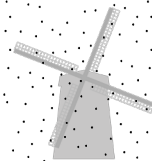


MSc Thesis presentation 5

Rafael Gridelli



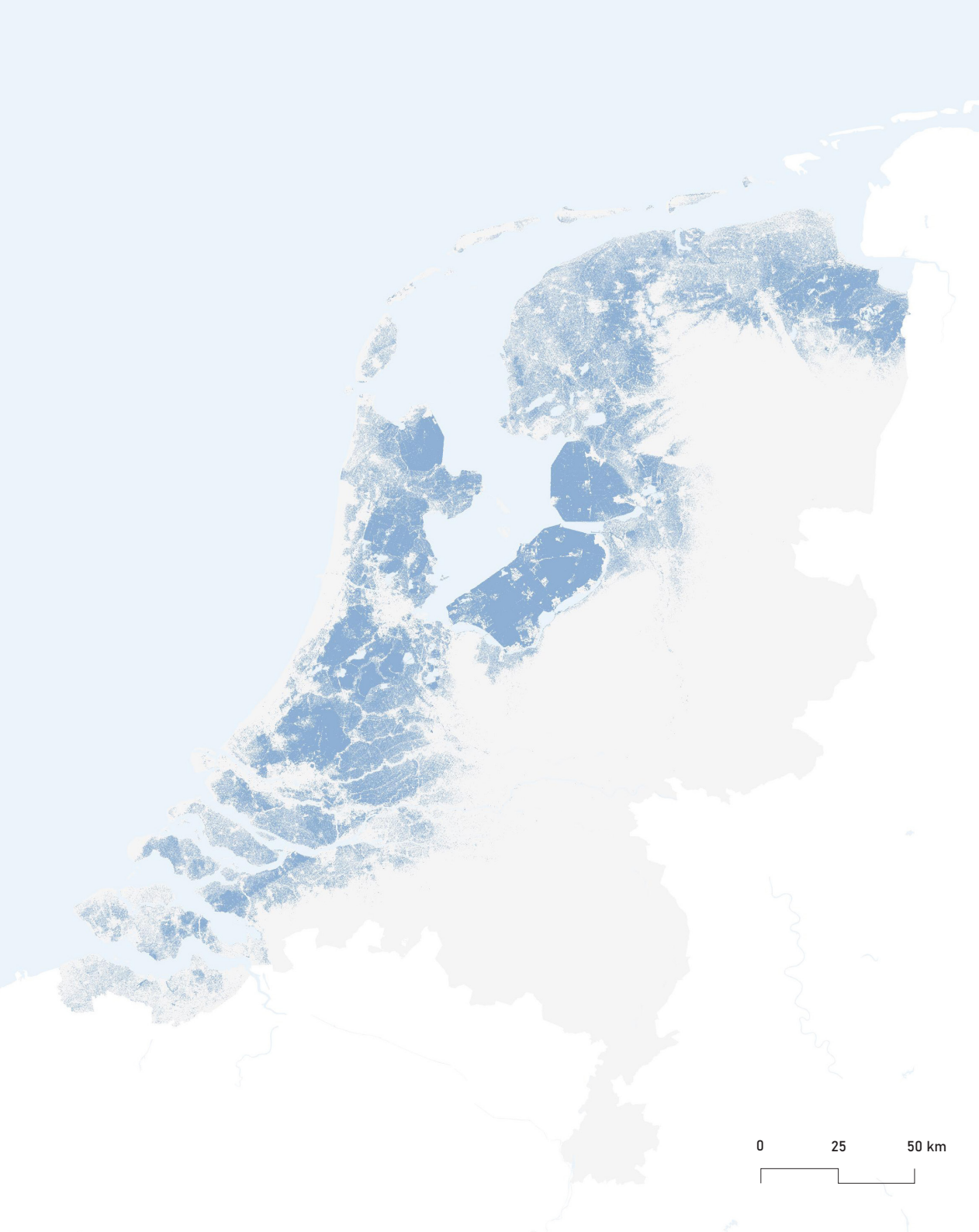


Circular Water Stories - lab

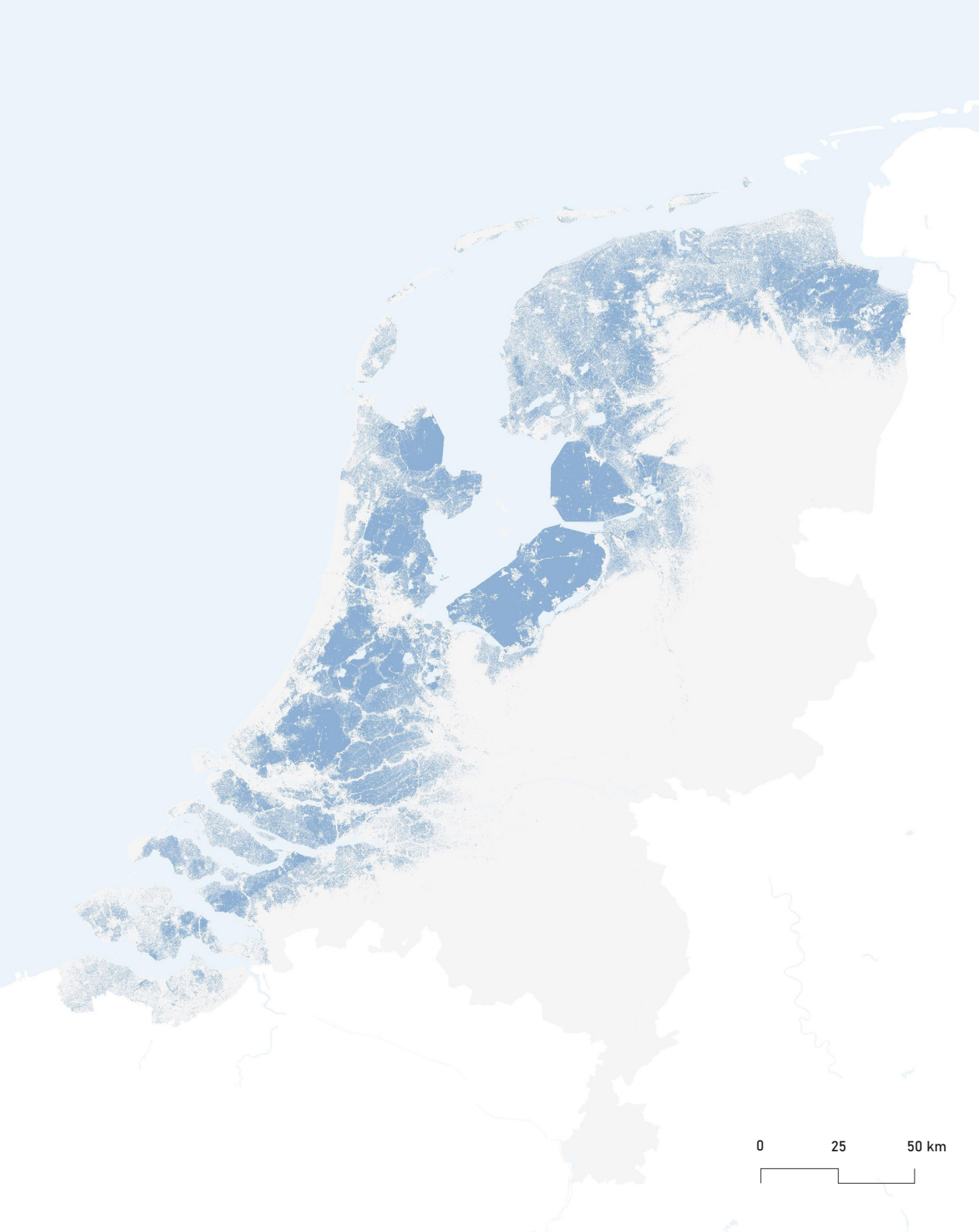
As of my fascination for
human interactions
and water



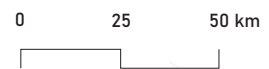
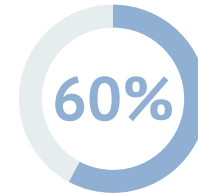
THE NETHERLANDS



0 25 50 km

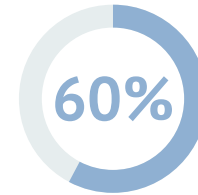


THE NETHERLANDS

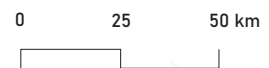
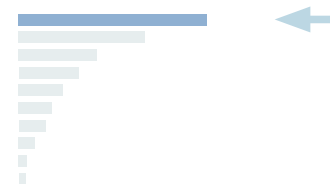




THE NETHERLANDS



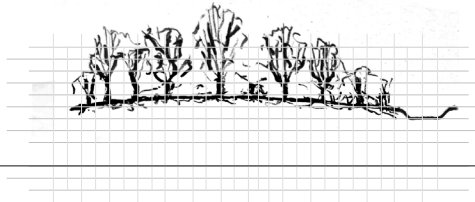
DENSITY



POLDER

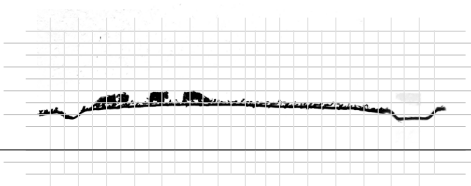


EVOLUTION OF THE POLDER



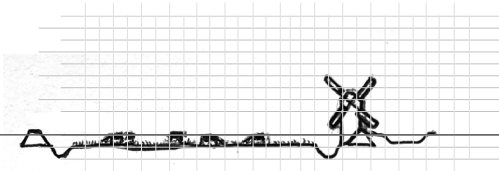
*Subboreal, development of peat marshes:
Nature ruling over culture*

*DEFENSIVE relation
with the landscape*



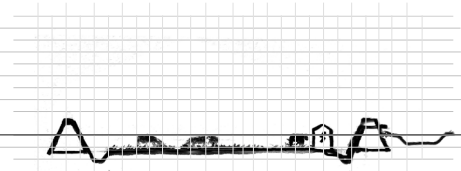
First interventions for agricultural purposes

*ANTICIPATIVE relation
with the landscape*



*Middle Ages: Draining land below sea level
by invention of windmill*

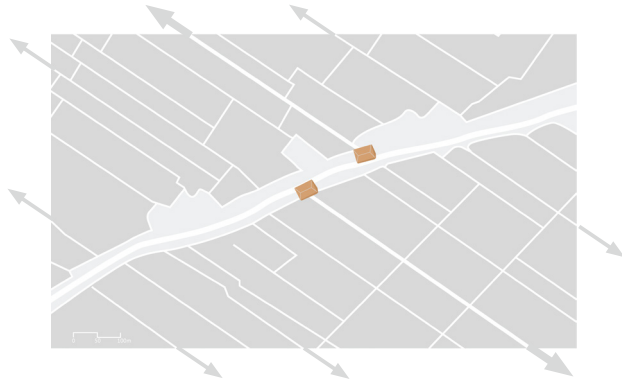
*OFFENSIVE relation
with the landscape*



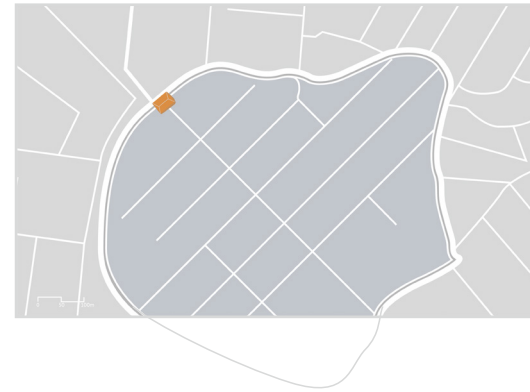
*Industrial revolution: Complex polder system draining the polder
and maintaining water levels*

CONTROLLING the landscape

PEAT POLDER

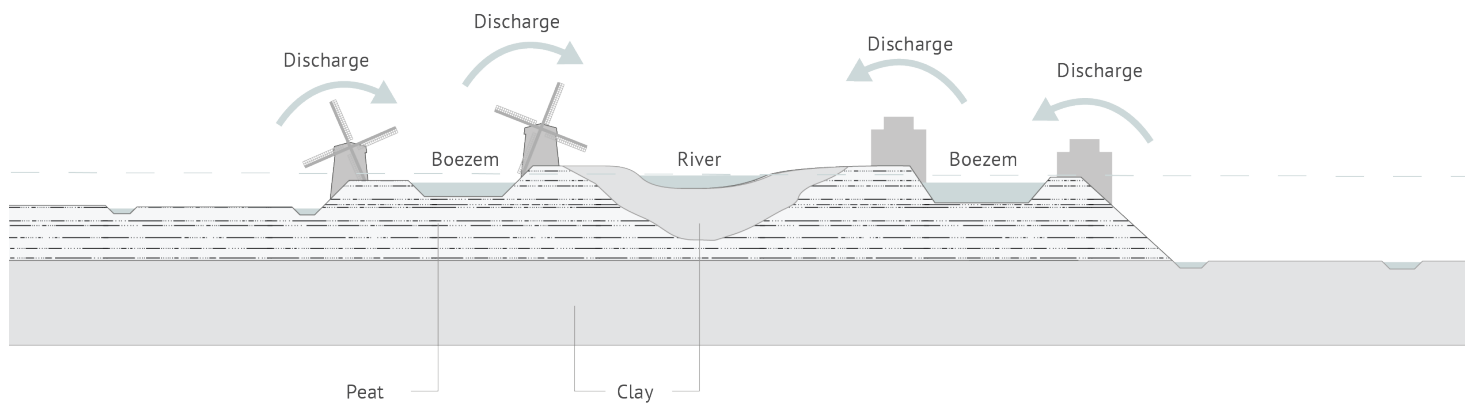


LAKE-BED POLDER



Peat polder

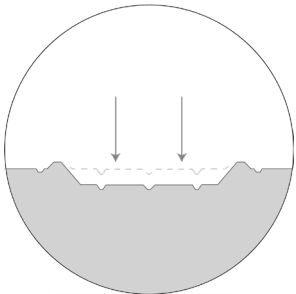
Lake-bed polder



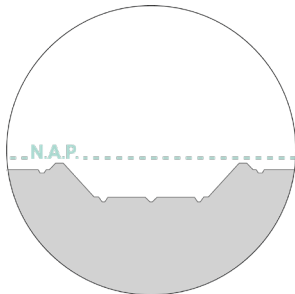
PEAT POLDER PROBLEMS



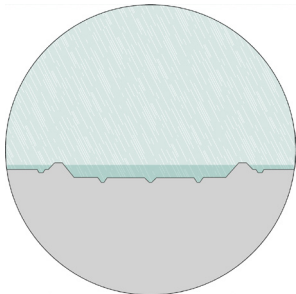
PEAT POLDER PROBLEMS



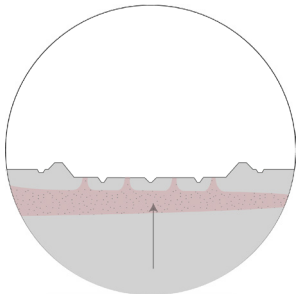
Soil subsidence



Below sea level

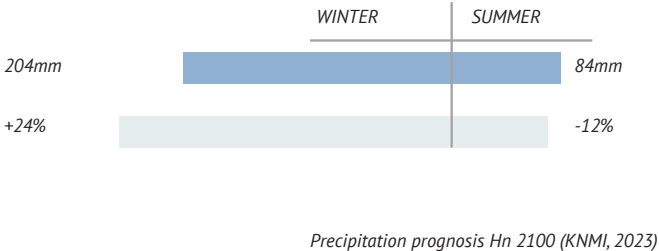


Fill up due to surplus of precipitation

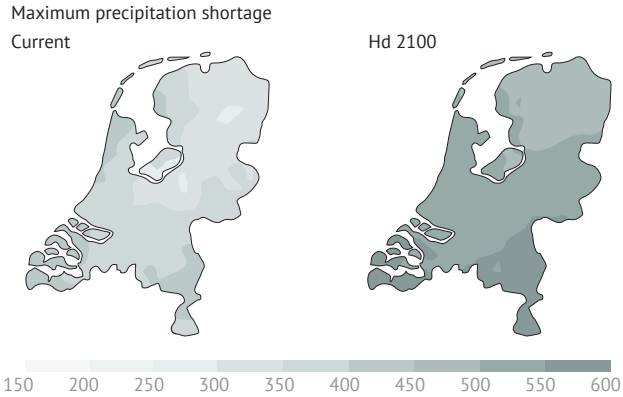


Salt water seepage

PRECIPITATION

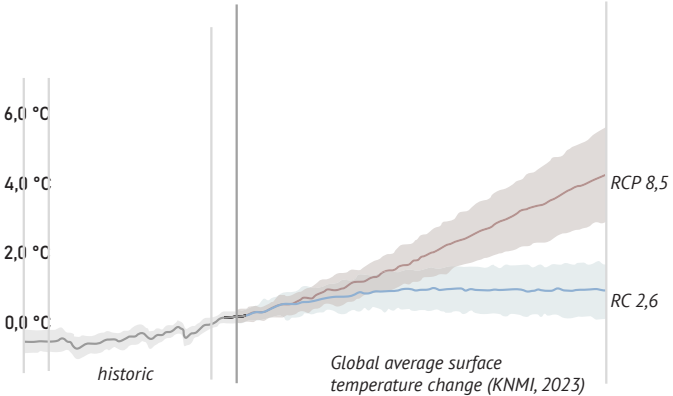


DROUGHT

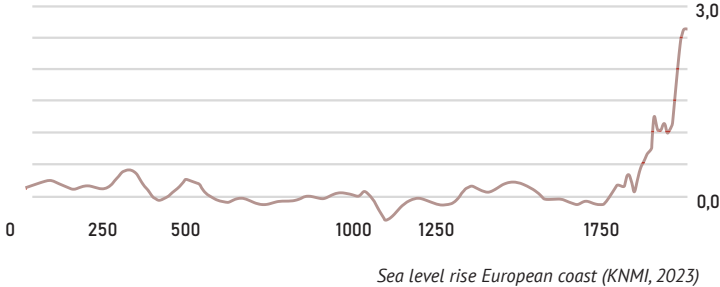


Maximum precipitation shortage, Hd 2100 (KNMI, 2023)

TEMPERATURE



SEA LEVEL RISE

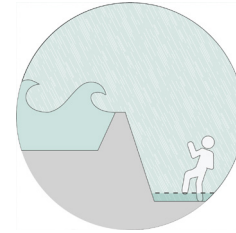


PROBLEM STATEMENT

Current water management

Roughly half of the Netherlands lies **below sea level**; the country has a **high population density** and **limited space**. With rapid changing climate conditions, water management in the Netherlands are **under pressure**.

The lower polders face more water pressure from the sea, rivers, rain, and seepage. In the long term, current water management **cannot guarantee future living in the lowlands**.



RESEARCH ASSIGNMENT

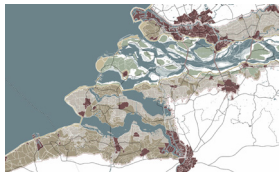
A new water system for the polder

The primary objective of this research is to critically examine and **propose alternative water management** practices of polder ecosystems. By examining methods for tolerating the presence of water within our living environment.



RESEARCH ON FUTURE STRATEGIES

Attempts regarding an alternative future of the polder Current water management



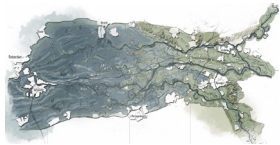
Project Zeelandia



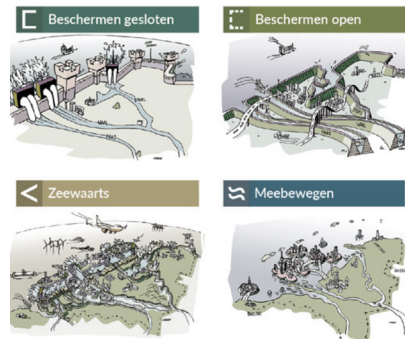
Project Rotterdam Sponge City.



Project Midden-Delfland as National Productive National Park.



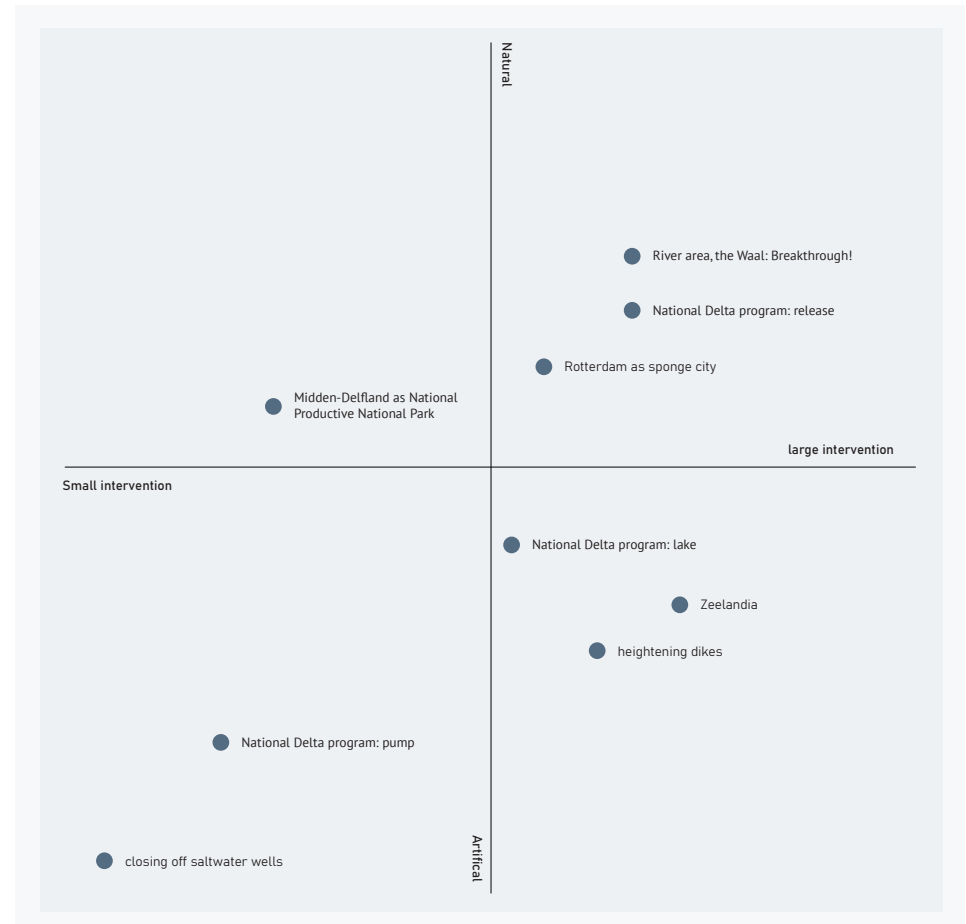
Project River Area, the Waal: Breakthrough!



