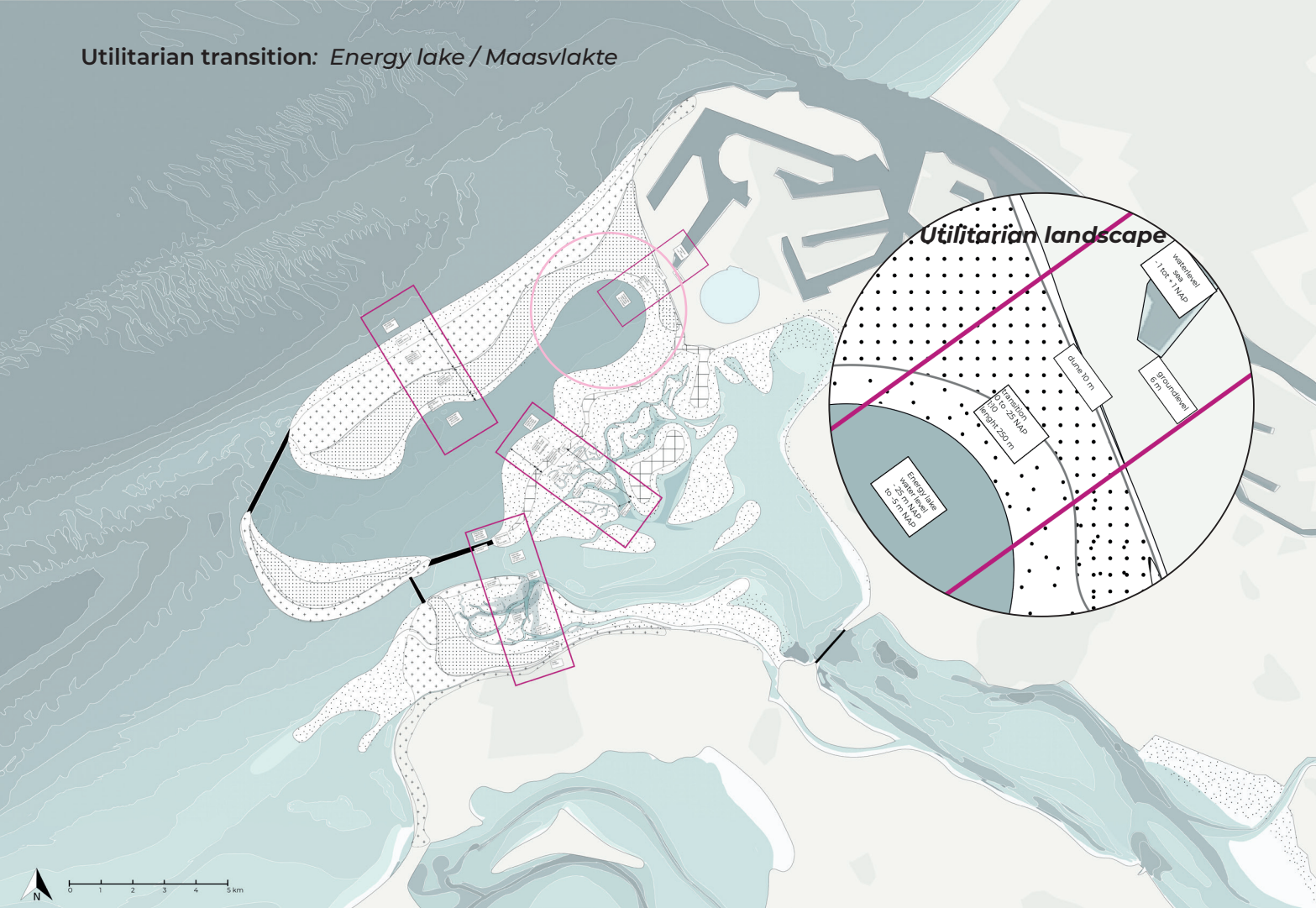
Flow of ecology combined with flow of people

Collage of the new transition from polder to creek.



