



Fish Migration River (under construction)

Wiepkje Elsinga & Erik Bruins Slot (Province of Fryslân)

The Fish Migration River is a project of:



Initiators Fish Migration River:



The Fish Migration River is financially made possible by:



VISMIGRATIERIVIER 2023



The Afsluitdijk – Our Dutch example

‘building against nature’

Fish Migration River - Afsluitdijk





Fish Migration River - Afsluitdijk





Modern Dutch design – building with nature



marine/
brackish

freshwater

Target fish species of the Fish Migration River

Sport fishing



Sea Trout

Iconic



Sturgeon

Fisheries Lake IJssel



Eel

Smelt



EU Natura2000

Houting



Atlantic salmon



Allis shad



Sea lamprey



Twaite shad



River lamprey

Fish-eating
Birds



Three-spined stickleback



Flounder

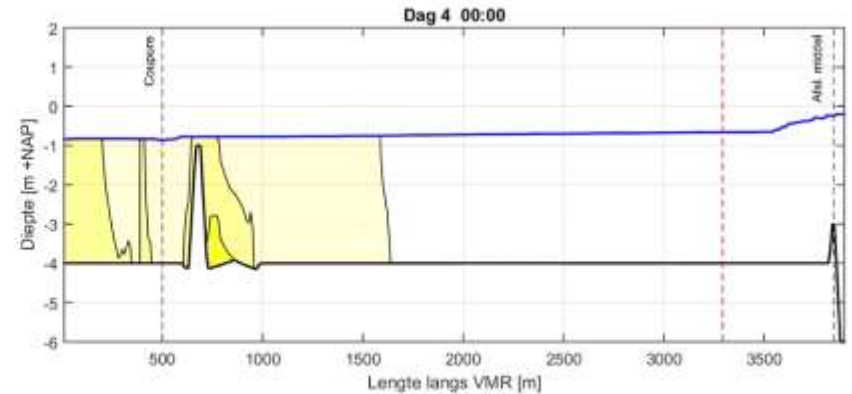
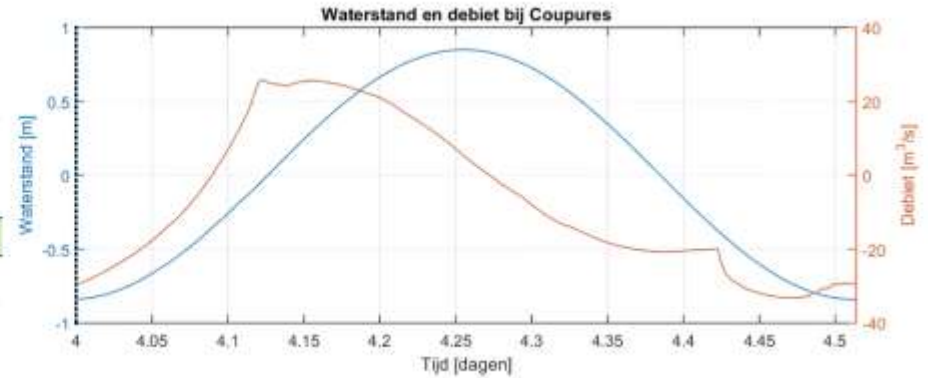
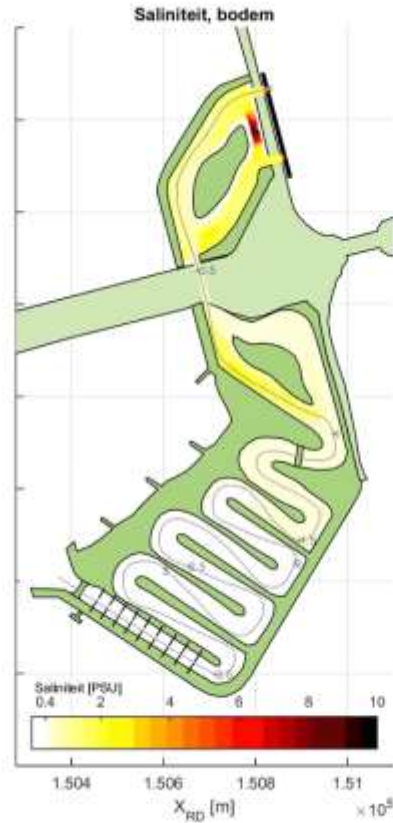
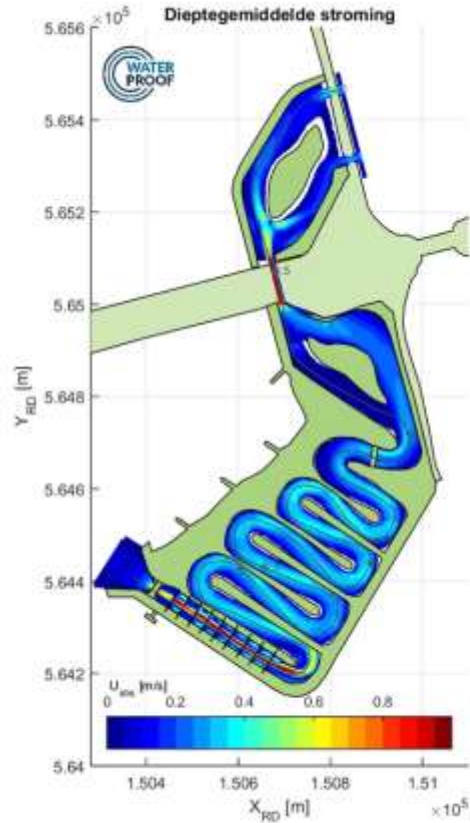