Deltare's adaptation strategies



The National Delta Program adaptation strategies



THE TERP

Safe without dikes



(Het geheugen van schagen, 2023)

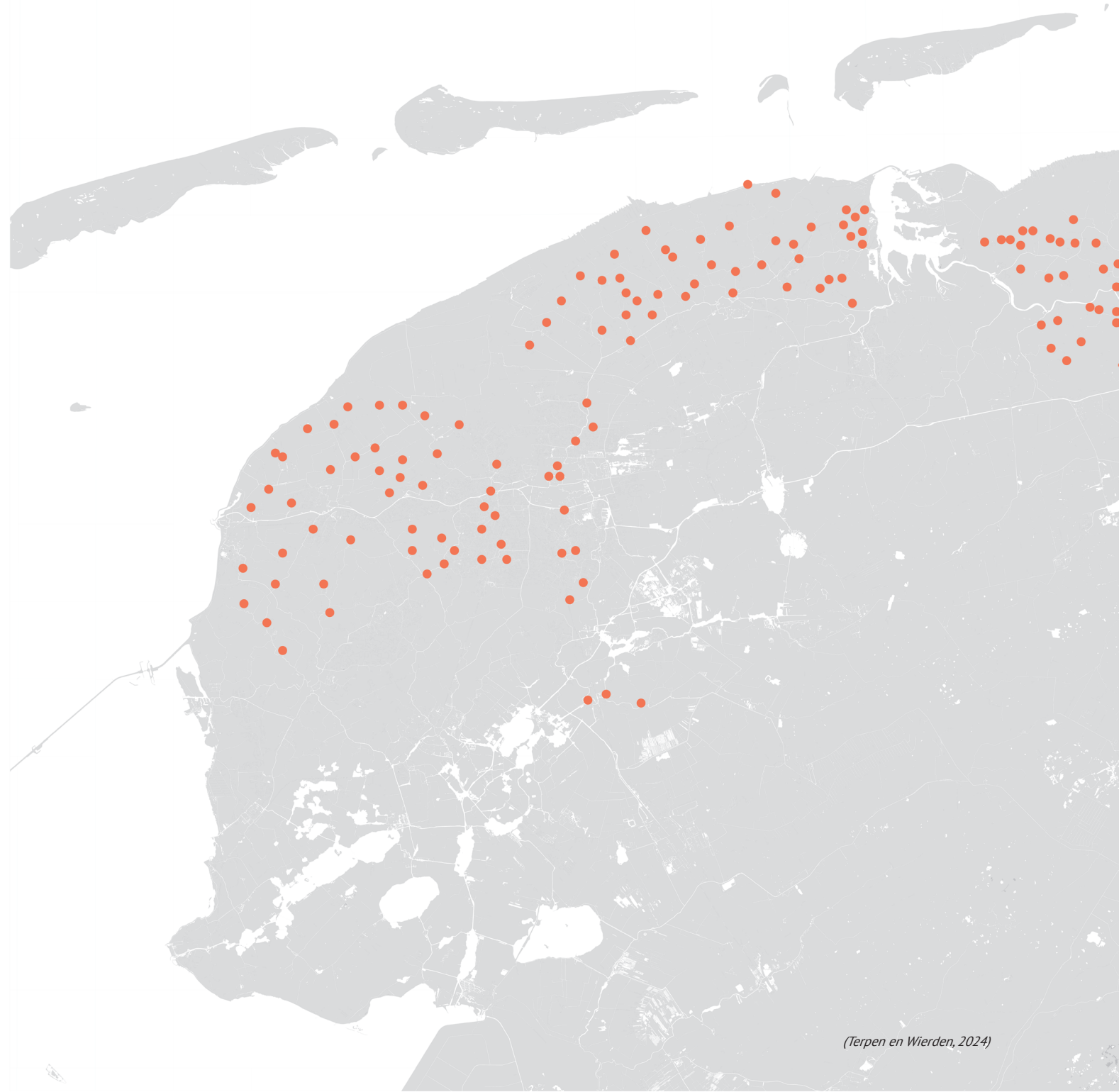
THE TERP

Safe without dikes



(Het geheugen van schagen, 2023)

THE TERP



6000 BC Hunter & collectors



Settlement on higher ground



5000 BC Sedimentation



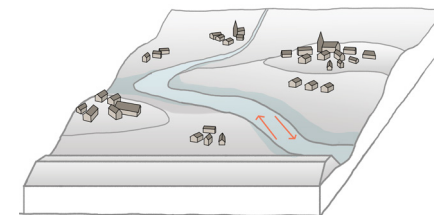
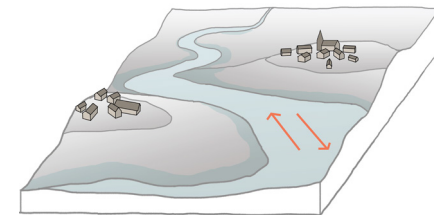
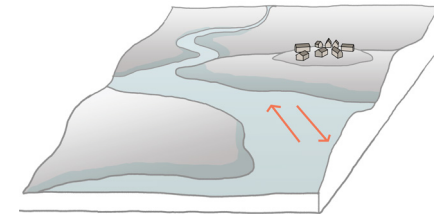
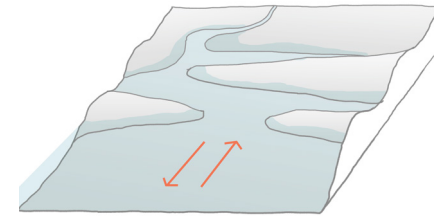
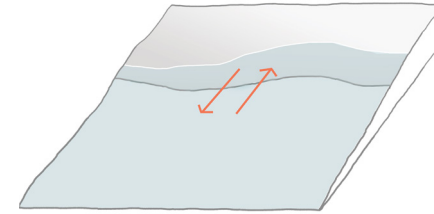
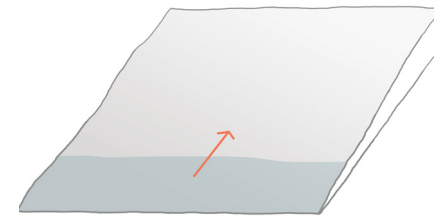
600 BC First human settlement



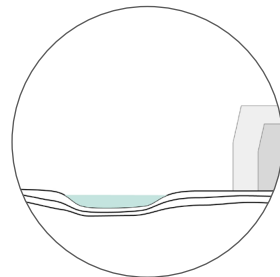
Expansion of villages



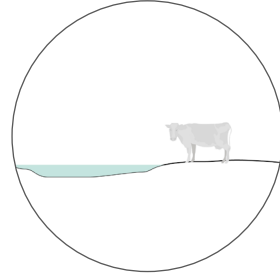
Early middle-ages, built of sea dikes



THE TERP



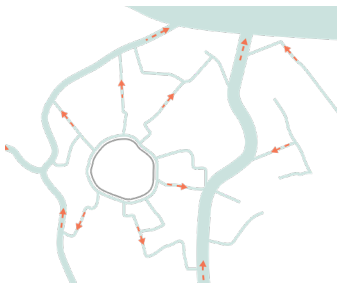
Dobben



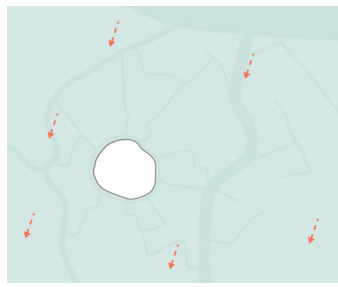
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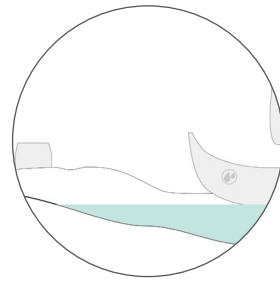
Trade



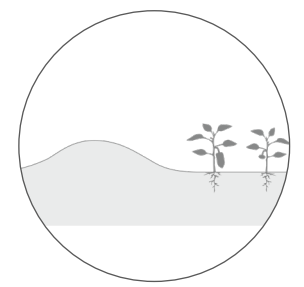
Low tide



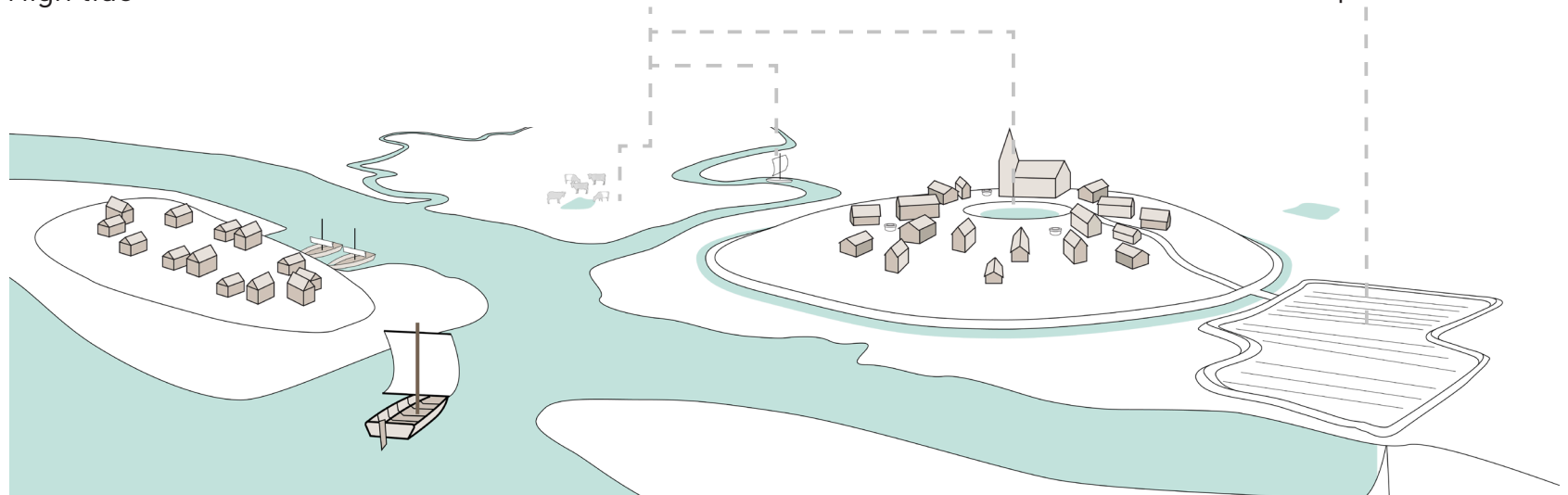
High tide



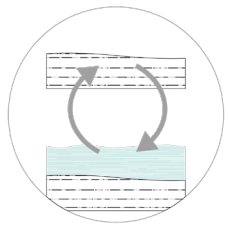
Fresh water



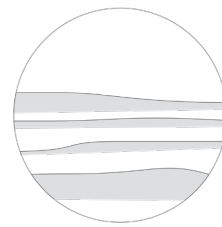
Crop Growth



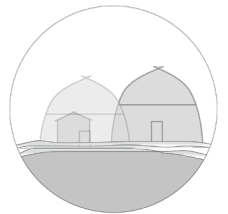
ELEMENTS OF THE TERP



Fluctuating water levels



Sedimentation



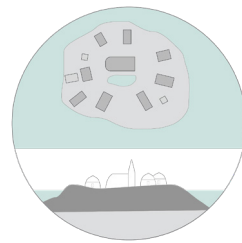
Adaptability of houses



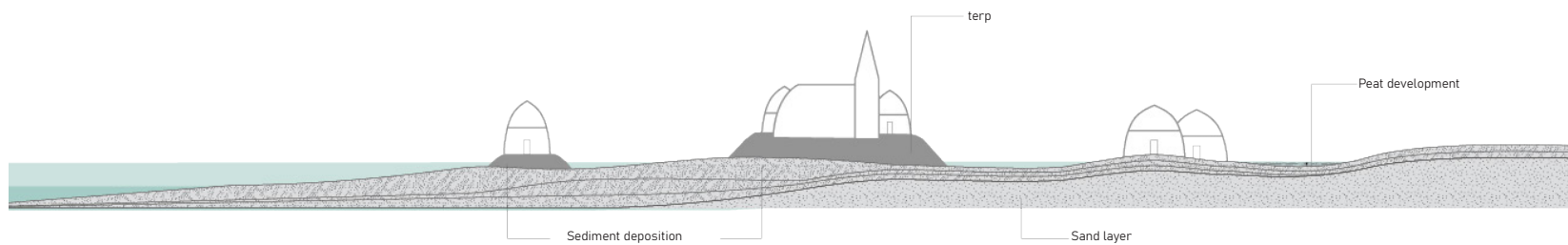
Increase of biodiversity



Built with waste material

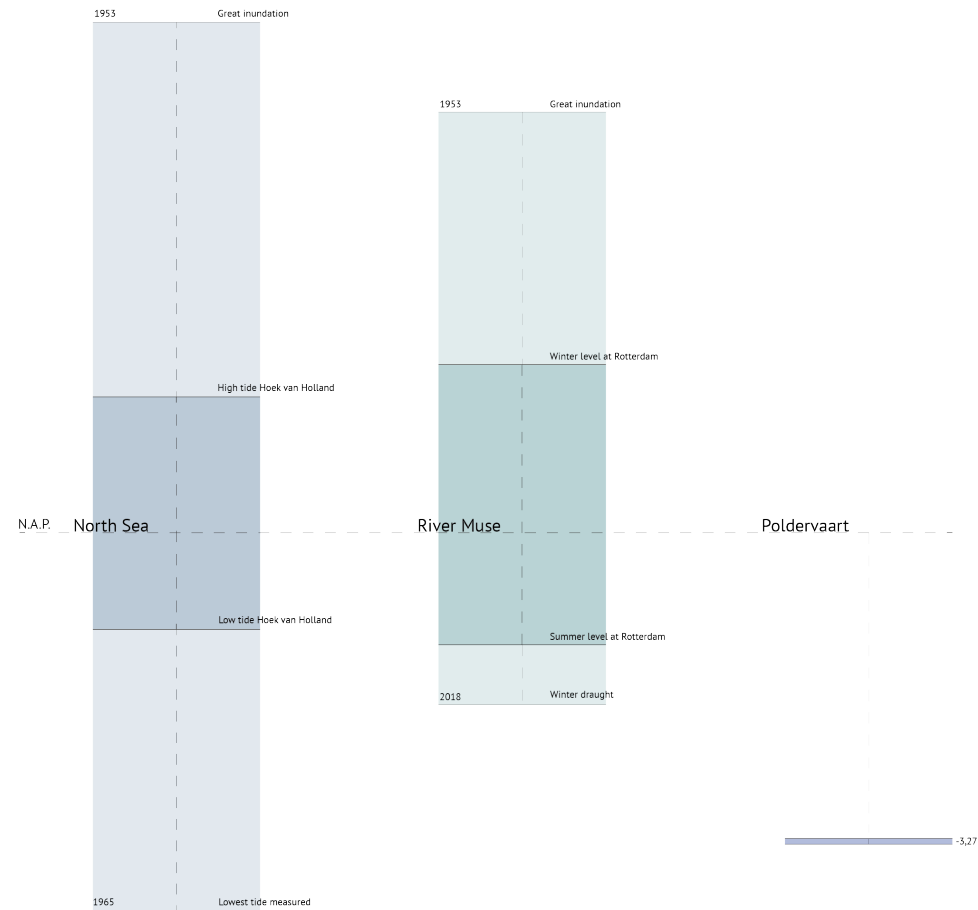


Social cohesion



FLAT LAND

Why terpen did not exist in the polder



DESIGN ASSIGNMENT

Is to create a **new concept** for polder in which **inundations are allowed**, by using a modern interpretation of the **concept of the terp**, to grow parts of the polder using (waste) material and create a safe living environment, eventually **above sea level**.

STRATEGY

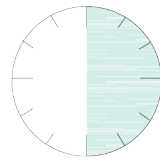
This will be illustrated by an **animation**, showing how the concept of the terp can be implemented in the polder. An **analysis** of the low-lying peat polder, a **master plan** of the implementation of the concept of the terp in the Noord-Kethel polder area, with some focus areas. Finally a **physical mock-up**, showing the evolution of the polder landscape.

