NICHES

Nature's integration in cities' hydrologies, ecologies and societies

Co-designing ecosystem service provisioning of NbS into hydrological-aquatic models

Lisette de Senerpont Domis (NIOO-KNAW)

Bringing forward NBS in major cities / 24-03-2025 / Online

Funded by the European Union

MEET THE TEAM

Sven Teurlincx

Researcher

s.Teurlincx@nioo.knaw.nl

Lisette de Senerpont Domis

Senior scientist, P.I.

s.Teurlincx@nioo.knaw.nl

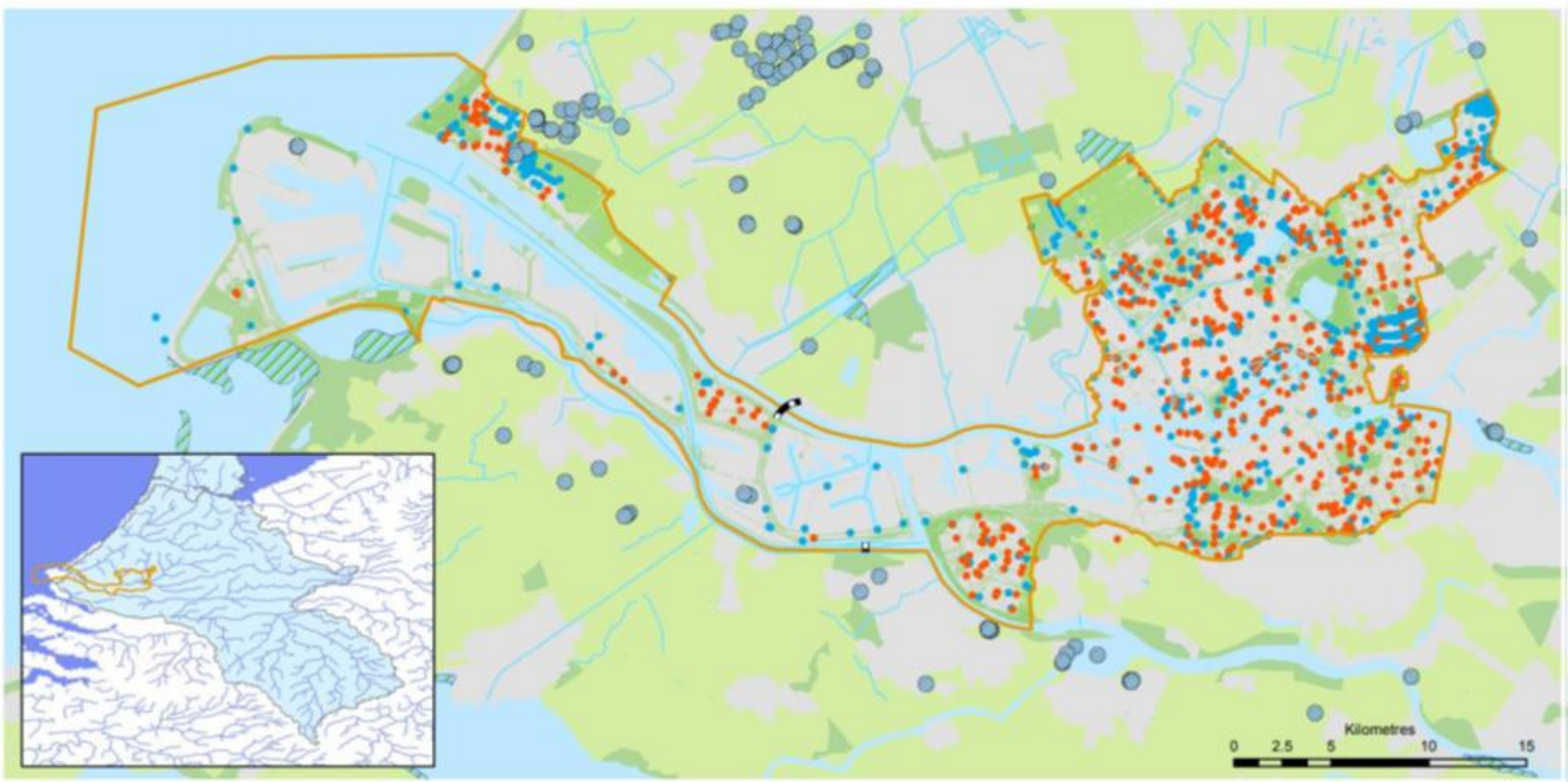
Francis Dullemond

Data specialist