Herring



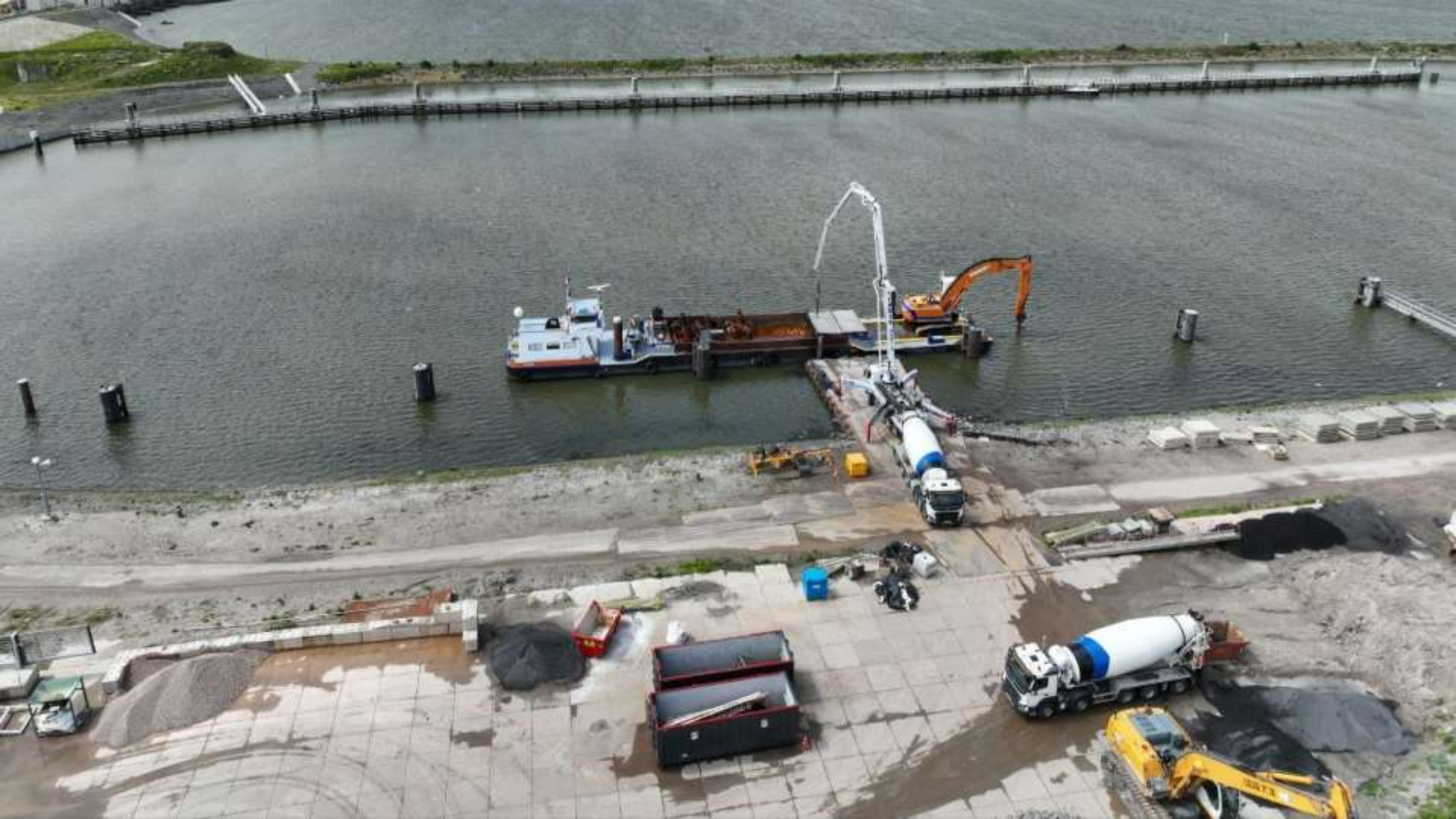
Anchovy

Tidal transport (modelled)

