Utilitarian landscape transition

Utilitarian transition: *Energy lake / Maasvlakte*

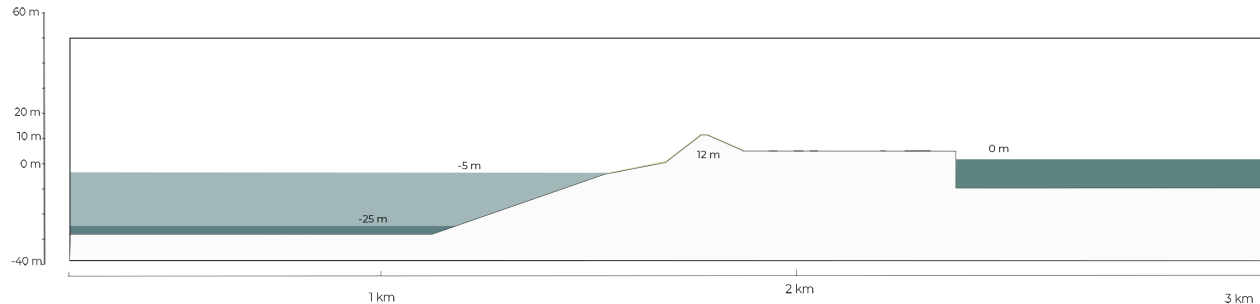
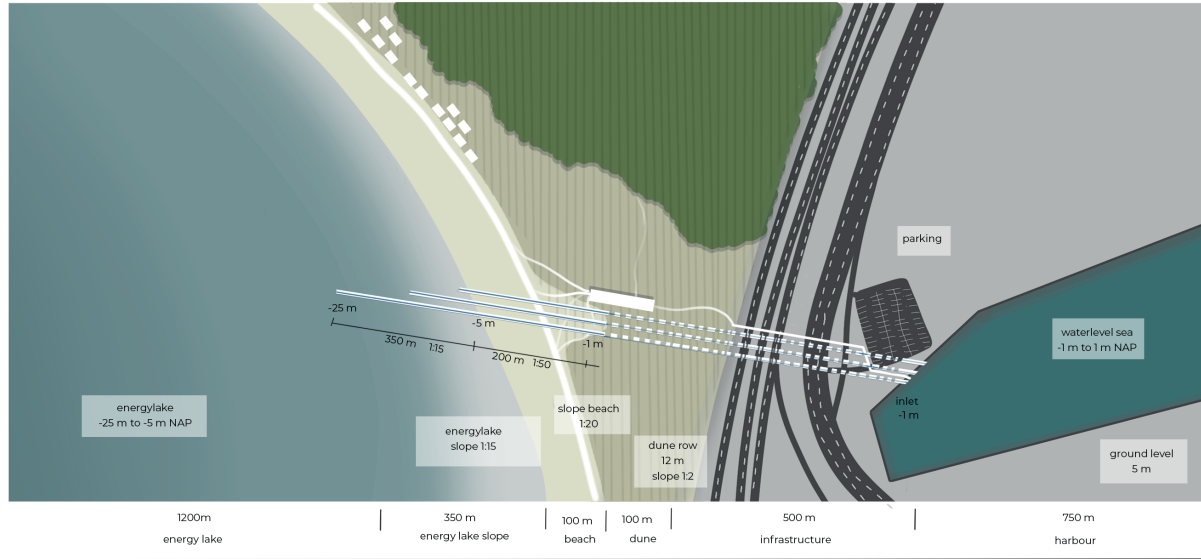


The characteristic of the land/water transitions is very strict at the Maasvlakte. The Maasvlakte and the energy lake are separated from each other by a dune row.

The characteristic of this transition will be based on recreational experience.

Utilitarian transition:

Plan, structure and technical requirements



The characteristic of this transition will be based on recreational experience by implementing a visitorscentre and water cascade. The visitorscentre will visually connect the Maasvlakte to the energy lake and the water cascade provides a water stream from the Maasvlakte to the energy lake and will connect both areas systemetically.

By this design intervention the working of the energy lake can be explained by experiencing the water level differences and by viewing the wind turbines on the Maasvlakte.

