BETWEEN LAND & SEA

Building with nature to sustain, secure and live
on a sustainable Schouwen-Duiveland

FROUKJE OTTEMA

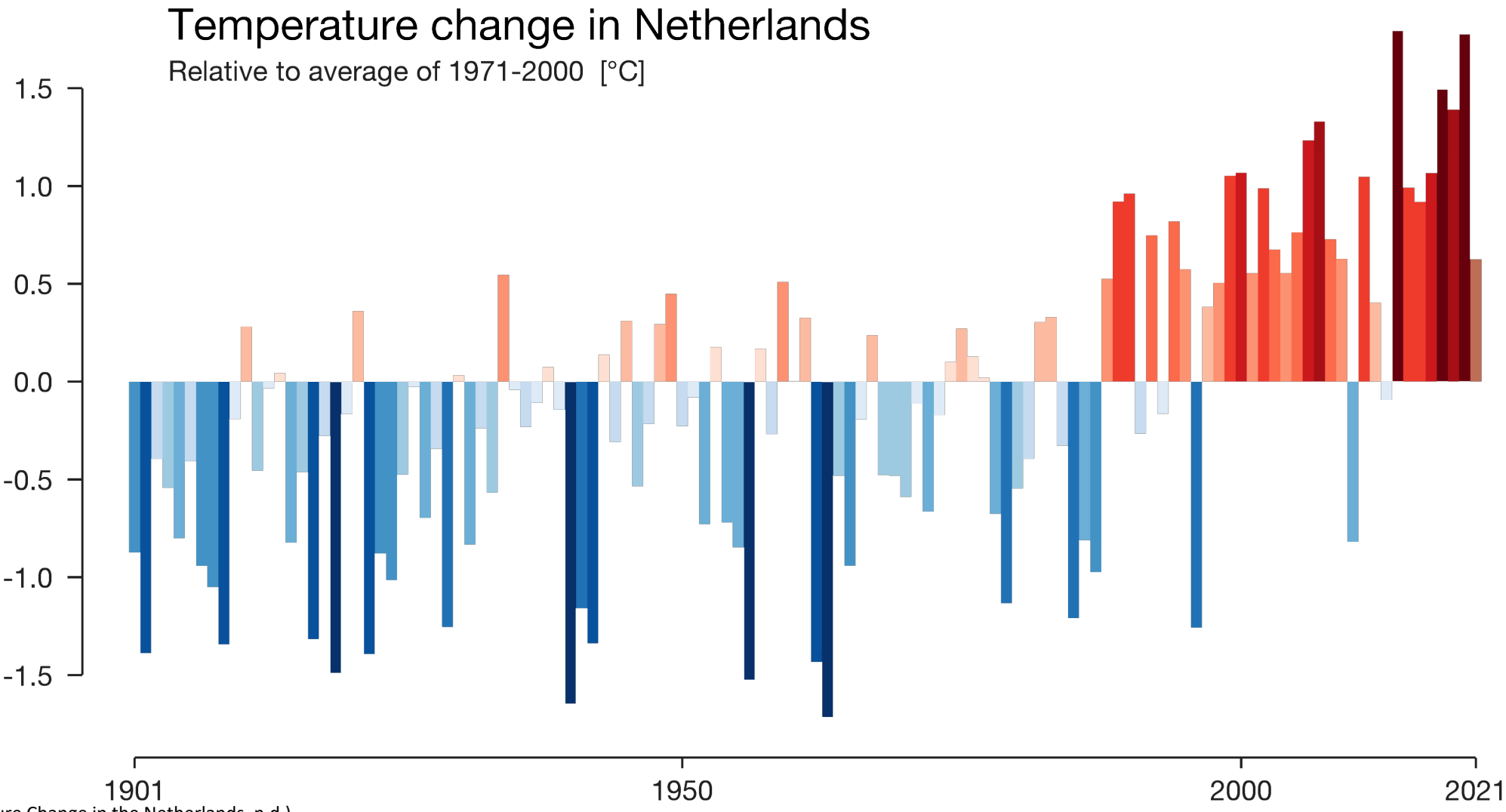
Studio: Metropolitan ecologies of places

First mentor: Arjan van Timmeren

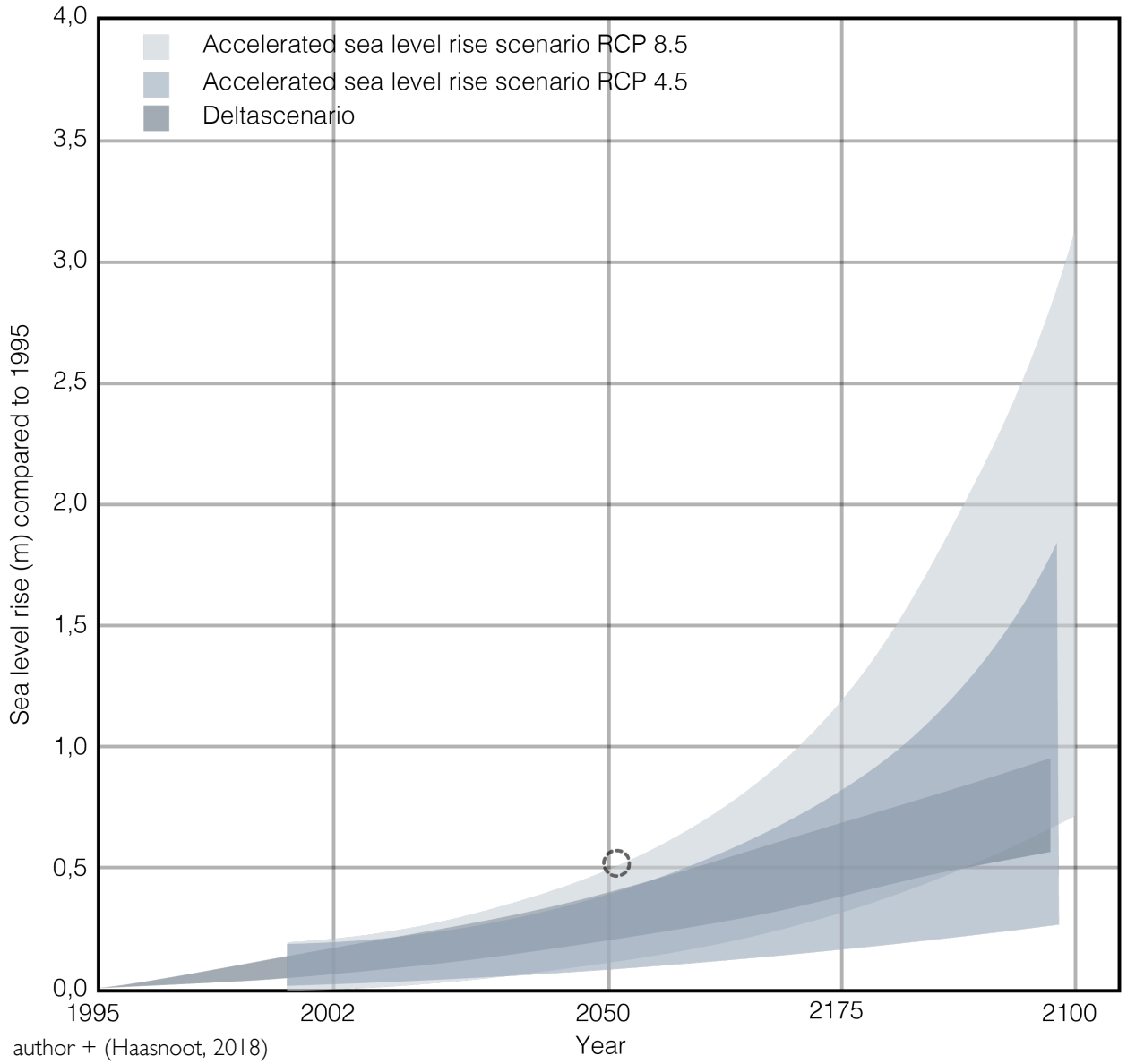
Second mentor: Nico Tillie


0
100
200 km


0 10 20 km

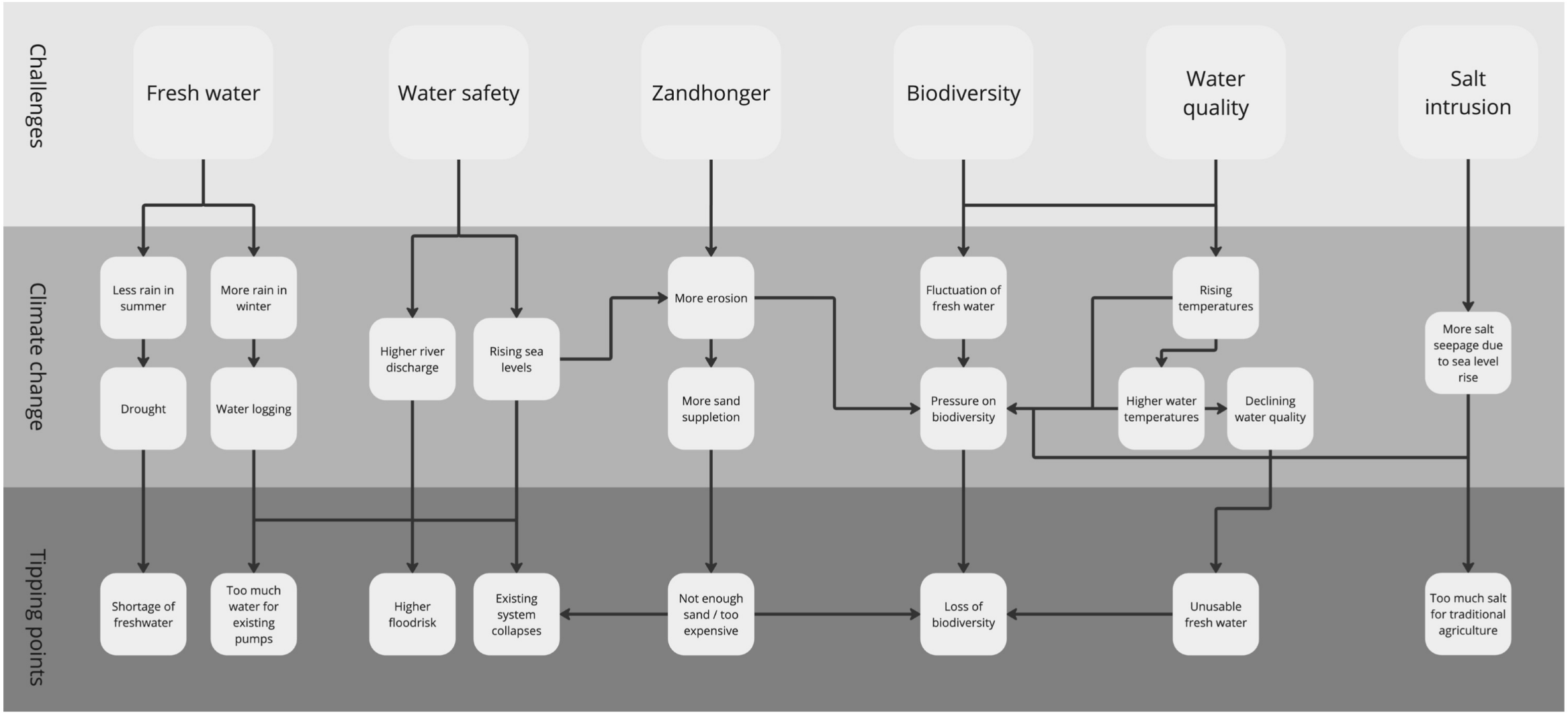


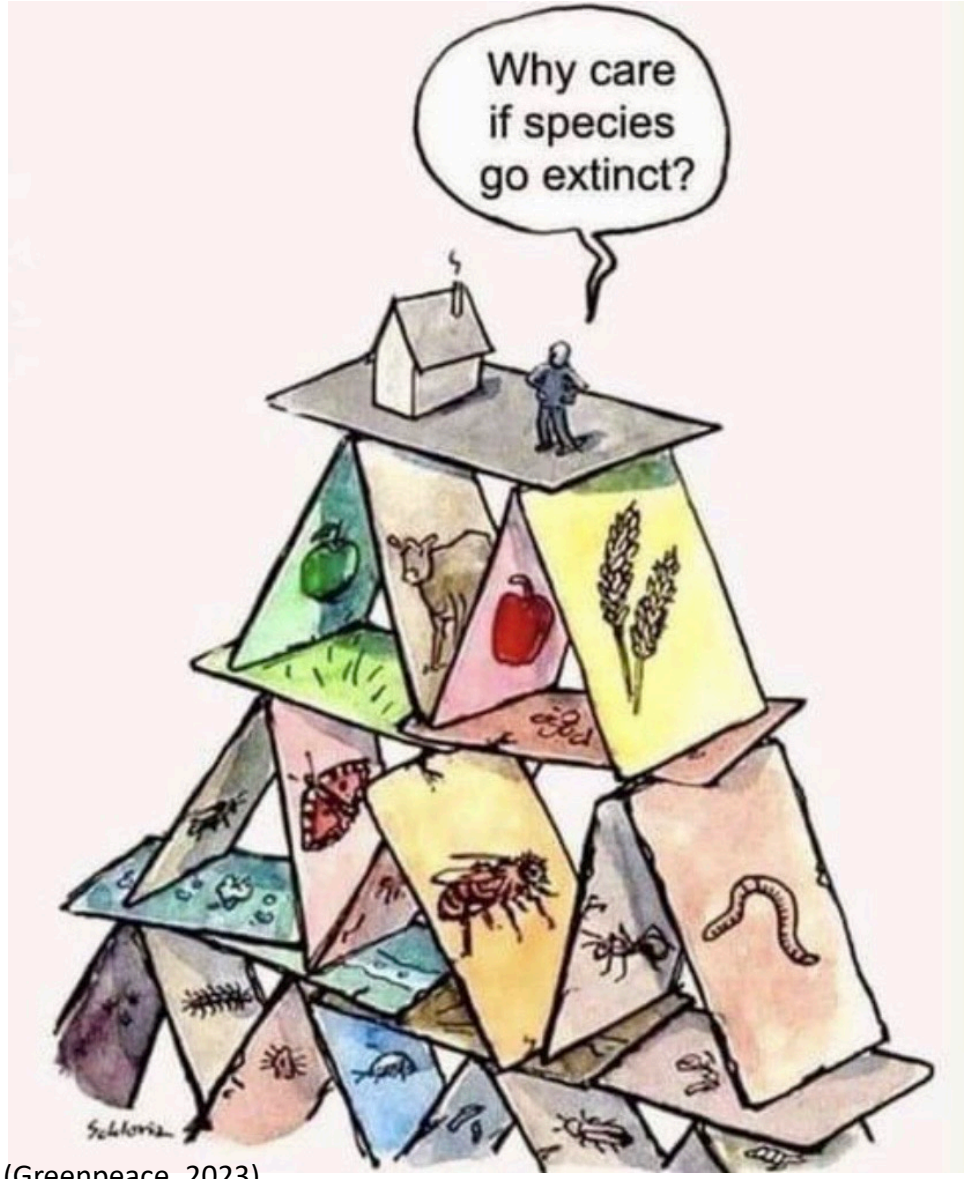
(Temperature Change in the Netherlands, n.d.)



author + (Haasnoot, 2018)

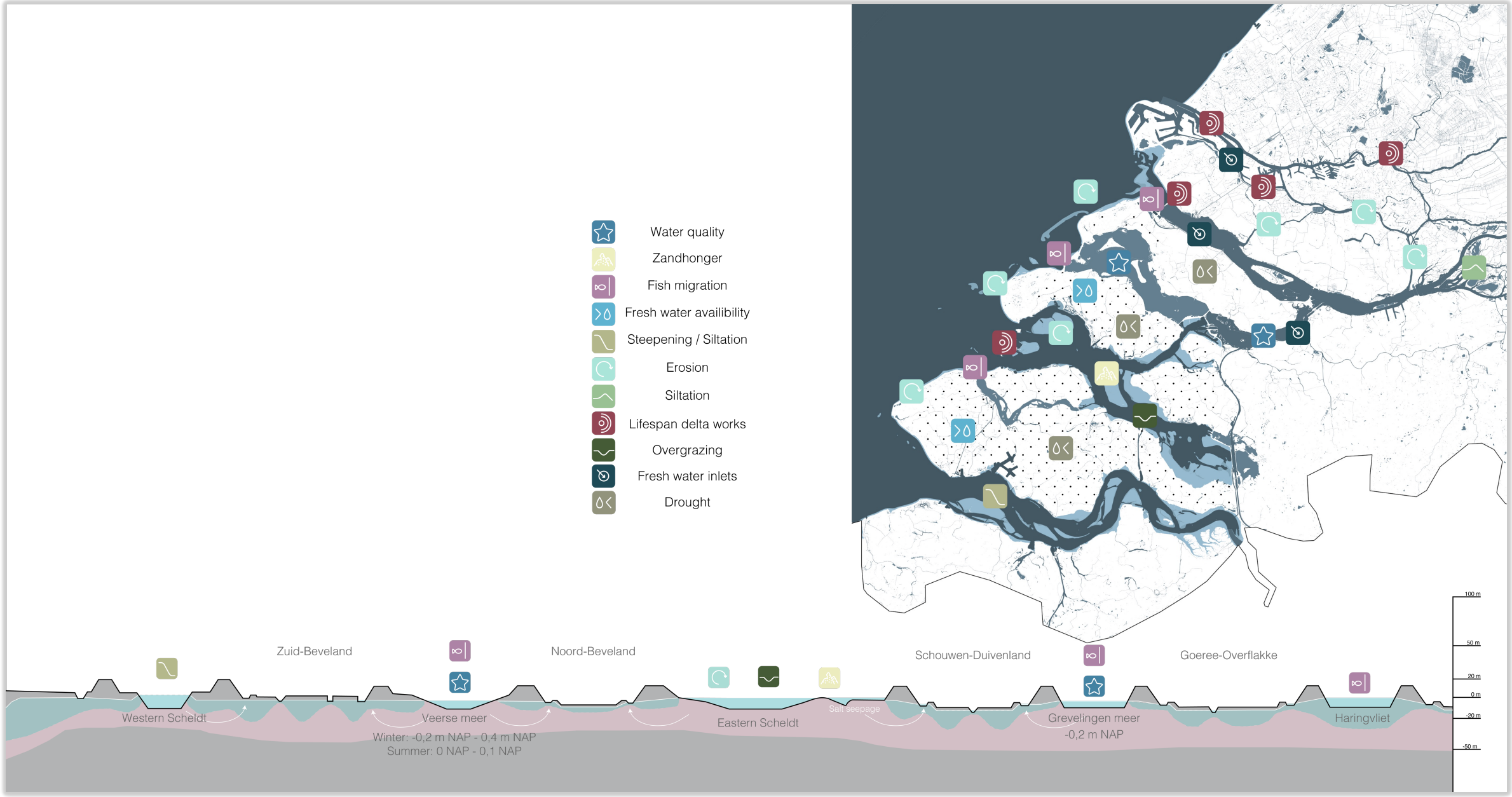

1 February 1953
(PZC, 2018)


Challenges
Climate change
Tipping points
Fresh water
Water safety
Zandhonger
Biodiversity
Water quality
Salt intrusion
Less rain in summer
More rain in winter
Drought
Water logging
Higher river discharge
Rising sea levels
More erosion
More sand suppletion
Fluctuation of fresh water
Pressure on biodiversity
Rising temperatures
Higher water temperatures
Declining water quality
More salt seepage due to sea level rise
Shortage of freshwater
Too much water for existing pumps
Higher floodrisk
Existing system collapses
Not enough sand / too expensive
Loss of biodiversity
Unusable fresh water
Too much salt for traditional agriculture



(Greenpeace, 2023)


0
2,5
5 km


Water quality
Zandhonger
Fish migration
Fresh water availibility
Steepening / Siltation
Erosion
Siltation
Lifespan delta works
Overgrazing
Fresh water inlets
Drought
Zuid-Beveland
Noord-Beveland
Schouwen-Duivenland
Goeree-Overflakke
Western Scheldt
Veerse meer
Winter: -0,2 m NAP - 0,4 m NAP
Summer: 0 NAP - 0,1 NAP
Eastern Scheldt
Salt seepage
Grevelingen meer
-0,2 m NAP
Haringvliet
100 m
50 m
20 m
0 m
-20 m
-50 m

Problem statement

The Southwestern delta is facing environmental and agricultural challenges, now and in the future. By understanding what a (semi-) open delta implies for Schouwen-Duiveland, in particular for the green-blue structures, these challenges can be addressed. While implying a (semi-) open delta, the water safety of the society should at all times be guaranteed. When taking up the multiple challenges in a spatial framework, the existing qualities need to be sustained and secured.