MODERN ELEMENTS OF THE TERP

Translating the concept of the terp to the polder



WATER FLUCTUATION



DAY



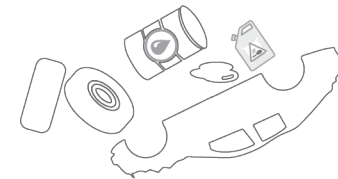
YEAR



WASTE



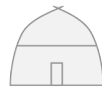
DEGRADABLE



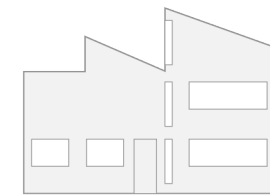
NON DEGRADABLE



BUILDINGS



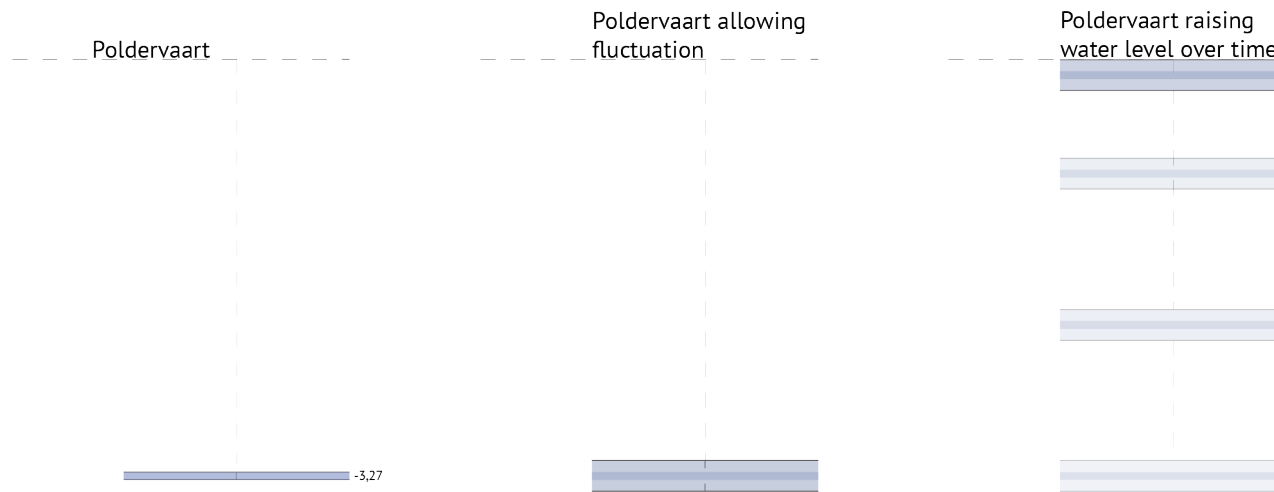
SIMPLE



COMPLEX

TERP IN THE POLDER

allowing water fluctuations



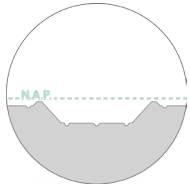
SURMOUNTING THE POLDER



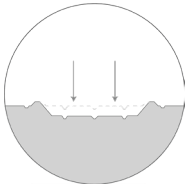
LOCATION



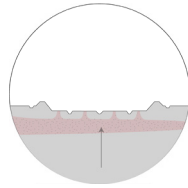
LOCATION REQUIREMENTS



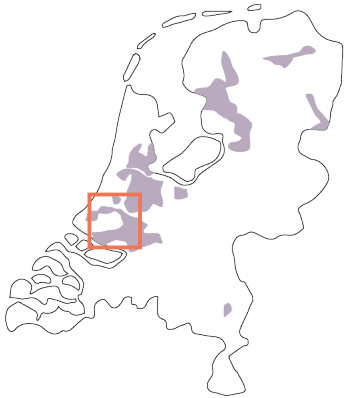
Polders below sea level



Subsiding areas



Salt intrusion



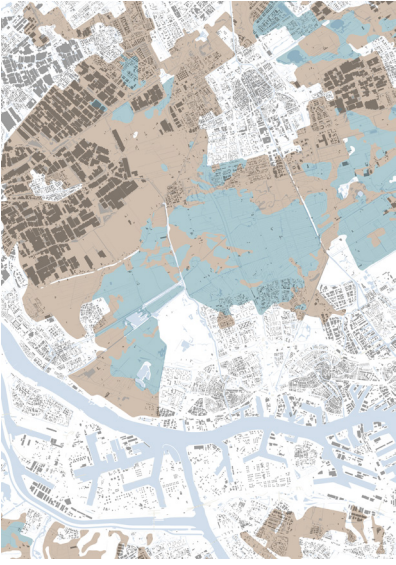
COASTAL PEAT POLDERS



Ground level to NAP



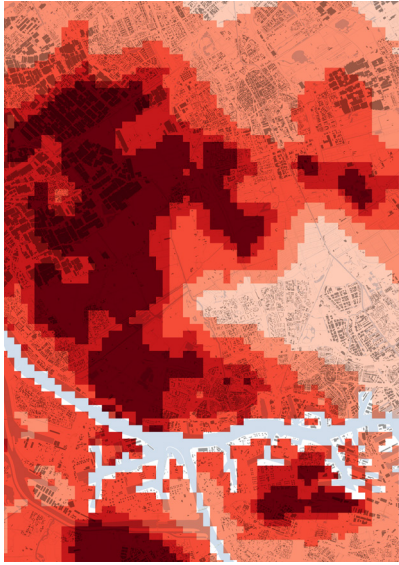
Soil: peat and clay



Soil subsidence

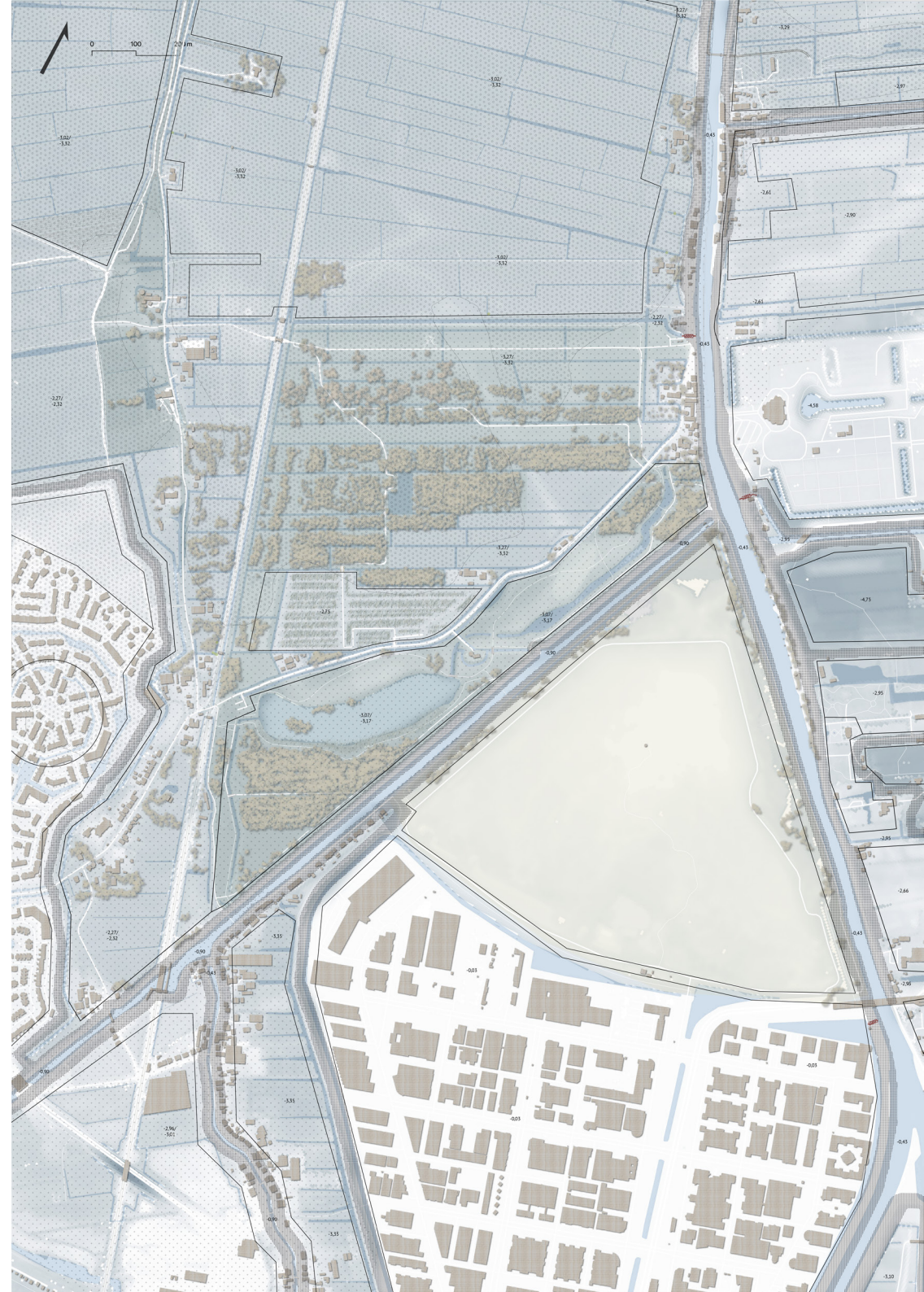
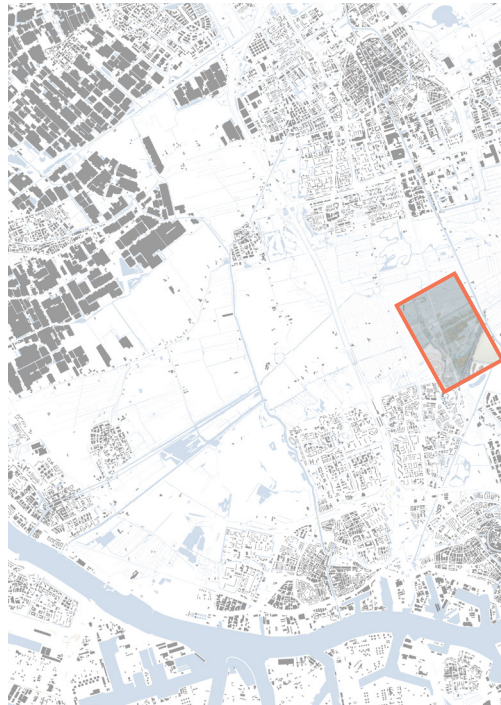
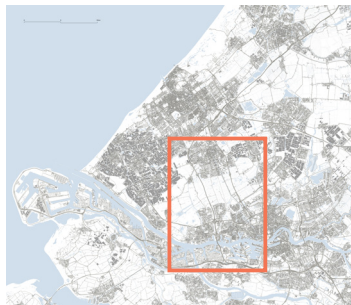


Salt intrusion



NOORD-KETHEL POLDER

A low-lying polder with all polder elements

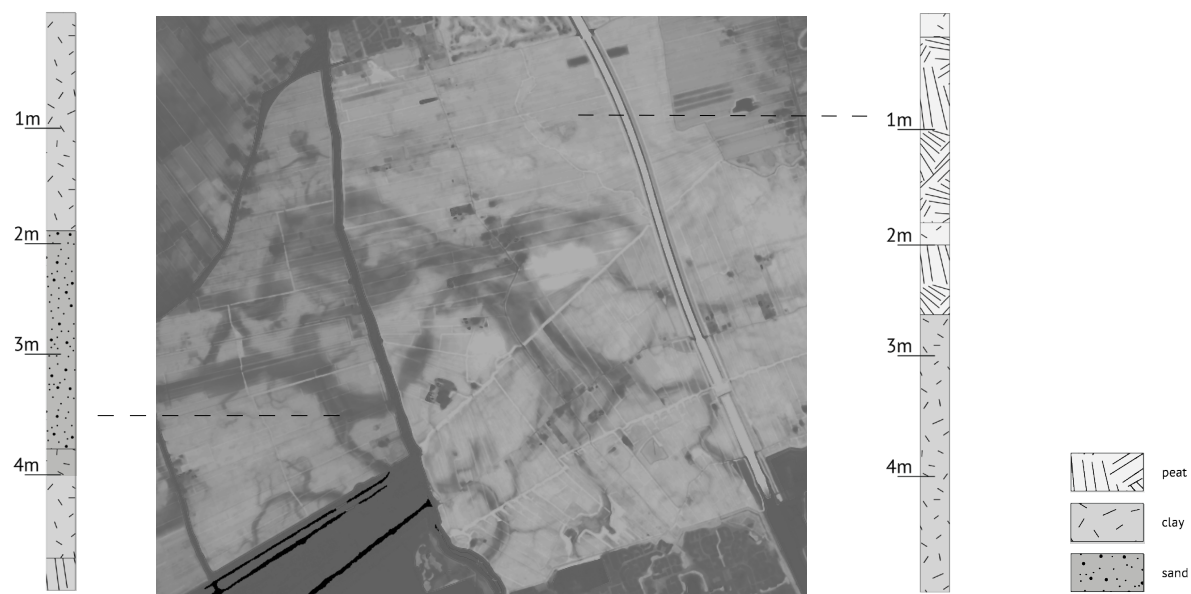


LANDSCAPE

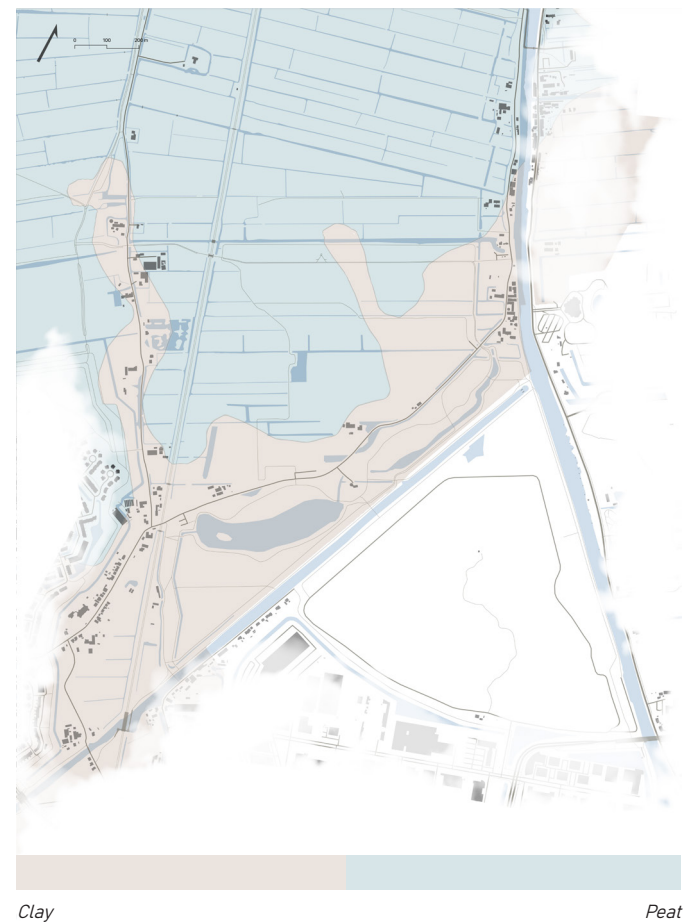


GEOLOGICAL REMAINS IN THE PEAT POLDER

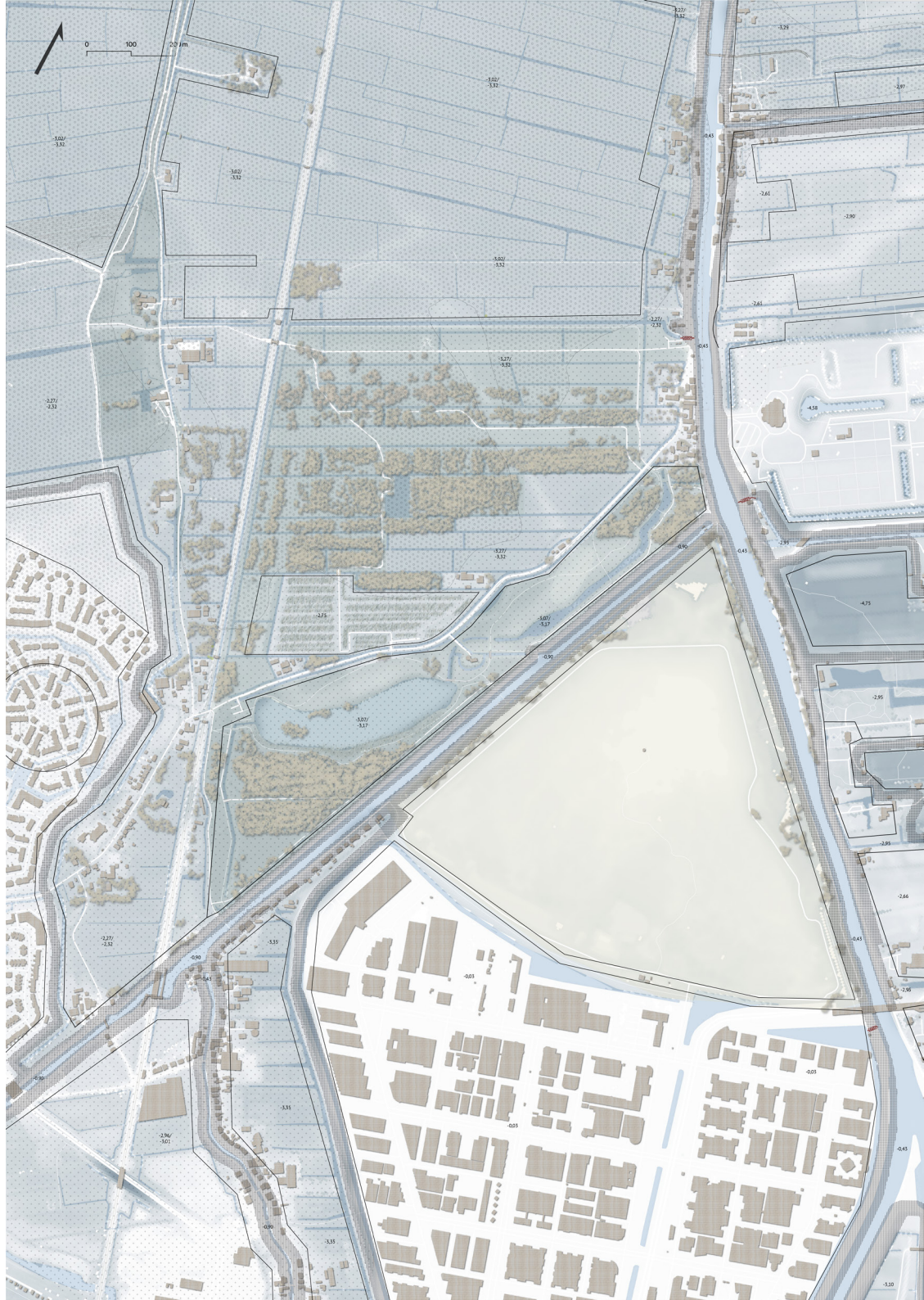
soil analysis



GEOLOGICAL REMAINS IN THE POLDERVAART soil analysis at location



DAIRY FARMING



WASTE HILL

Superficial terp with profound potential

1985 Oost-abspolder becomes waste storage area.



Former Oost Abtspolder
(Topotijdreis 2024)



Dredging soil (afdekshop 2024)



Aerial view of waste hill (dS+V, 2010)

Soil egalisation for golf course.

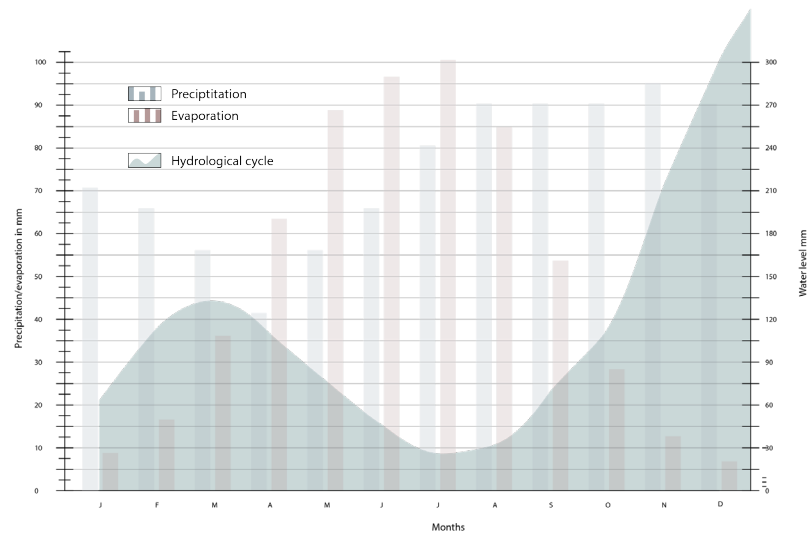


Pioneer ecology development.

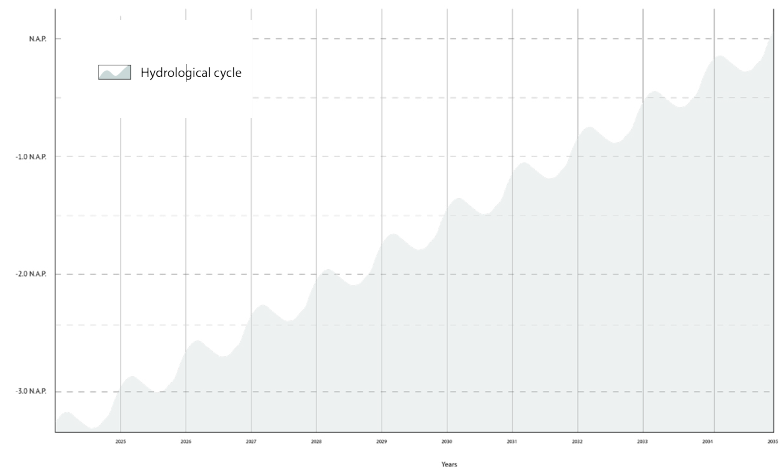


THE DUTCH PRECIPITATION SURPLUS

Climate in the Netherlands



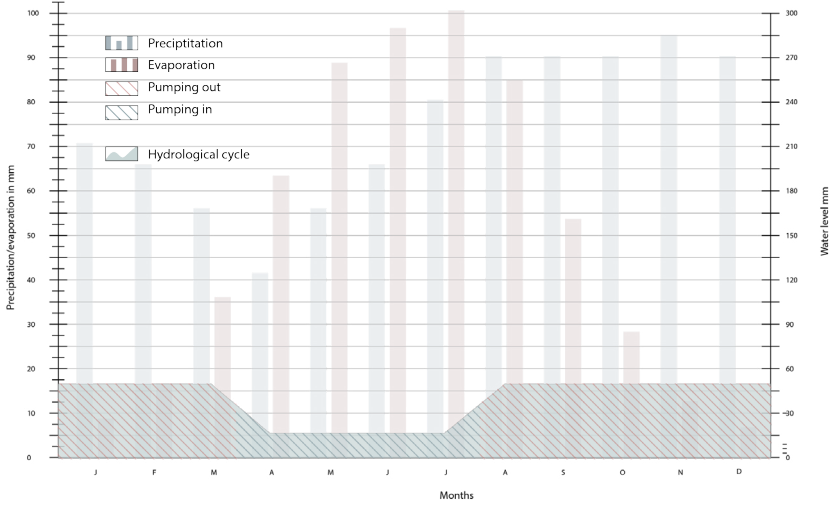
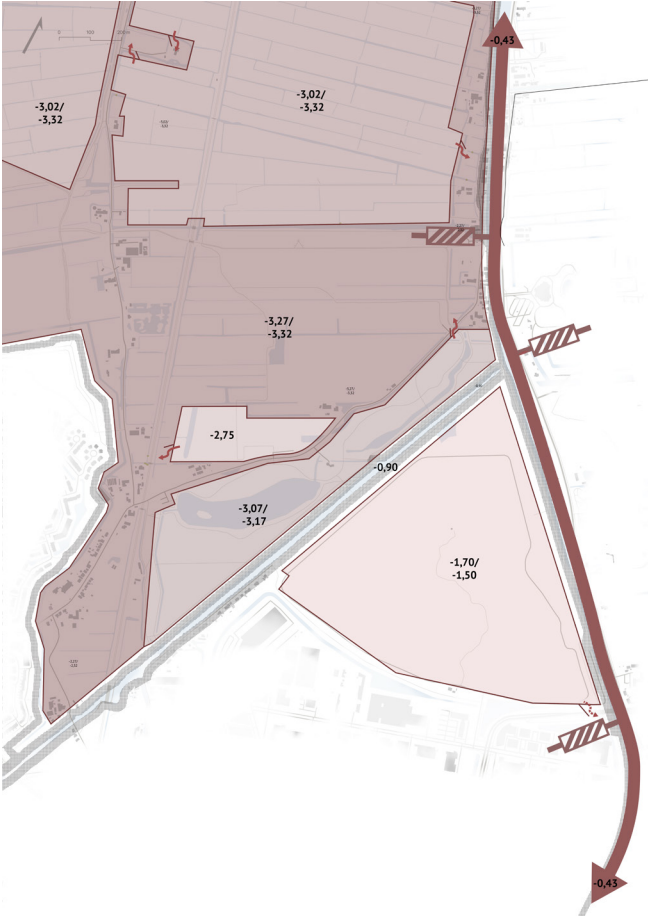
Annual precipitation cycle.



Sequence of annual hydrological cycles.