Utilitarian transition:

Plan, structure and technical requirements

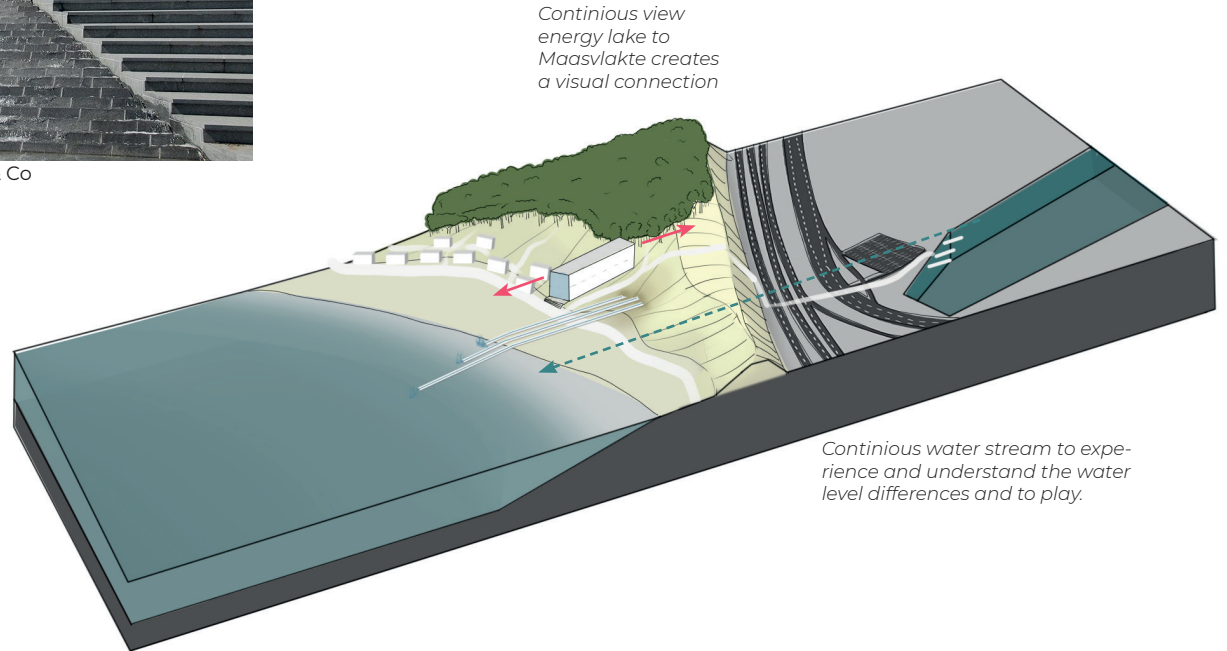
References



Watercascade Ballyfin



Roofpark Rotterdam by Sant & Co



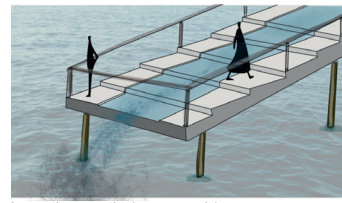
*Continuous view
energy lake to
Maasvlakte creates
a visual connection*

Continuous water stream to experience and understand the water level differences and to play.

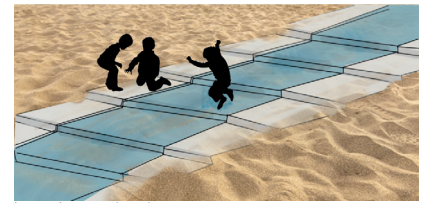
Utilitarian transition:

Impression

Visitorscentre and watercascade to understand the area but also as a recreational destiny on itself.