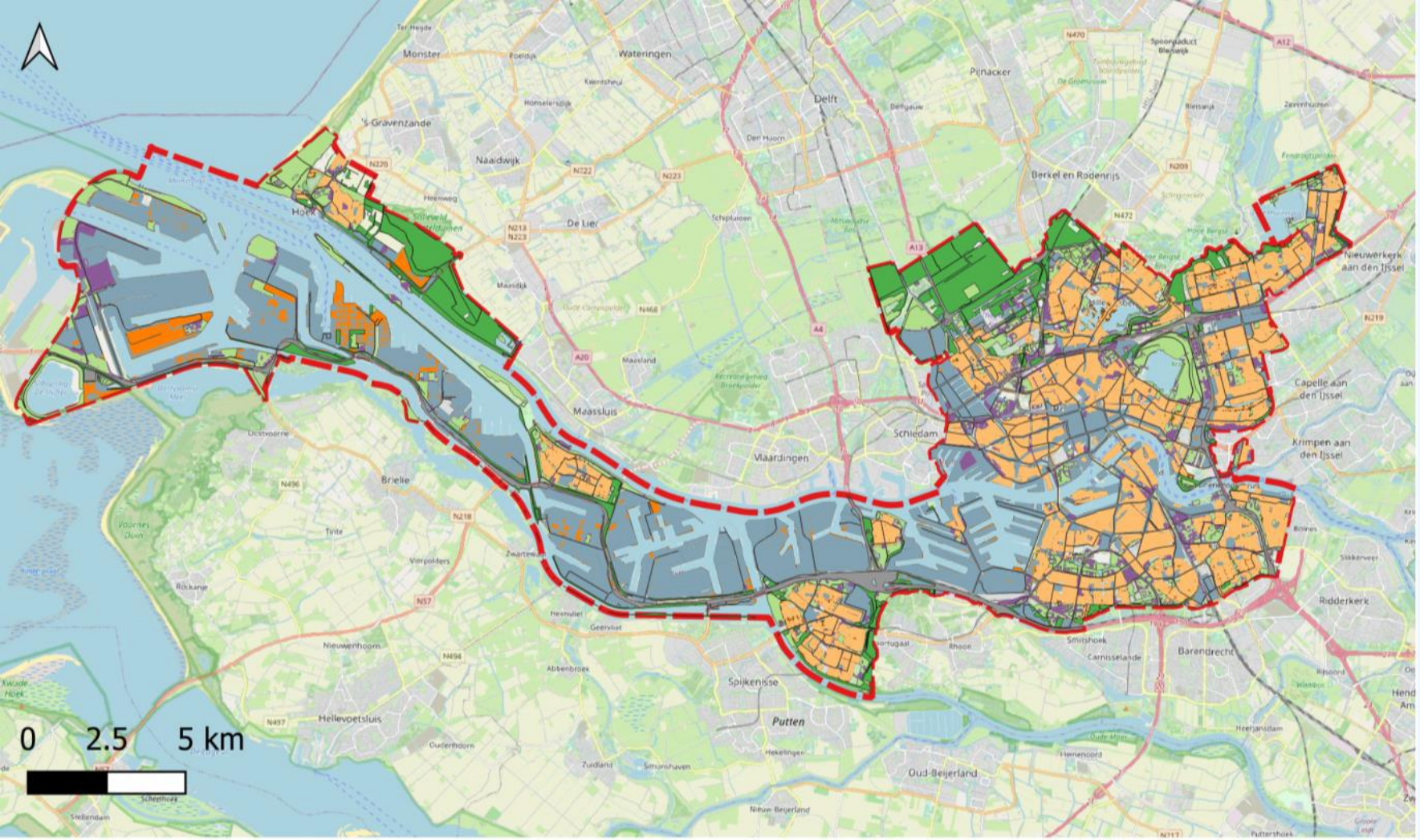
f.Dullemond@nioo.knaw.nl

From co-design to modelling

Rotterdam: highly controlled water management



Source: NU/UoB



Legend

- Highways
- Agriculture
- Comercial Impervious
- Comercial Pervious
- Residential Impervious
- Residential Pervious
- Open Land Impervious
- Open Land Pervious
- Rotterdam cityborders
- OSM Standard

Source: NU/UoB

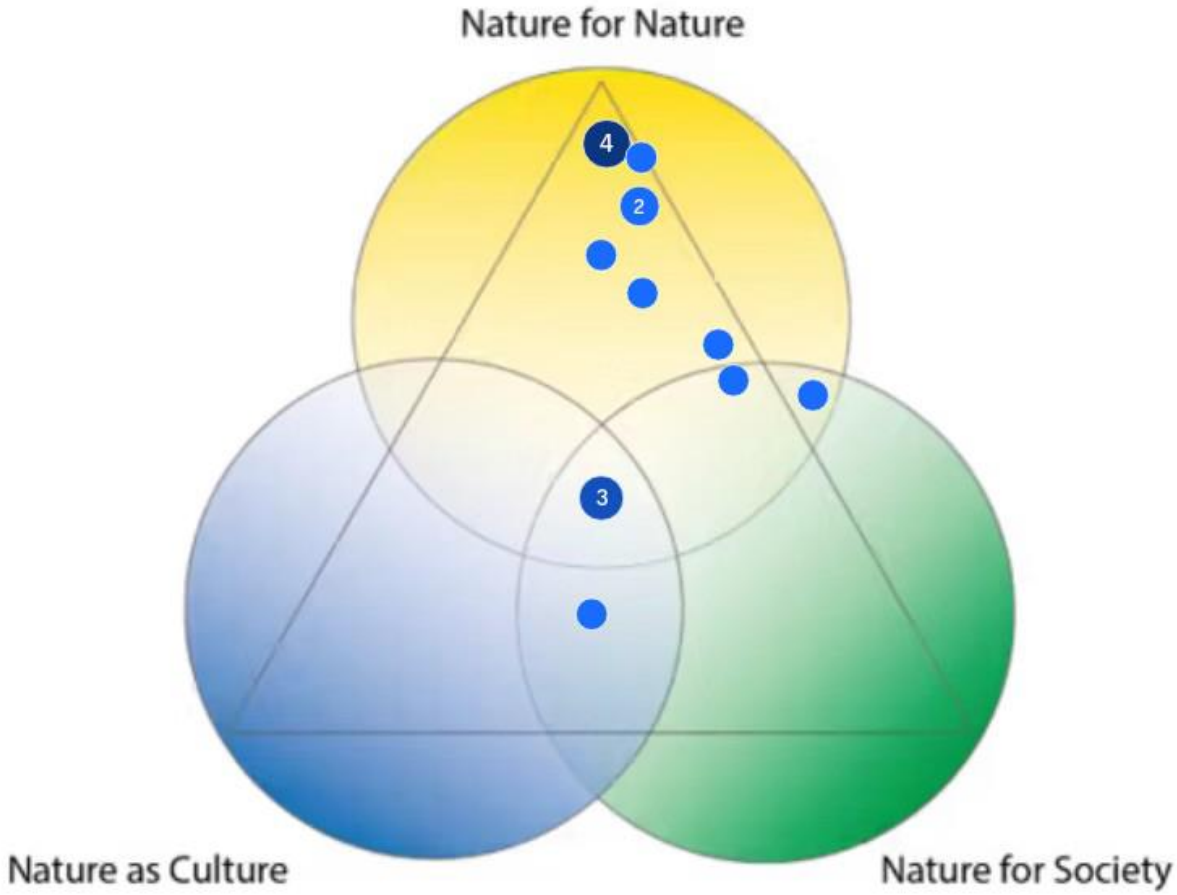
Co-creating the future of water in Rotterdam: stakeholders perspectives