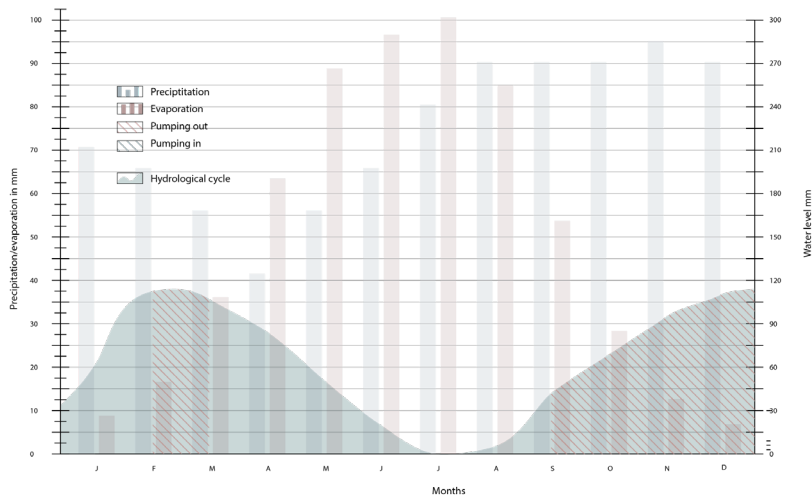
PUMPING IN WINTER AND SUMMER

Current water management

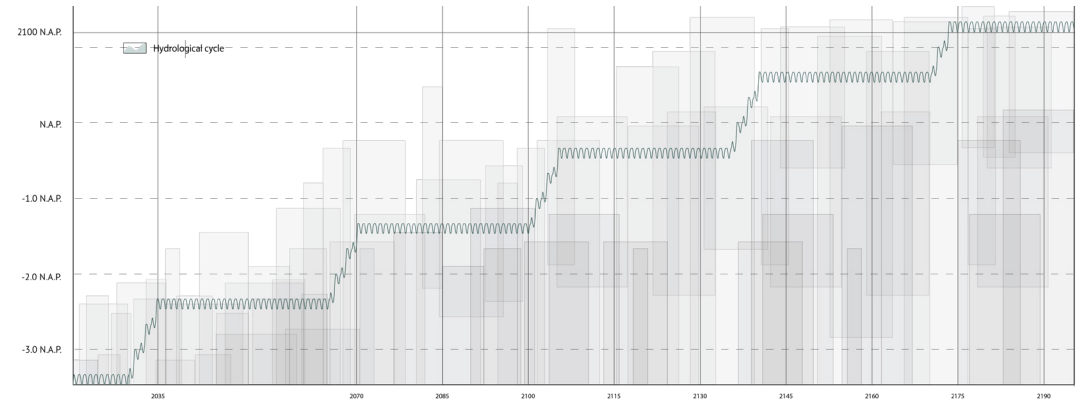


INTRODUCING FLEXIBILITY

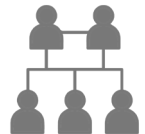
new water management proposal



Allowing 10.8cm of fluctuation
 -less pumping
 -less peat oxidation

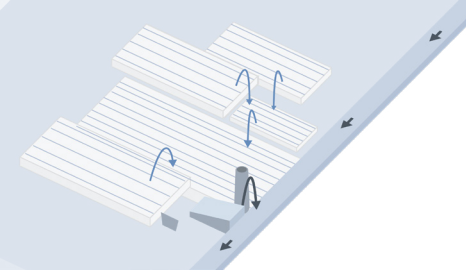


Graduate increase of water level
 -every 1.5 generation
 -Increasing water levels until sea level

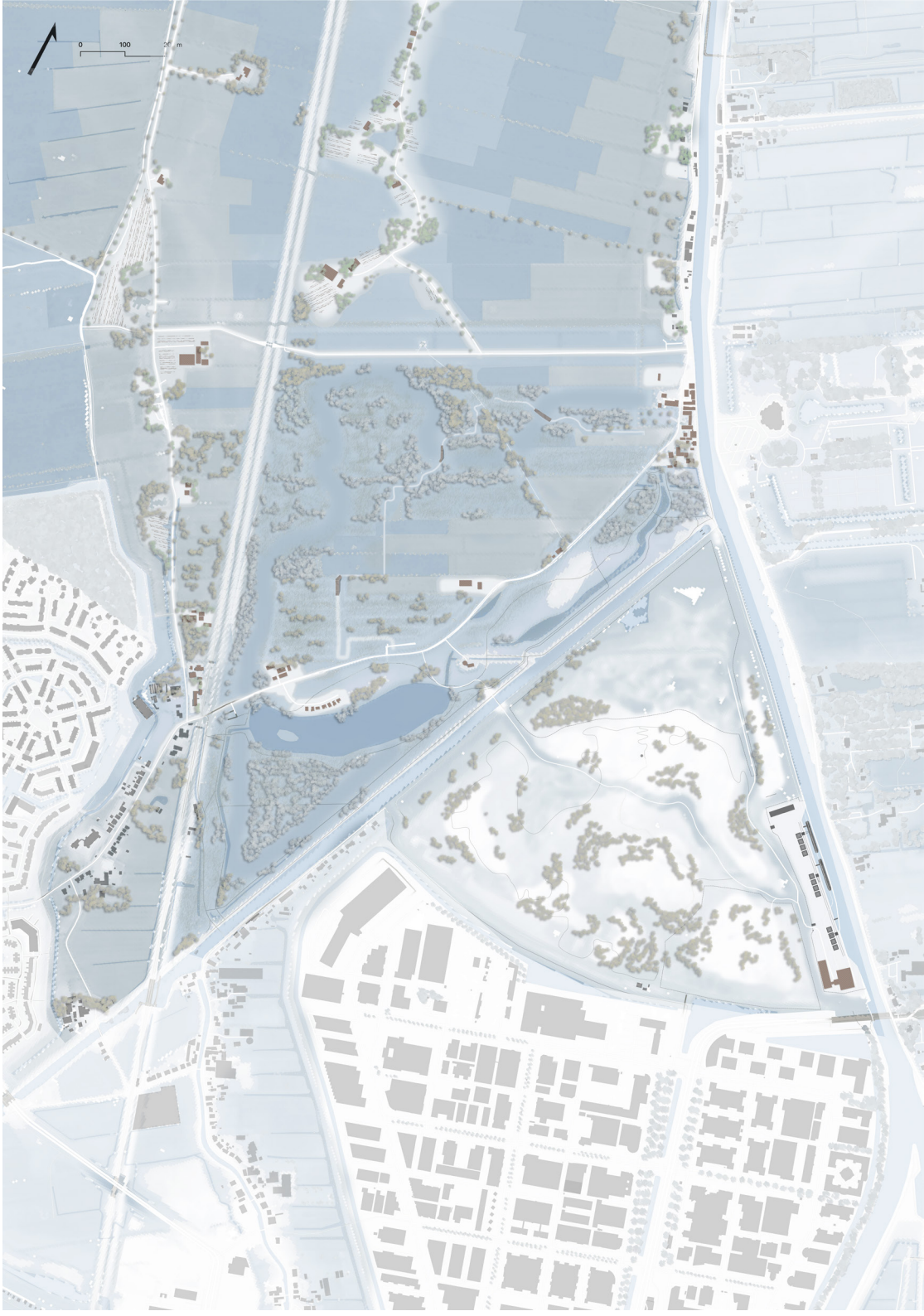
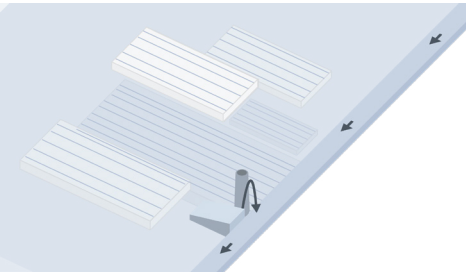


PART ONE

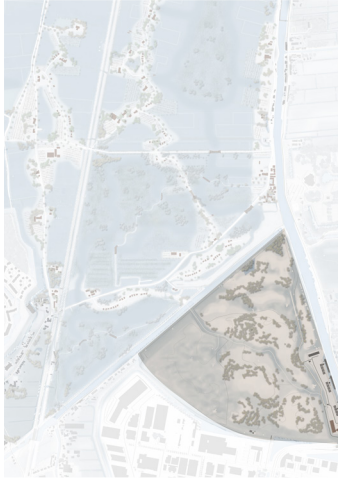
One landscape type, different water levels



Multiple landscape types, one water level



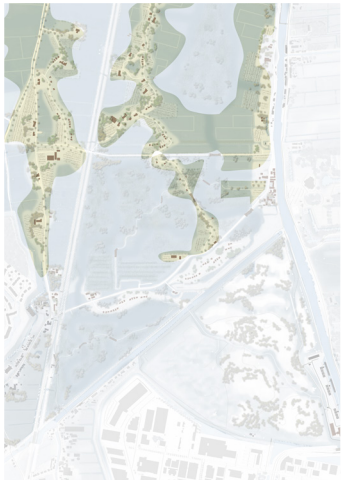
4 IMPORTANT LANDSCAPE ELEMENTS



Waste hill



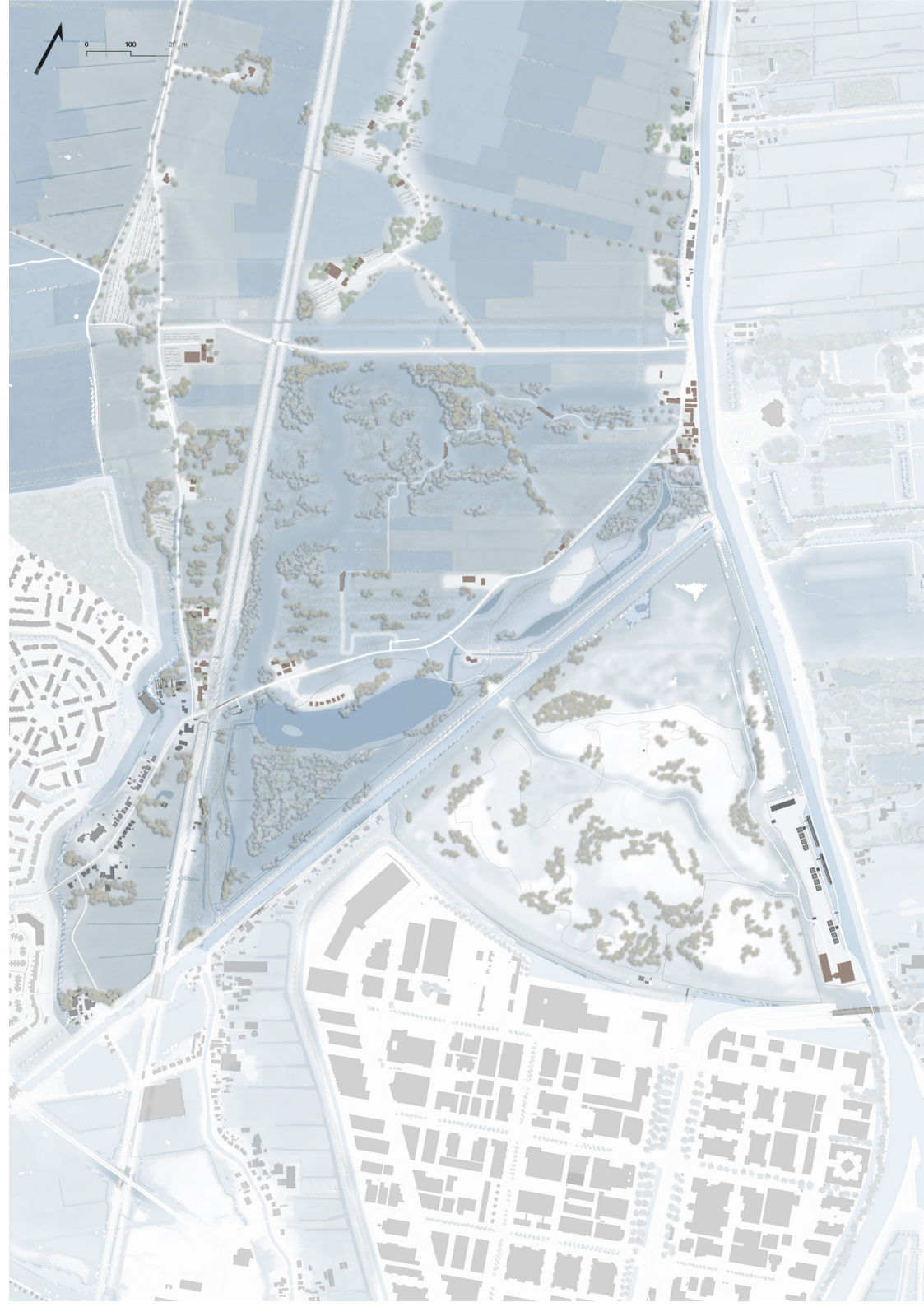
Creek ridges



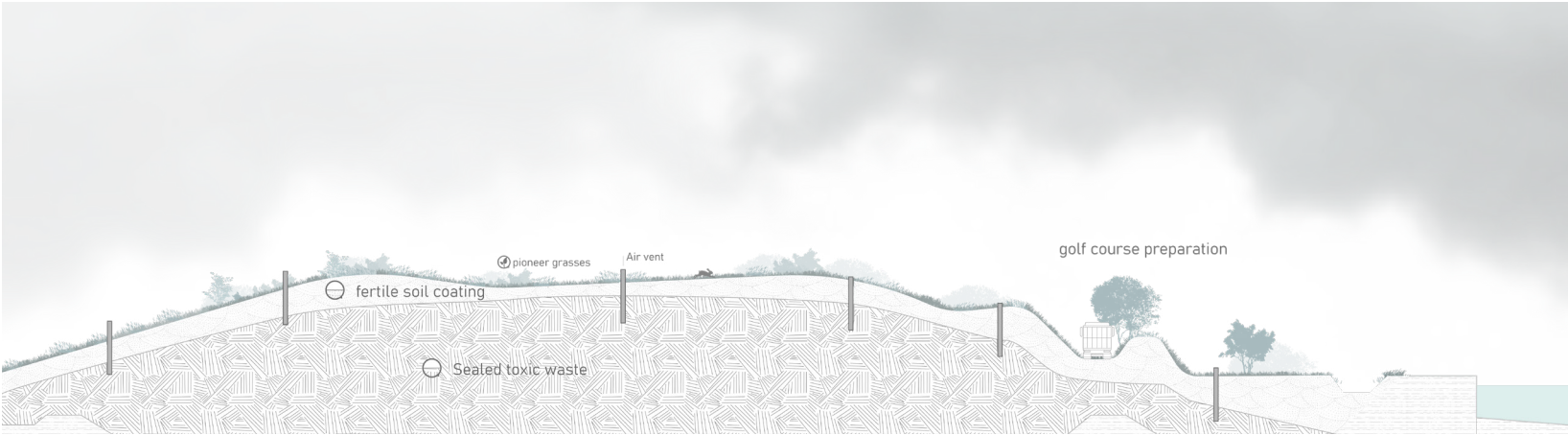
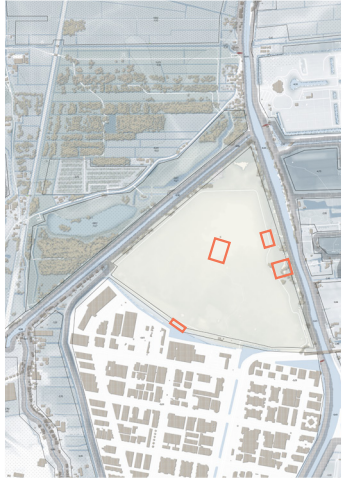
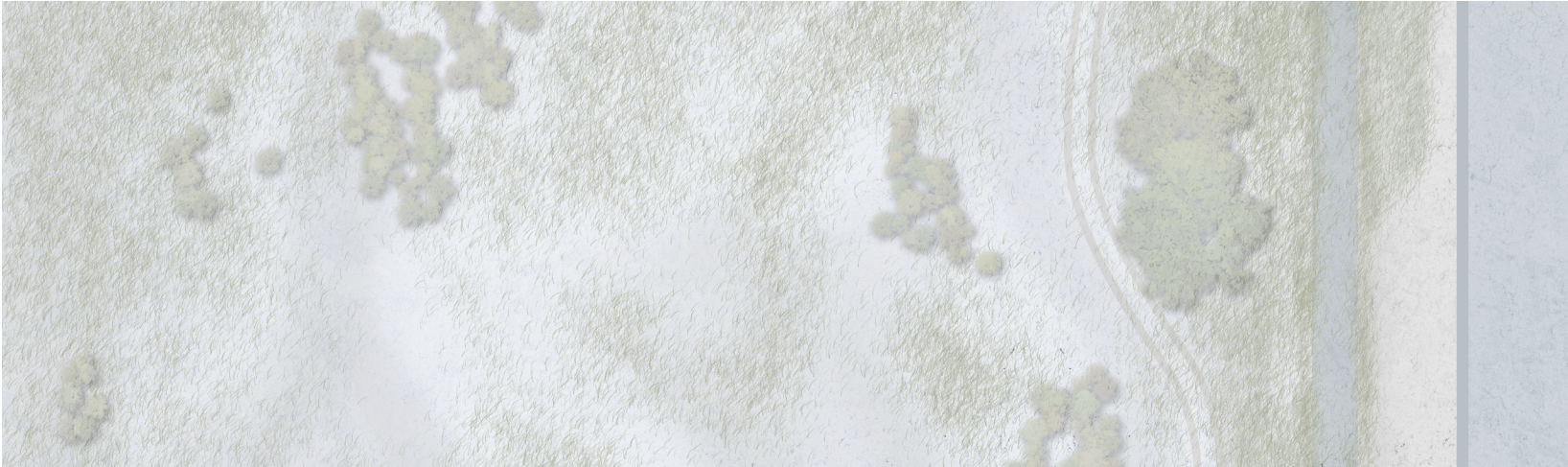
Agriculture



Nature



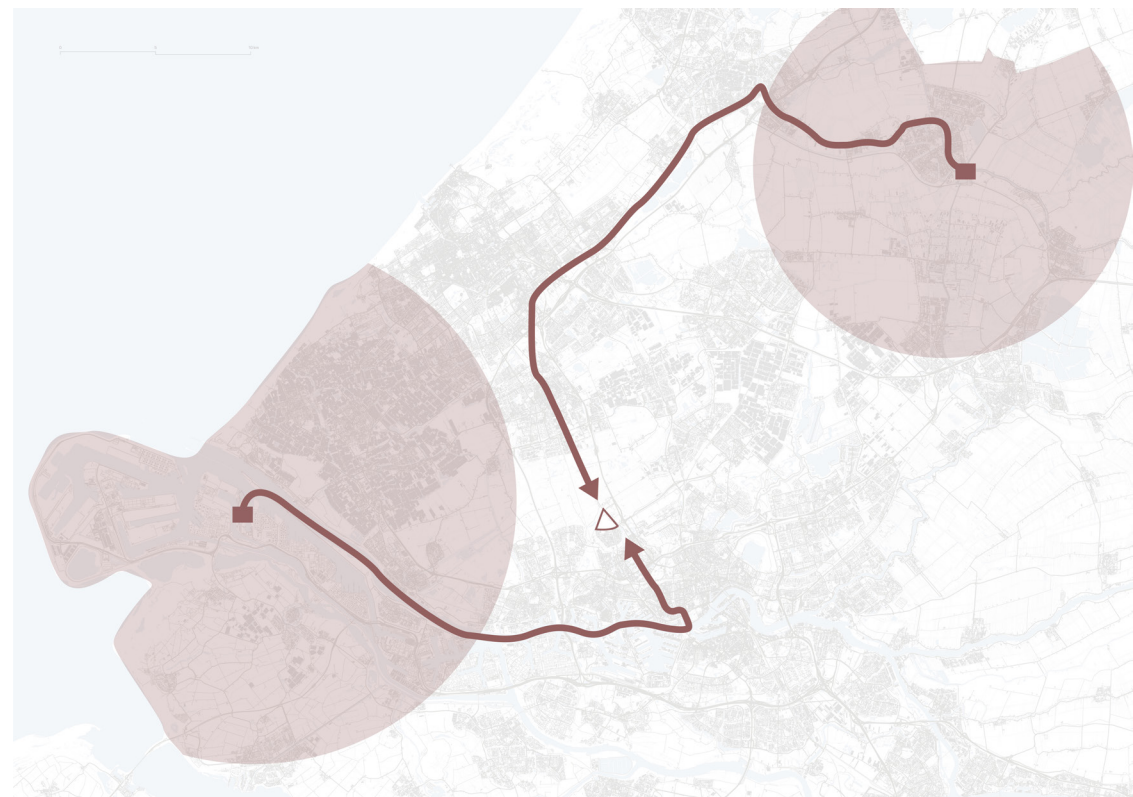
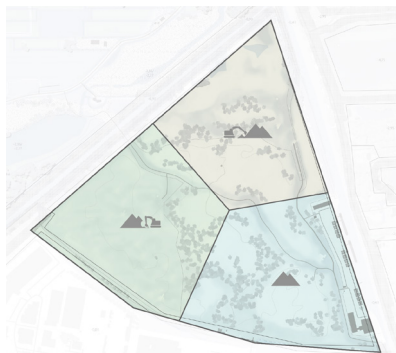
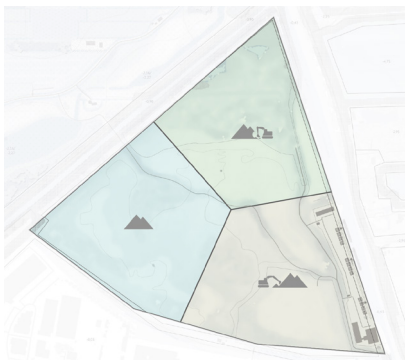
WASTE LAND/GOLF COURSE