impression cascade above energy lake



impression cascade at dune area



New estuarine landscape



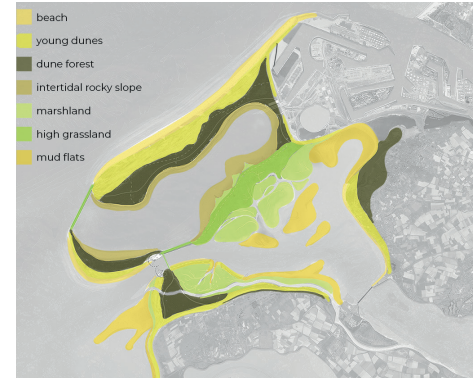
Legend

- 1 Pumping station
- 2 Spillway
- 3 Storm surge barrier + eco-bridge
-  Fish migration river
-  Beach
-  Young dunes
-  Old dune forest
-  Holiday housing and restaurants
-  Aquaculture on slope
-  Visitorscentre
-  Intertidal marshland
-  High grassland and hidden dike
-  Main road
-  Secondary road - cyclists
-  Nature path - pedestrians
-  Ferry route

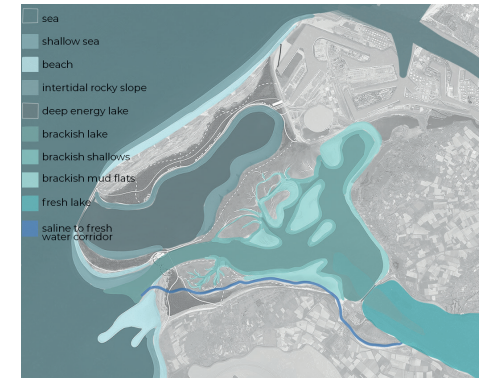
Ecological corridors



Ecotopes on land



Aquatic ecotopes



Energy system



Energy is stored directly next to the wind turbines and is delivered to the industry and city in the same region.

The amount of energy that can be stored is huge and will contribute significantly in achieving the climate goals.

Food production



Seafood can now be produced locally. This can decrease the dependency on the fisheries at sea and in Asia.

Local distribution of the food will help in getting shorter producer-consumer chains.

Flood protection



The pump turbines have a capacity so large it can pump out all the excess river water during an extreme event.

In this way, the river dikes do not need to be strengthened. This will save an enormous amount of money and solves the problem of lack of space around the dikes.



retrieved from: BHC.nl

Flood protection - pump turbines



Infrastructure



One main road which only can be used for long-stay visitors, good delivery and people with a physical disability

People move through this area by bus, ferry, bike or walking.

The low amount of traffic in this area will provide more quietness, less pollution, and slow down the visitors, who will experience their visit as more calming and remote where they spend time in nature.

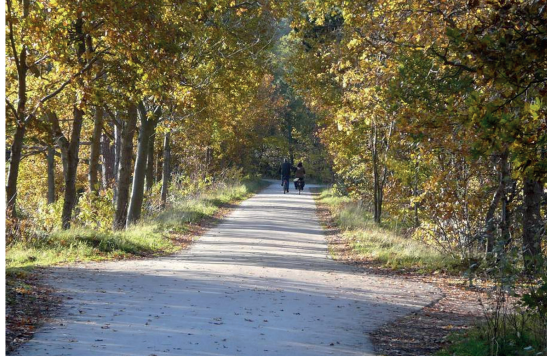
Infrastructure - road typologies and vehicles

Main road - cars and bikes



Google maps, Vierhouterweg Gelderland

Secondary road - cars and bikes



Schoorlse duinen, retrieved through: Hétbouwdeateller.nl

Bicycle lanes



Schoorlse duinen, retrieved through: residentieCalifornia.nl

Ferry to cross the energy lake



Shutterstock

Beach bus along the coastline



Trein Scheepstra via Twitter

Hiking trails



Schoorlse duinen, retrieved through: Wargaanviedaen.nl

Recreational nodes



Small villages for recreation with their own identities subdivide the landscape into more intelligible distances.