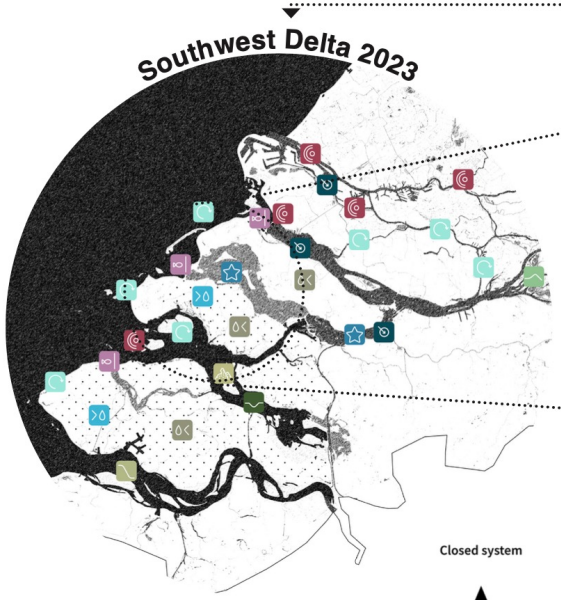
RESEARCH QUESTIONS

What would the return to a (semi-) open delta mean for the green blue network of Schouwen- Duivenland, and what spatial framework and guiding design principles would be necessary to sustain and upgrade both green blue networks and live ability, now and in the future?

- *What is a (semi-) open delta approach?*
- *How can a (semi-) open delta solve existing and future challenges?*

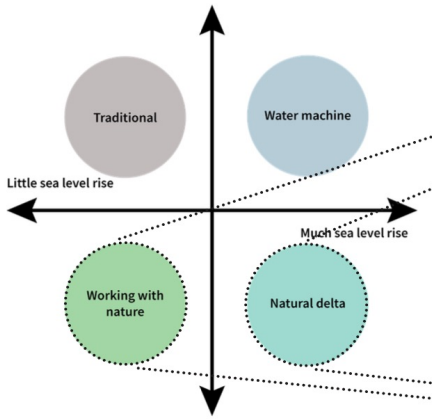
- *What are the existing qualties and threats of the green-blue network and the liveability on Schouwen-Duivenland?*
- *How can these qualities be sustained and/or upgraded when returning to a (semi-) open delta?*

- *How can the green blue structures of Schouwen-Duivenland be improved when returning to a (semi-) open delta?*
- *What are the spatial implications when Schouwen-Duiveland is situated in a (semi-) open delta?*

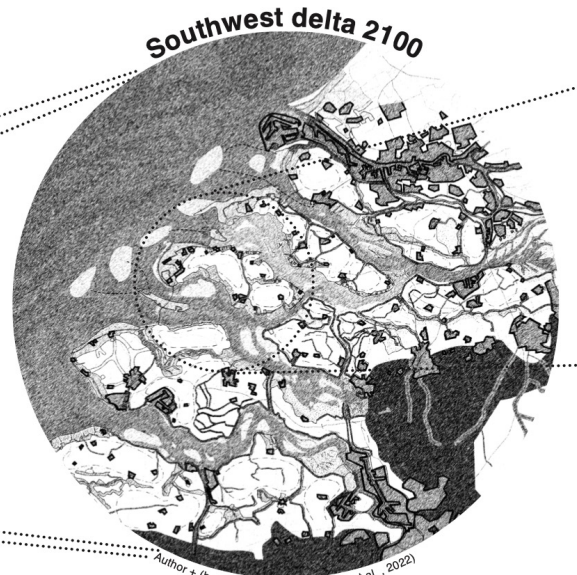


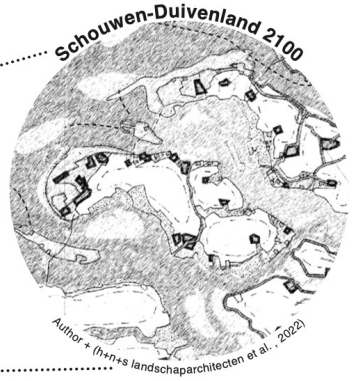
Closed system

SCENARIOS

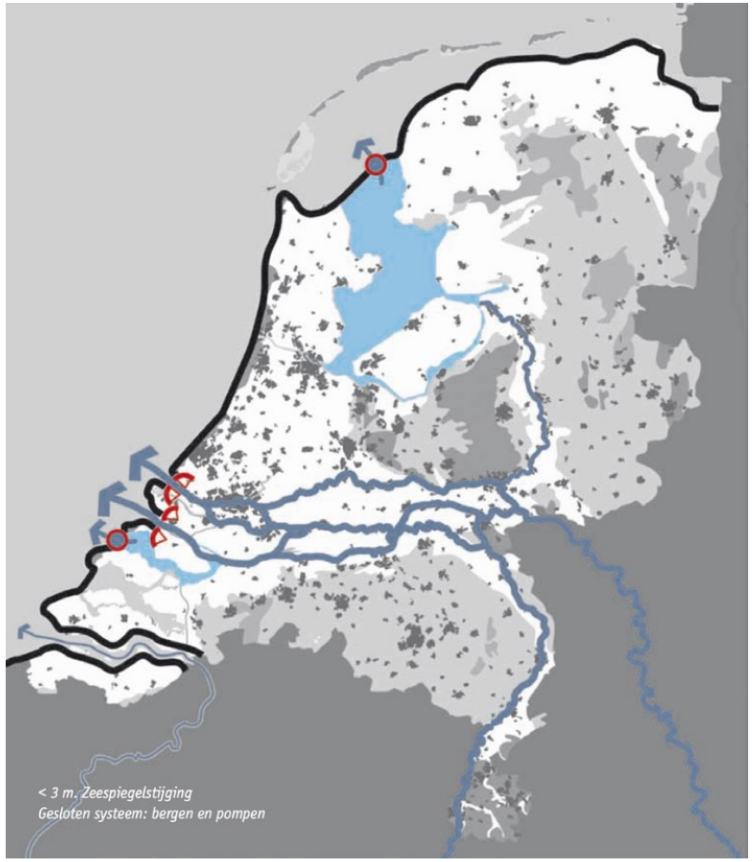


Open system

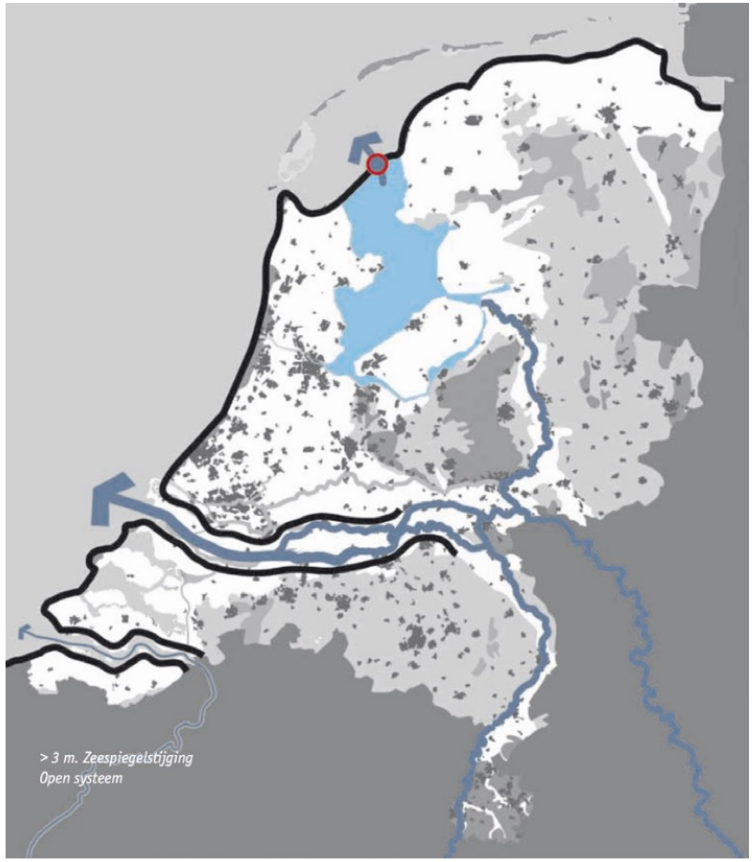




Delta Scenarios

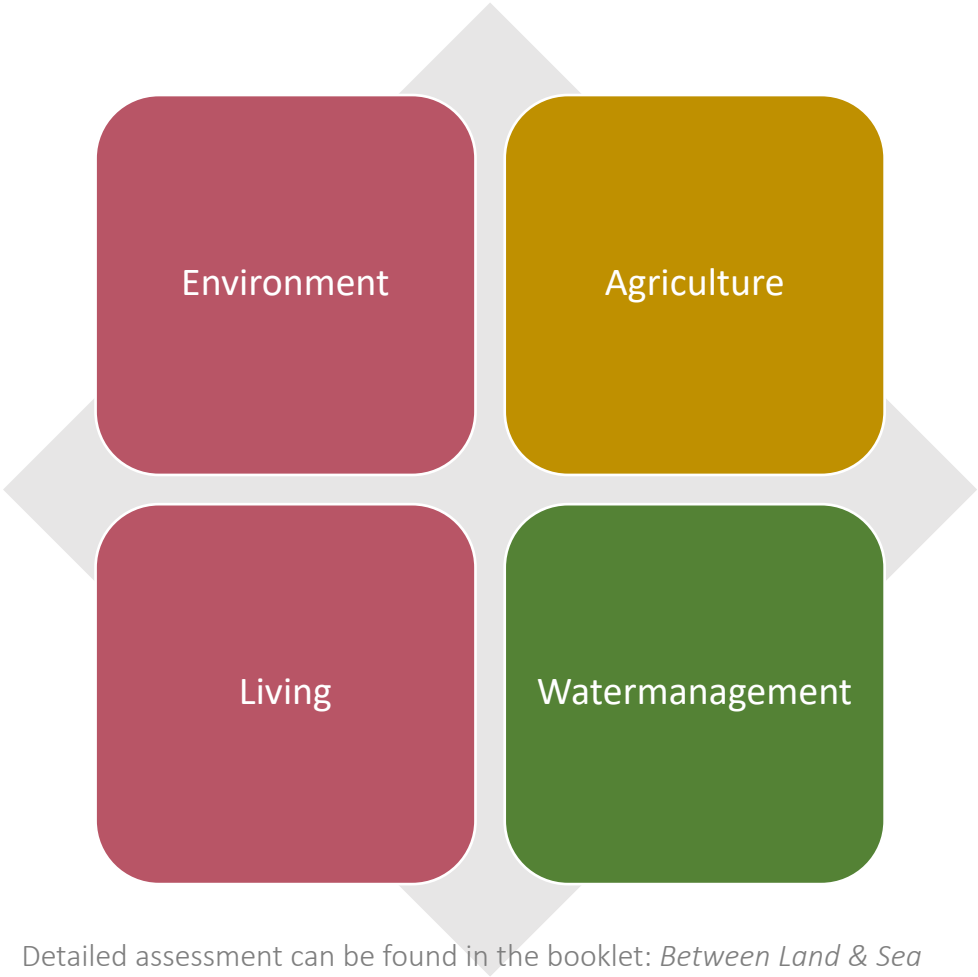


Closed system, (H+N+S landschaparchitecten et al., 2009)

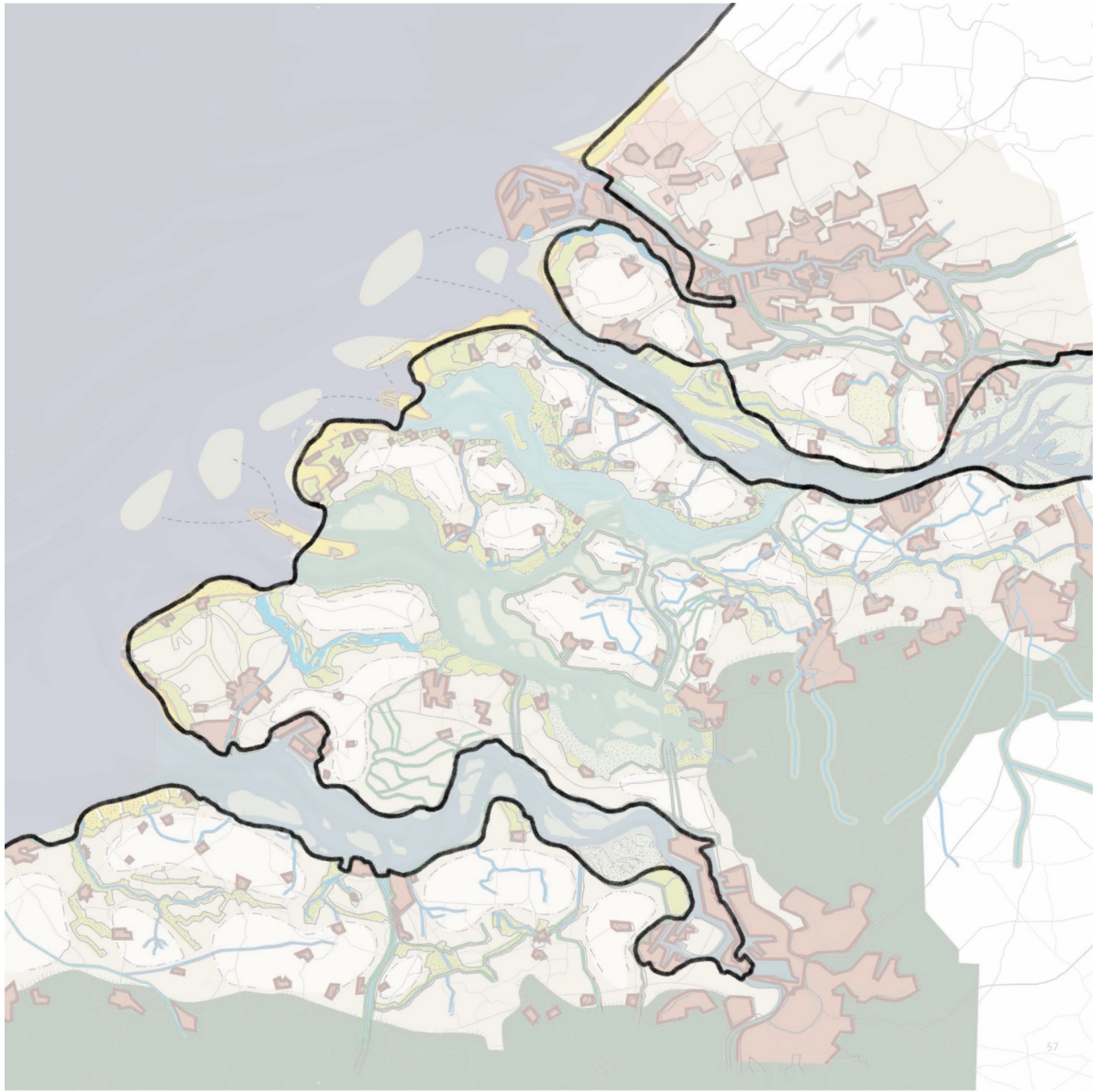


Open system, (H+N+S landschaparchitecten et al., 2009)