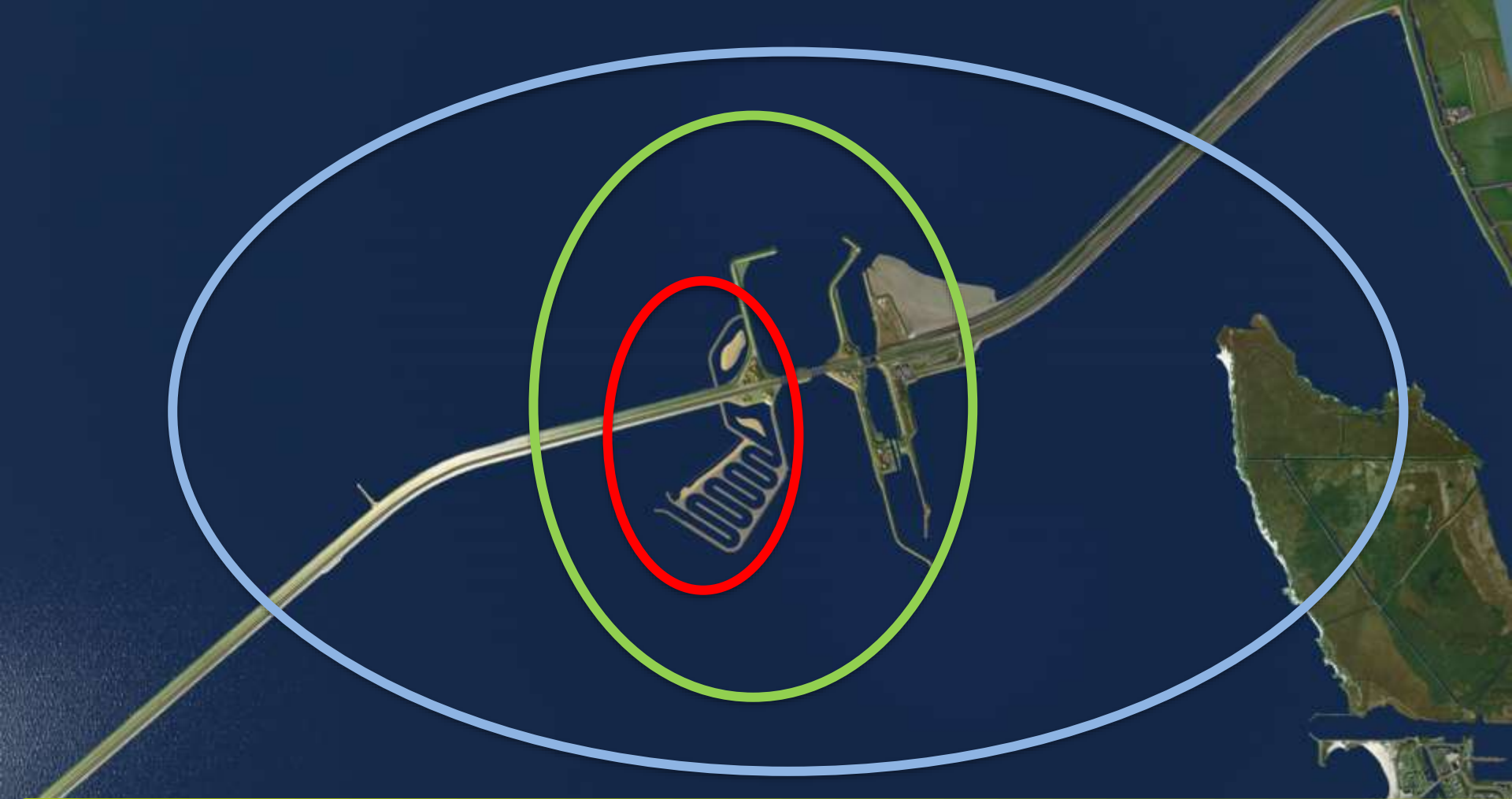


Research & Monitoring plan

Together with our NGO's, scientists and contractor:

- **Monitoring**; does the FMR what we promised?
 - Increase (migrating) fish stocks
 - Influence on Biodiversity
 - **Good condition migrated fish**
 - Predation
 - Touristic recreative - education
- **Research**
 - Improve FMR system by 'try and error' – climate adaption





Fish Migration River - Afsluitdijk

Research Questions

1. A-biotic functioning

- eco-hydraulic, sand transport, salt intrusion, stability, extremes?
Validating and develop our 3D eco-hydraulic model to 4D

2. Passage success:

- attraction % VMR, passage %, residence, condition before and after?