Recreational nodes and infrastructure



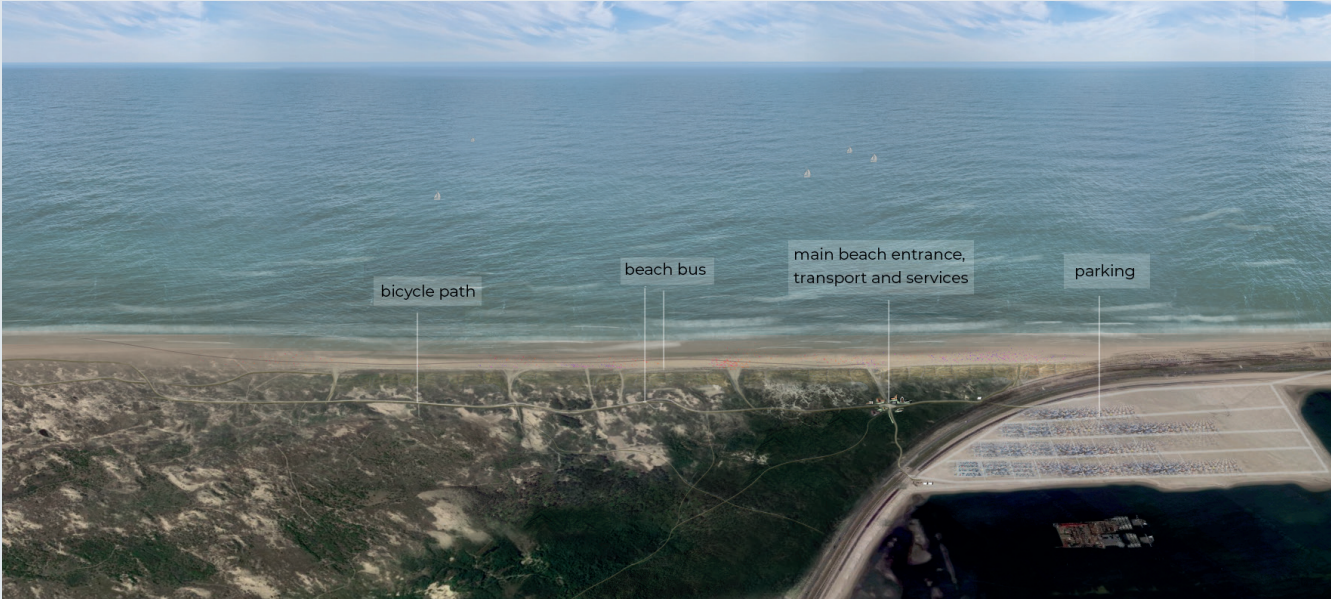
There are endless recreational routes to visit this area.

Hiking through the landscape with overnight stays in the villages.

You can take the ferry to the spillway and bike back to the parking lot.