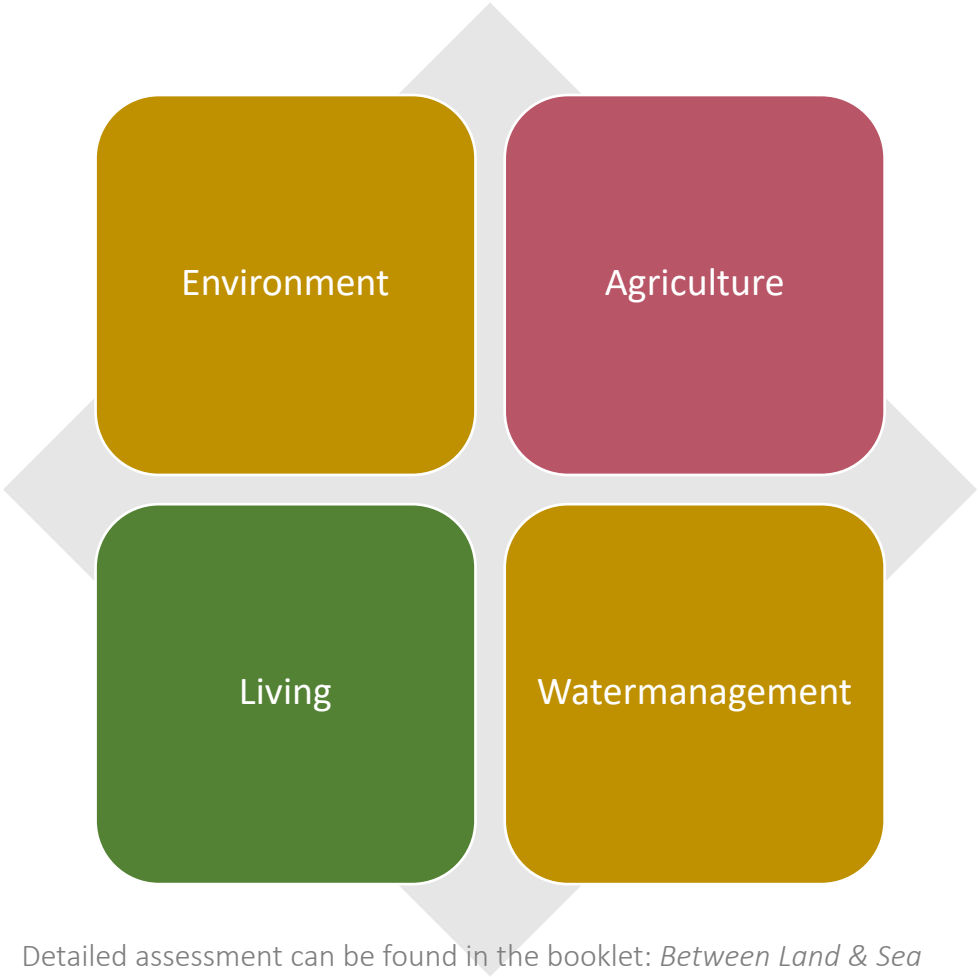
Closed delta



Detailed assessment can be found in the booklet: *Between Land & Sea*



Open Eastern Scheldt



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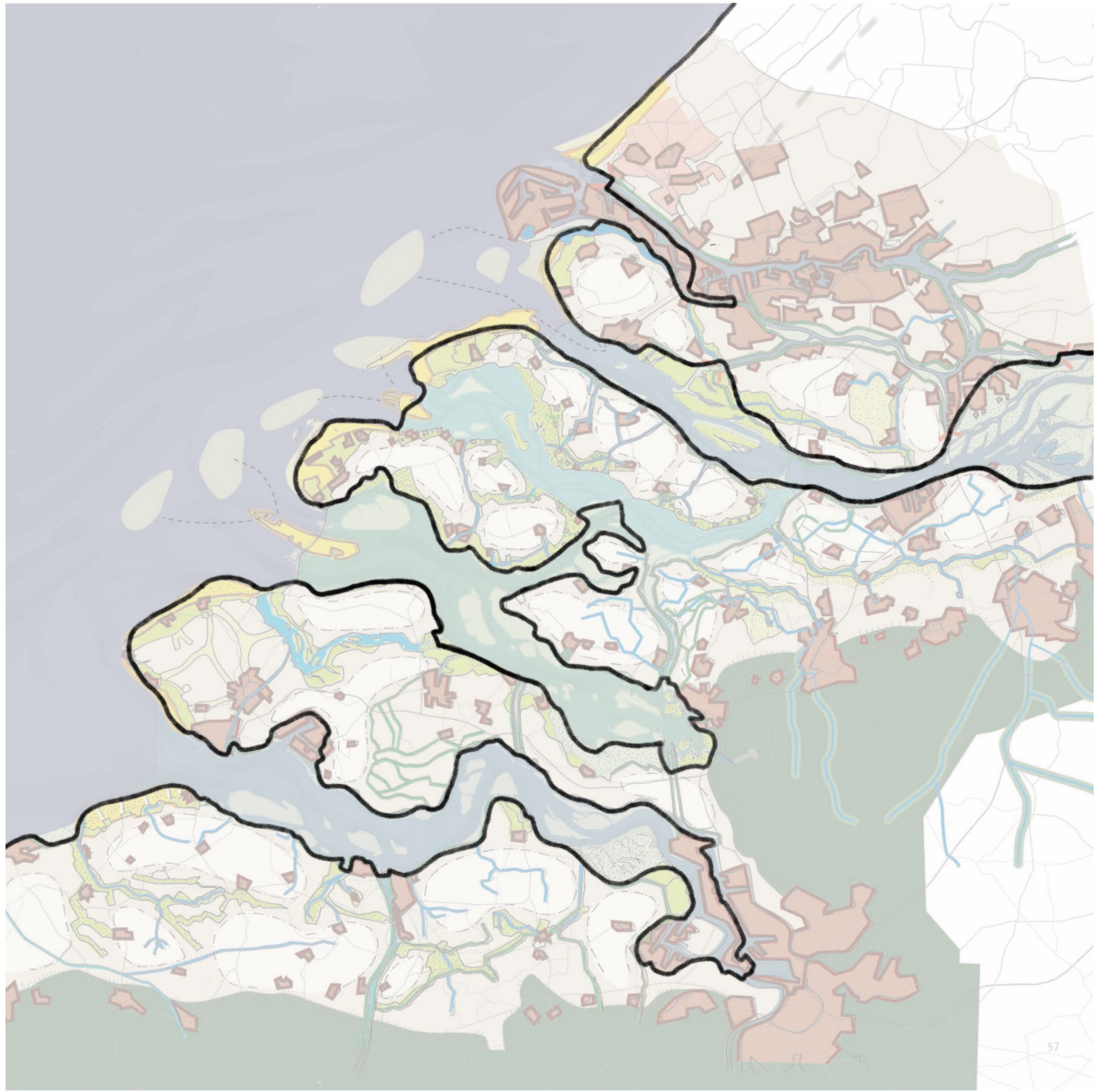
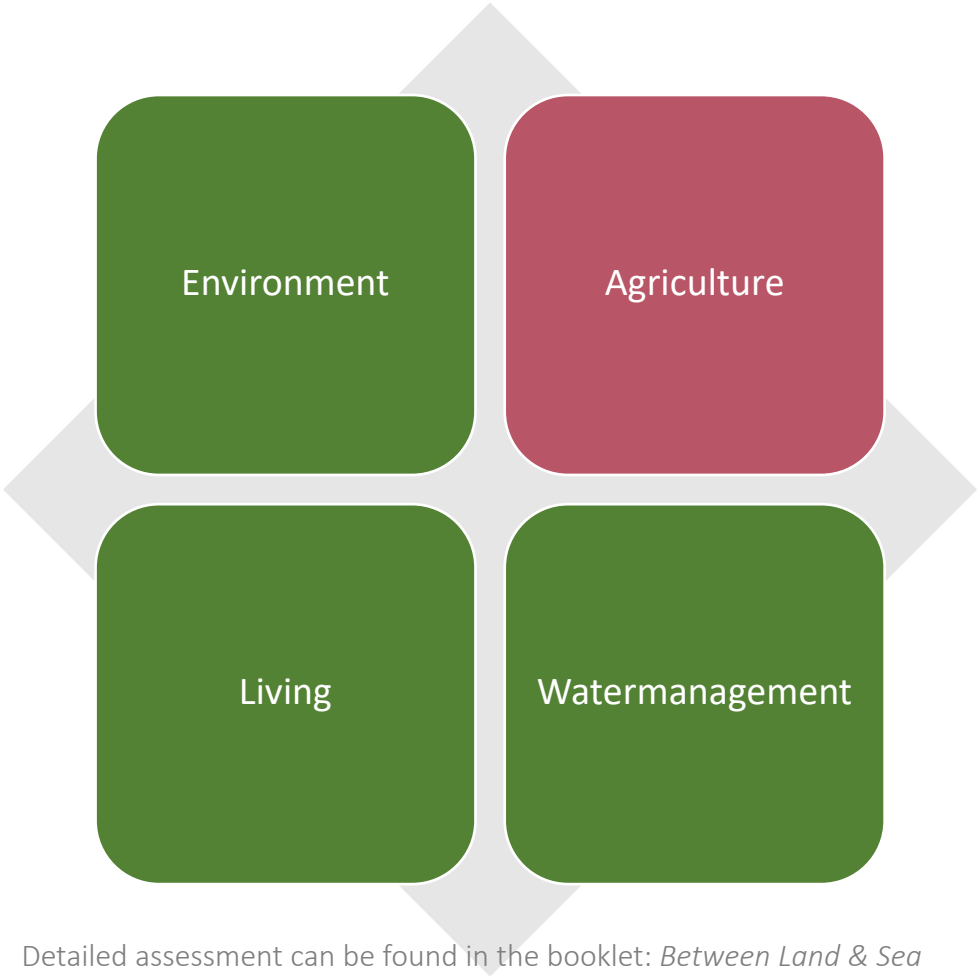


Semi open delta



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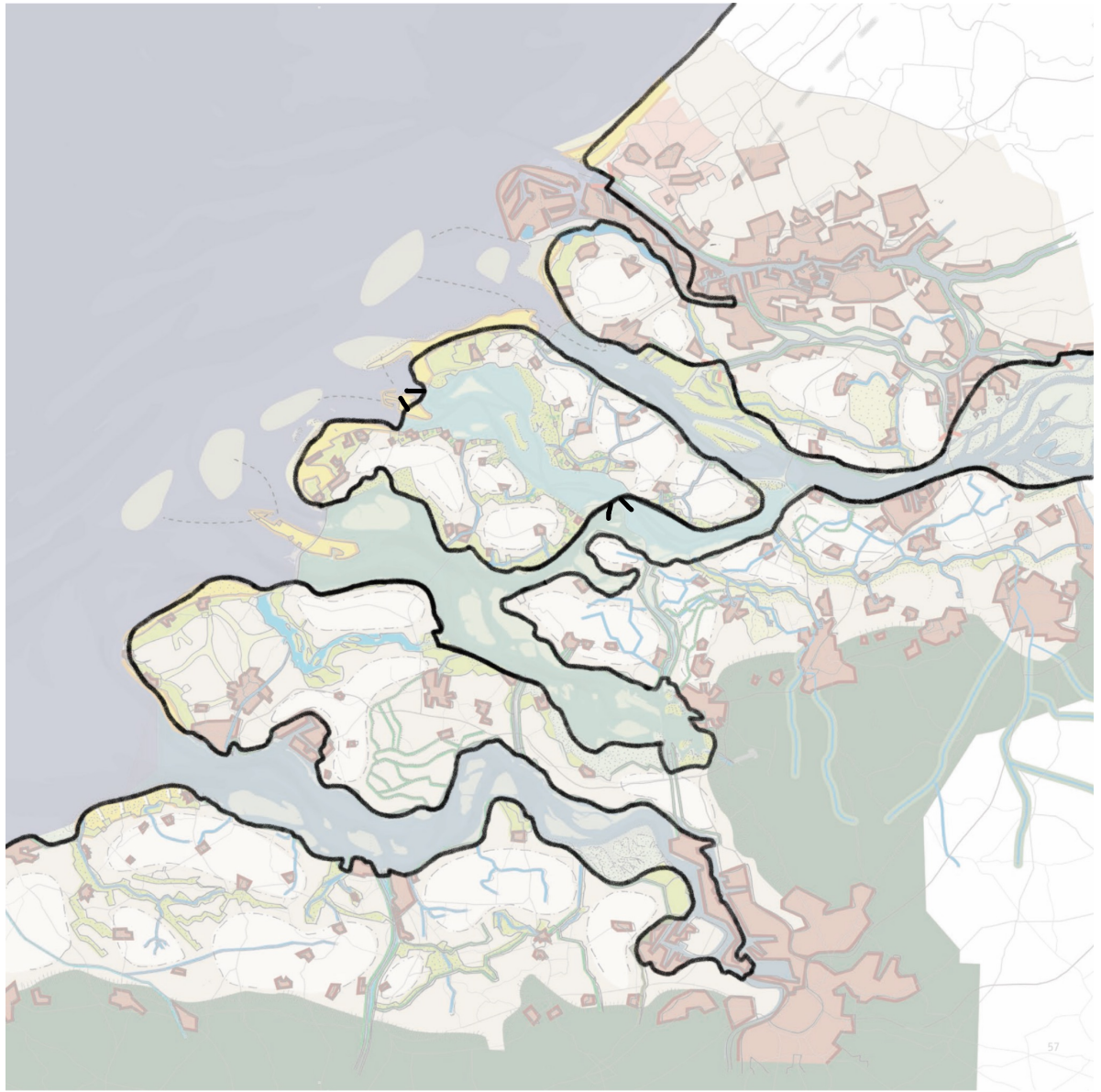
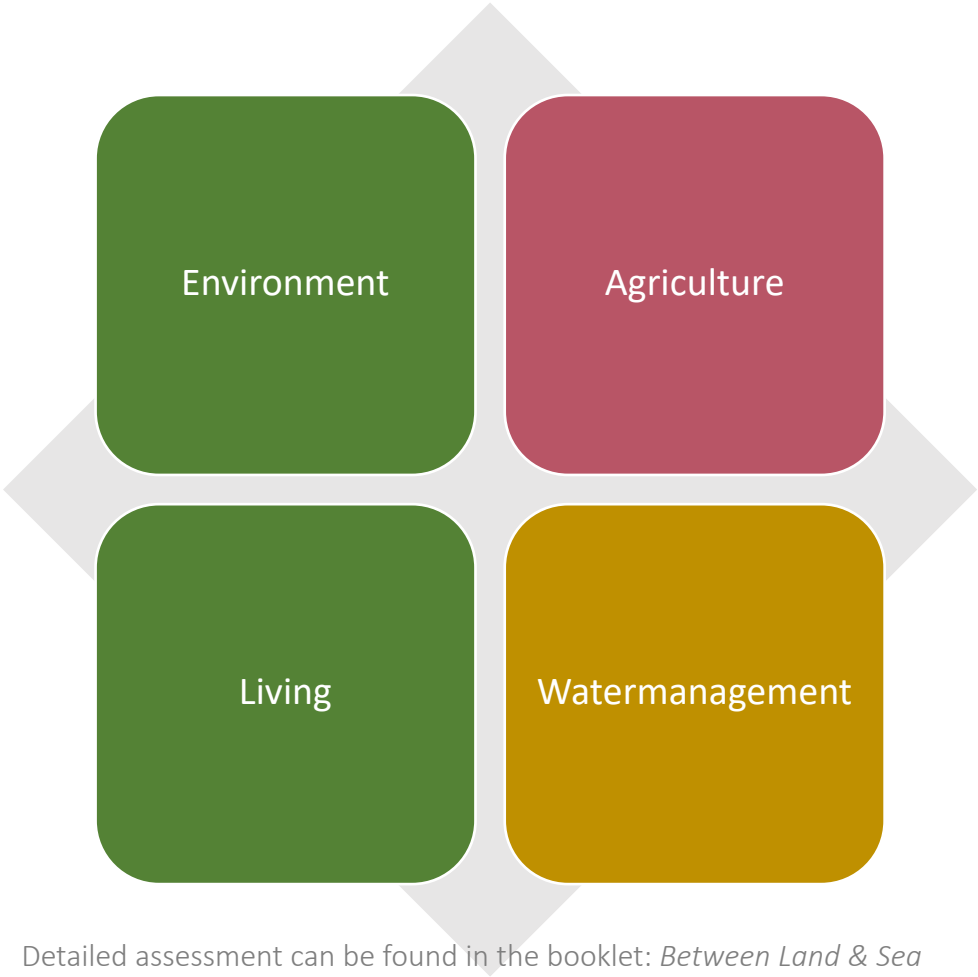