Nature for Nature

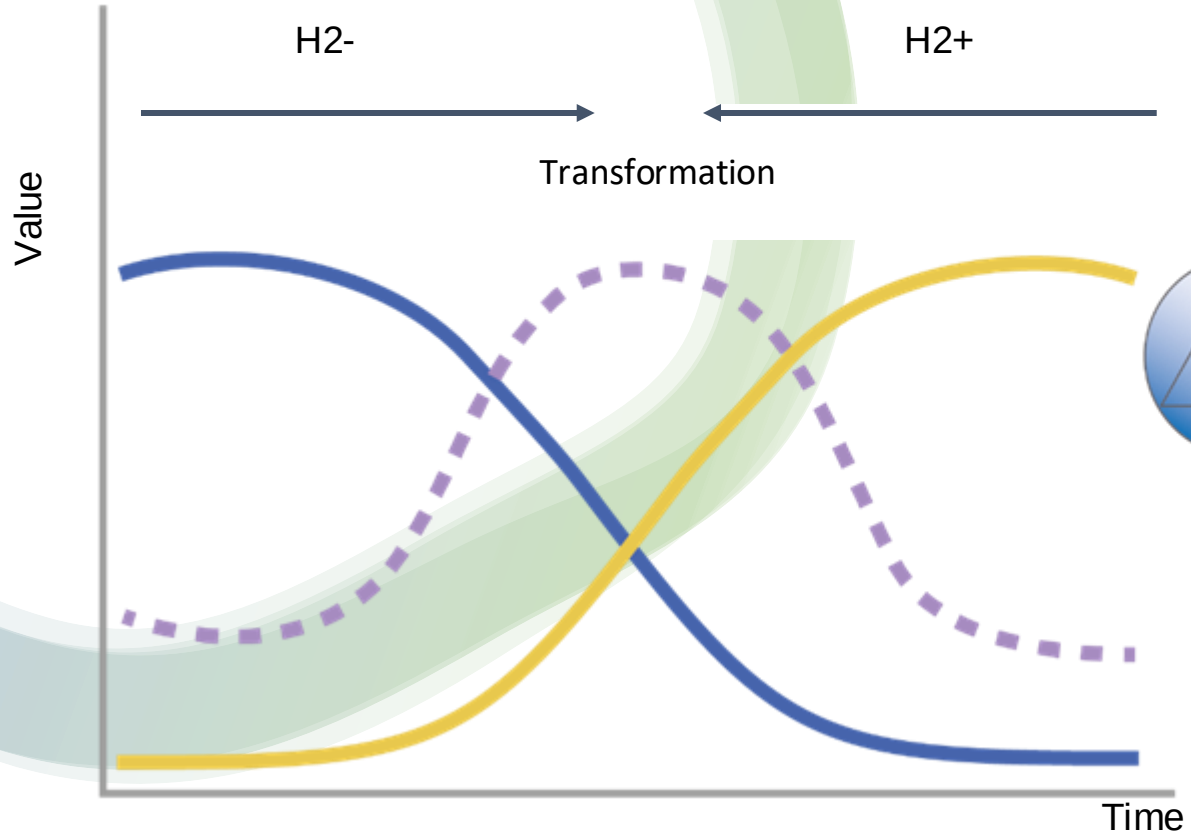
Nature as culture

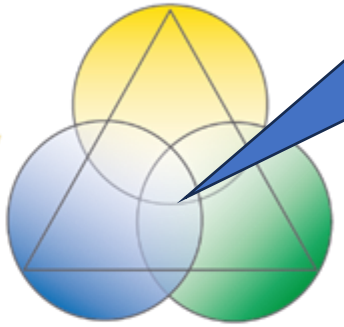
Nature for people

Stakeholders’ perspectives



Transformative change: 3 horizons



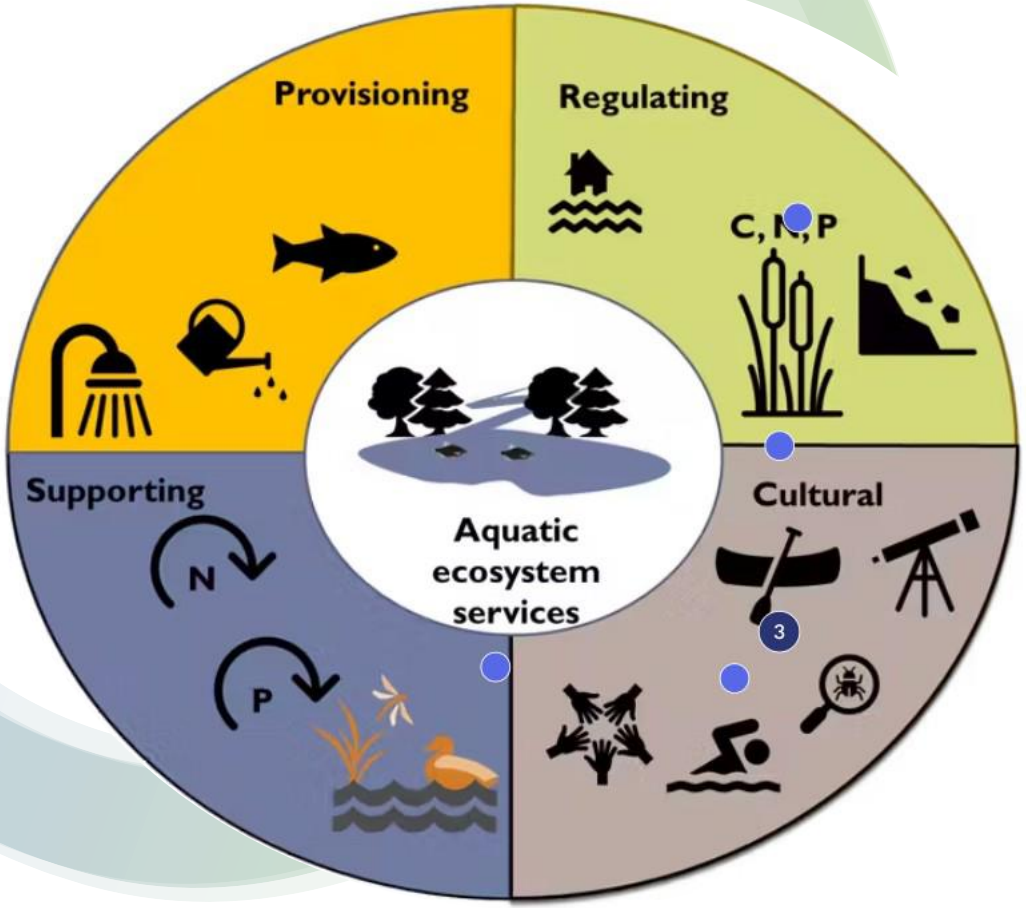


- Taxation on impervious substrate
- Natural water level and salinity fluctuations
- Each building its own water retention basis

People’s perspective on ecosystem services in urban waters

- Human health benefits
- Climate regulation
- Flood regulation
- Biodiversity
- Water quality

Niches consortium perspective on ecosystem services from urban waters



habitat provisioning
landscape aesthetics
flood regulation
human health
flood prevention
swimming
flooding
biodiversity
water quality
climate regulation
regulating runoff
recreation
nutrient capturing
connections - corridors
nutrient retention