A day to the beach

Recreational node - beach entrance



beach area

beach entrance & parking



beach opening, restaurants and services



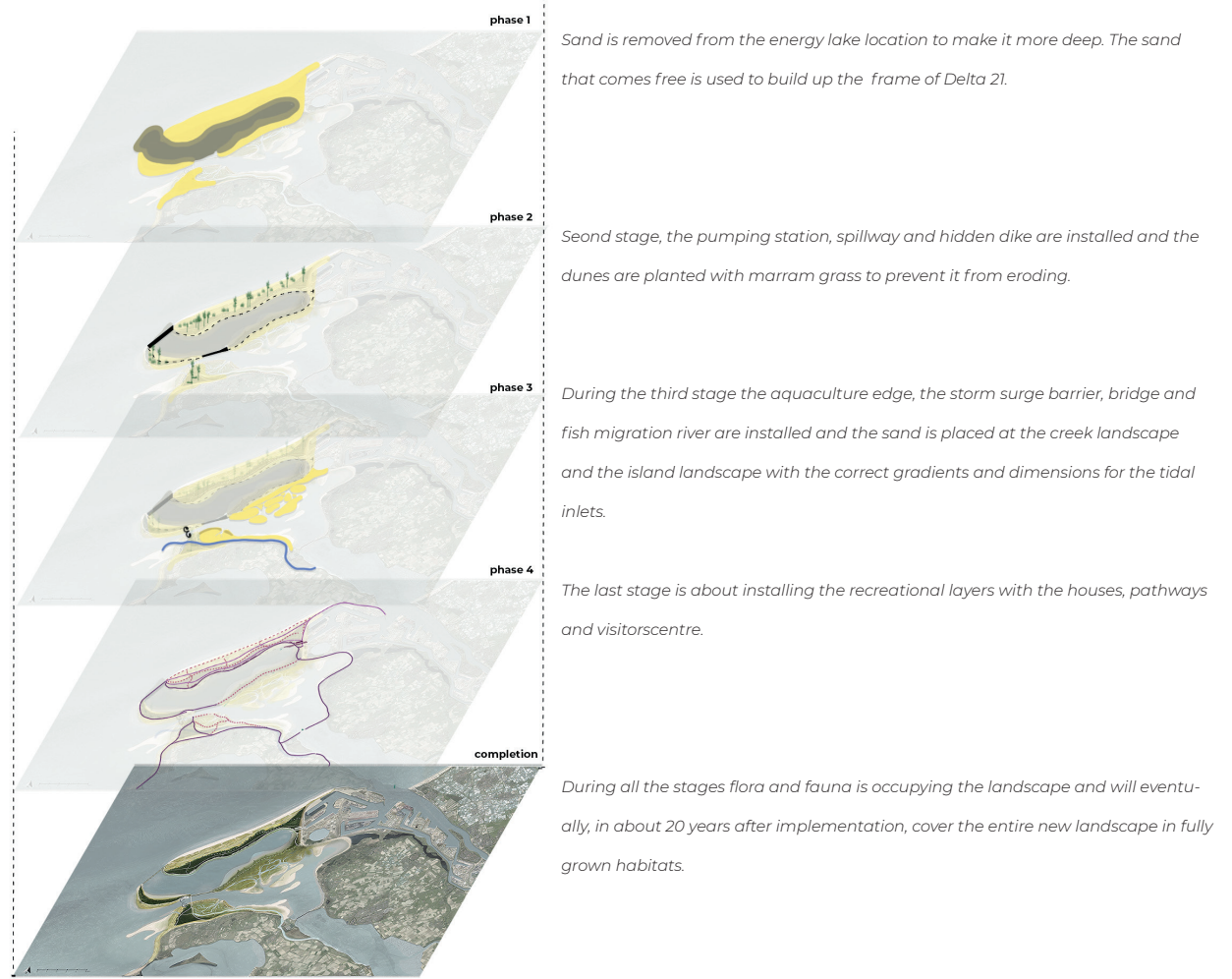
Pathways to other beaches



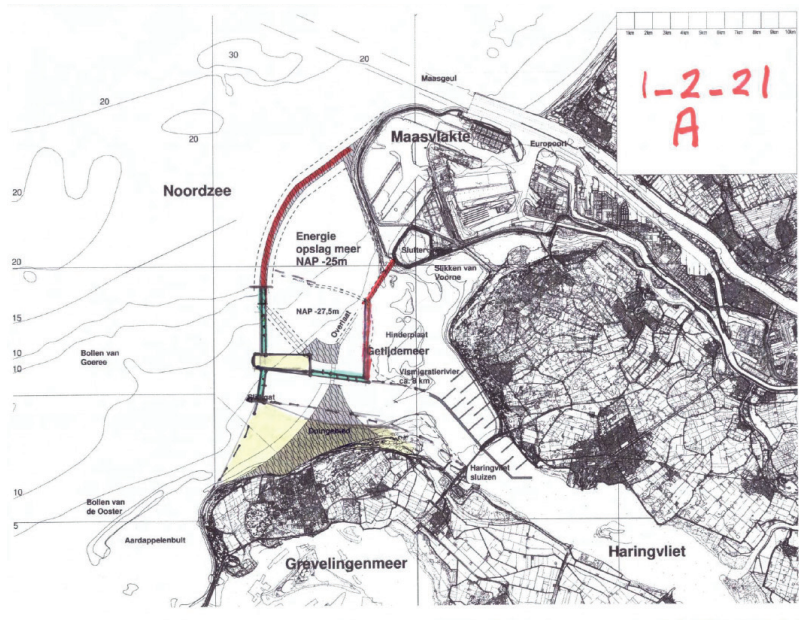
beach entrance



Implementation



Reflection



Conclusion



Thank you!