Open Delta



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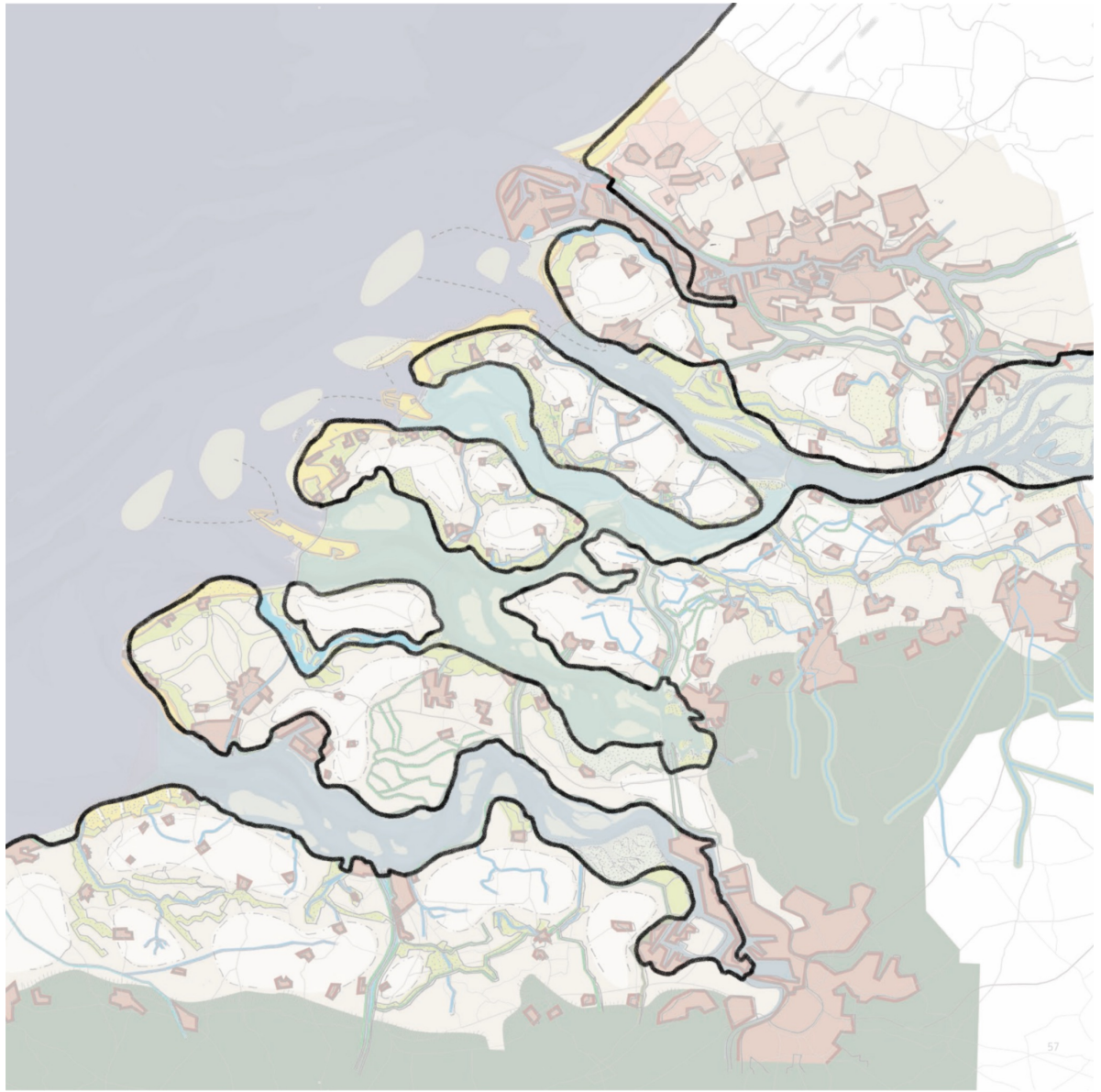
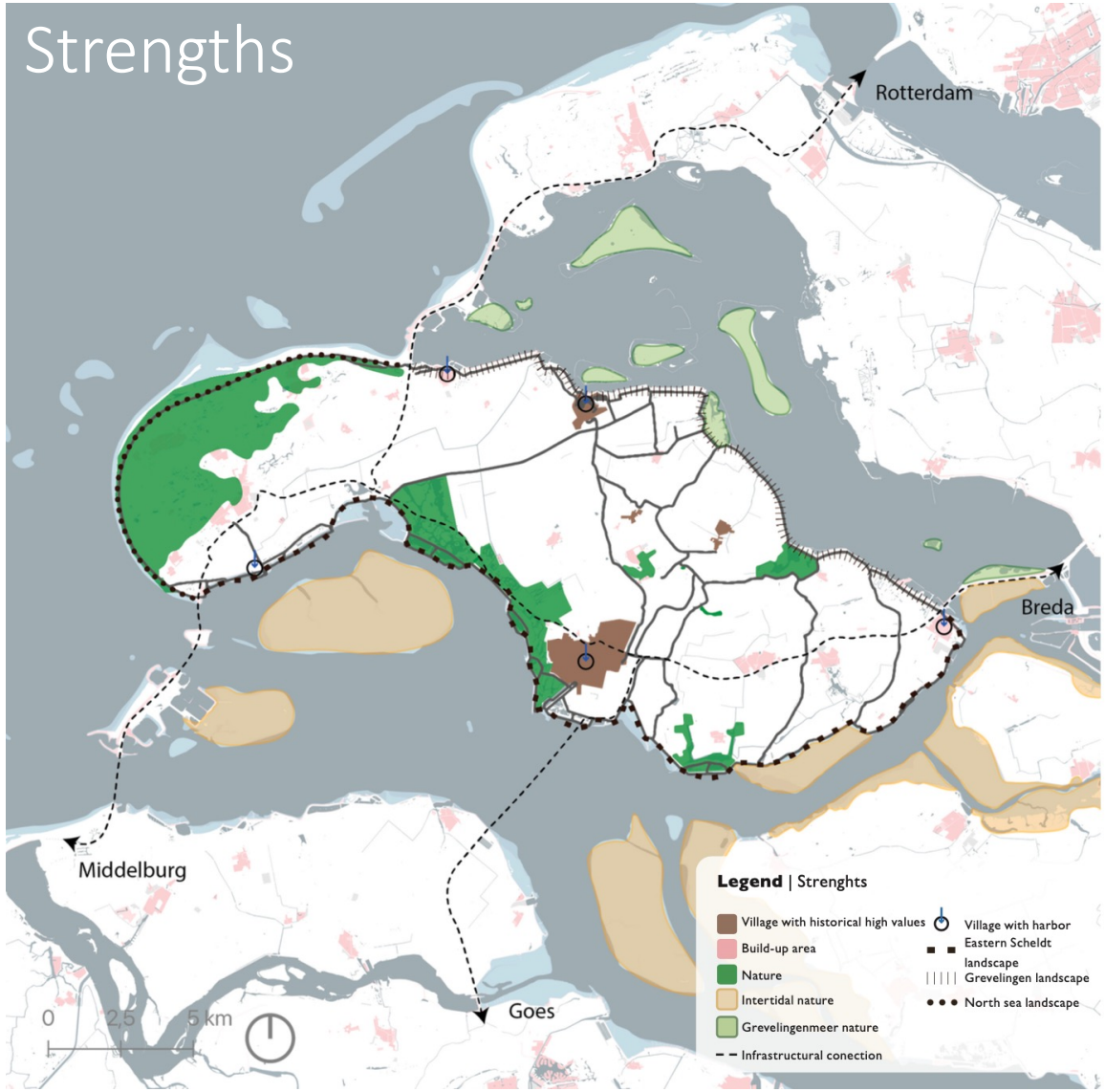
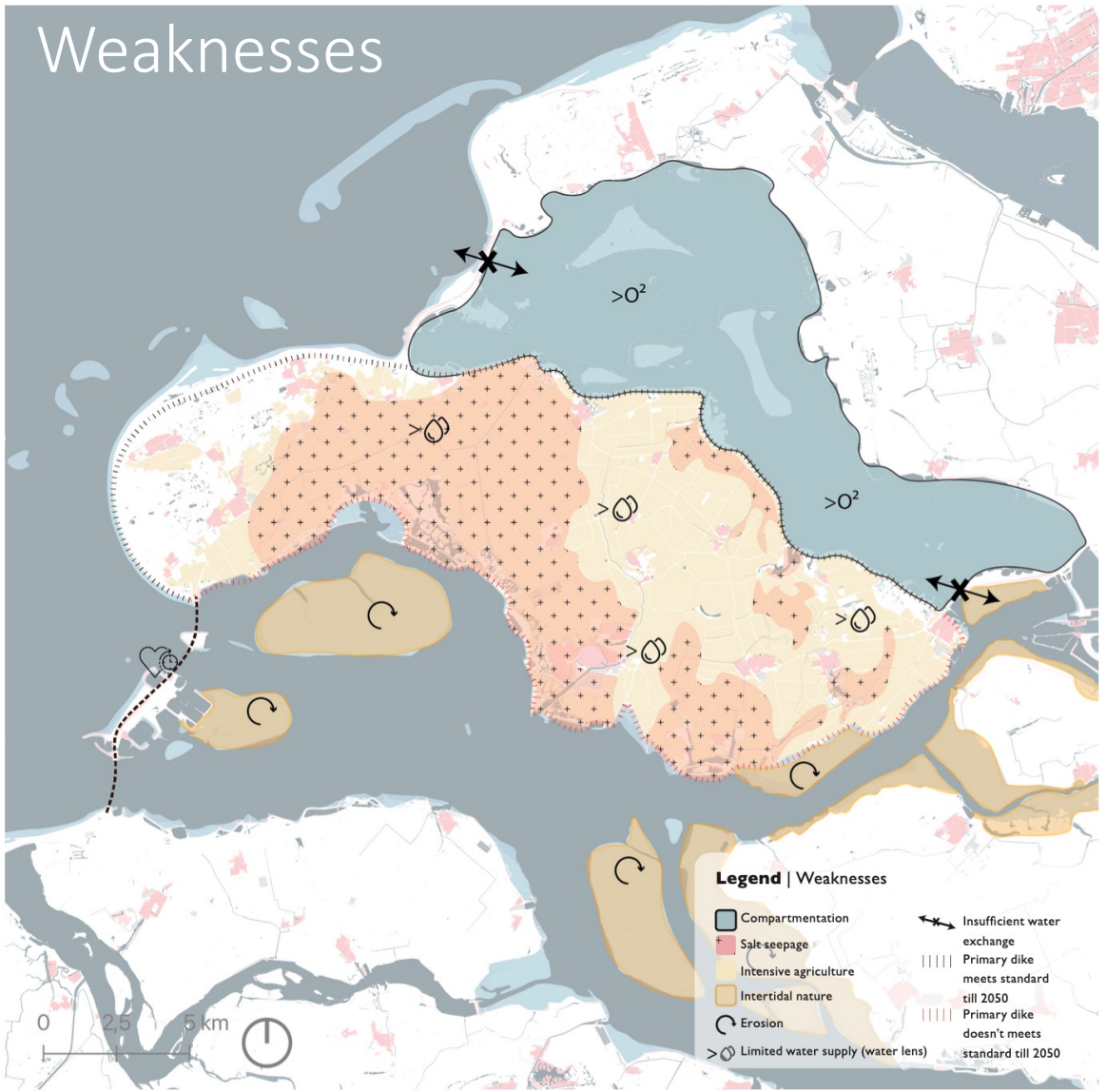
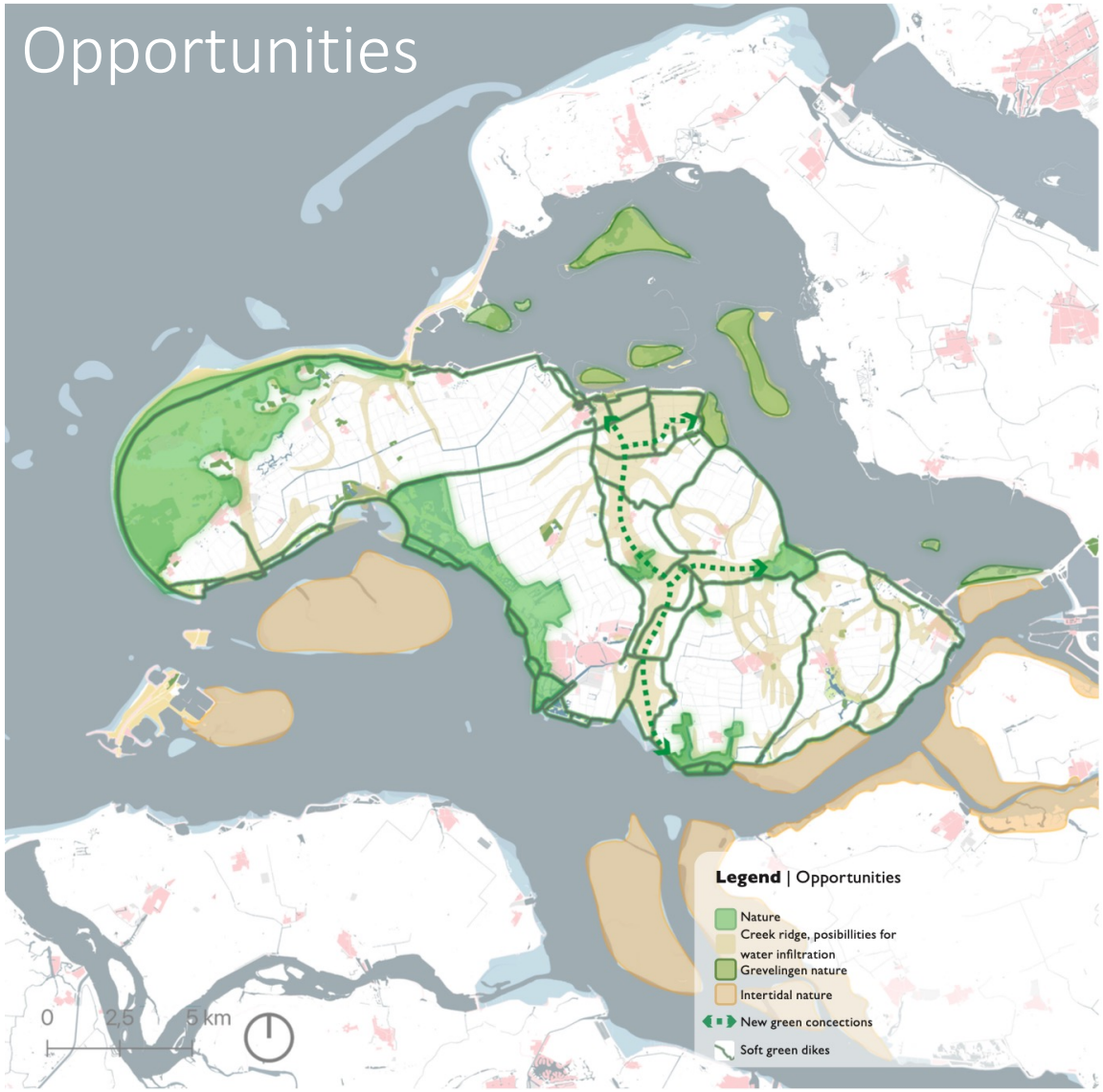


SWOT analysis

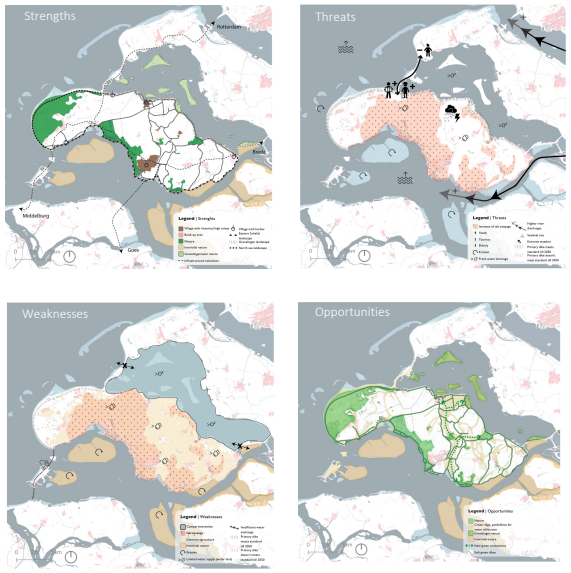

Strengths
Rotterdam
Breda
Middelburg
Goes
0 2,5 5 km
Legend | Strenghts
Village with historical high values
Build-up area
Nature
Intertidal nature
Grevelingenmeer nature
Infrastructural conection
Village with harbor
Eastern Scheldt landscape
Grevelingen landscape
North sea landscape

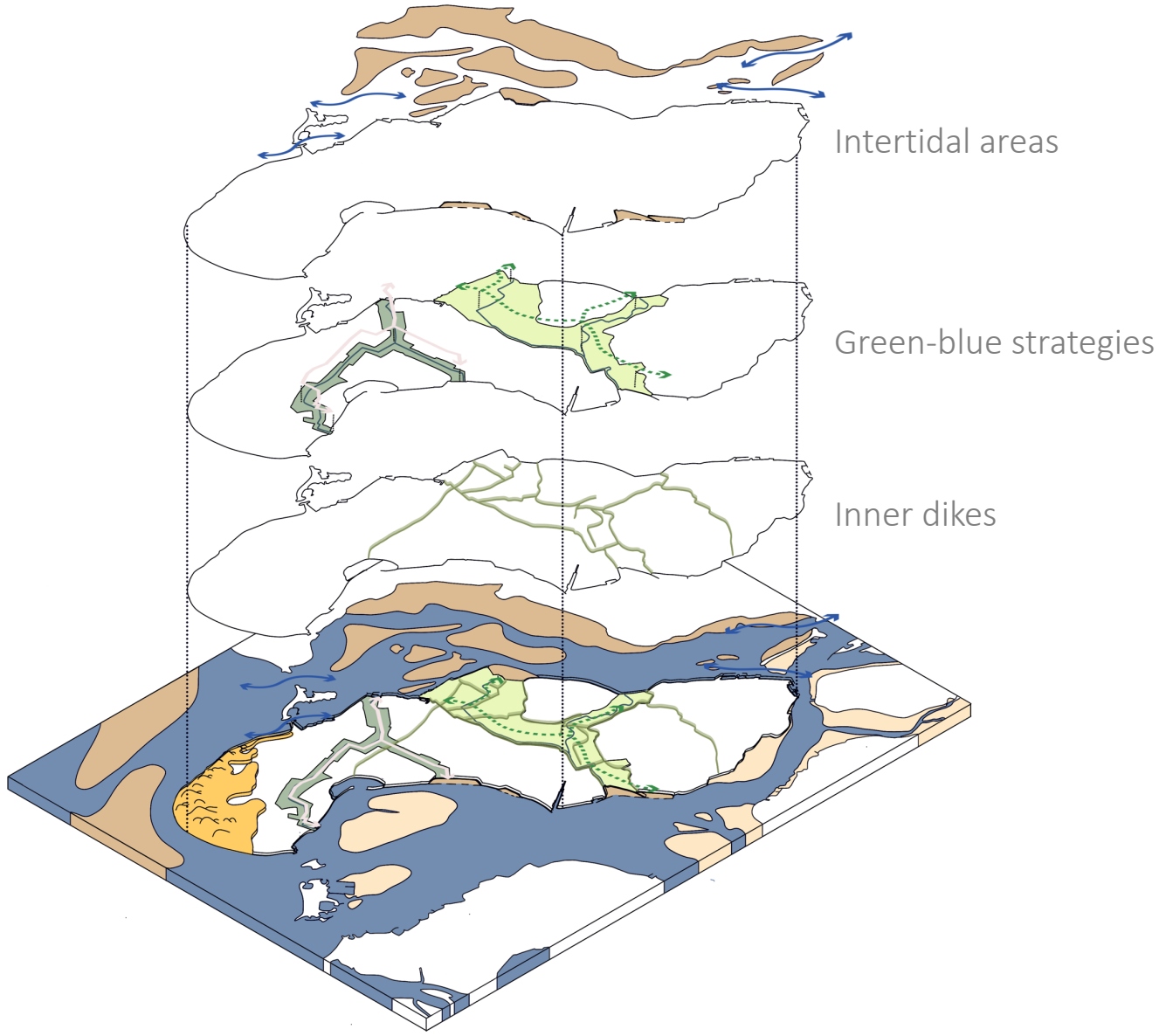

Weaknesses
>O²
>Ø
0 2,5 5 km
Legend | Weaknesses
Compartmentation
Salt seepage
Intensive agriculture
Intertidal nature
Erosion
Limited water supply (water lens)
Insufficient water exchange
Primary dike meets standard till 2050
Primary dike doesn't meets standard till 2050


Opportunities
Legend | Opportunities
Nature
Creek ridge, posibillities for water infiltration
Grevelingen nature
Intertidal nature
New green concections
Soft green dikes
0
2,5
5 km

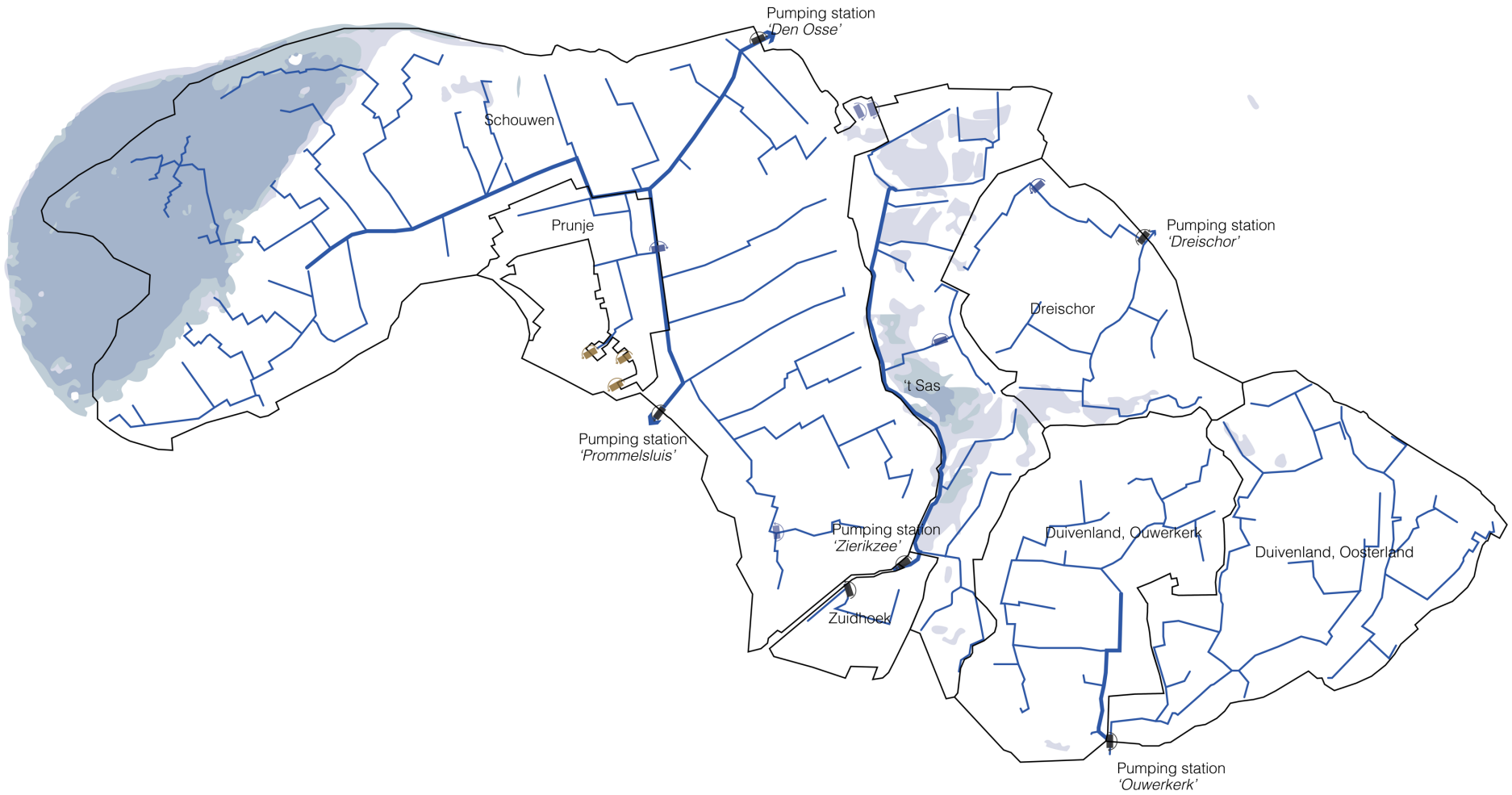

Threats
>O²
>O²
>O
>O
Legend | Threats
Increase of salt seepage
Youth
Tourists
Elderly
Erosion
>O Fresh water shortage
Higher river discharges
Sealevel rise
Extreme weather
Primary dike meets standard till 2050
Primary dike doesn't meet standard till 2050
0
2,5
5 km