3. Need to improve the functioning

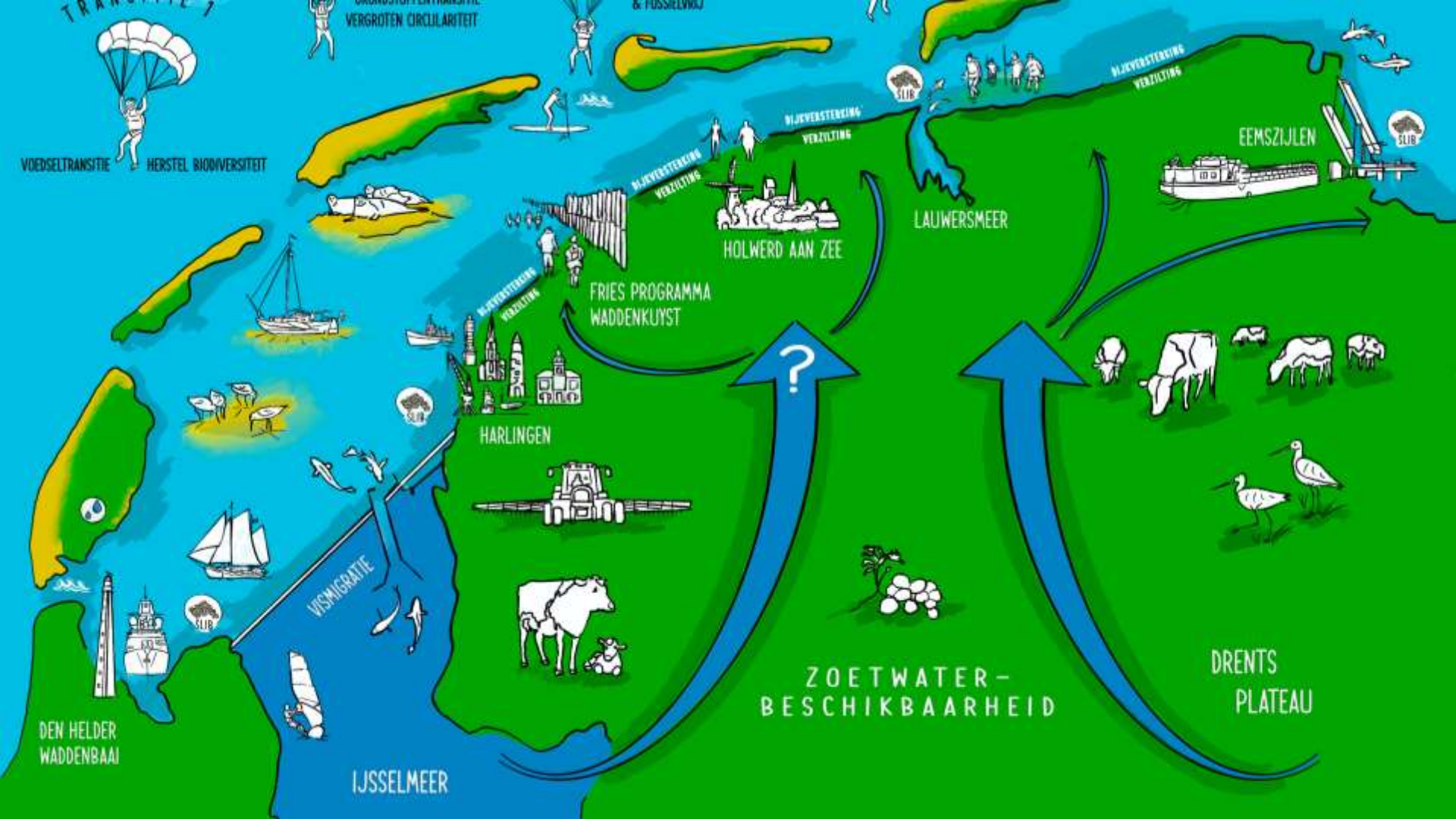
- **If yes:** how to optimize?

4. Estuarian:

- **Habitat** for fish, birds, seals - predators – other species, foodweb?
- **Fresh water Question** for Waddensea – power on salt-fresh water connections: FMR!

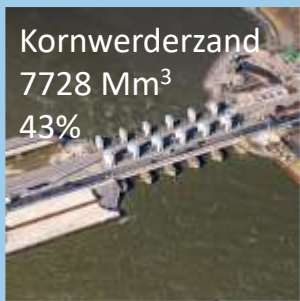
5. Contribution in restoring fish populations, communities and foodweb?

6. Climate change, effects and adaptation



Afvoer zoet water naar Waddenzee (in kalenderjaar 2016)