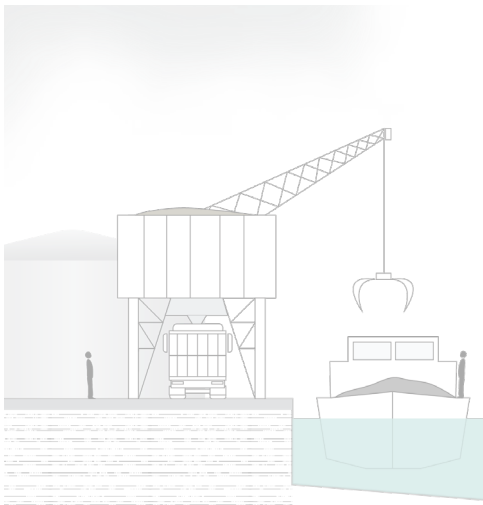
WASTE LAND HUB

Storing future land combined with nature and recreation

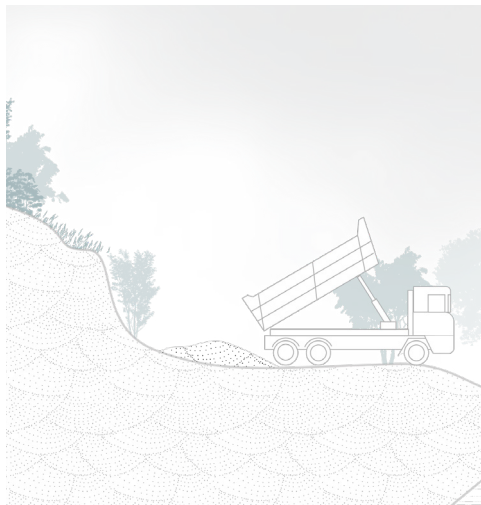
Change of function



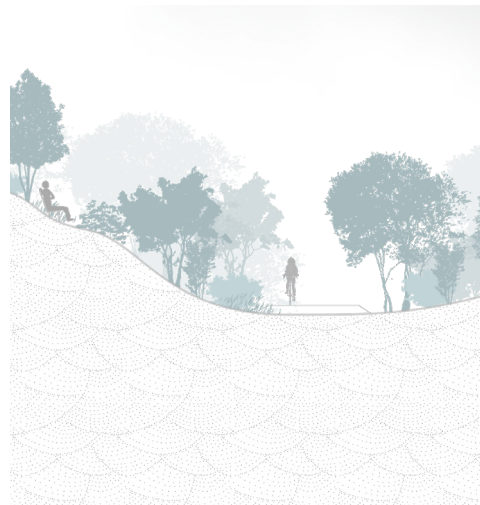
Harbour



Deposit area



Rest/Filter area

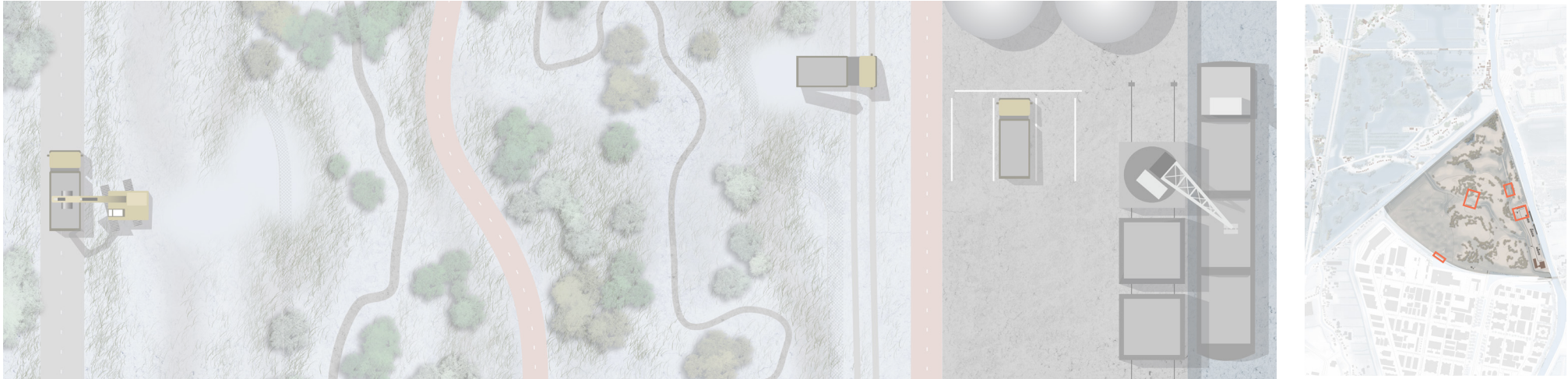


Dispersal area



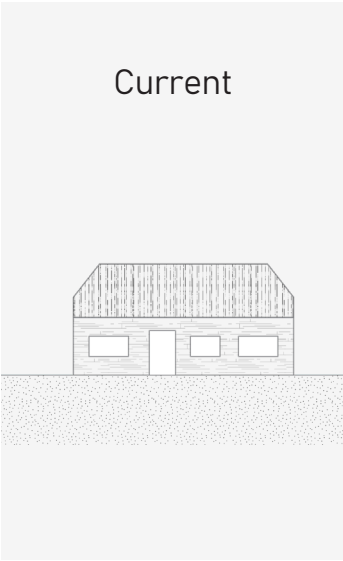
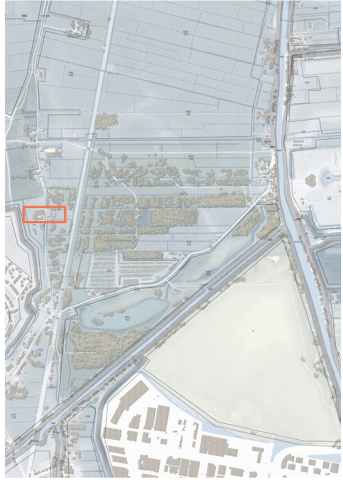
WASTE LAND HUB

Storing future land combined with nature and recreation



CREEK RIDGE ZOOM IN

current static buildings



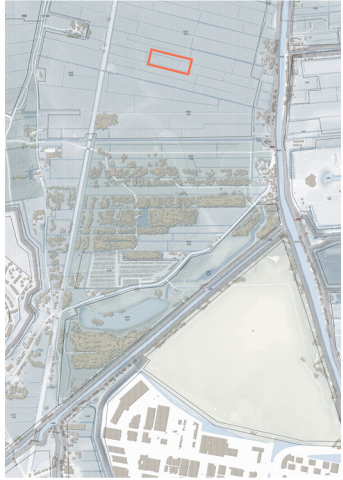
CREEK RIDGE ZOOM IN

from static buildings to modifiable houses

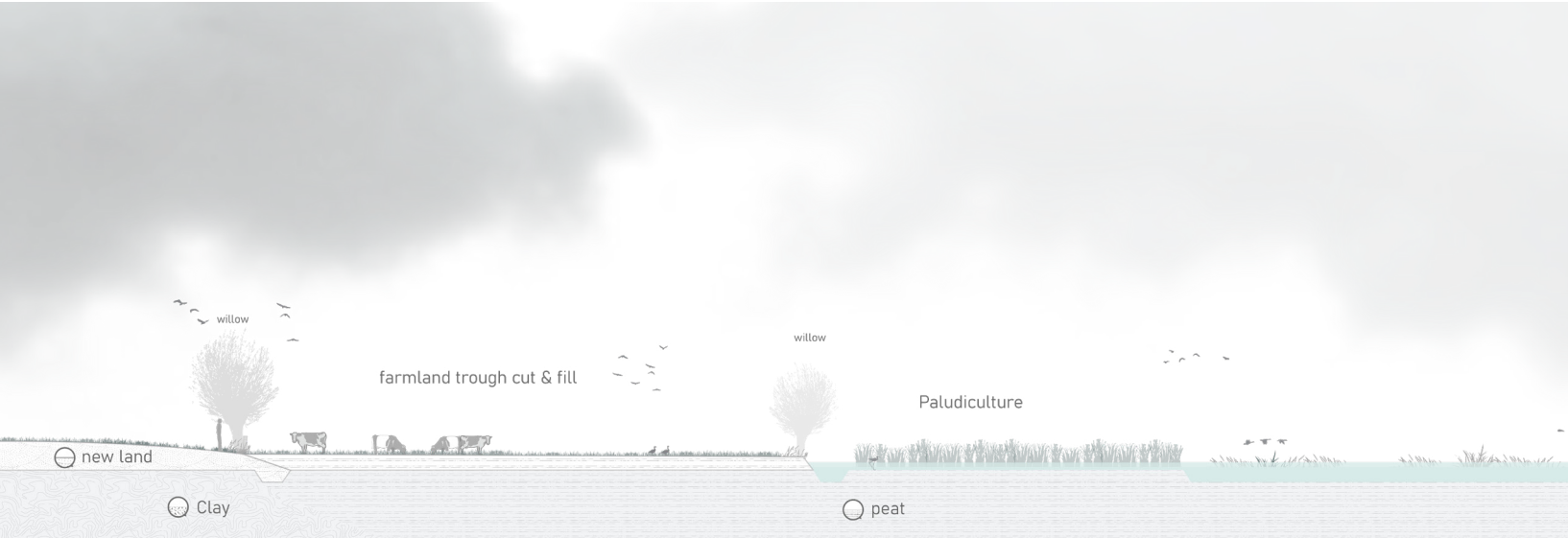
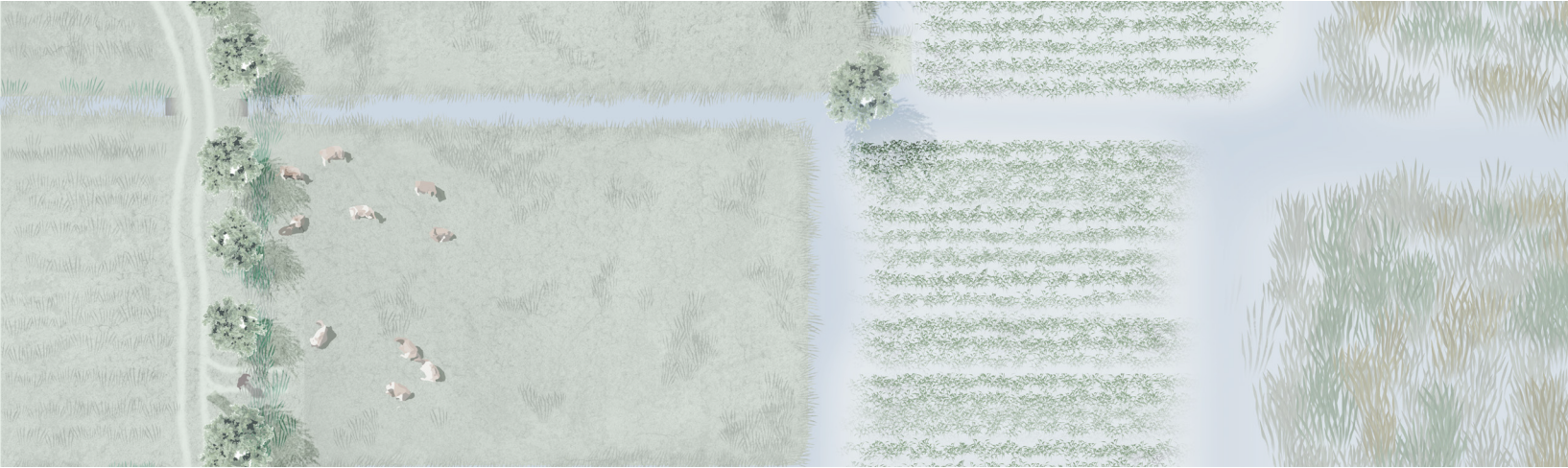


EXISTING POLDER LANDSCAPE

agriculture cut & fill

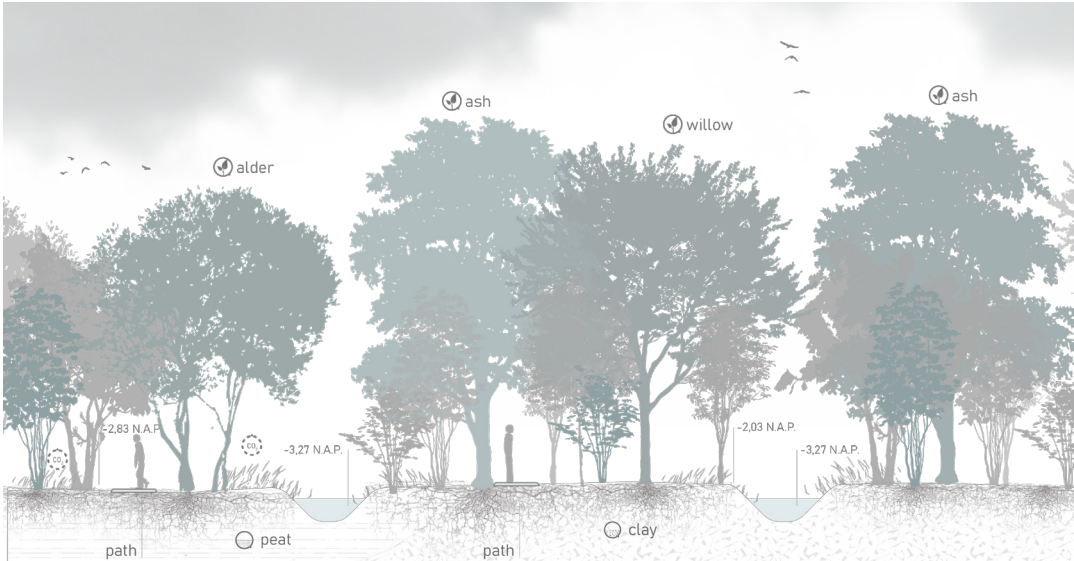
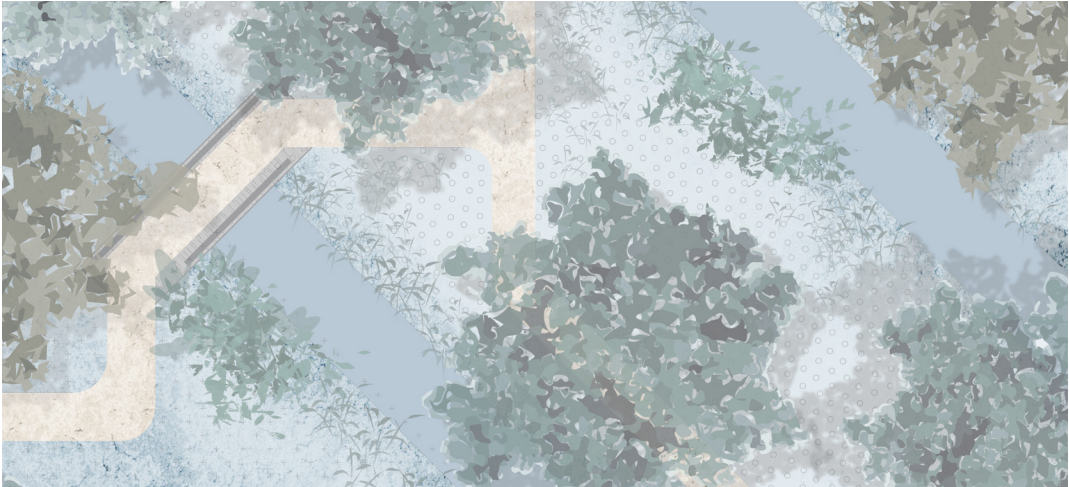


PROPOSED POLDER LANDSCAPE ZOOM IN agriculture cut & fill



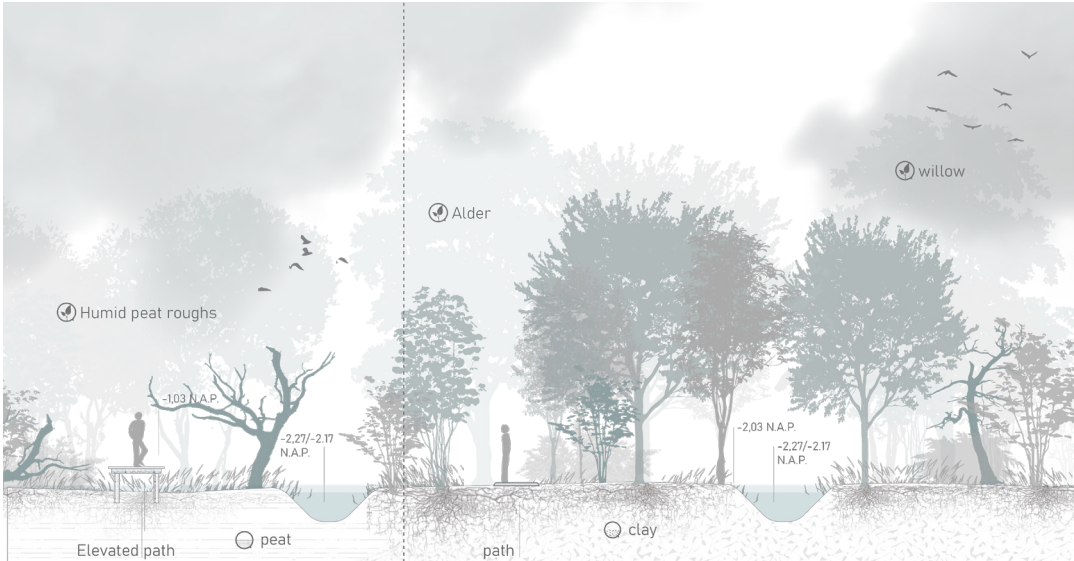
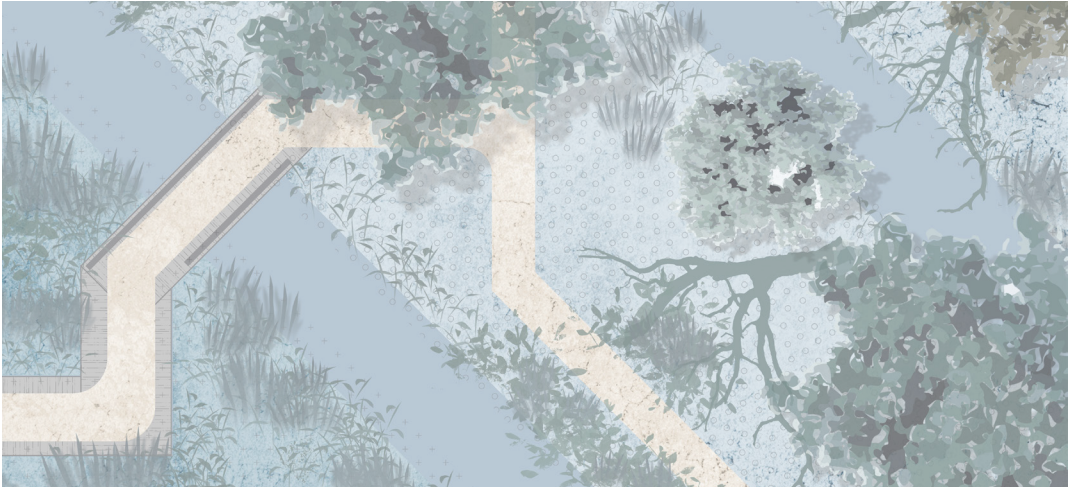
CURRENT ECOLOGICAL SITUATION

Change in nature and recreation



NEW ECOLOGICAL GRADIENTS

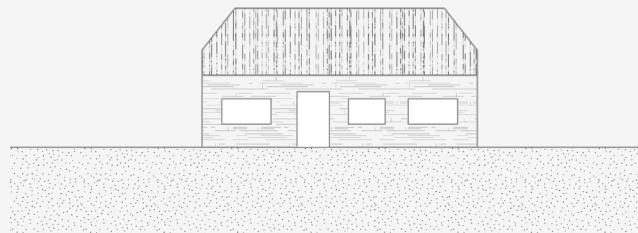
Change in nature and recreation



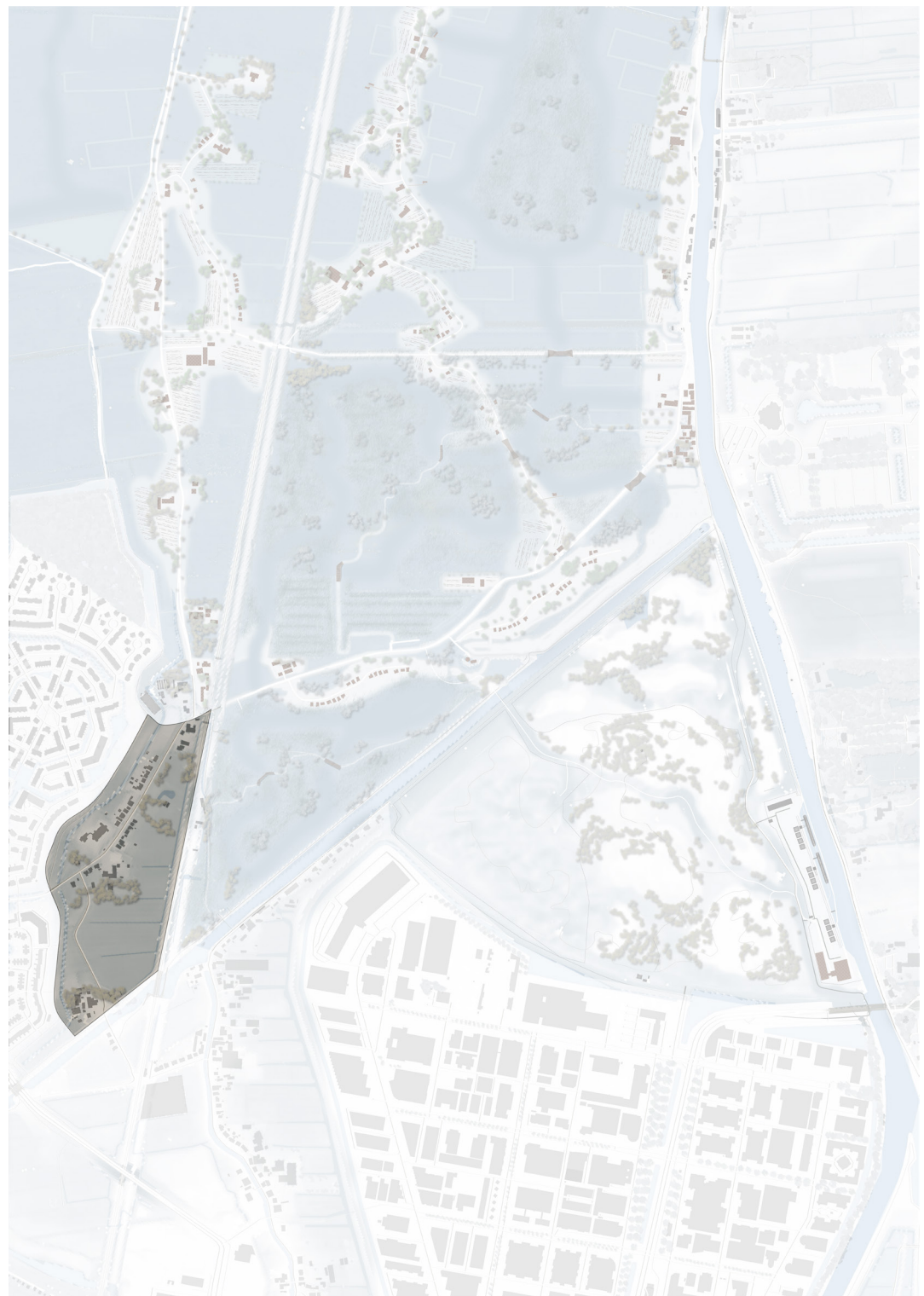
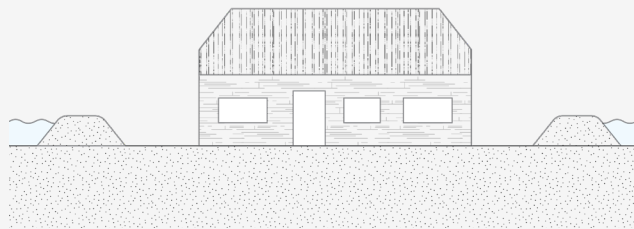
MAINTAINING CULTURAL HERITAGE