SWOT and previous analysis

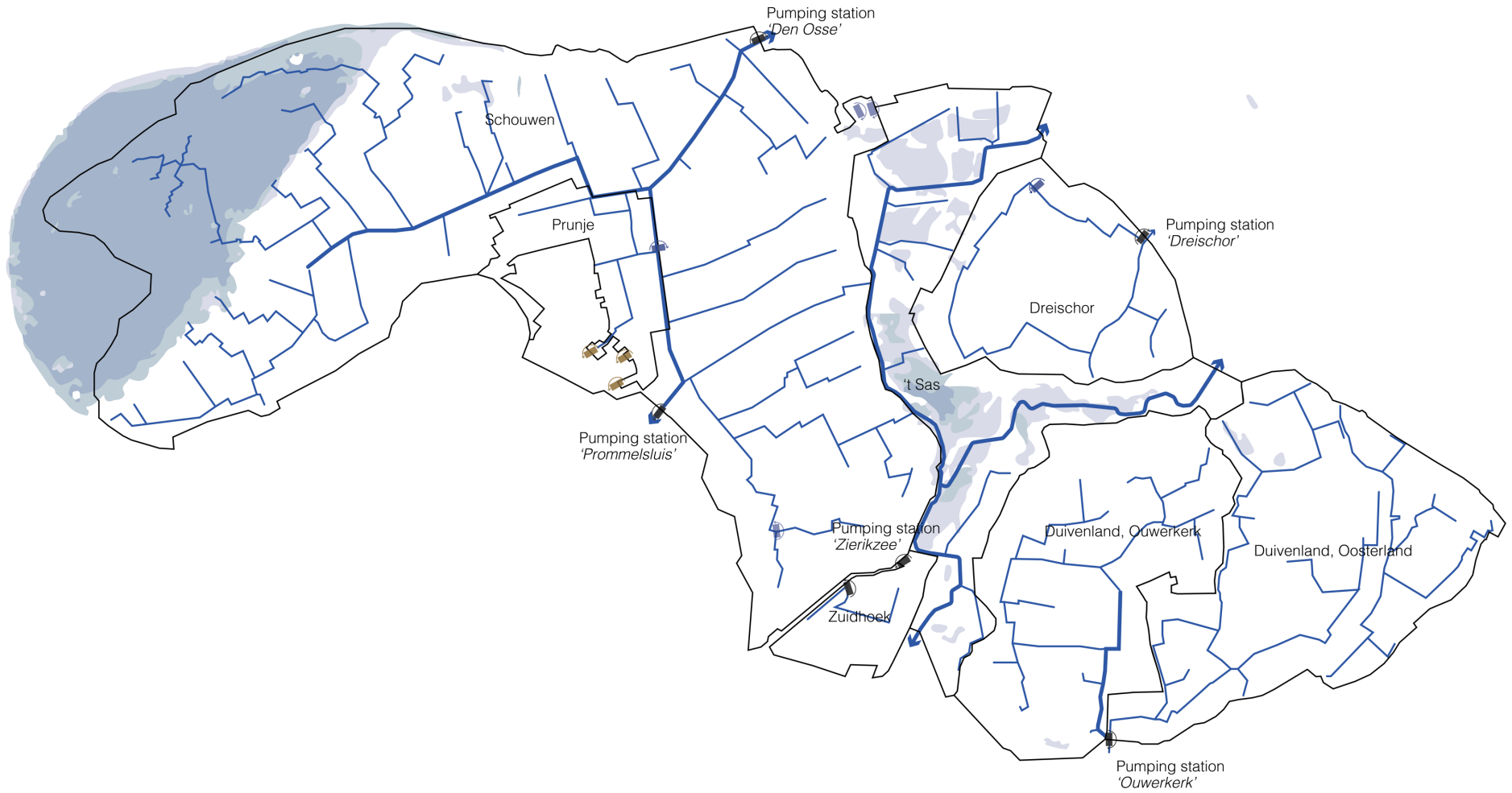




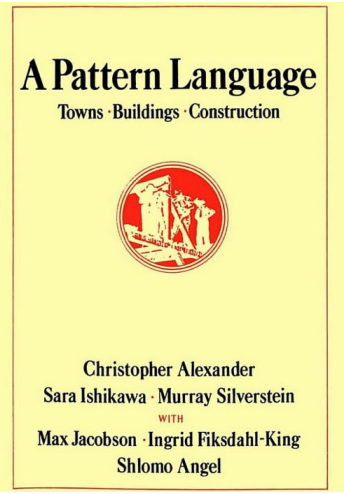
Before


Pumping station
'Den Osse'
Schouwen
Prunje
Pumping station
'Prommelsluis'
Pumping station
'Dreischor'
Dreischor
't Sas
Pumping station
'Zierikzee'
Zuidhoek
Duivenland, Ouwerkerk
Duivenland, Oosterland
Pumping station
'Ouwerkerk'

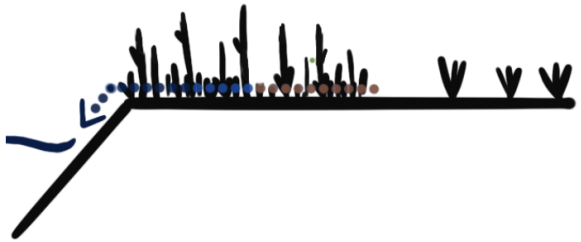
After


Pumping station
'Den Osse'
Schouwen
Prunje
Pumping station
'Prommelsluis'
Pumping station
'Dreischor'
Dreischor
't Sas
Pumping station
'Zierikzee'
Zuidhoek
Duivenland, Ouwerkerk
Duivenland, Oosterland
Pumping station
'Ouwerkerk'

Based on



Water quality W.3



Buffering Field Edges

Water qualtity improvement by buffering sown field margins

Runoff water that contains pesticides degrades the surface water quality. Buffering field edges can reduce the amount of pesticides entering the surface water.

Buffering Field Edges

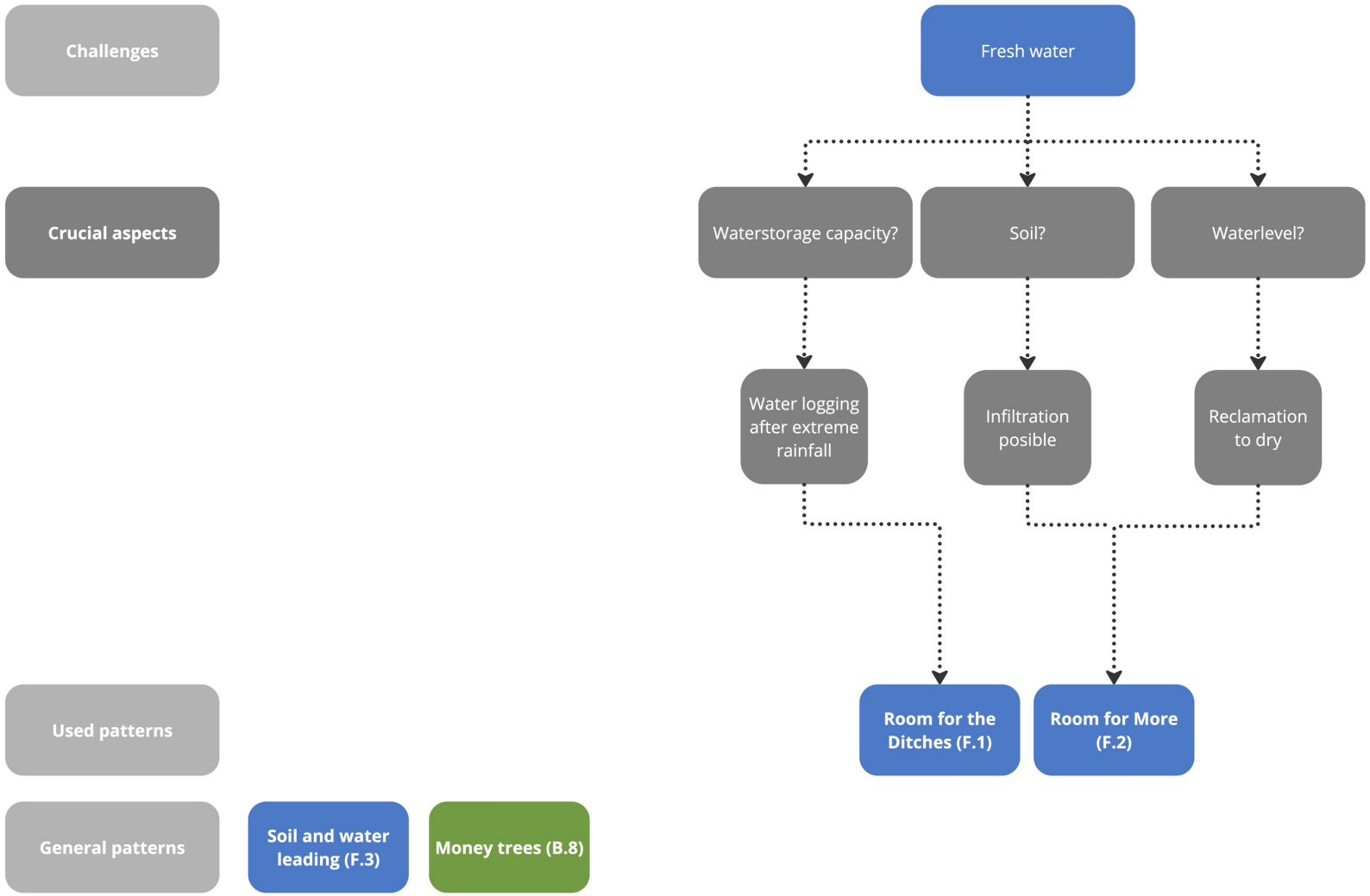
Transforming the outer field margin of agricultural land into a pesticide free zone, sown with plants that buffer

Theoretical background

Planting unsprayed field margins reduces the likelihood of pesticides entering the surface water. The width of the pesticide-free zone is determined by risk analyses, with a common width of 6 meters, although other factors such as the type of pesticide, wind direction, and spraying equipment can affect its effectiveness. Researchers suggest that high vegetation in buffer strips can also reduce pesticide drift but is not yet included in model calculations.
(Bos et al. 2014)

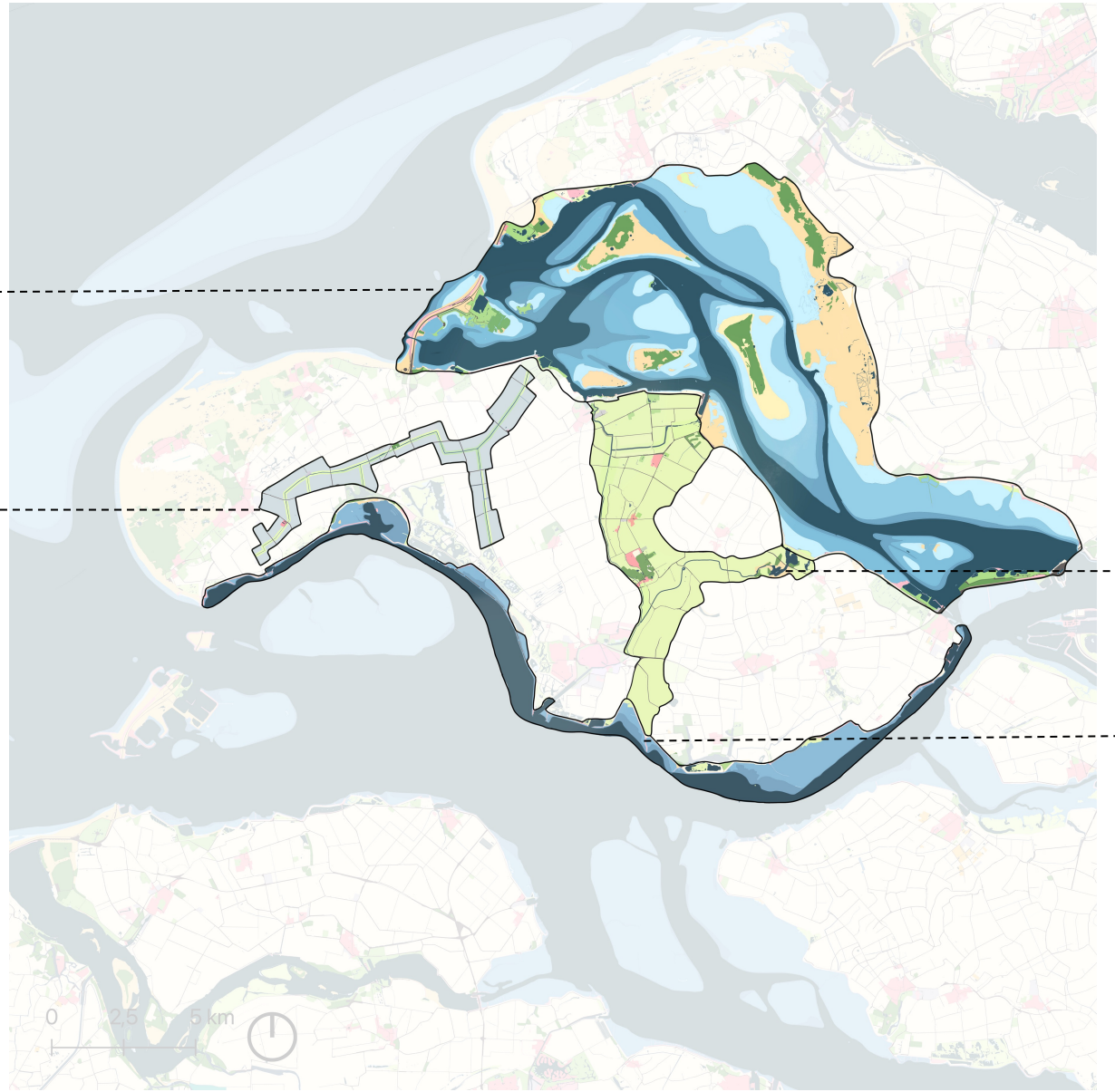
Relation with: **pattern** (**Flower Power B.6, Toxic Runoff Water W.2**)