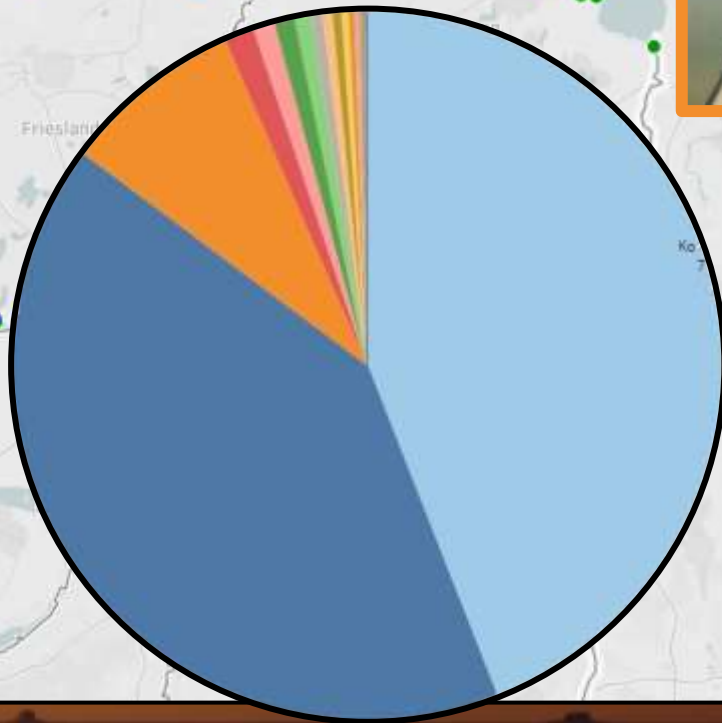
Kornwerderzand
7728 Mm³
43%



Den Oever
7219 Mm³
40%



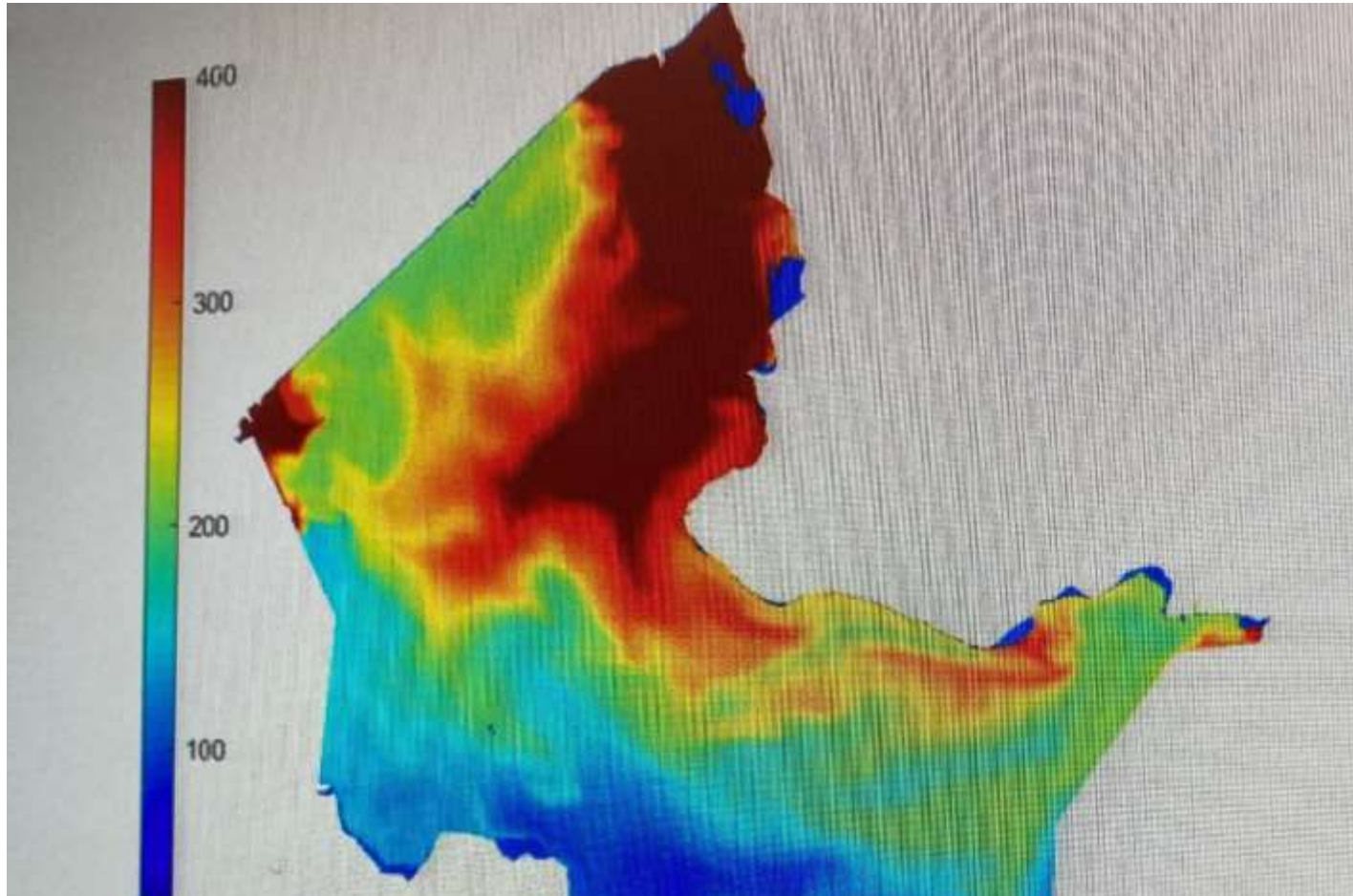
Lauwersoog
1449 Mm³
8%



Climate Change - adaptive

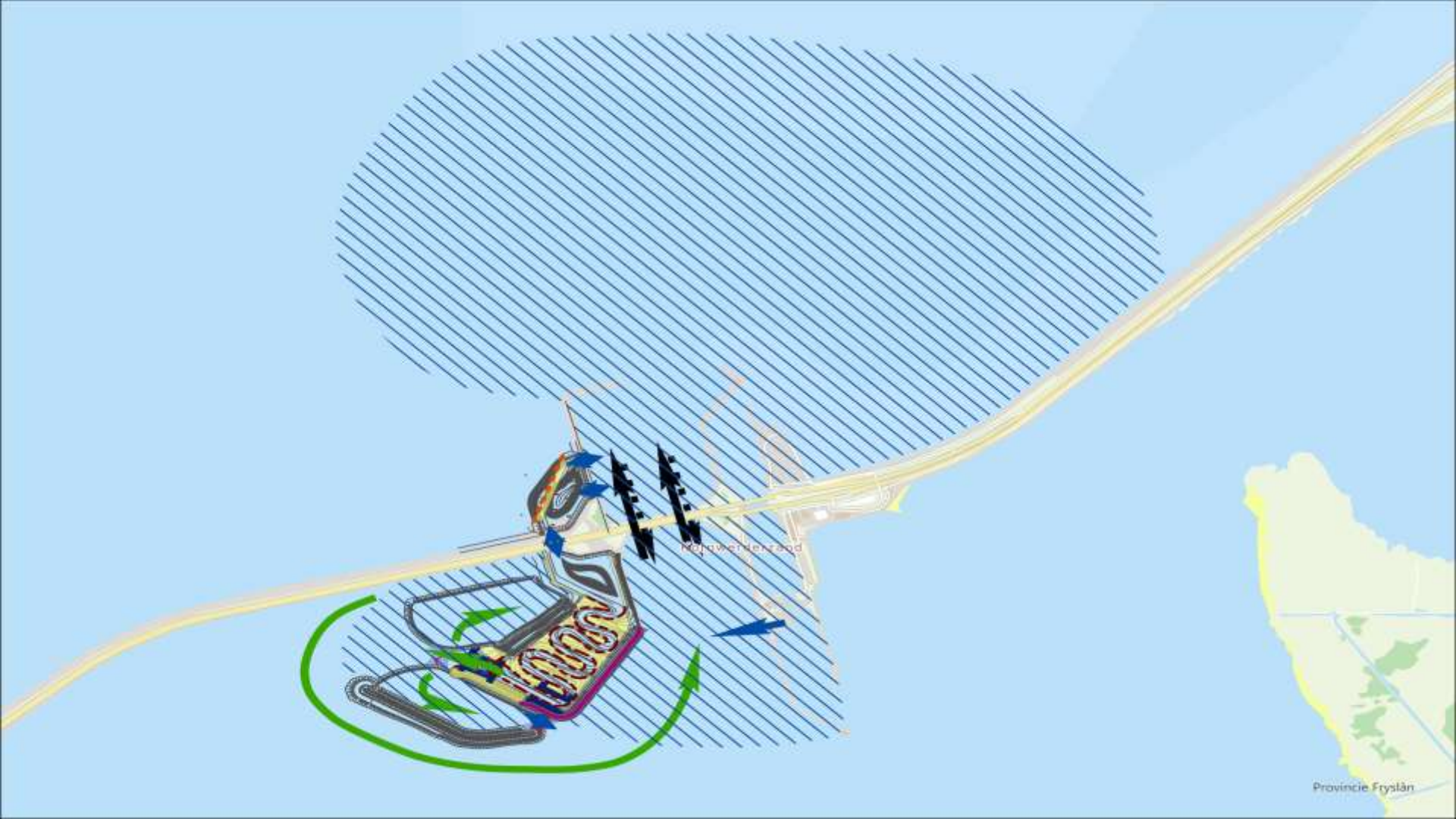
- Extreme weather
 - More and extreme fresh water spill; mostly in winter – no need for in the Waddensea
 - Less and extreme fresh water shortage in spring no spill at all for long periods in high season for our tidel migrations
 - Fresh water availability questions for functioning ecosystem Waddensea. Wrong season
- Temperature is rising
 - Waddensea: evaporation: salt levels higher than North sea – fish do'nt what to do – what direction to swim?
 - Oxygen level under water gets lower. Too low? For smelt?
 - Food for birds and fish on the Waddensea dies because of overheating
- Sea level rising; salt intrusion in Lake IJssel – problem or opportunity: 24/7 open?
 - More extreme waterlevels in Lake IJssel and on the Waddensea; the difference in waterlevels on both sides gives larger velocities in the FMR, risk for our sandy design.