saving landscape with historic importance

Current



Protect heritage



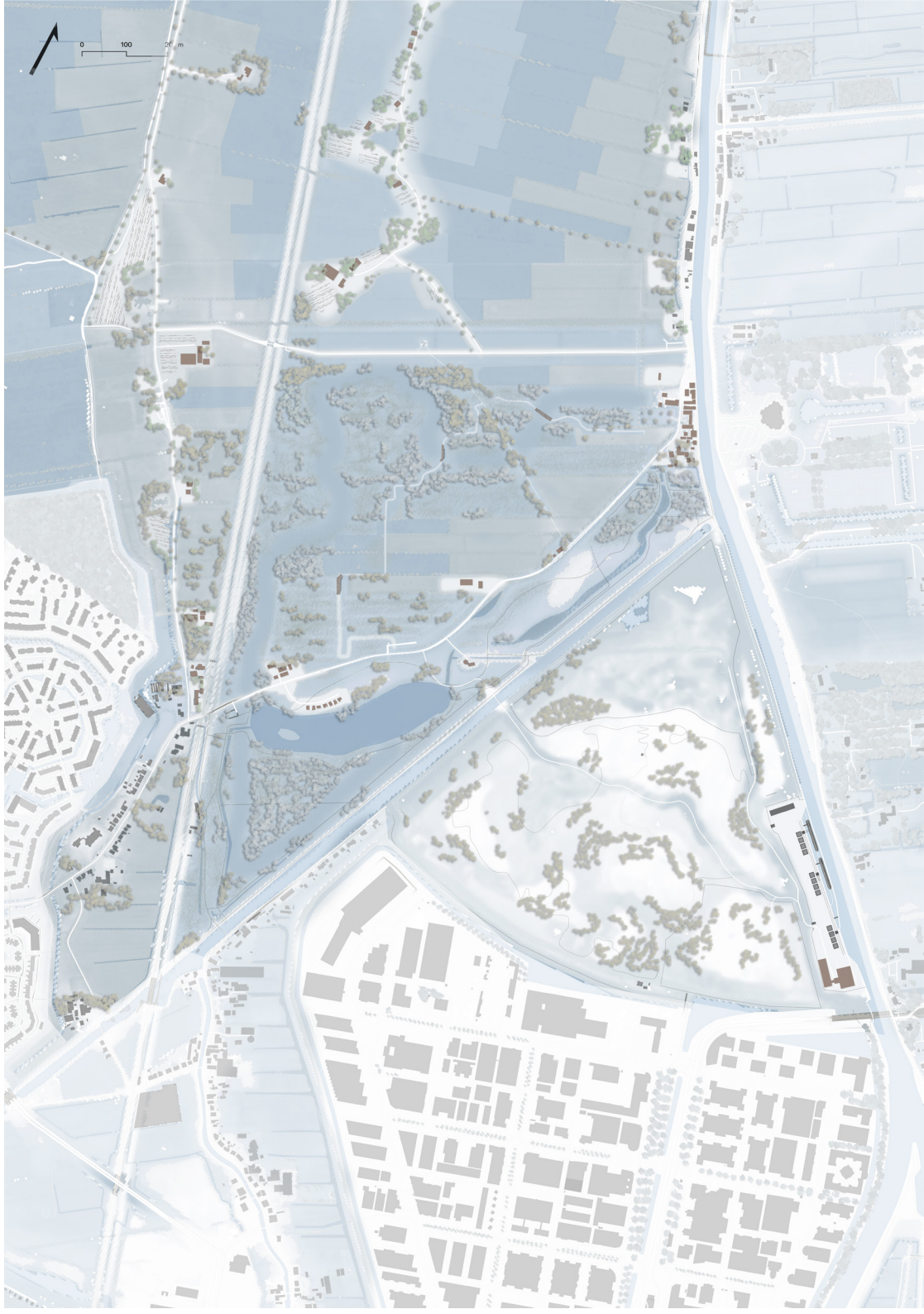
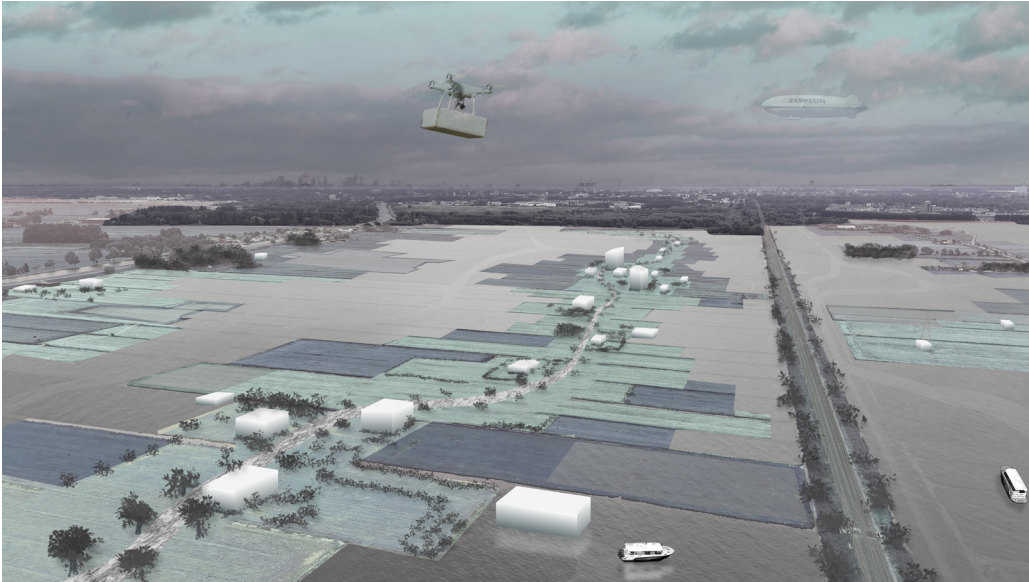
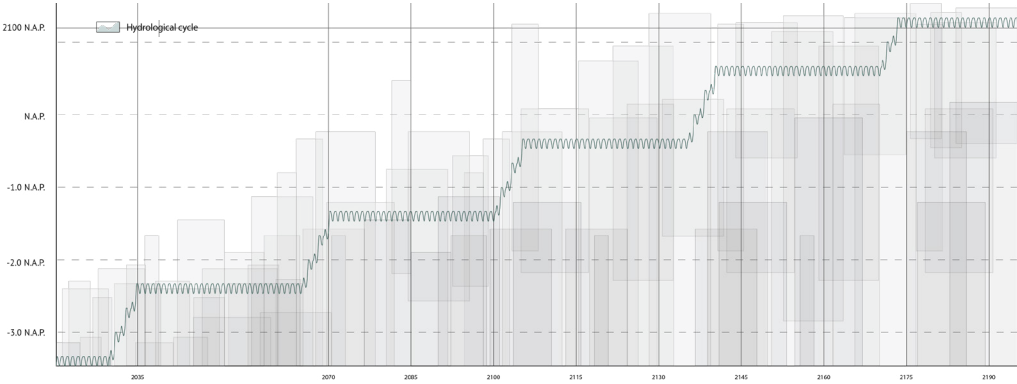
NOORD-KETHEL

protecting cultural heritage



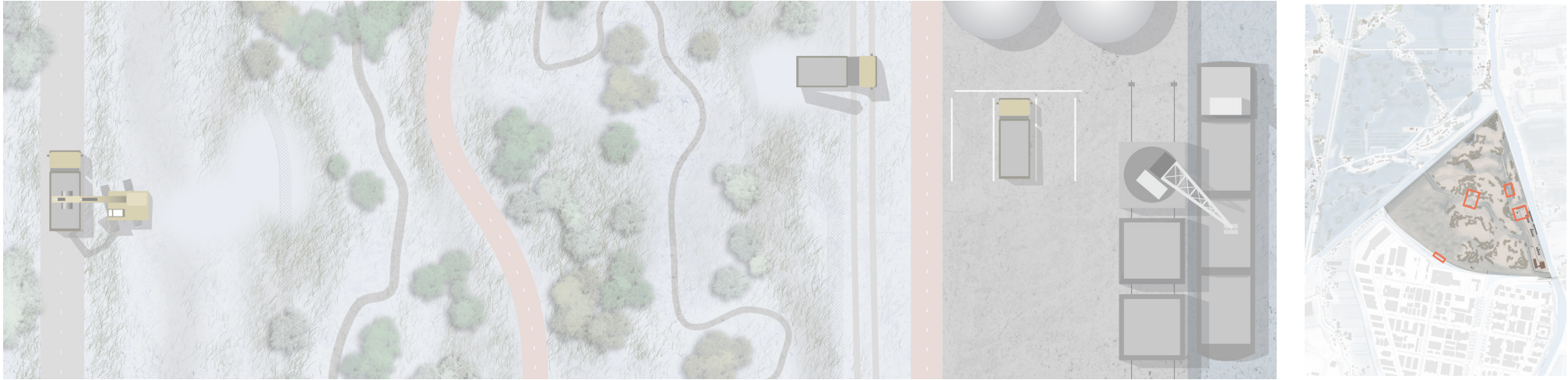
PART TWO

2070, the next generation

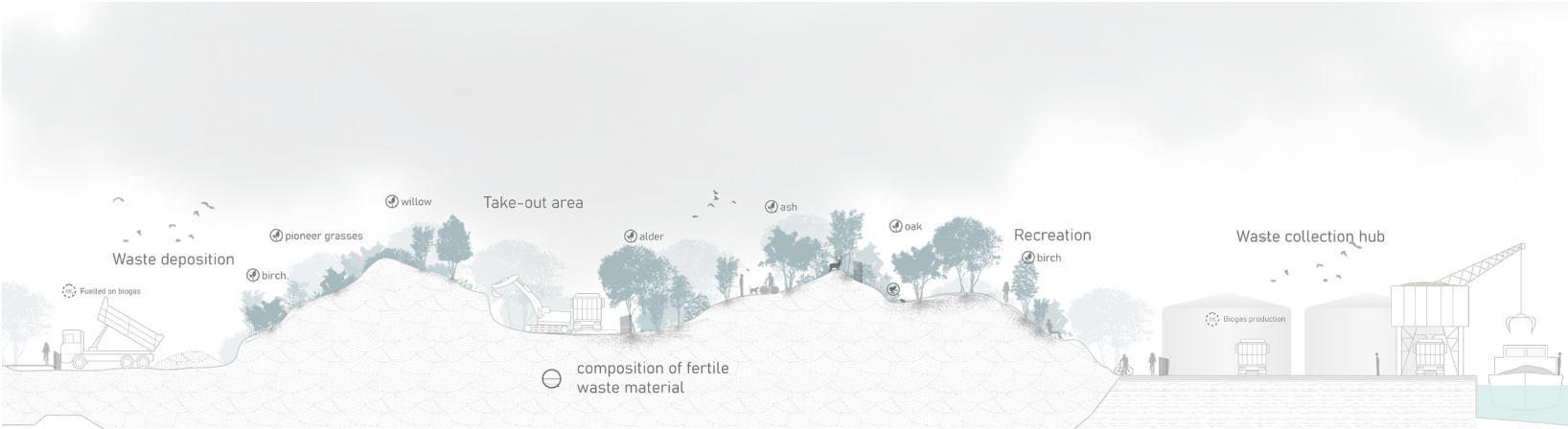


WASTE LAND HUB

Storing future land combined with nature and recreation

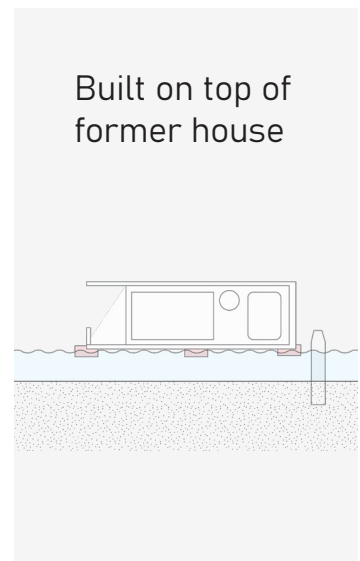
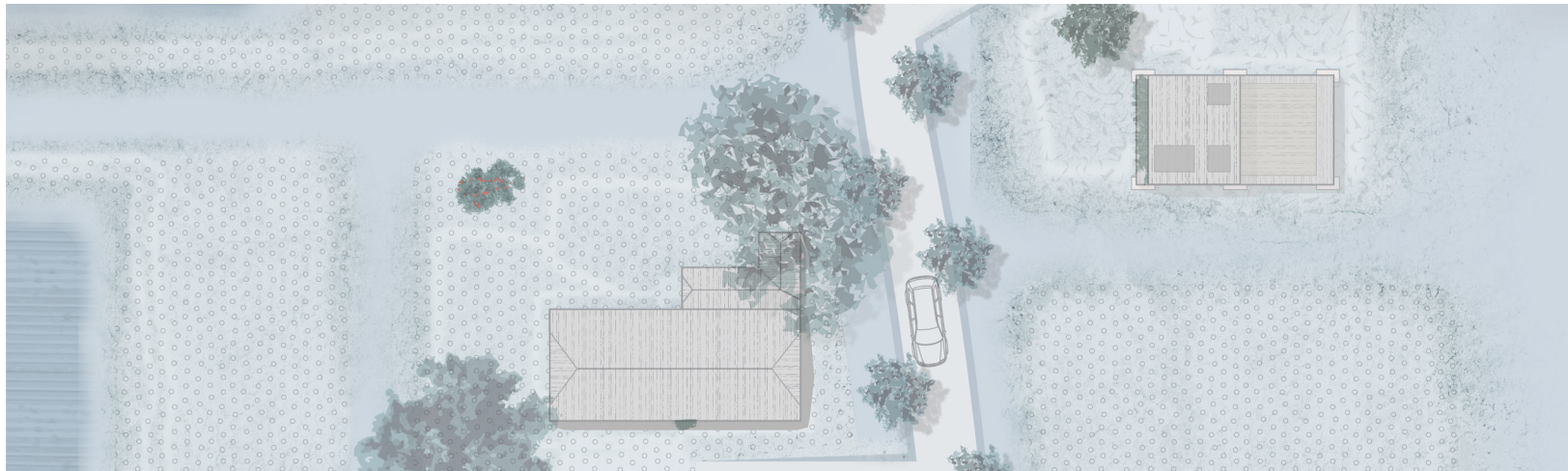


2070 WASTE LAND HUB
Storing future land combined with nature and recreation



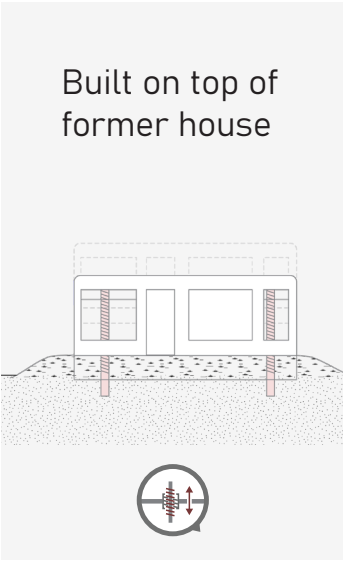
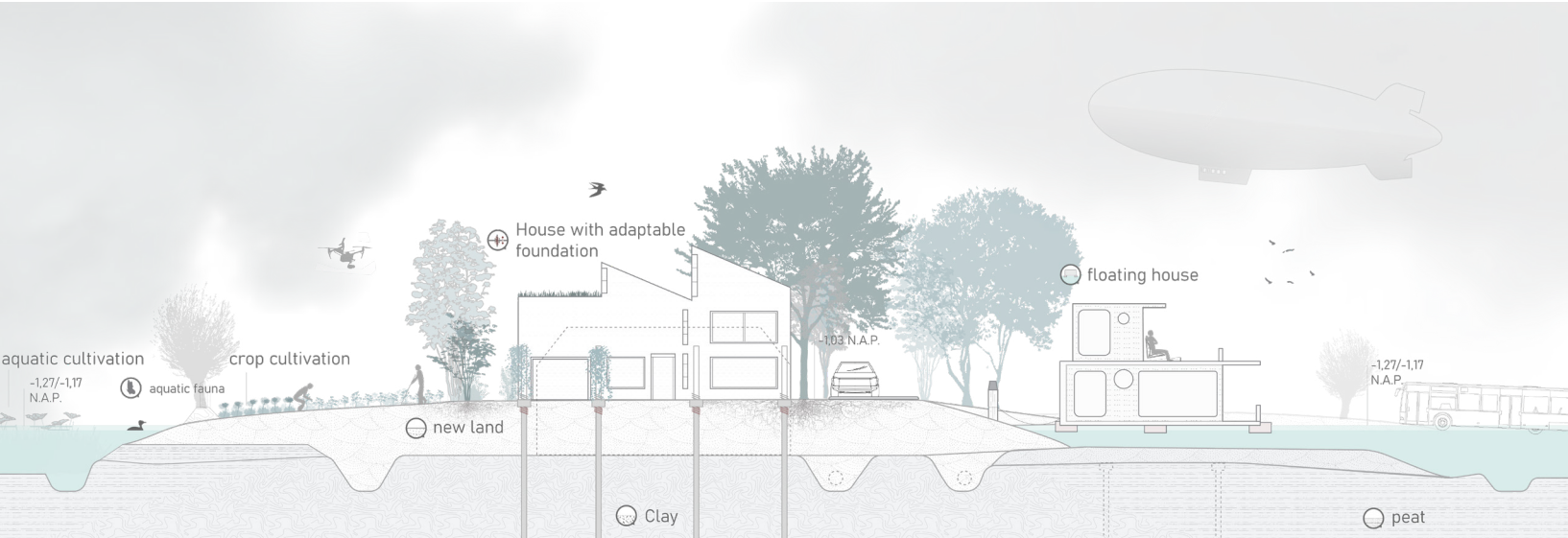
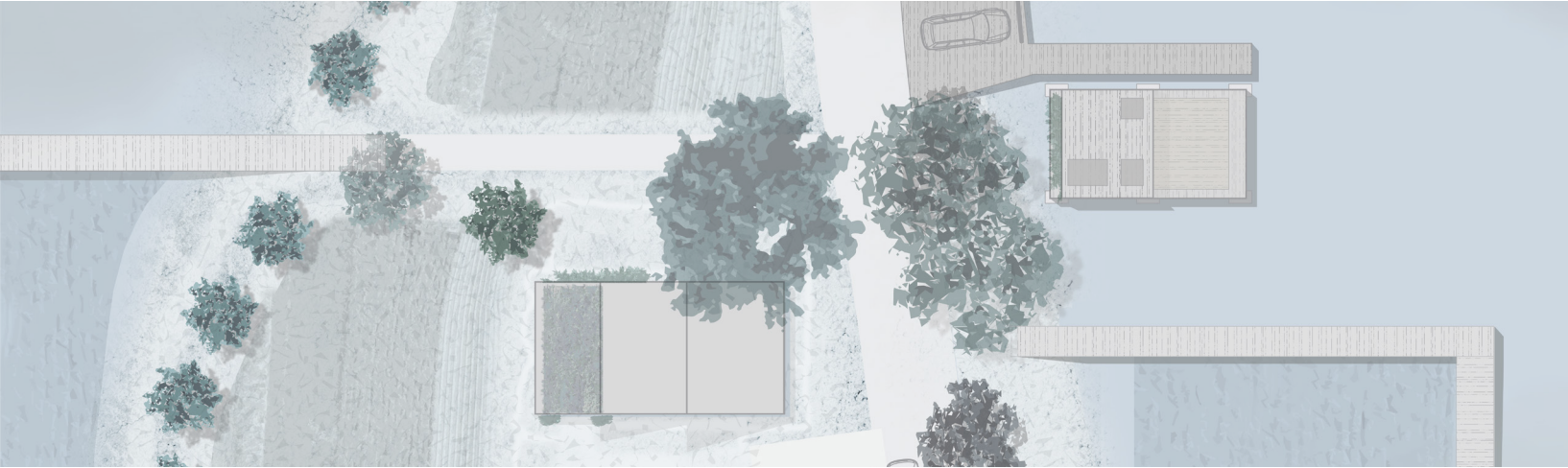
CREEK RIDGE ZOOM IN

from static buildings to modifiable houses

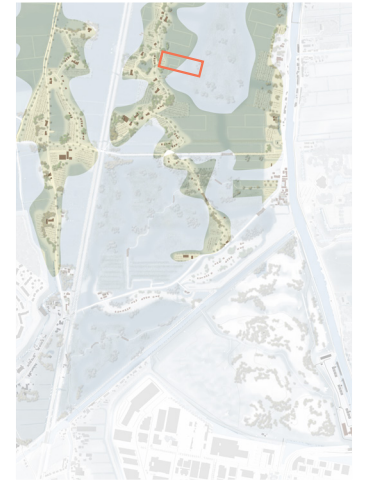
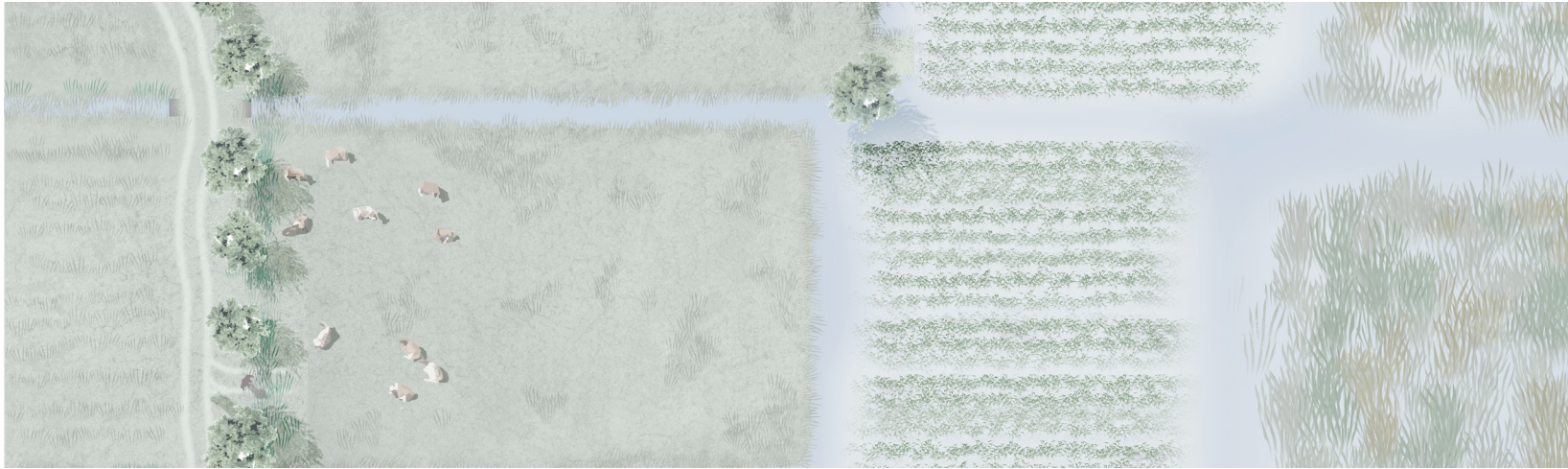