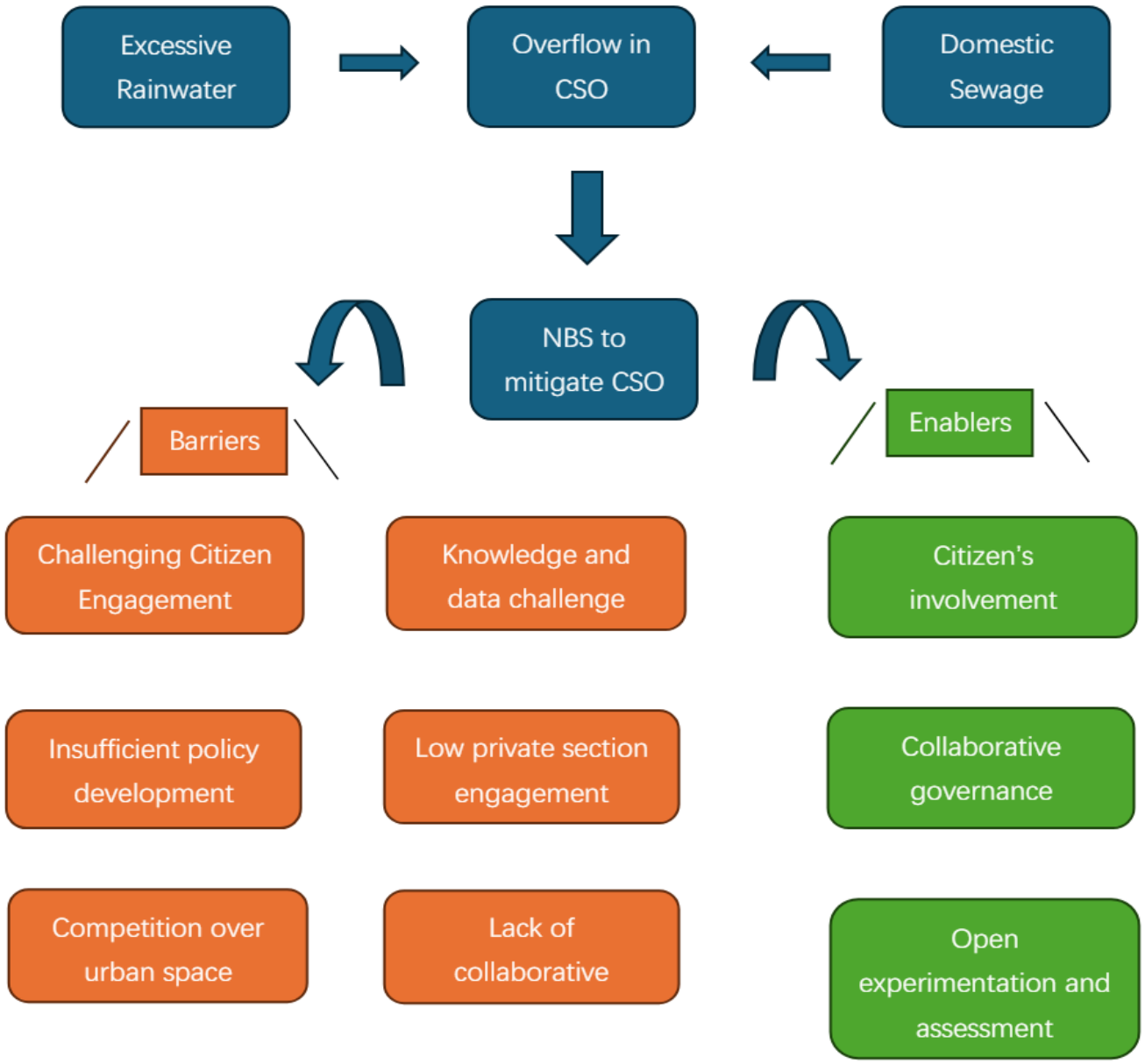
NBS, CSOs and Rotterdam

Credits: Consultancy project 2023 University of Utrecht

Semi-structured interviews with experts on NBS implementation

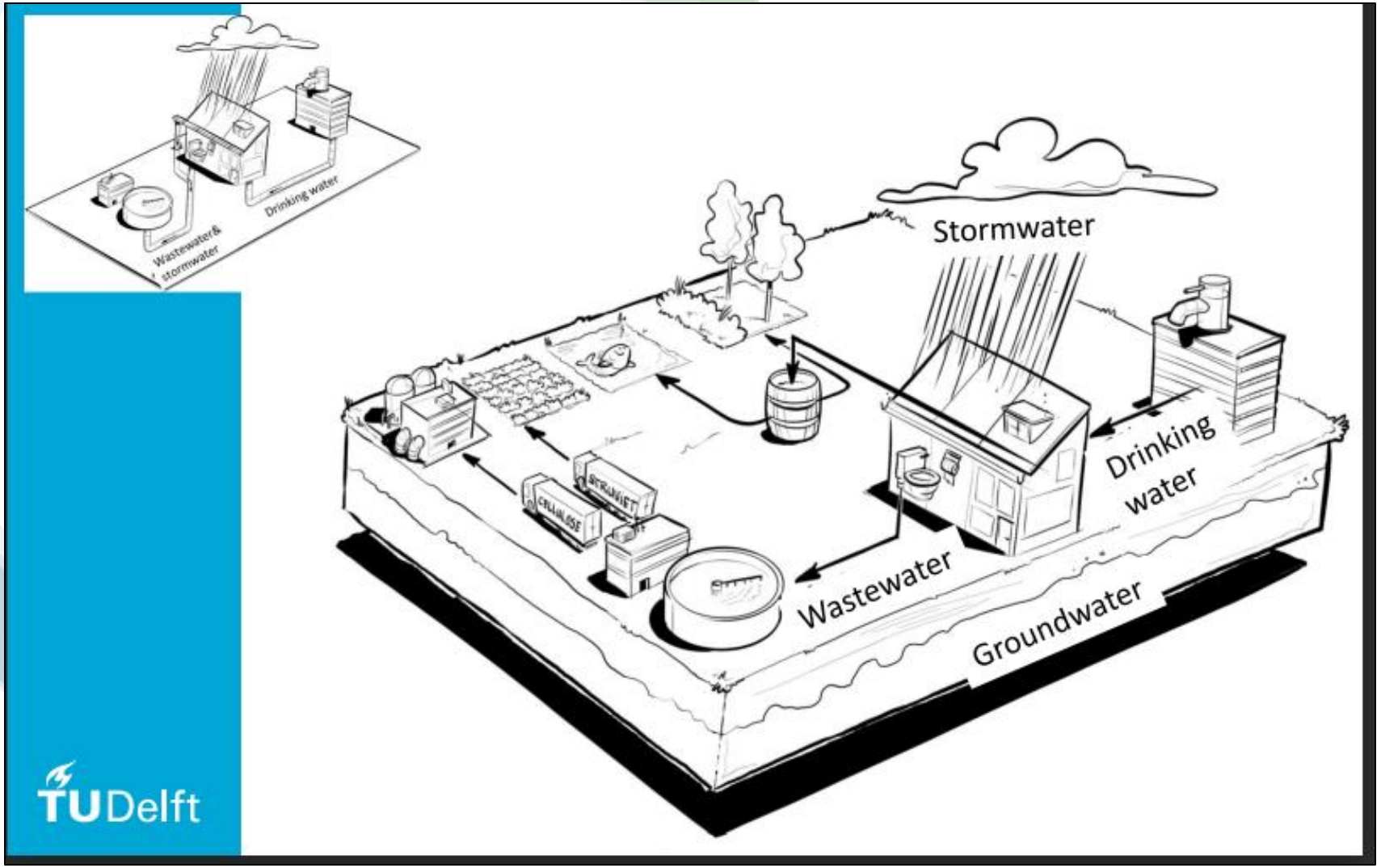
- Knowledge on the effectiveness of NBS in mitigating CSO events is limited
- Installing a separate sewer system considered more effective in mitigating CSO events
- Co-benefits from NBS in terms of biodiversity, environmental and human health?