Salinization summer 2018 freshwater Lake IJssel



Climate adaptive measures FMR

- Living dikes that rise in balance with sealevel -> building with nature
 - Living oysters / mussels reefs - dutch mangroves (reed – willow)
 - As low as possibly design which can easy grow – adapt on higher waterlevvels
- Flexibel integral watermanagement in the spill sluices
 - Care for freshwater needs of the Waddensea – timing and quantity
 - Waiting fish for migration on our front door
- Ambition: to increase the gradual area, grow to an estuary
 - Foodproduction - improving waterquality – habitat for a lot of species – FMR not only for fish -> ecosystem biodiversity



Kornewiersead

Marker Wadden - Design with nature

Rik de Visser - Vista landscape architects



EYE Amsterdam October 12, 2022

Photo Natuurmonumenten

Lessons learnt: No Risk no Fun: Go for it!

- Natural fish migration in the Netherlands is not natural anymore, but..
 - depending on human technical watermanagement: selection on human adaption??
- Stay flexible and adaptive in solutions and in cooperation
 - Try and error - experiment
 - Integral Climate future proof design
- Work together with our natural system, human technics have limits and ...
 - With People who have better skills than yourself
 - Have more experts in your team than managers 😊
- Diversity in your team
 - Including the next generation – students in your team
 - Including education – share your knowledge
- Go for opportunities and not for avoiding risks
- Be friendly and kind to each other



The Fish Migration River is a project of:

provinsje fryslân
provincie fryslân



Initiators Fish Migration River:



The Fish Migration River is financially made possible by:

provinsje fryslân
provincie fryslân

NEM Provincie
Noord-Brabant



Dutch solution to world issue

- FMR design is nature based, functions optimally for fish – hopefully...
- Many similar situations worldwide that require a solution.
- International showcase and export opportunity for the Dutch hydraulic engineering sector.