DECISION TREE| *Example*



(semi) Open Grevelingen

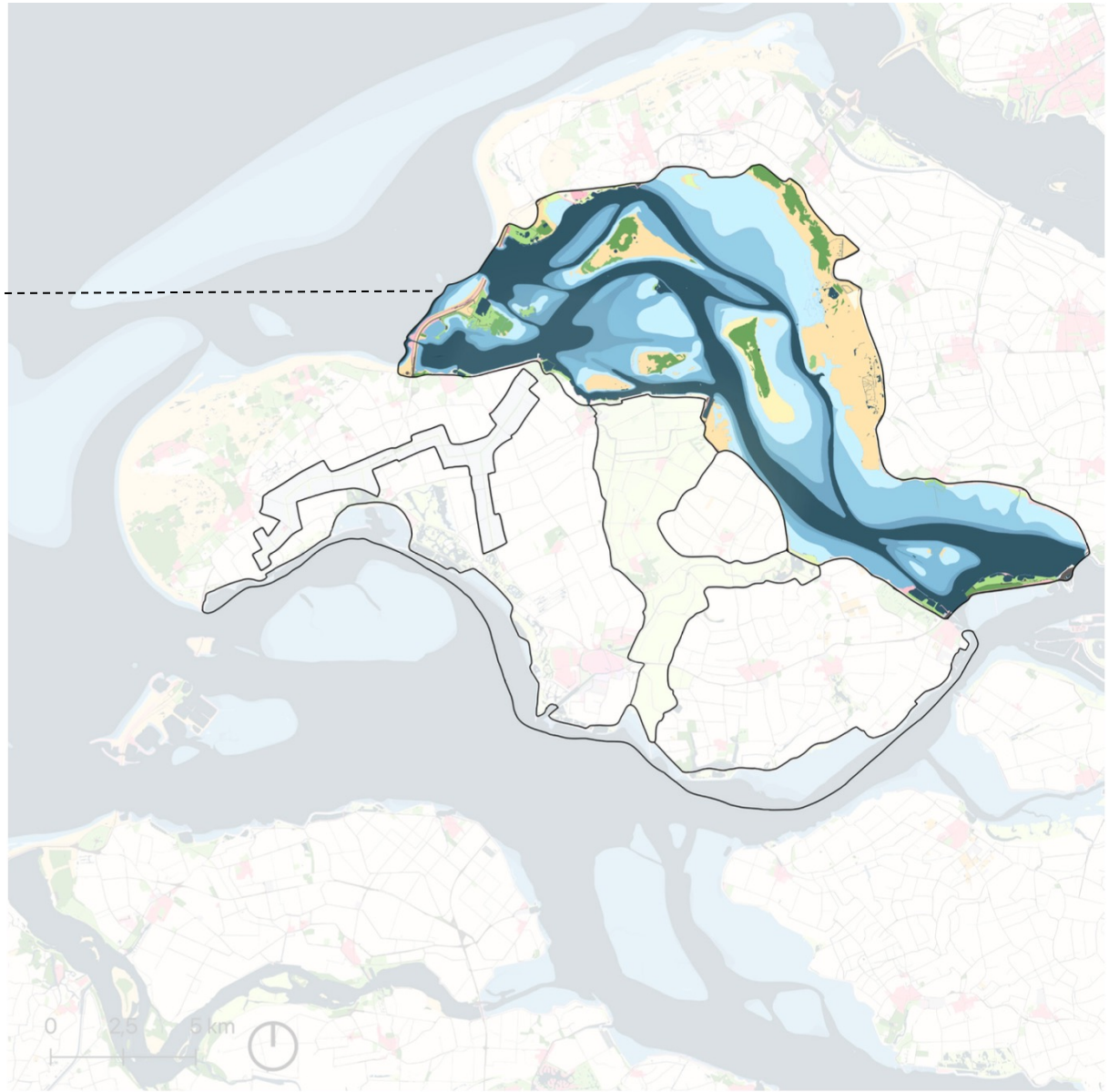
Salt agriculture

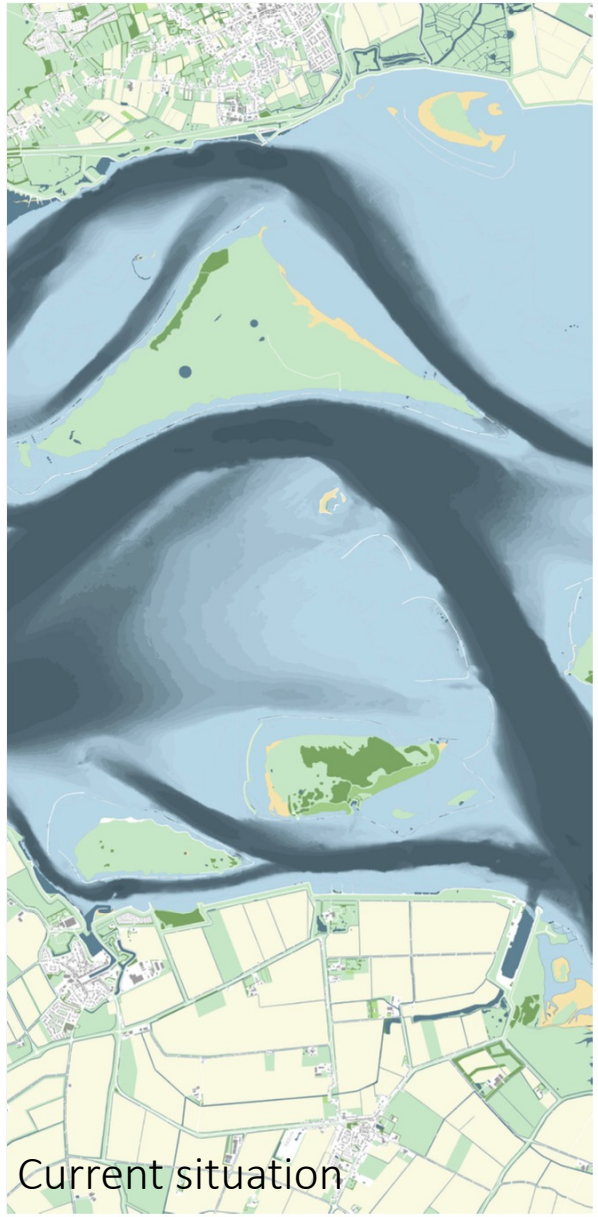


De Gouwe

Eastern Scheldt

(semi) Open Grevelingen



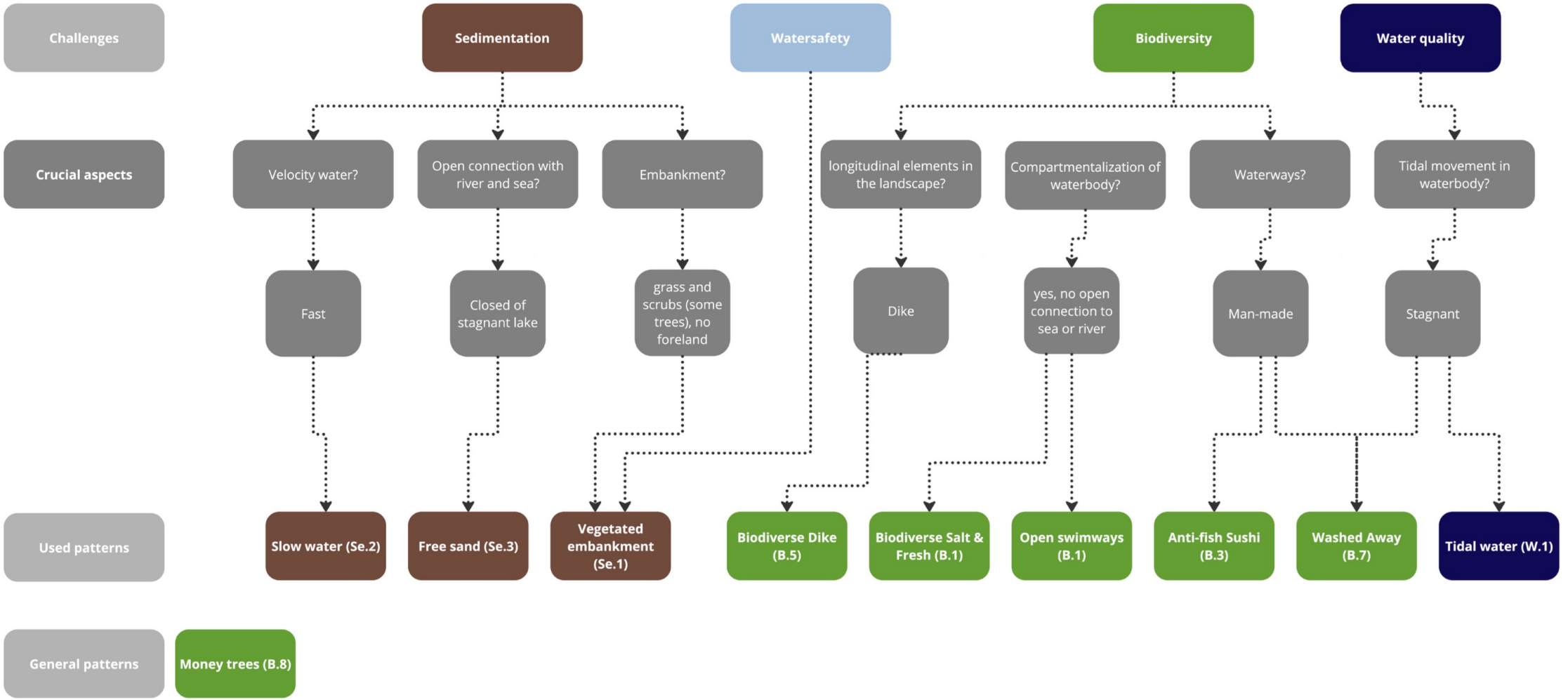


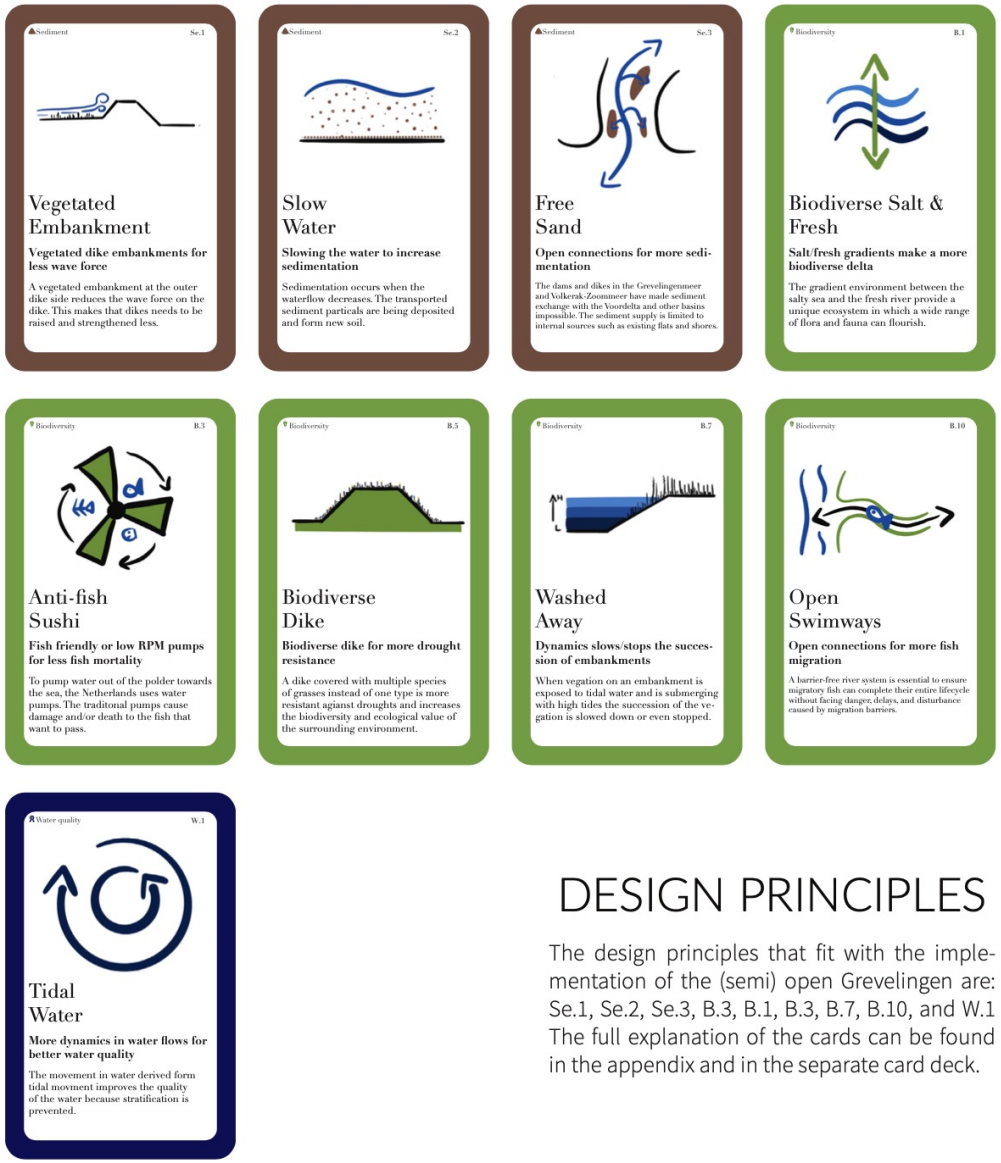
Current situation

Challenges

- Fish migration
- Biodiversity decline
- Water quality
- Erosion
- Water safety

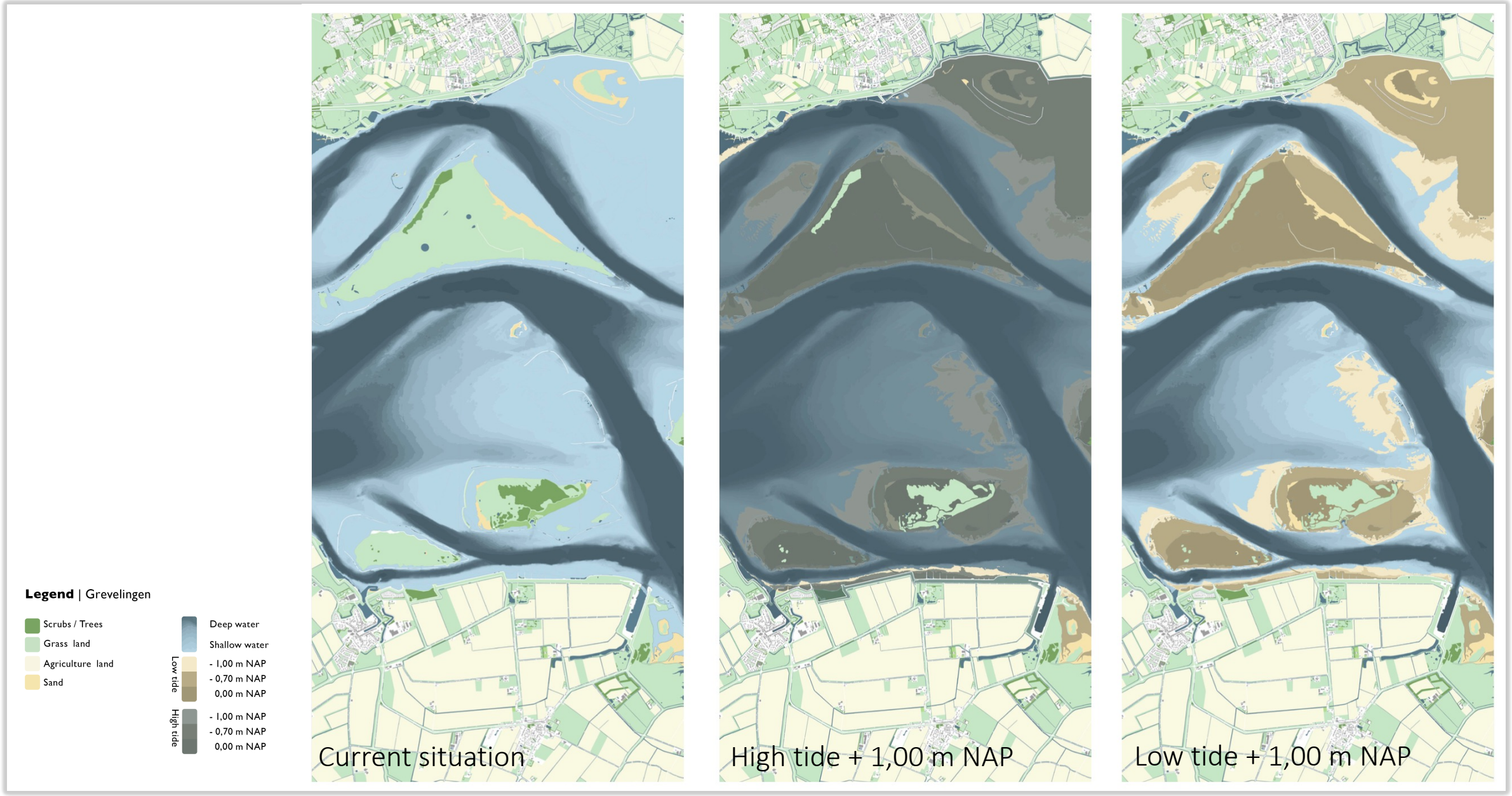
DECISION TREE| Open *Grevelingen*

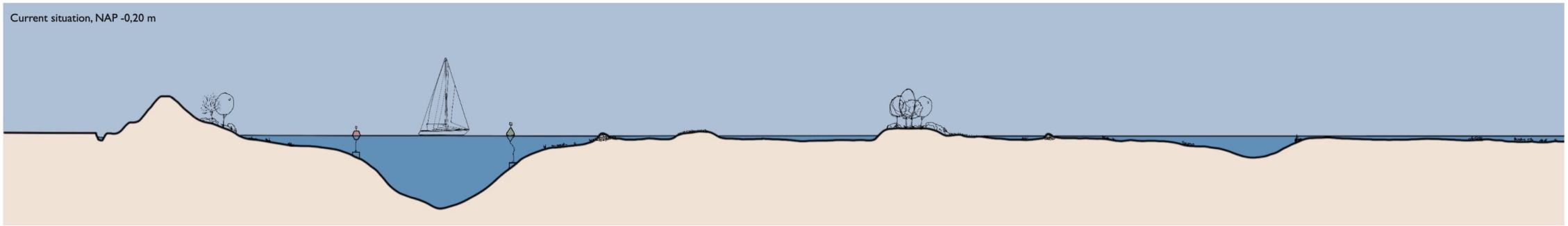


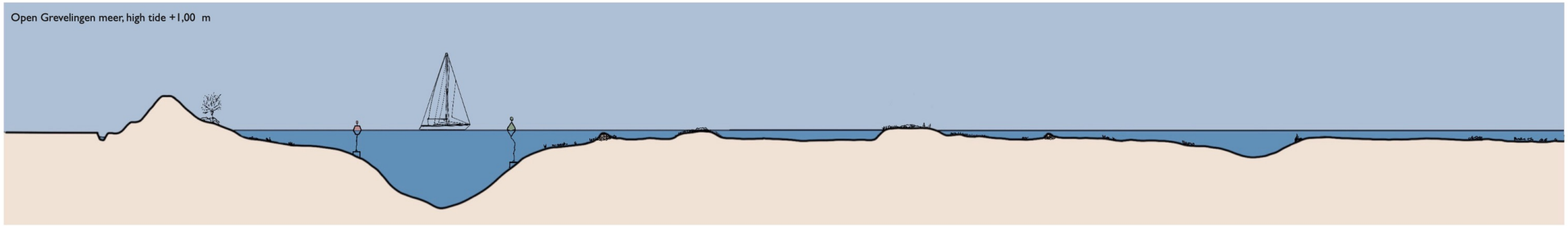


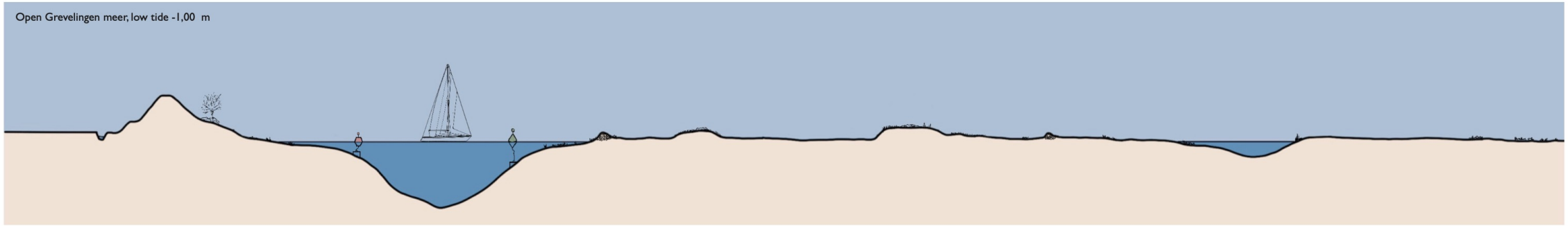
DESIGN PRINCIPLES

The design principles that fit with the implementation of the (semi) open Grevelingen are: Se.1, Se.2, Se.3, B.3, B.1, B.3, B.7, B.10, and W.1 The full explanation of the cards can be found in the appendix and in the separate card deck.


Legend | Grevelingen
Scrubs / Trees
Grass land
Agriculture land
Sand
Deep water
Shallow water
Low tide
- 1,00 m NAP
- 0,70 m NAP
0,00 m NAP
High tide
- 1,00 m NAP
- 0,70 m NAP
0,00 m NAP
Current situation
High tide + 1,00 m NAP
Low tide + 1,00 m NAP


Current situation, NAP -0,20 m


Open Grevelingen meer, high tide +1,00 m


Open Grevelingen meer, low tide -1,00 m

Phase 1

Challenges
- Fish migration
- Biodiversity decline

Stakeholders
Funders; Municipality Schouwen-Duivenland; Central government; Waterboard Scheldestromen; Rijkswaterstaat; European union

Pattern cards


Phase 2

Challenges
- Water quality
- Fish migration
- Biodiversity decline

Stakeholders
Waterboard Scheldestromen; Funders; Municipality Schouwen-Duivenland; Rijkswaterstaat; Province Zeeland; Planners; Nature parties; Fisheries

Pattern cards


Phase 3

Challenges
- Erosion
- Fish migration
- Biodiversity decline

Stakeholders
Province Zeeland; Funders; Municipality Schouwen-Duivenland; Rijkswaterstaat; Province Zuid-Holland; Planners; Flora & fauna; Nature parties

Pattern cards


Kentish Plover
(staatbosbeheer, 2023)

Avocet in the mud (np oosterschelde, n.d.

Eelgrass (Govers, 2021)

Red fescue (Dijksen, n.d.)

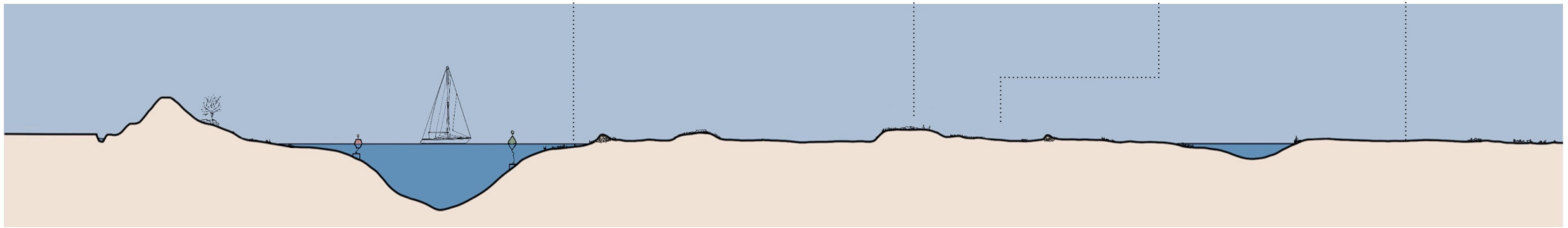
Zeerus (de Jong, 2010)

Common marsh grass (Schelde-schorren, n.d.

Sea purslane, (Roek, 2020)

Samphire (Ophen, 2019)

Cord grass (Itkor, n.d.)