Barriers and enablers



Credits Consultancy project 2024, Utrecht University

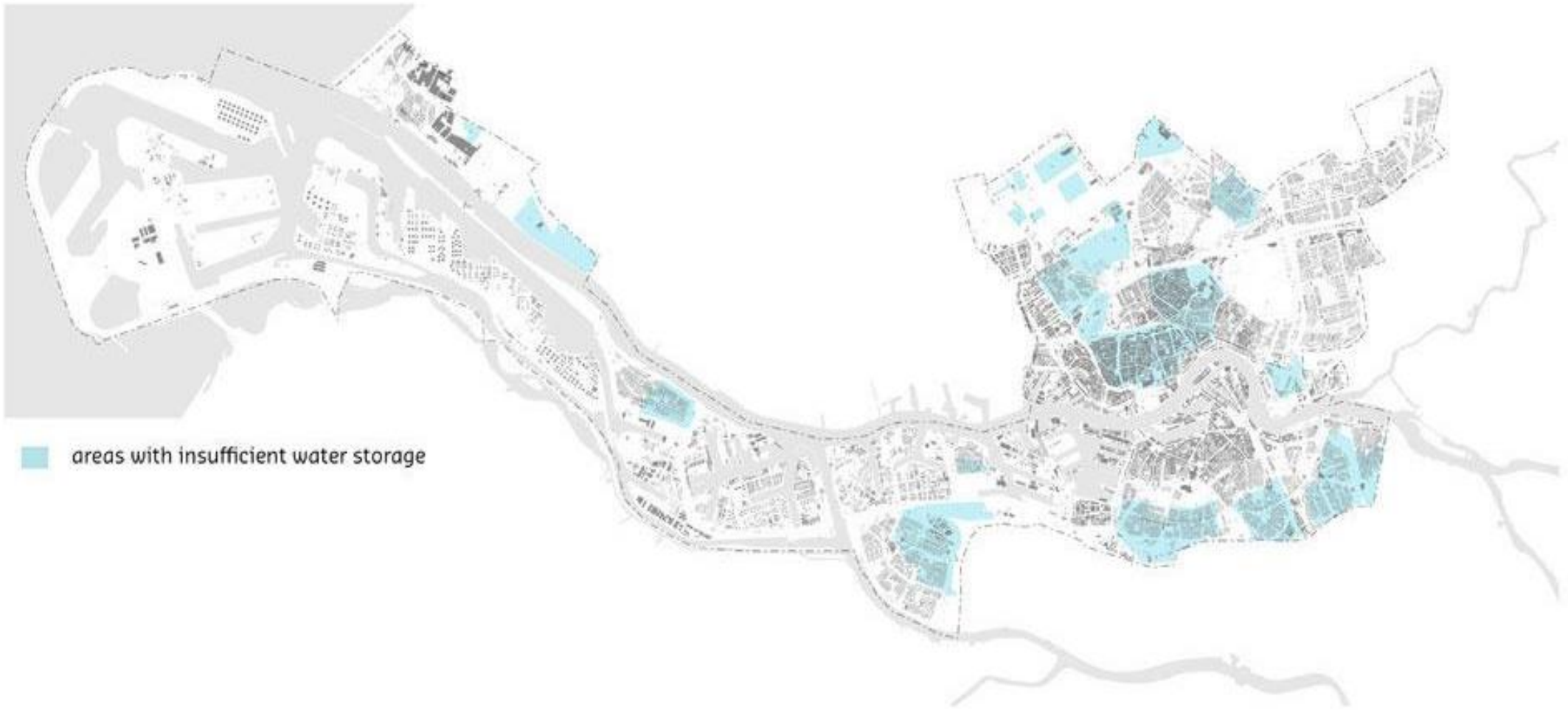
Very likely urban water system 2050



Jeroen Langeveld, TU Delft

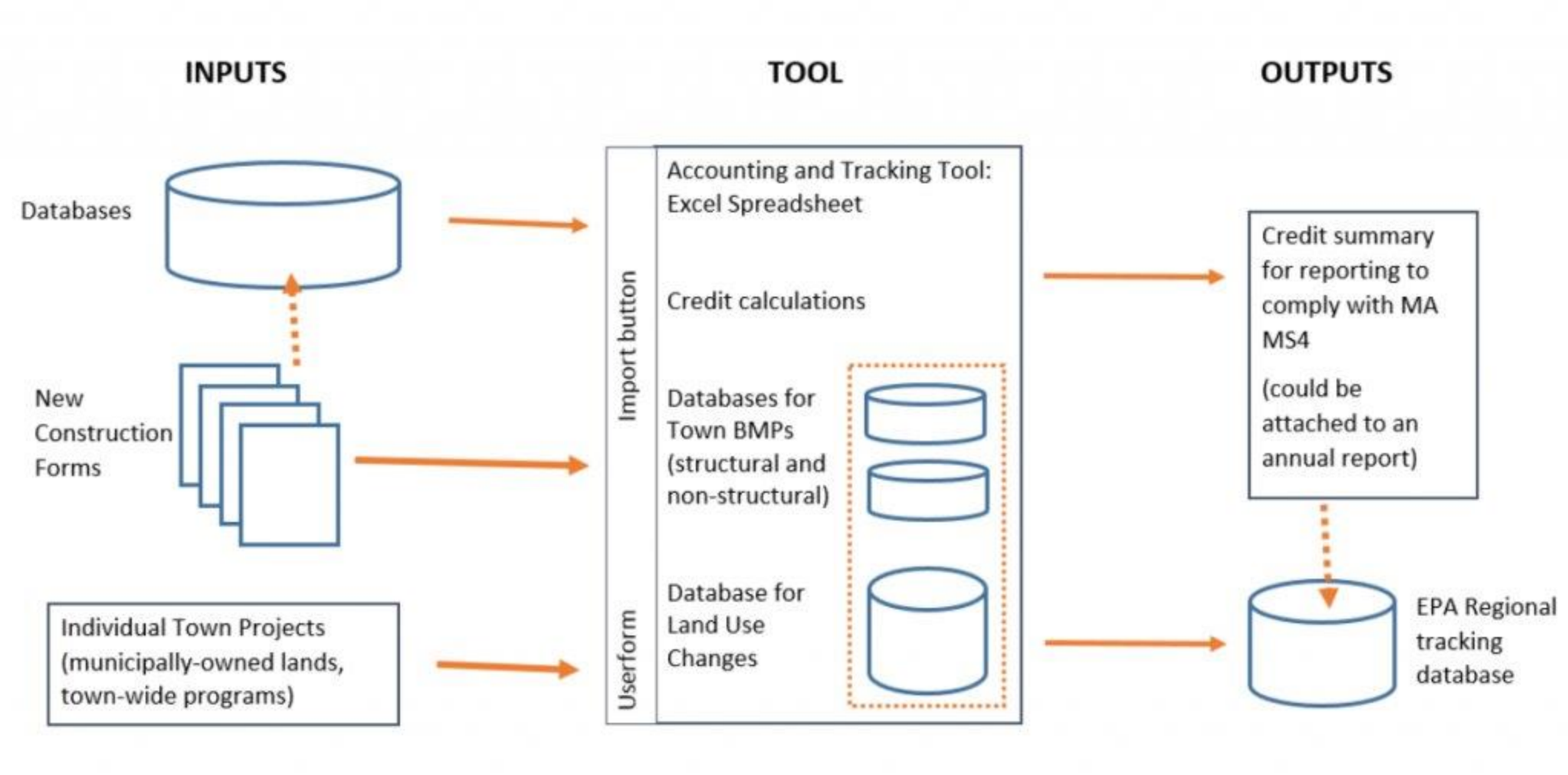
But what does the modeling tell us on effectiveness of NBS?