2070 CREEK RIDGE ZOOM IN

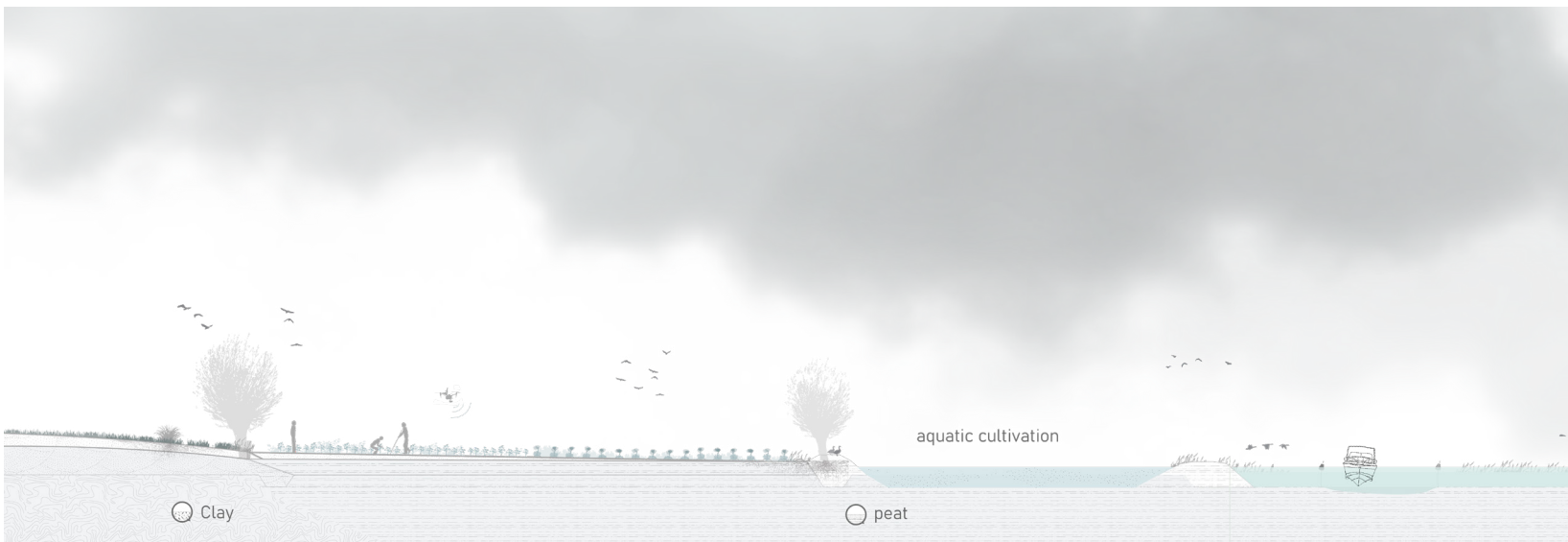
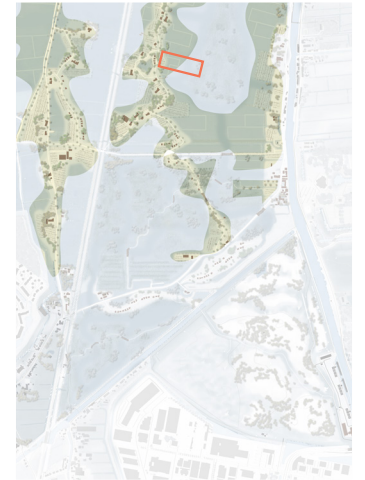
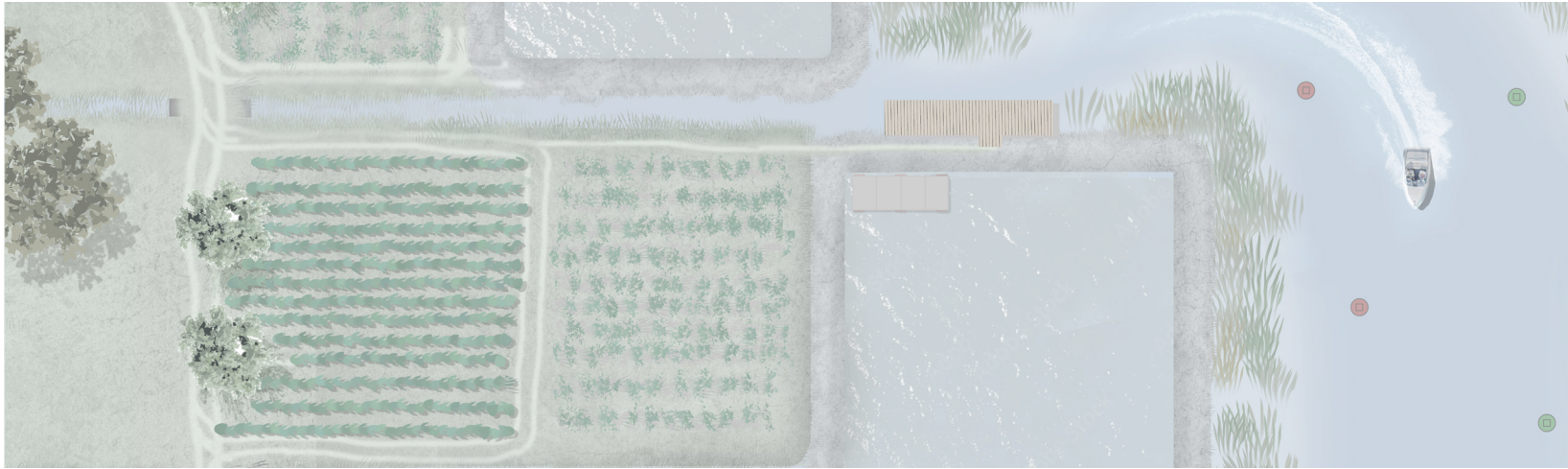
from static buildings to modifiable houses



POLDER ZOOM IN agriculture cut & fill

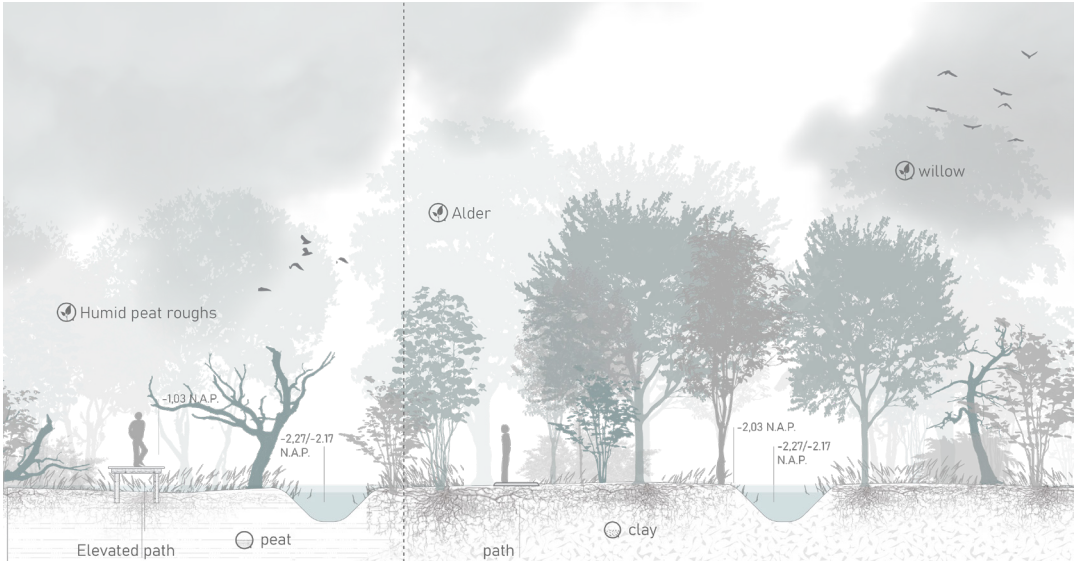
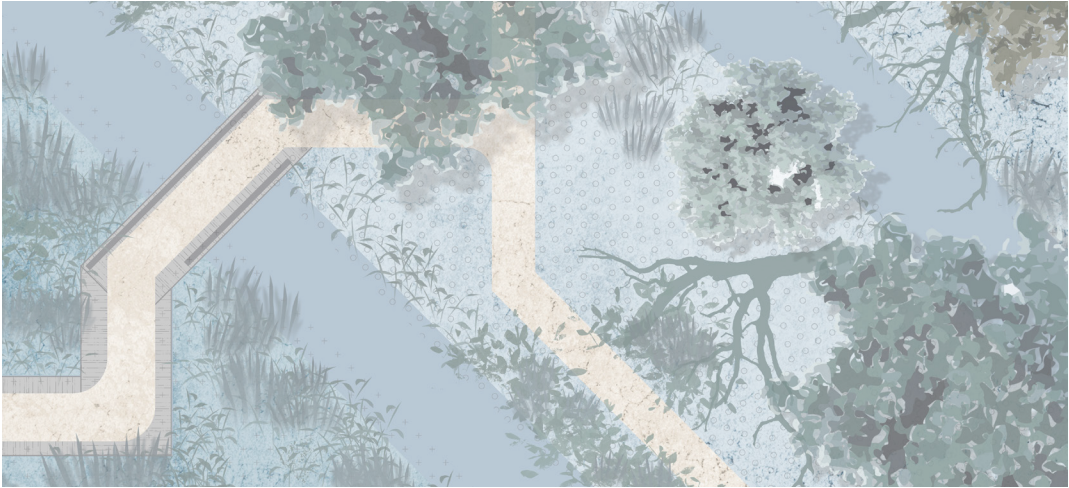


2070 POLDER ZOOM IN agriculture cut & fill



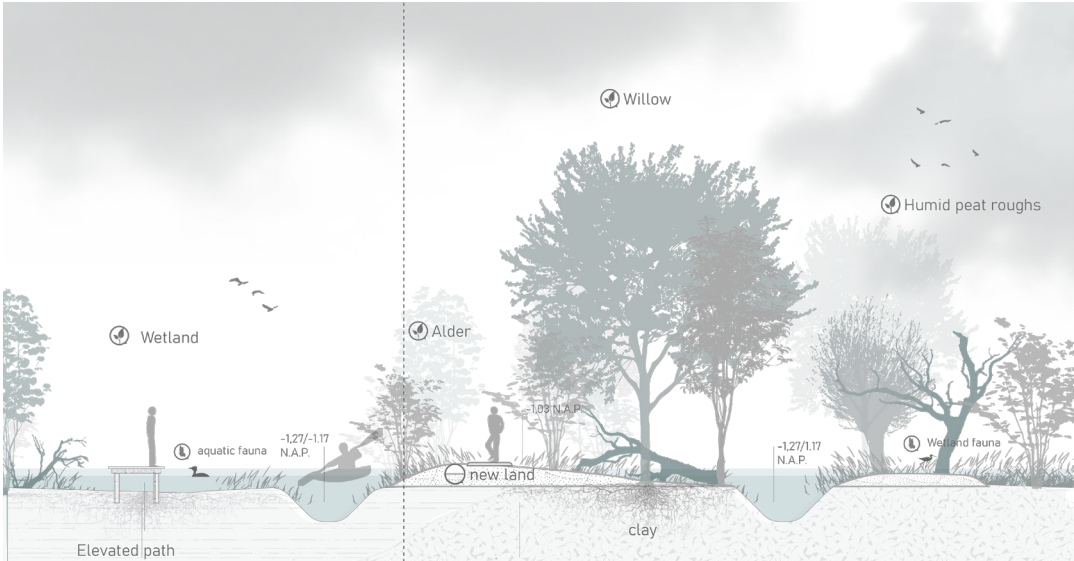
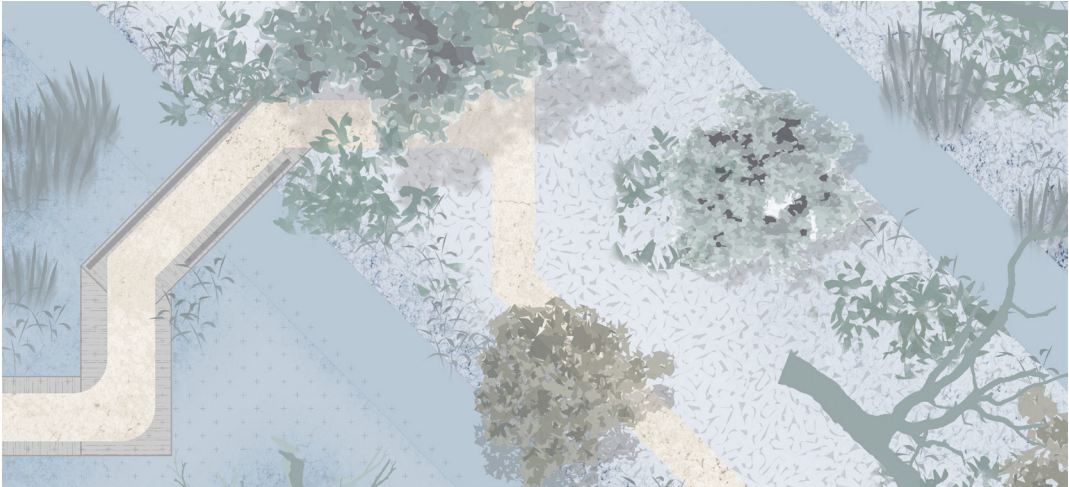
ECOLOGICAL GRADIENTS