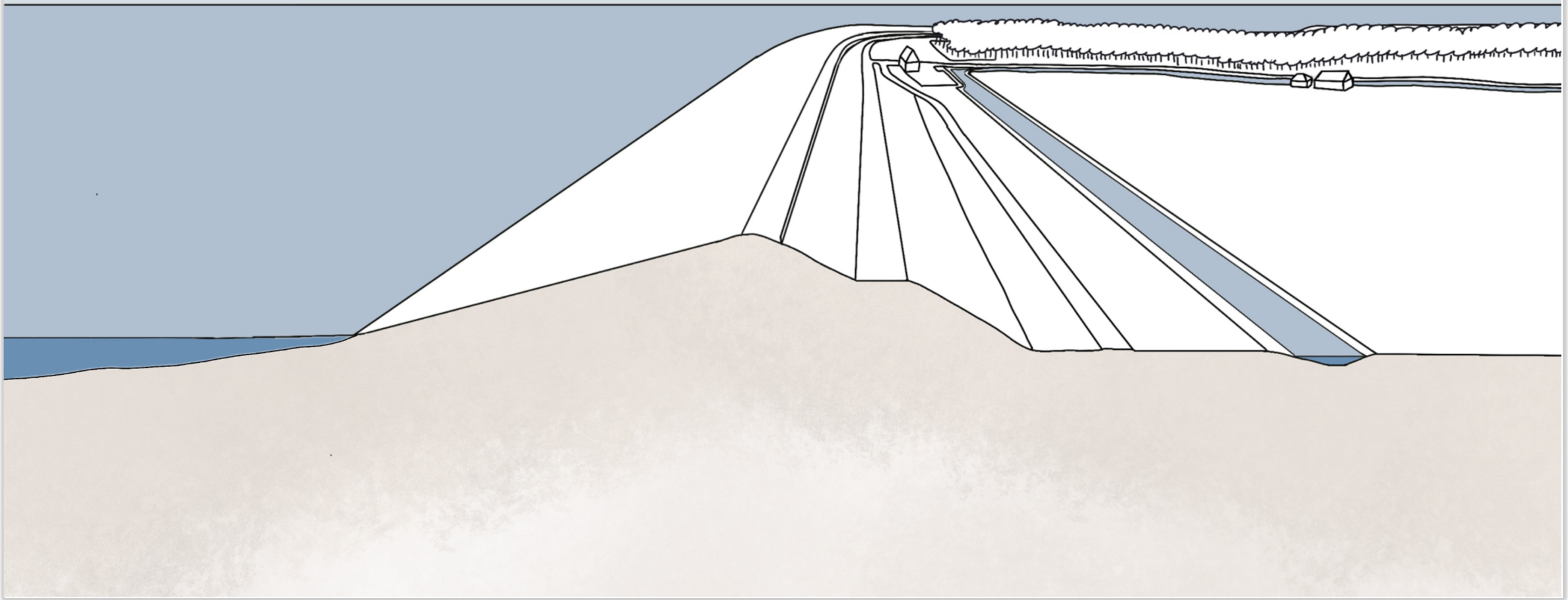
+

Priority / Order

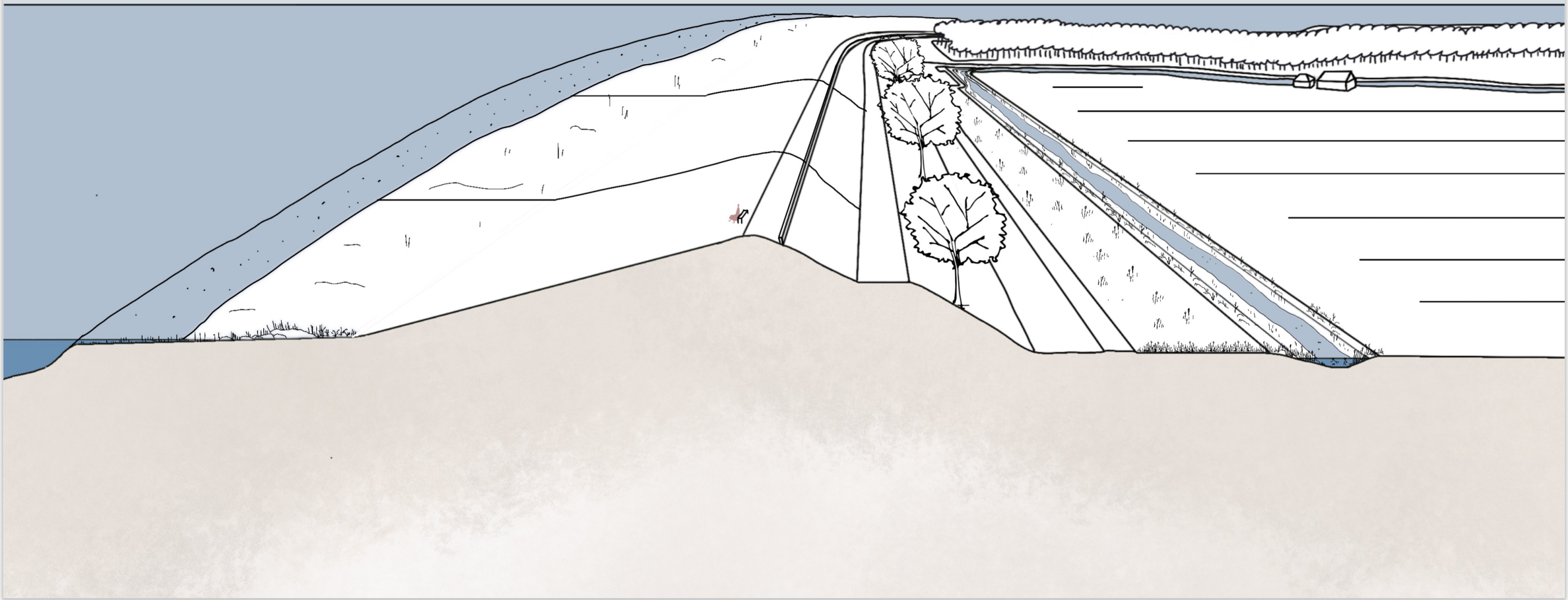
-

Patern	Code	How
Tidal water	W.1	Reintroducing the tidal movement by opening the Brouwesdam
Washed away	B.7	letting tidal dynamics back into the stagnant lakes
Anti-fish Sushi	B.3	Installing new pomps or slowing down the rotation per minute
Slow Water	Se.2	Construction of oyster dams, breakwater or other elements that slows the current
Vegetated Enbankment	Se.1	Creating a marshland on the seaside of the dike
Biodiverse Dike	B.5	sowing the dike with a biodiverse seed mix
Open swimways	B.10	Connecting waterbodies by open connections and/or installing fish laders
Free sand	Se.3	removing dams or making bigger passages
Biodiverse salt & fresh	B.1	breaking the compratimalizajion by opening dams

Before



After



De Gouwe

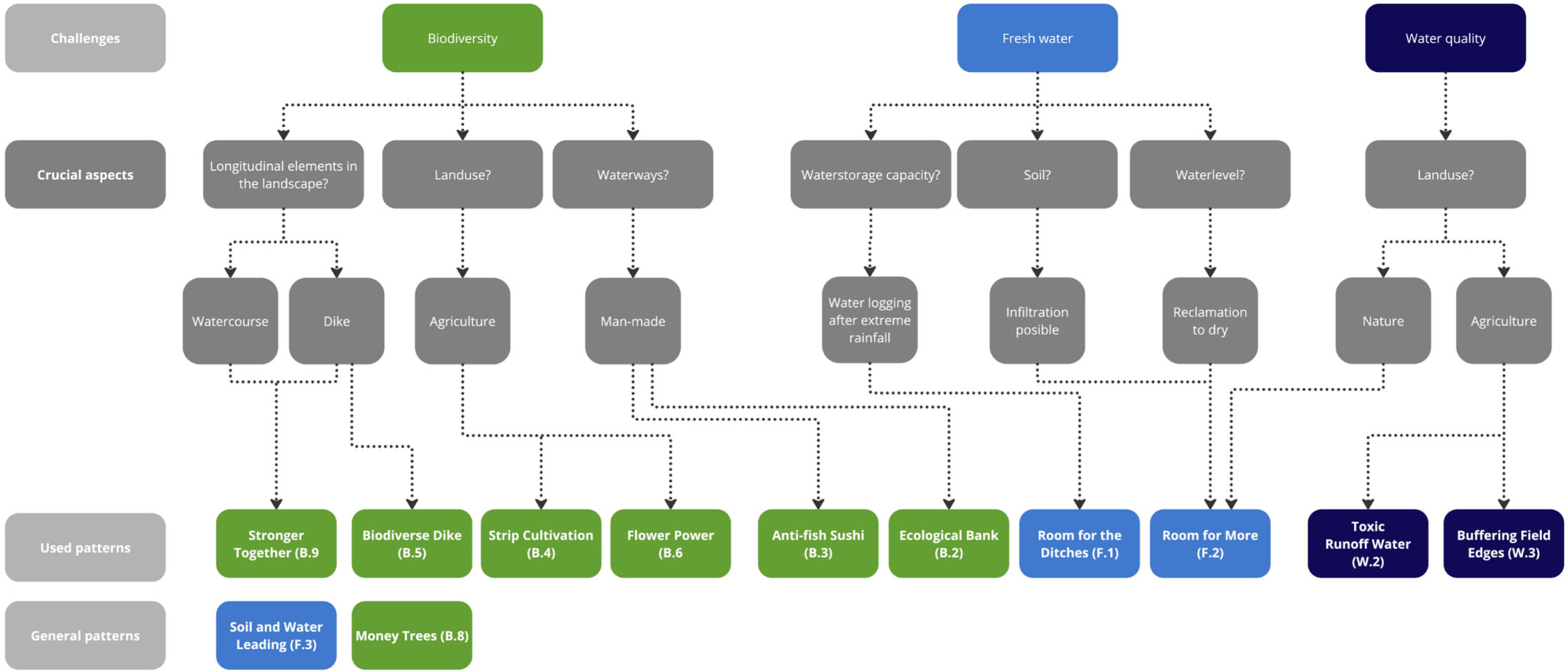
Legend | de Gouwe

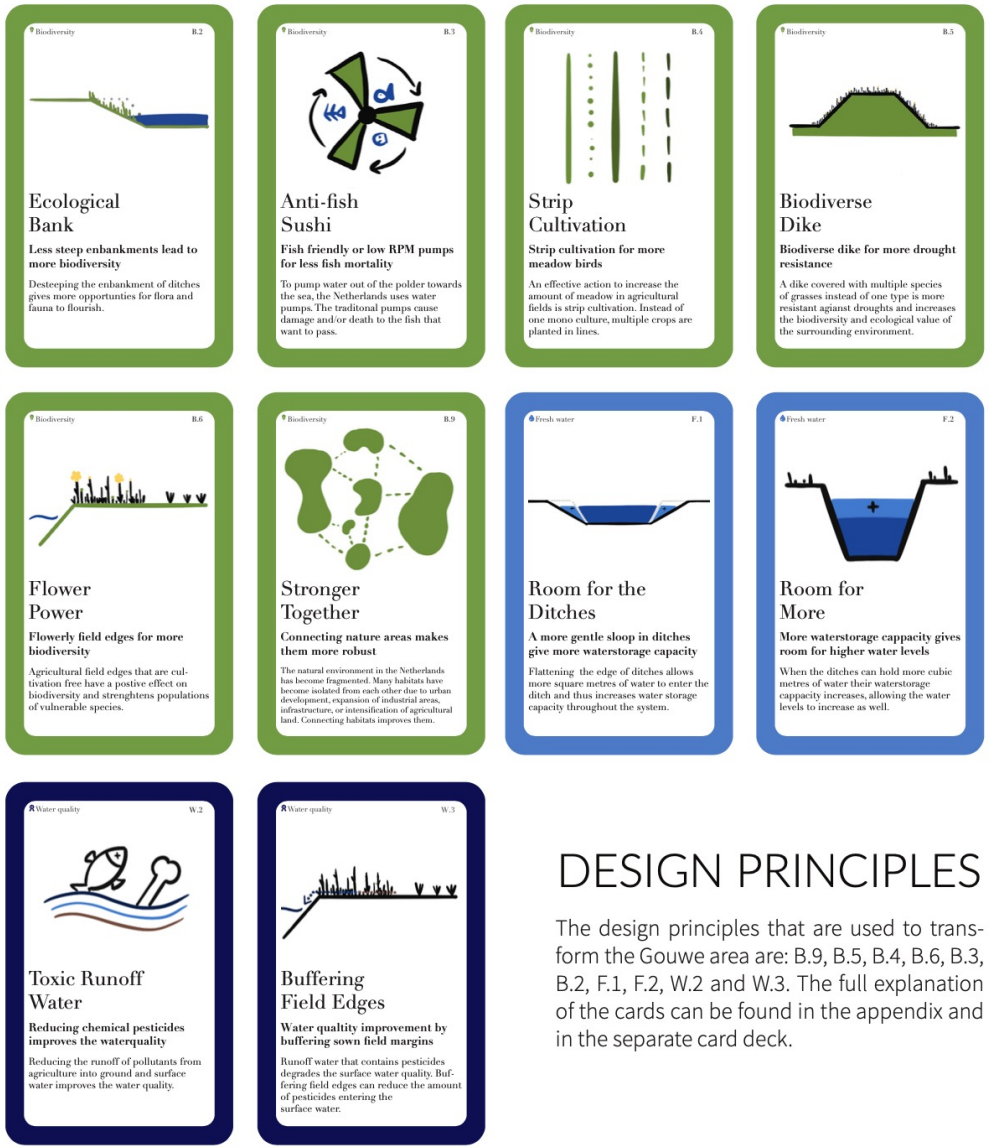
- Scrubs / Trees
- Grass land
- Agriculture land
- Sand

Challenges

- Fresh water availability
- Drought
- Salinization
- Biodiversity decline
- Water quality

DECISION TREE| de Gouwe



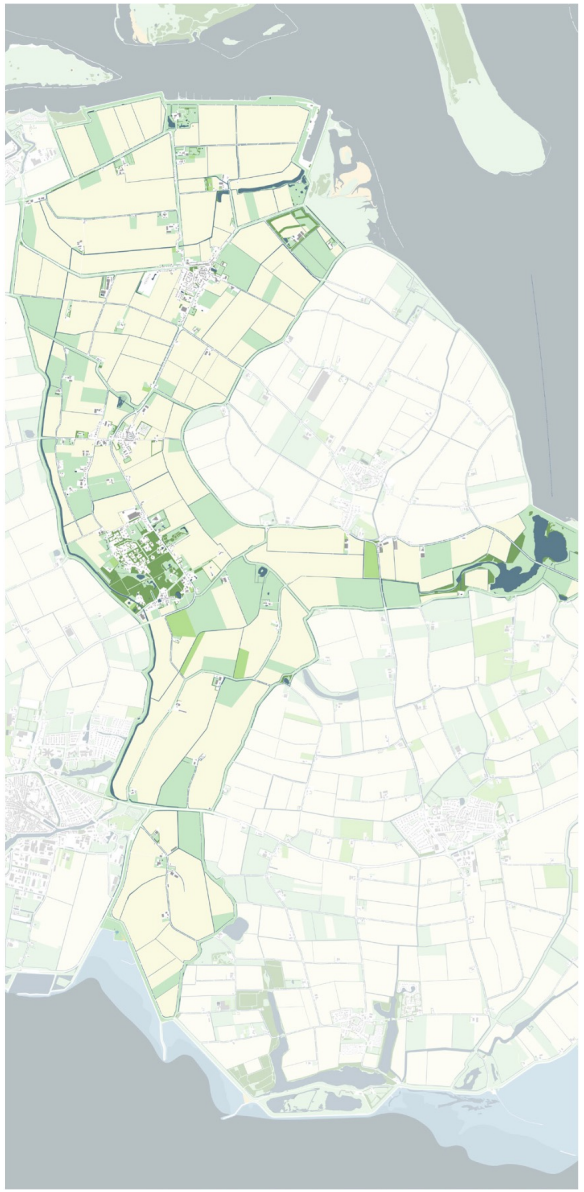


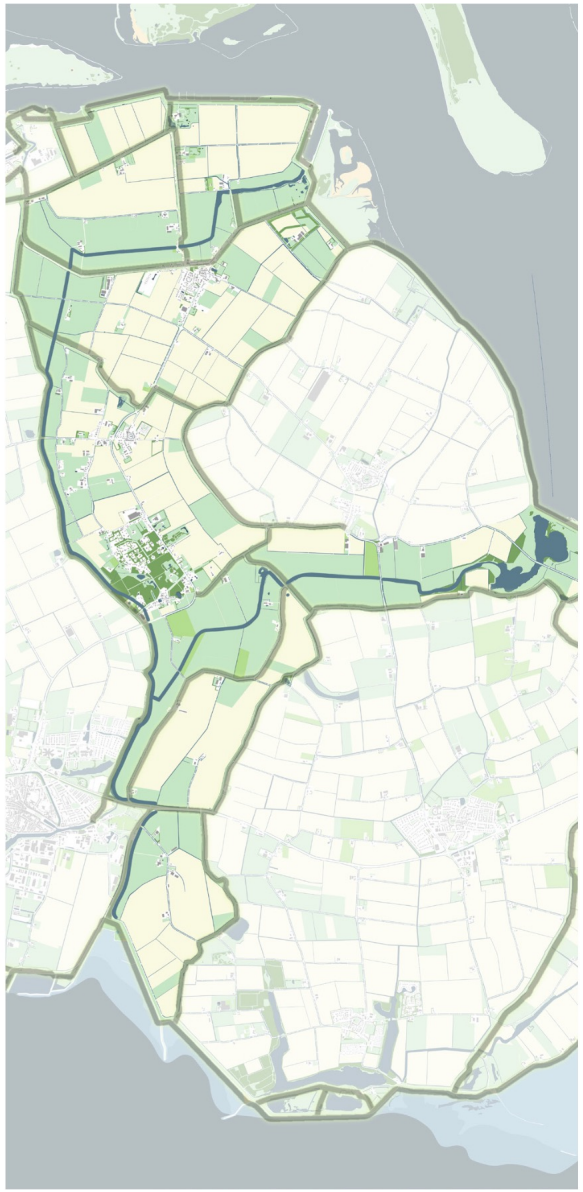
DESIGN PRINCIPLES

The design principles that are used to transform the Gouwe area are: B.9, B.5, B.4, B.6, B.3, B.2, F.1, F.2, W.2 and W.3. The full explanation of the cards can be found in the appendix and in the separate card deck.

Legend | de Gouwe

- Scrubs / Trees
- Grass land
- Agriculture land
- Sand





Phase 1

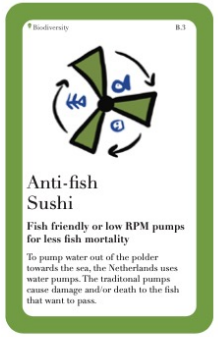
Challenges

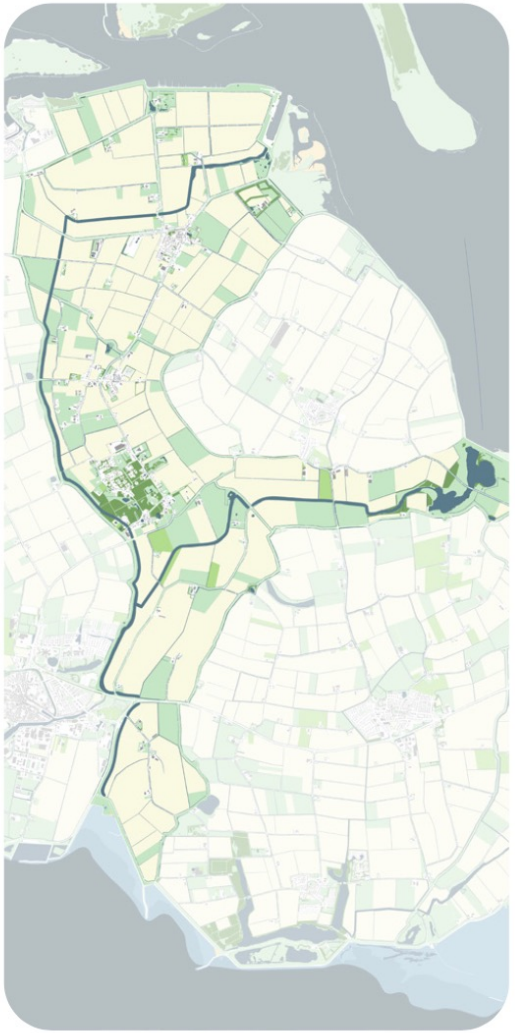
- Fresh water availability
- Drought
- Salinization

Stakeholders

- Municipality Schouwen-Duivenland
- Rijkswaterstaat
- Waterboard Scheldestromen
- Funders
- Planners
- Farmers

Pattern cards





Phase 2

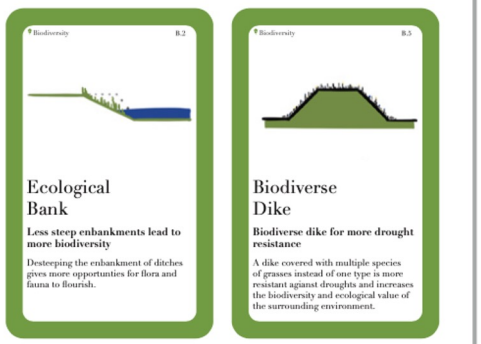
Challenges

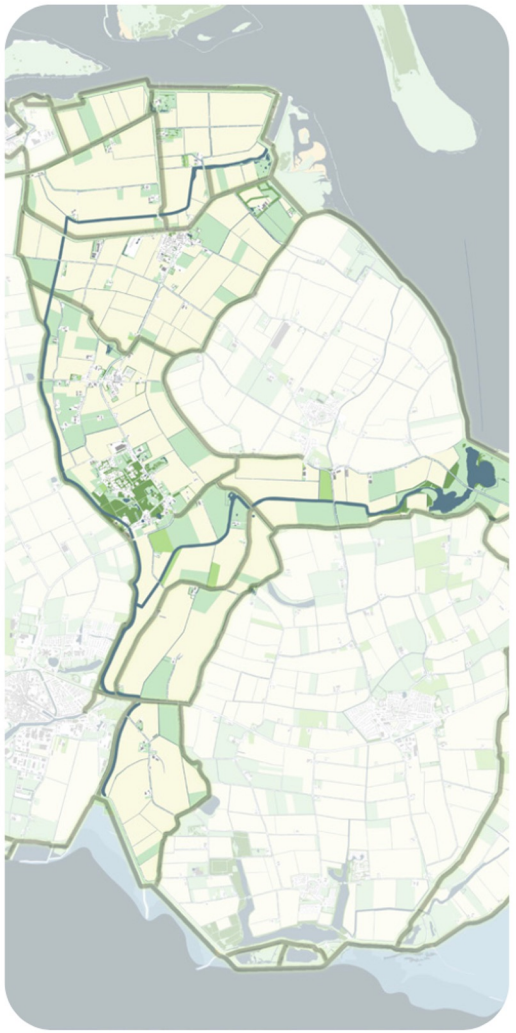
- Water quality
- Drought
- Biodiversity decline
- Water safety