areas with insufficient water storage



Source: Interactive climate Atlas

Batt modeling: engineering tool for local implementation of NBS

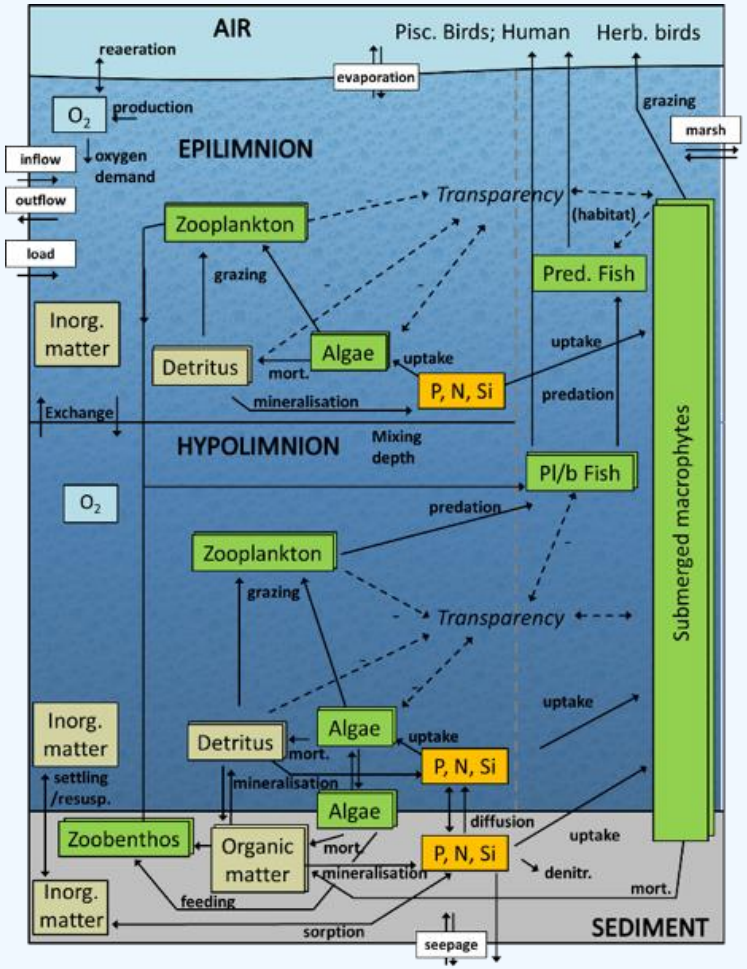


Ecosystem

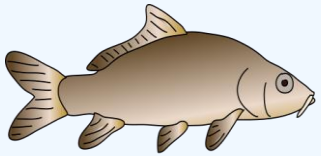
Ecosystem state

Ecosystem service

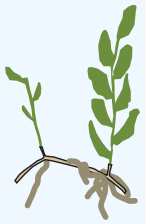
PCLAKE+



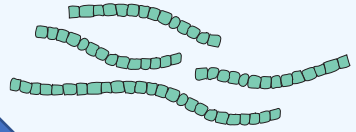
Janssen et al. 2019, Zhan et al. 2023



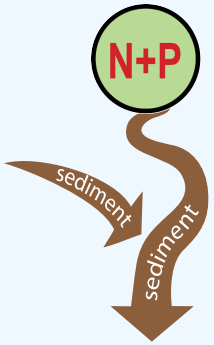
Fish biomass



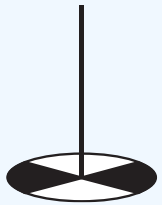
Plant biomass



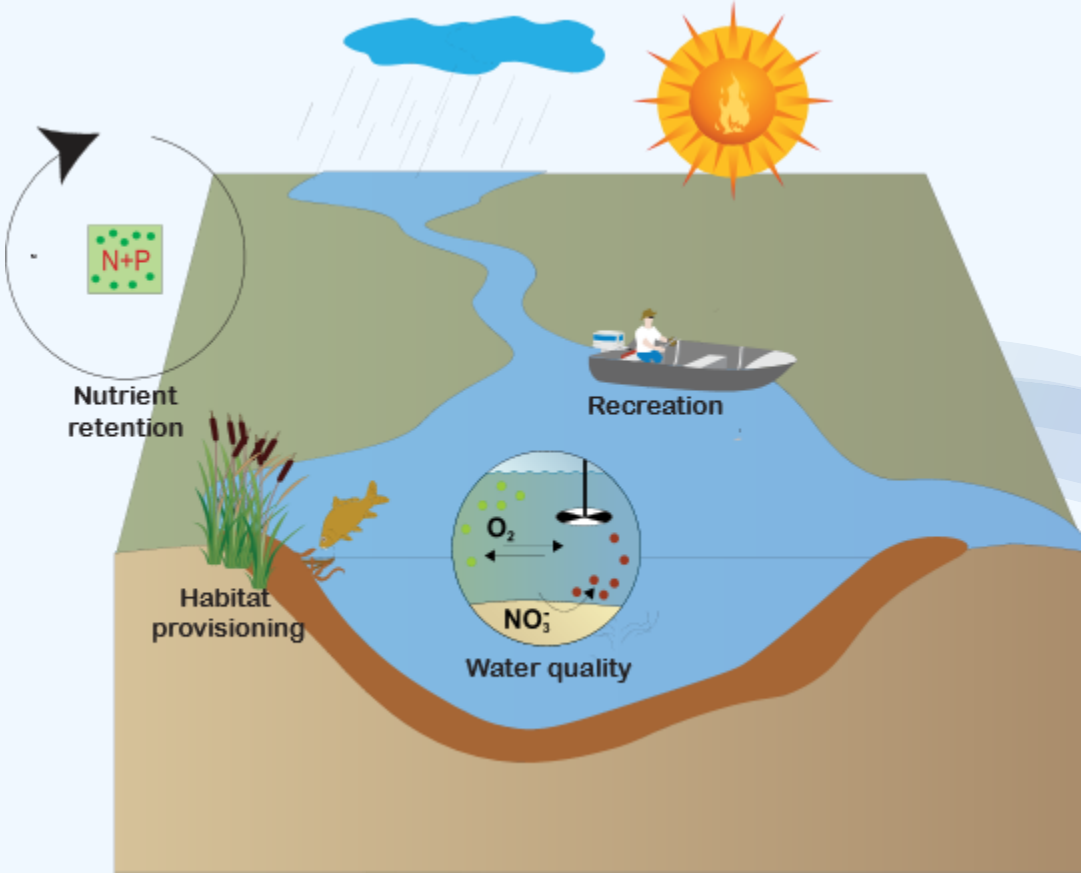