Change in nature and recreation



ECOLOGICAL GRADIENTS IN 2070

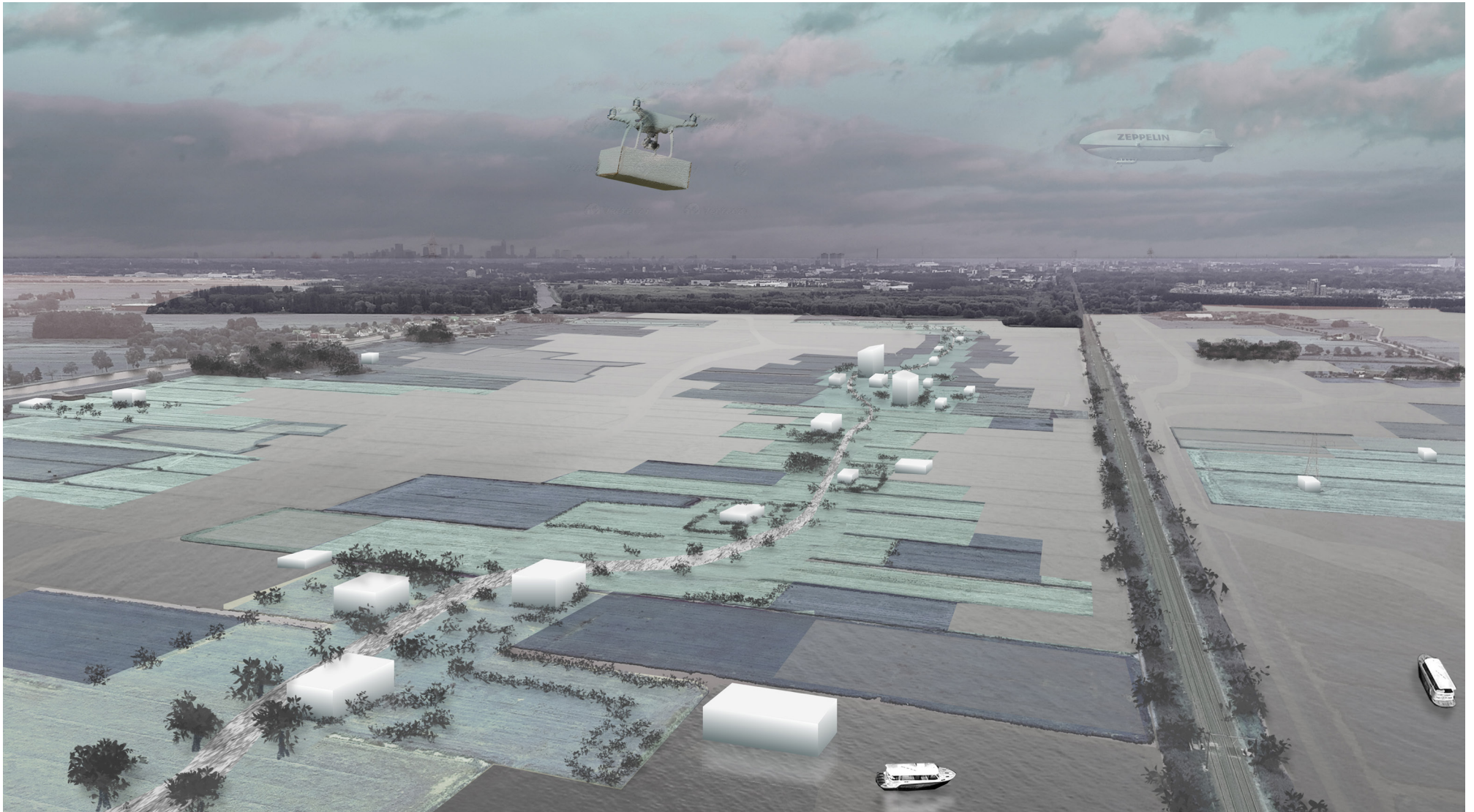
Change in nature and recreation





CONCLUSION



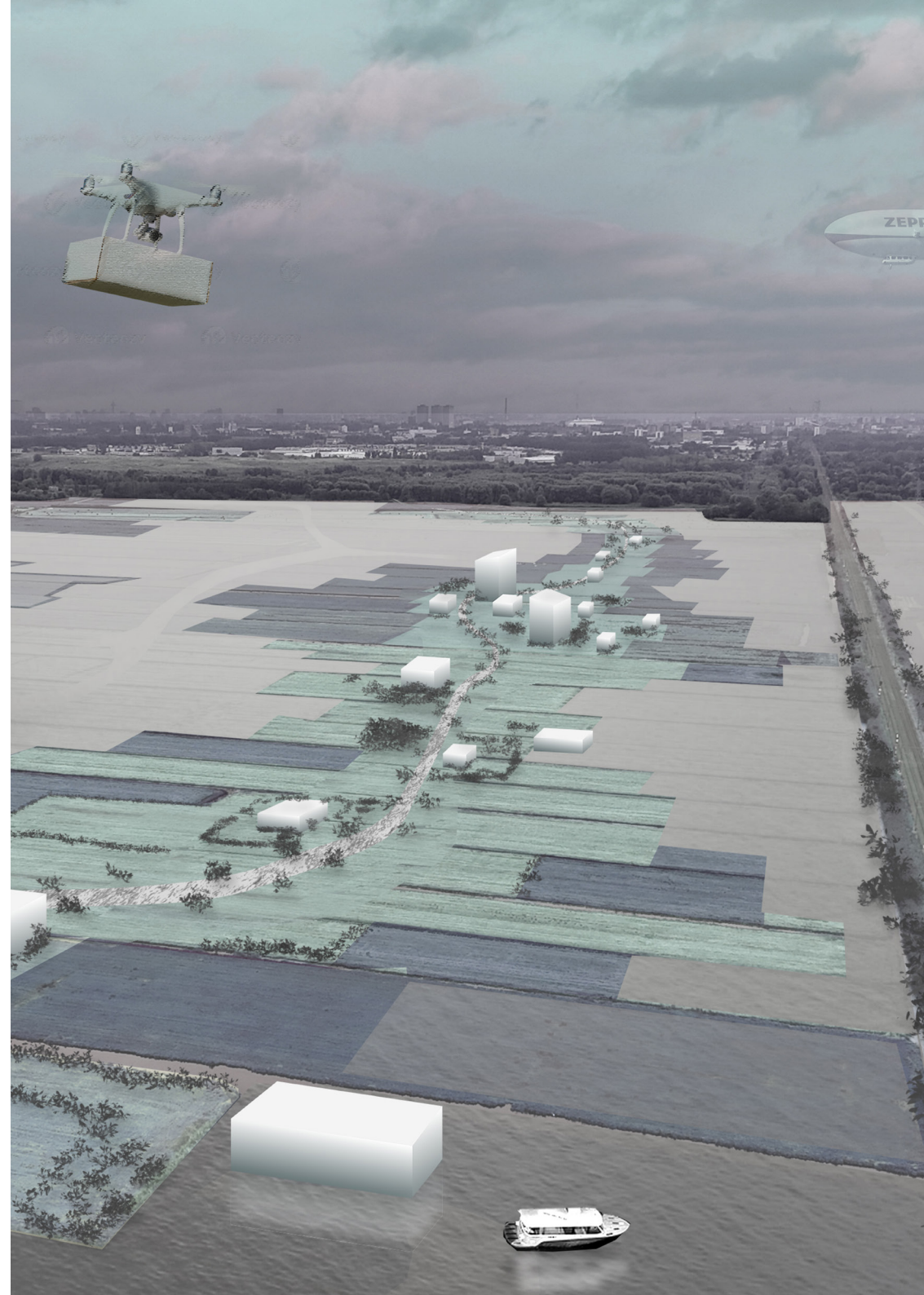


REFLECTION

The concept of a terp as an alternative to current water management



Designing the concept of a terp in the polder



FUTURE OF THE DUTCH DELTA

3 strategies



Close and discharge



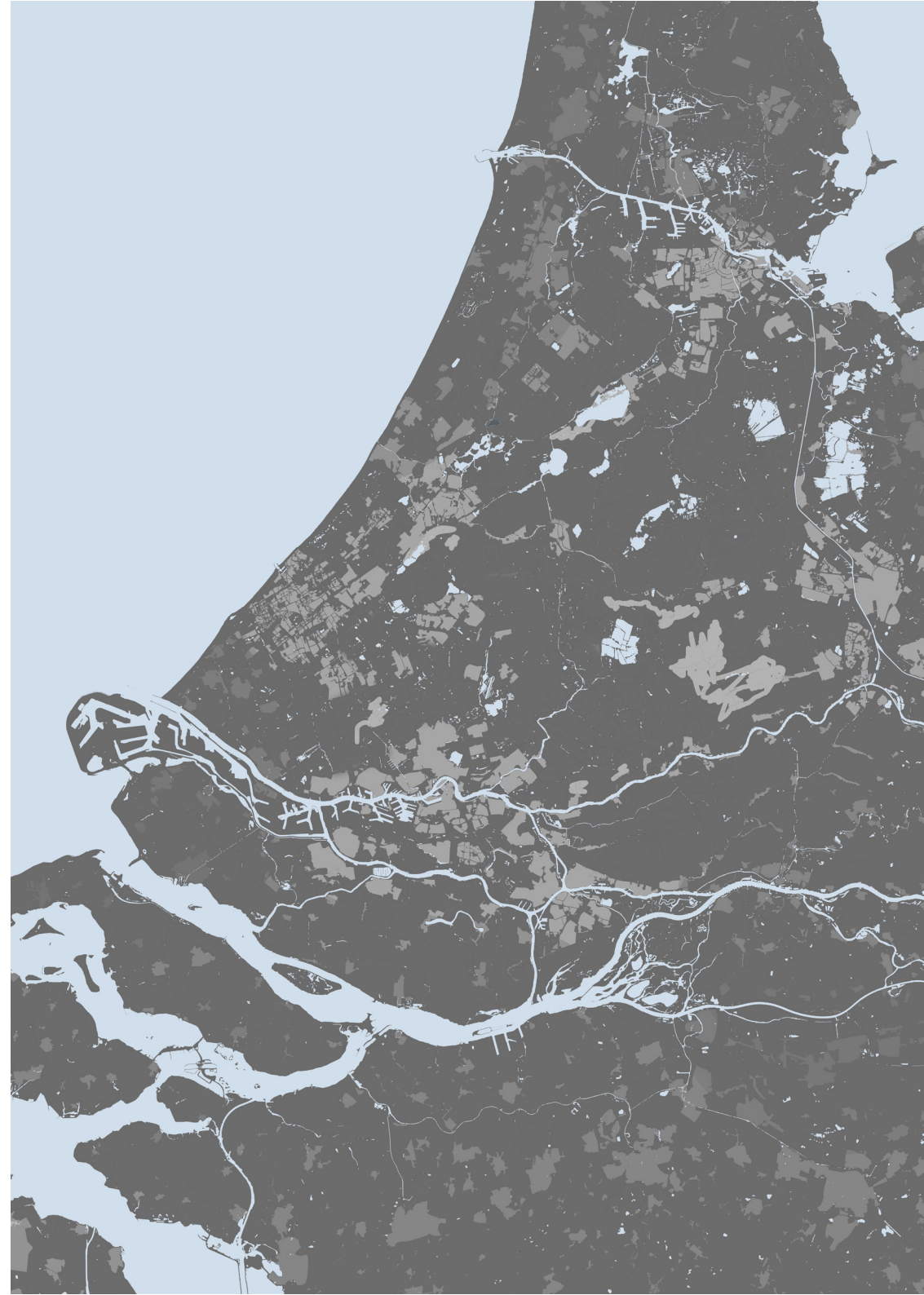
Store and protect



Draw back and adapt



The National Delta Program
adaptation strategies



FUTURE OF THE DUTCH DELTA

3 strategies



Close and discharge



Store and protect

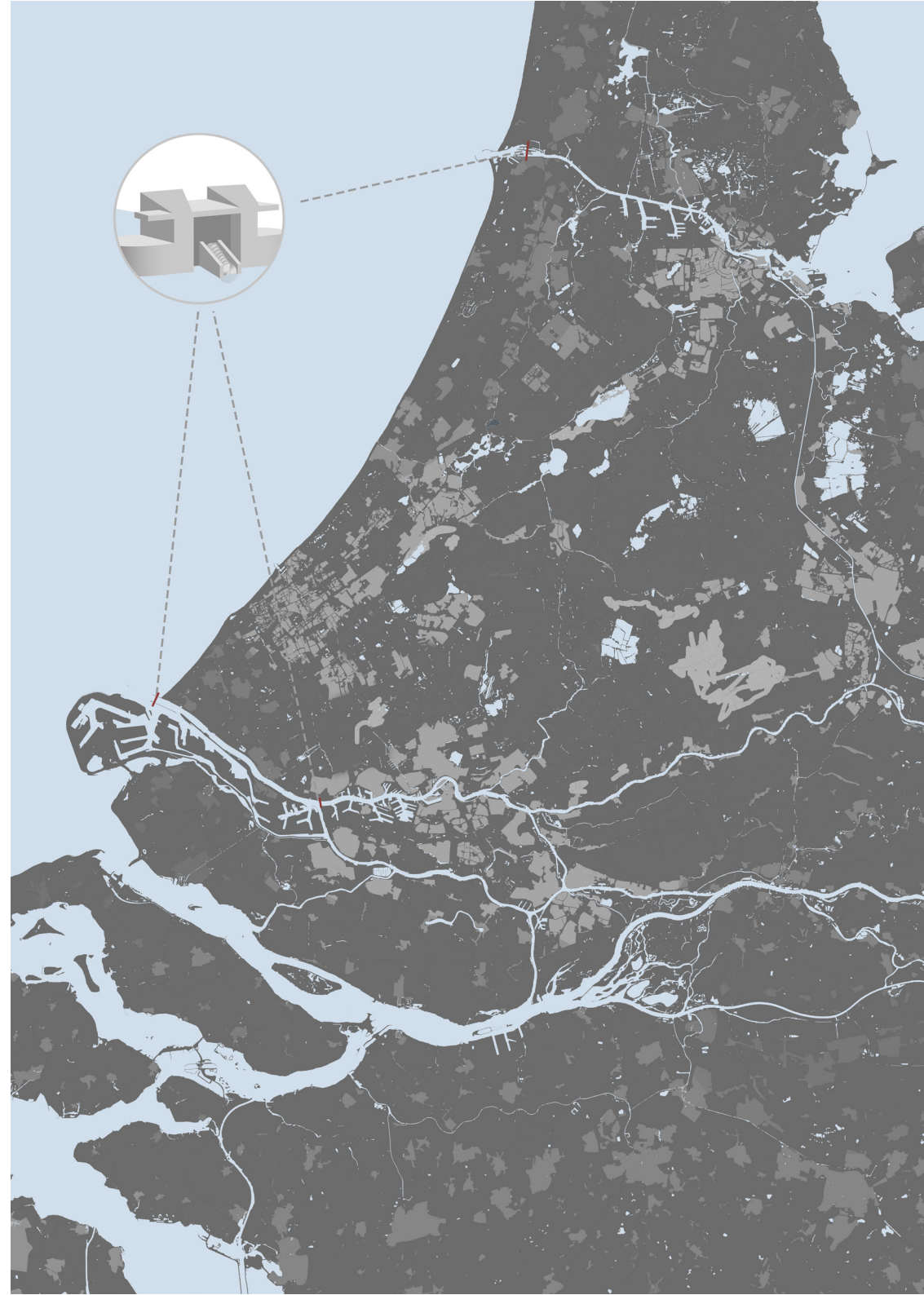


Draw back and adapt

Defensive – Anticipative – Offensive – Absolute control



The National Delta Program
adaptation strategies



FUTURE OF THE DUTCH DELTA

3 strategies



Close and discharge



Store and protect

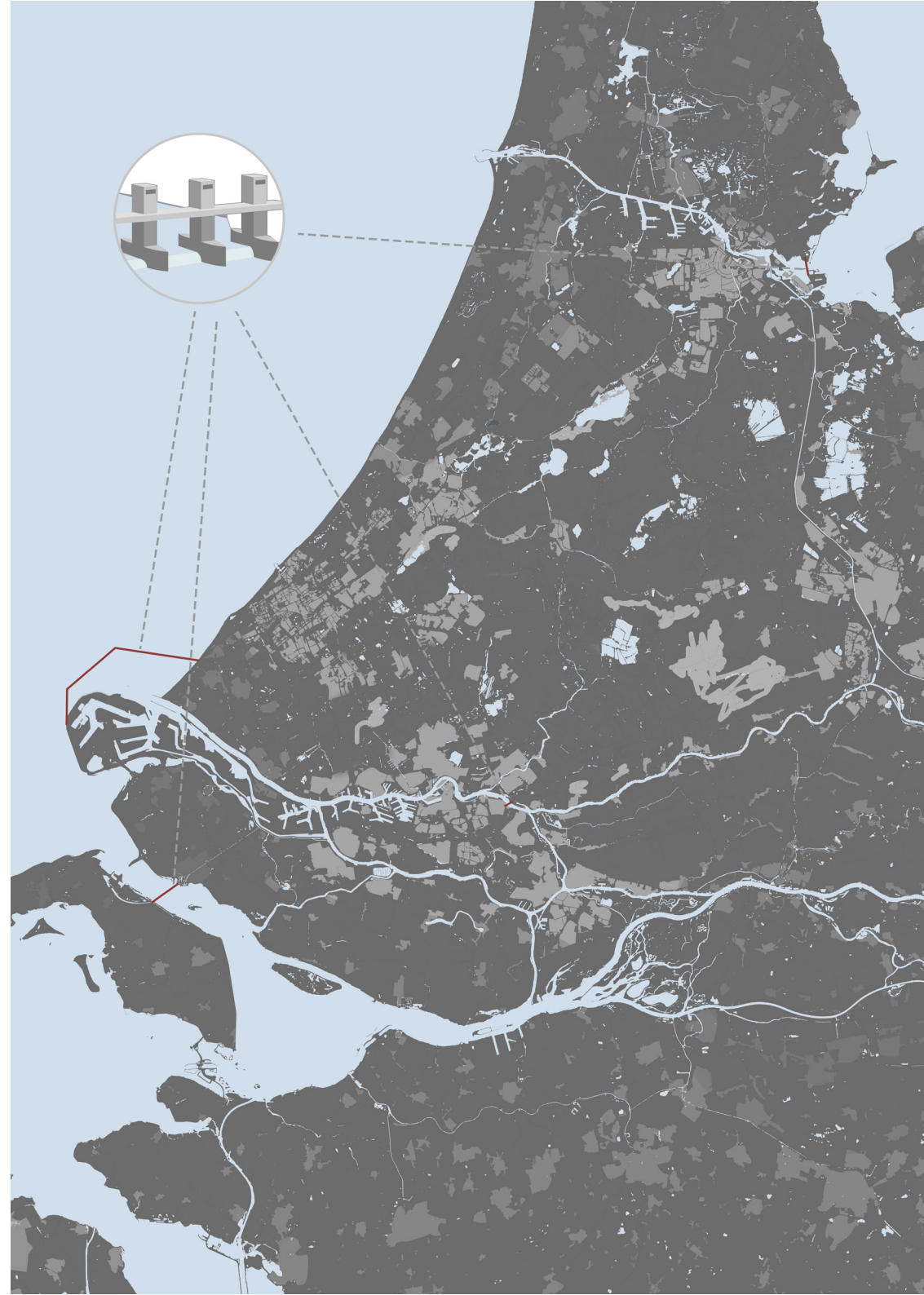


Draw back and adapt

Defensive – Anticipative – Offensive – Absolute control



The National Delta Program
adaptation strategies



FUTURE OF THE DUTCH DELTA

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Close and discharge



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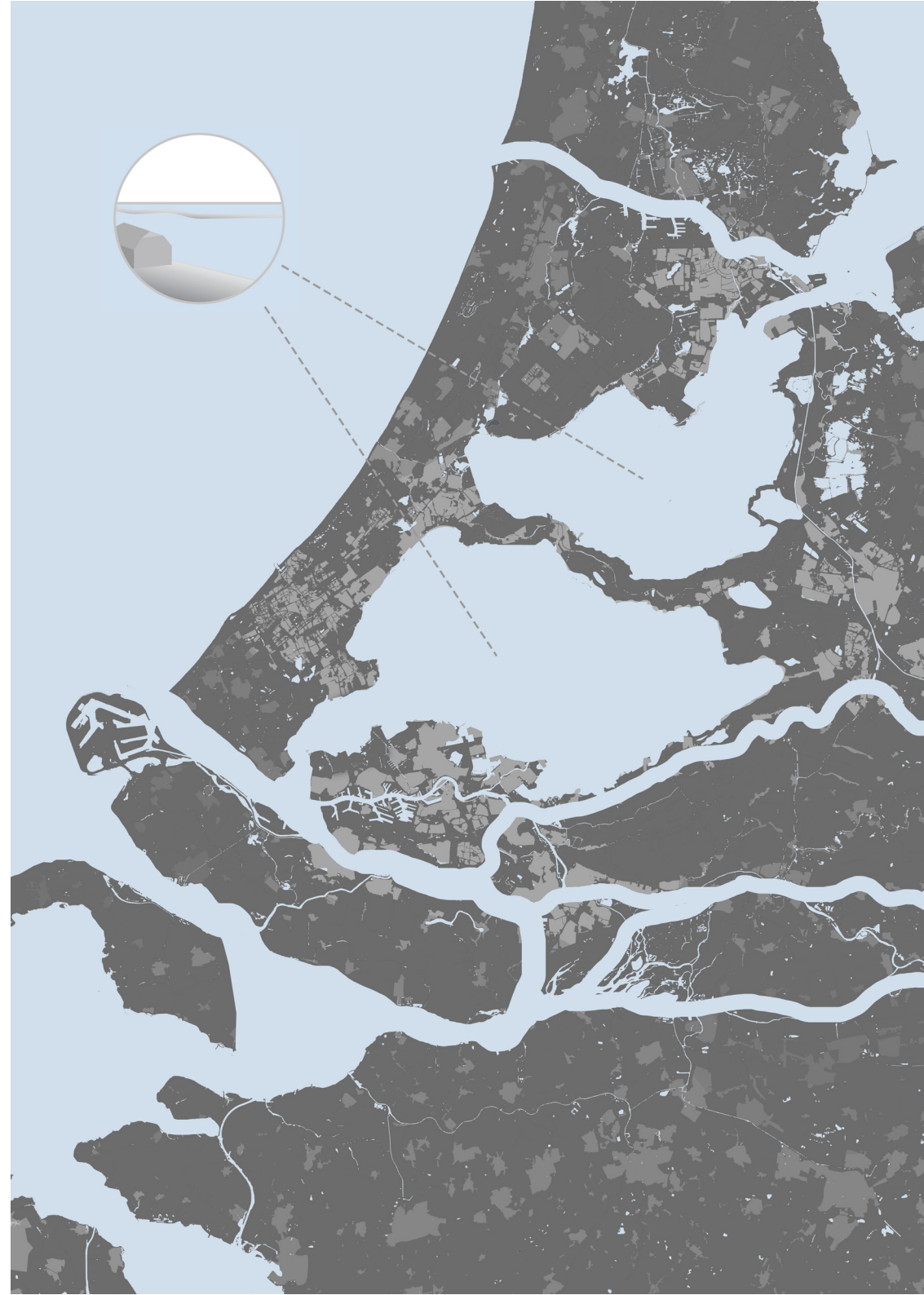


Draw back and adapt

Defensive – Anticipative – Offensive – Absolute control



The National Delta Program
adaptation strategies



FUTURE OF THE DUTCH DELTA

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Close and discharge



Store and protect

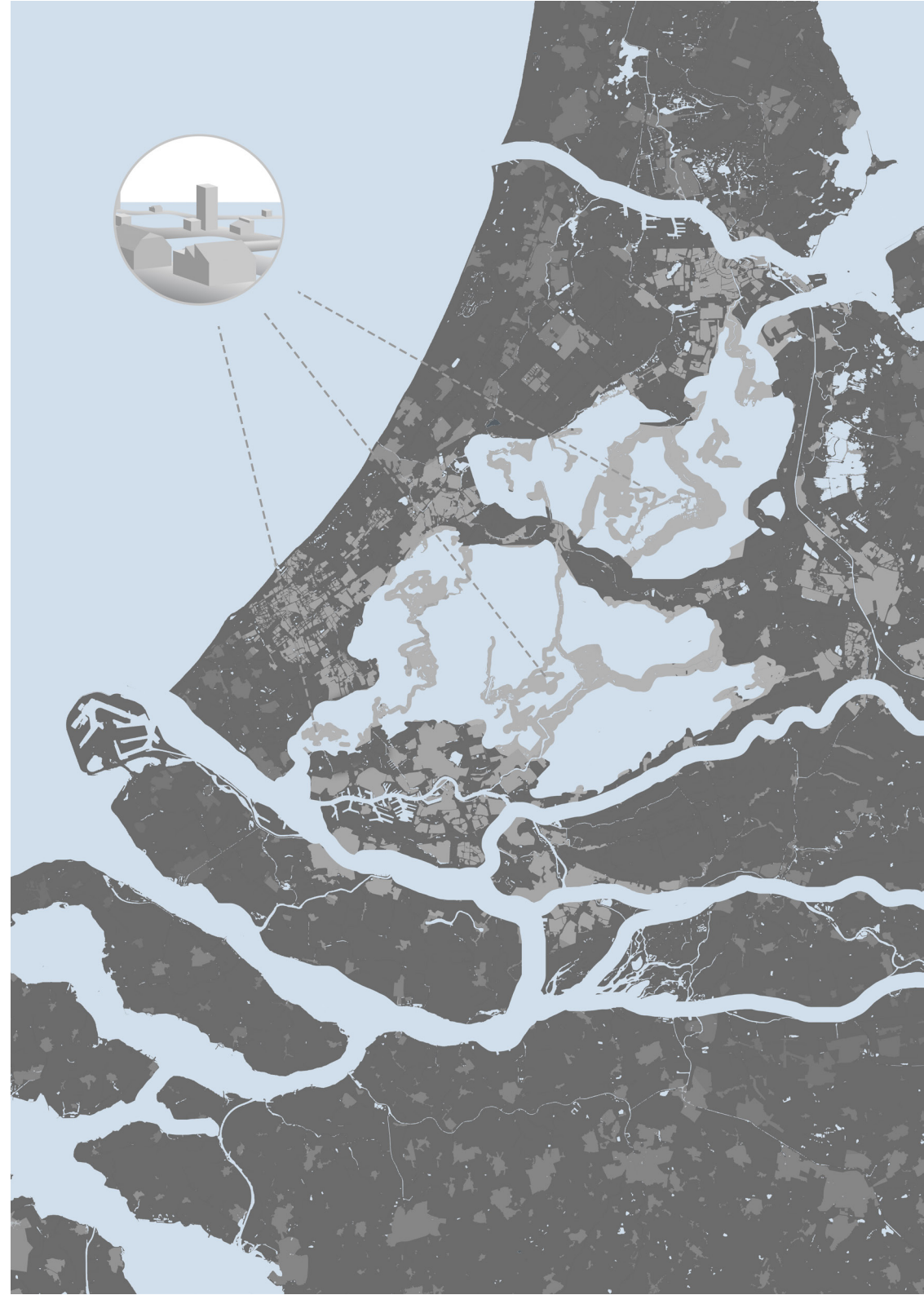


Draw back and adapt

Defensive – Anticipative – Offensive – Absolute control



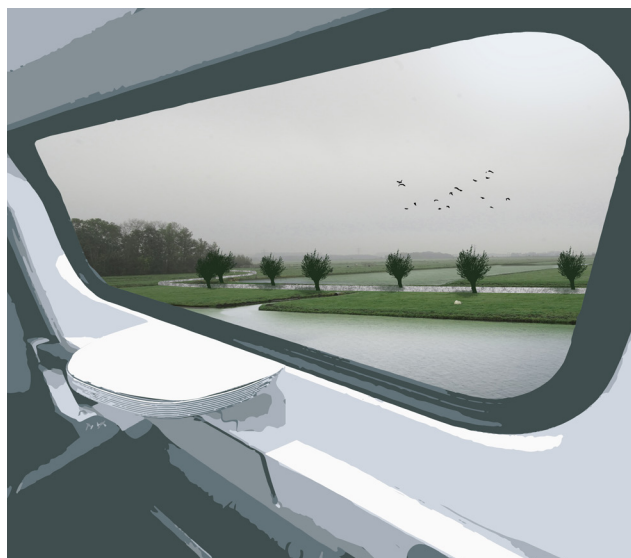
The National Delta Program
adaptation strategies



TRAIN RIDE TROUGH TIME



TRAIN RIDE TROUGH TIME



TRAIN RIDE TROUGH TIME