Stakeholders

- Municipality Schouwen-Duivenland
- Rijkswaterstaat
- Waterboard Scheldestromen
- Funders
- Planners
- Farmers
- Nature parties
- Implementers

Pattern cards





Phase 3

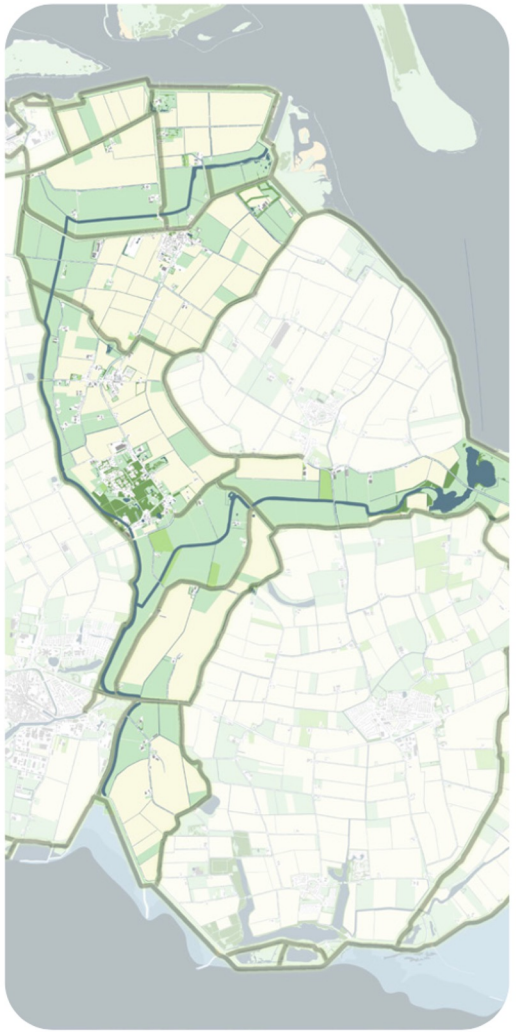
Challenges

- Water quality
- Biodiversity decline

Stakeholders

- Municipality Schouwen-Duivenland
- Ministry of Agriculture, Nature
- Nature parties
- Funders
- Flora & fauna
- Farmers

Pattern cards



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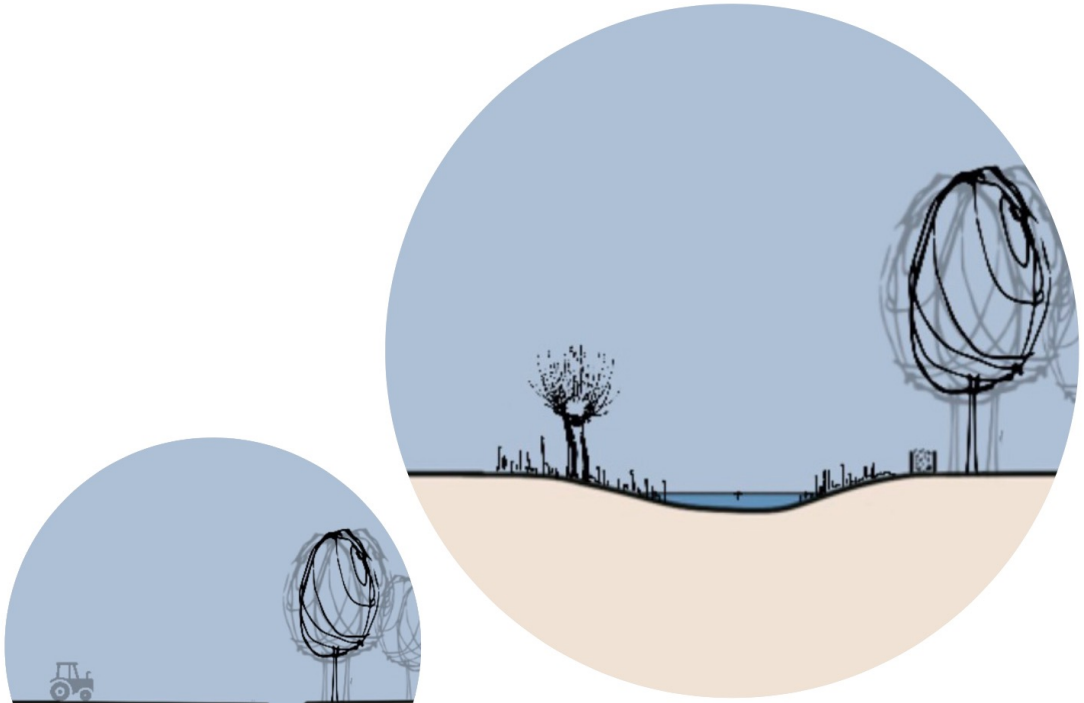
Priority / Order

-

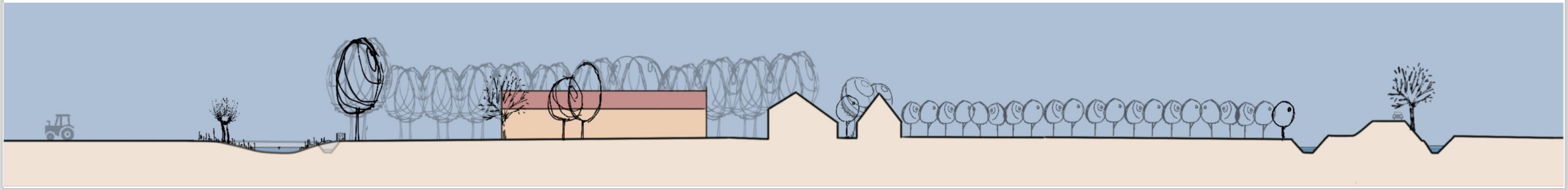
Pattern	Code	How
Room for the Ditches	F.1	Ground can be excavated and used to heighten other places on the island
Room for More	F.2	Changing 'het Peilbesluit'
Ecological Bank	B.2	Changing the slope and adding planting
Biodiverse Dike	B.5	Sowing the dike with a biodiverse seed mix
Stronger Together	B.9	Connecting the different habitats with ecological routes
Flower Power	B.6	Sowing the field edge with a biodiverse seed mix
Buffering Field Edge	W.3	Sowing the field edge with a buffering seed mix
Strip Cultivation	B.4	Instead of one mono cultivation, cultivating in strips
Anti-fish Sushi	B.3	Installing new pomps or slowing down the rotation per minute
Toxic Runoff Water	W.2	Banning chemical pesticides

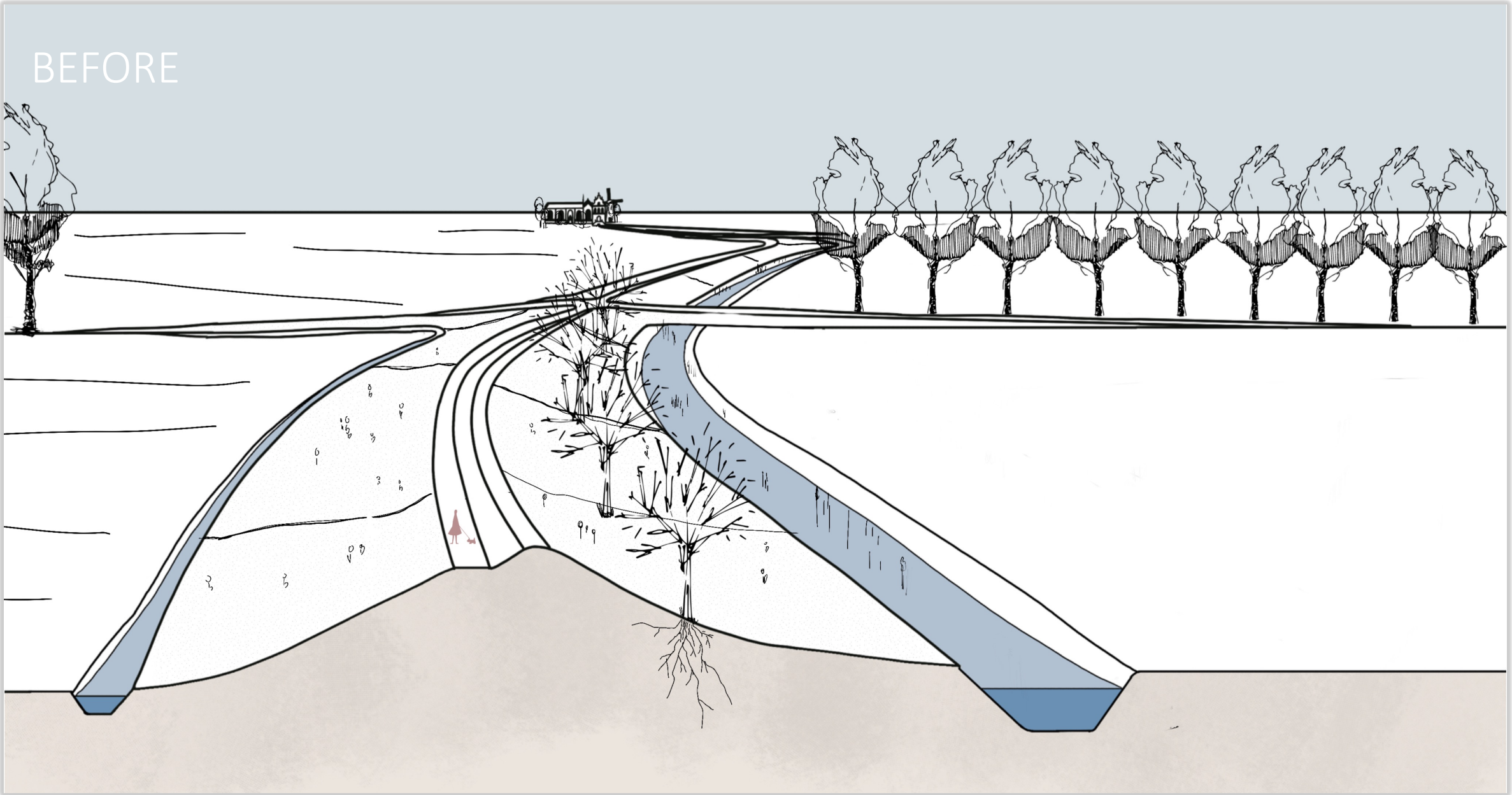


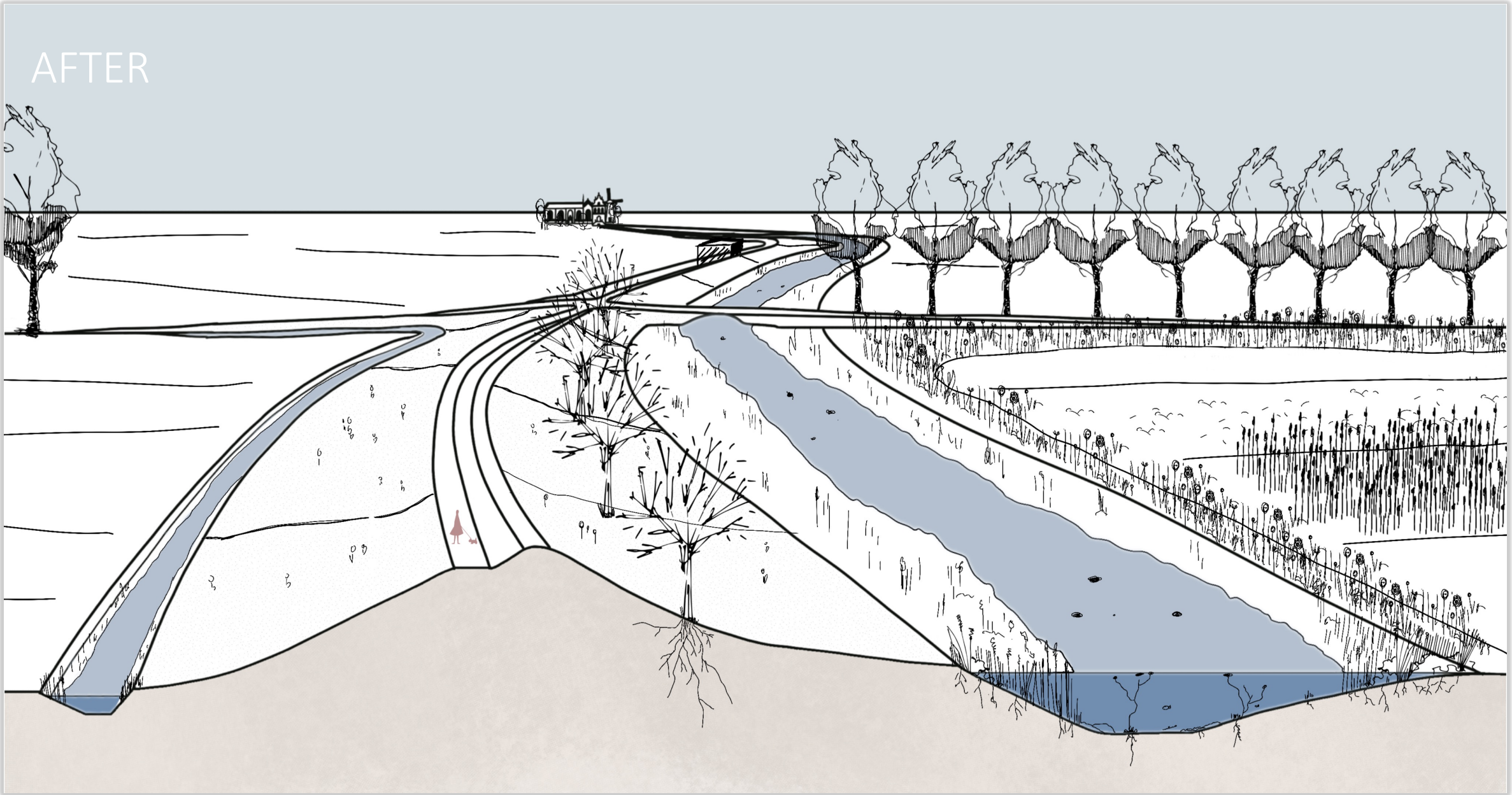
After

Before

The little owl
(Marle, n.d.)




BEFORE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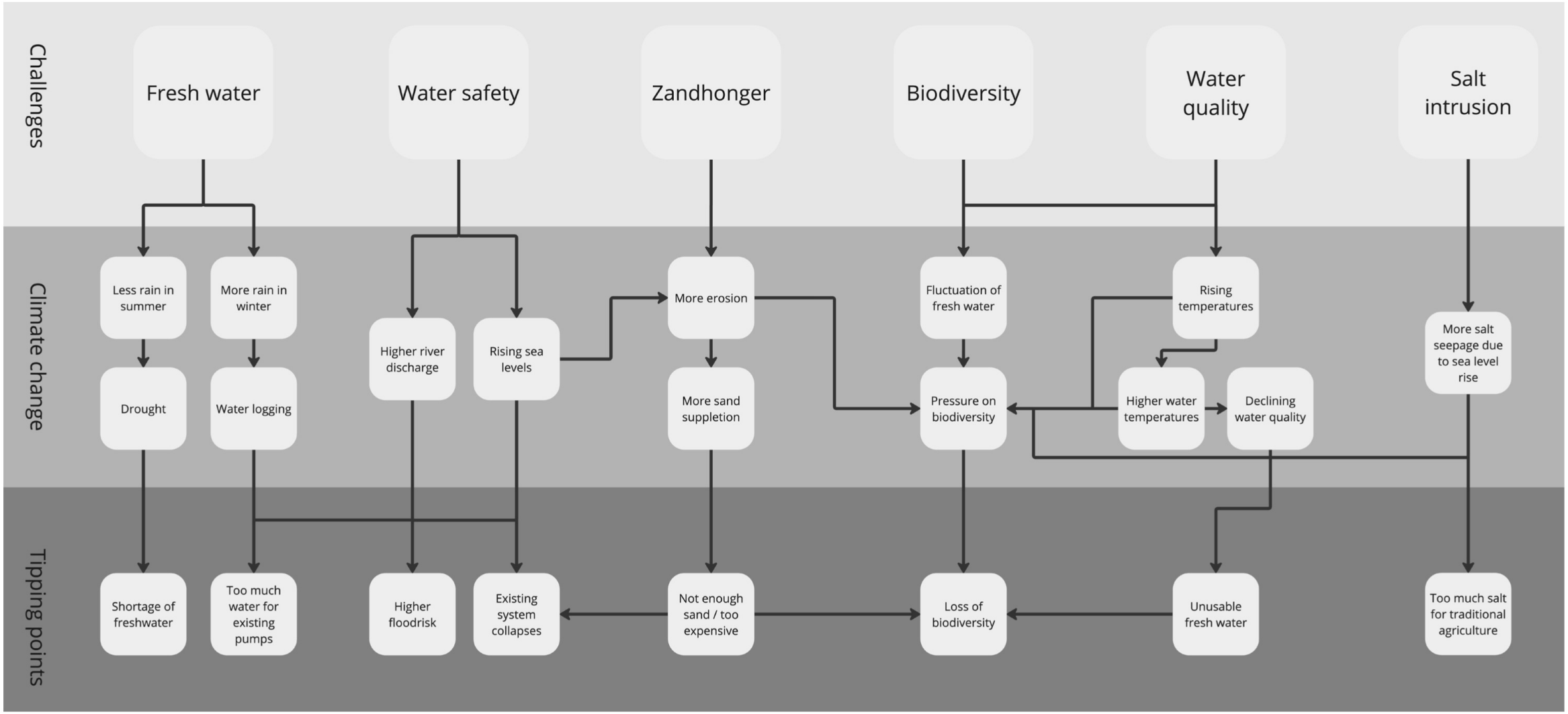
Challenges
Climate change
Tipping points
Fresh water
Water safety
Zandhonger
Biodiversity
Water quality
Salt intrusion
Less rain in summer
More rain in winter
Drought
Water logging
Higher river discharge
Rising sea levels
More erosion
More sand suppletion
Fluctuation of fresh water
Pressure on biodiversity
Rising temperatures
Higher water temperatures
Declining water quality
More salt seepage due to sea level rise
Shortage of freshwater
Too much water for existing pumps
Higher floodrisk
Existing system collapses
Not enough sand / too expensive
Loss of biodiversity
Unusable fresh water
Too much salt for traditional agriculture

Pattern cards

BETWEEN LAND & SEA

Building with nature to sustain, secure and live
on a sustainable Schouwen-Duiveland

FROUKJE OTTEMA

Studio: Metropolitan ecologies of places

First mentor: Arjan van Timmeren

Second mentor: Nico Tillie