Cyanobacteria biomass



Nutrient burial

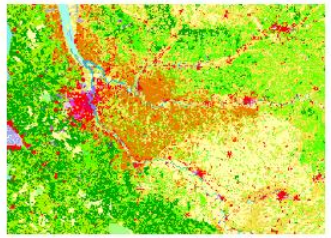


Water transparancy



Modeling work flow

CORINE Land Cover



Landuse

JOINT RESEARCH CENTRE
EUROPEAN SOIL DATA CENTRE (ESDAC)

Soil characteristics

OpenStreetMap

Buildings/footpaths

HydroSHEDS

Rainfall

HydroSHEDS

Lake depth

Sediment type

Lake area

BATT

PCLAKE+

+/- NBS

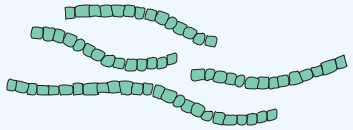
NICHES

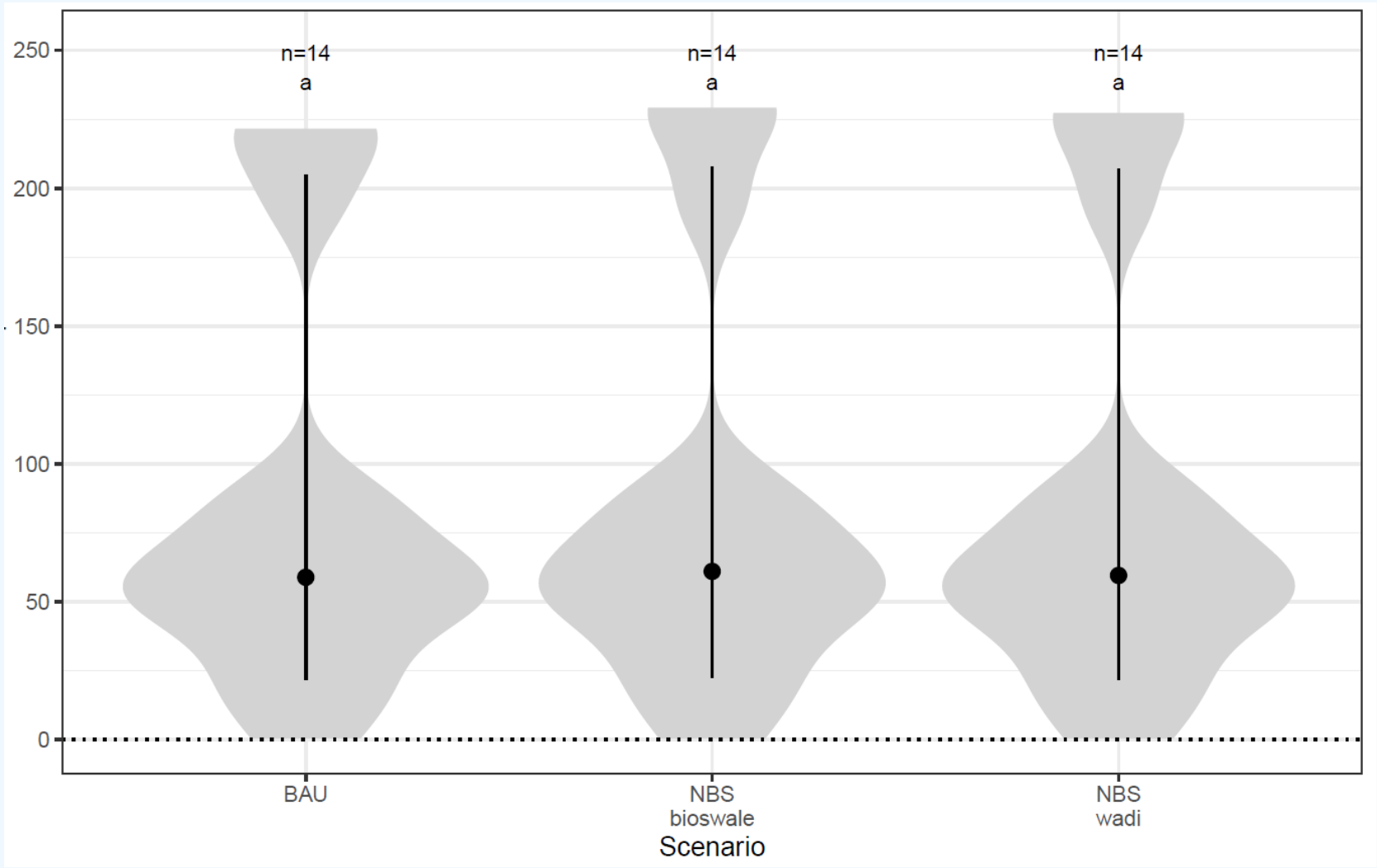
NBS scenario applied:

Bioswales

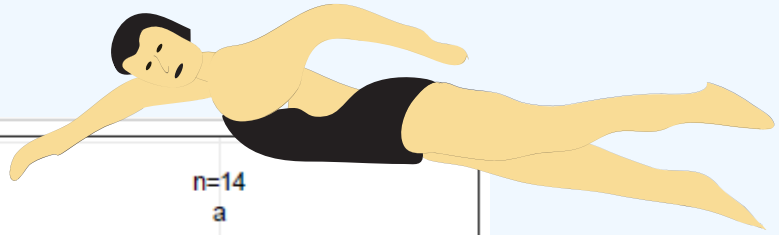
Urban wadis

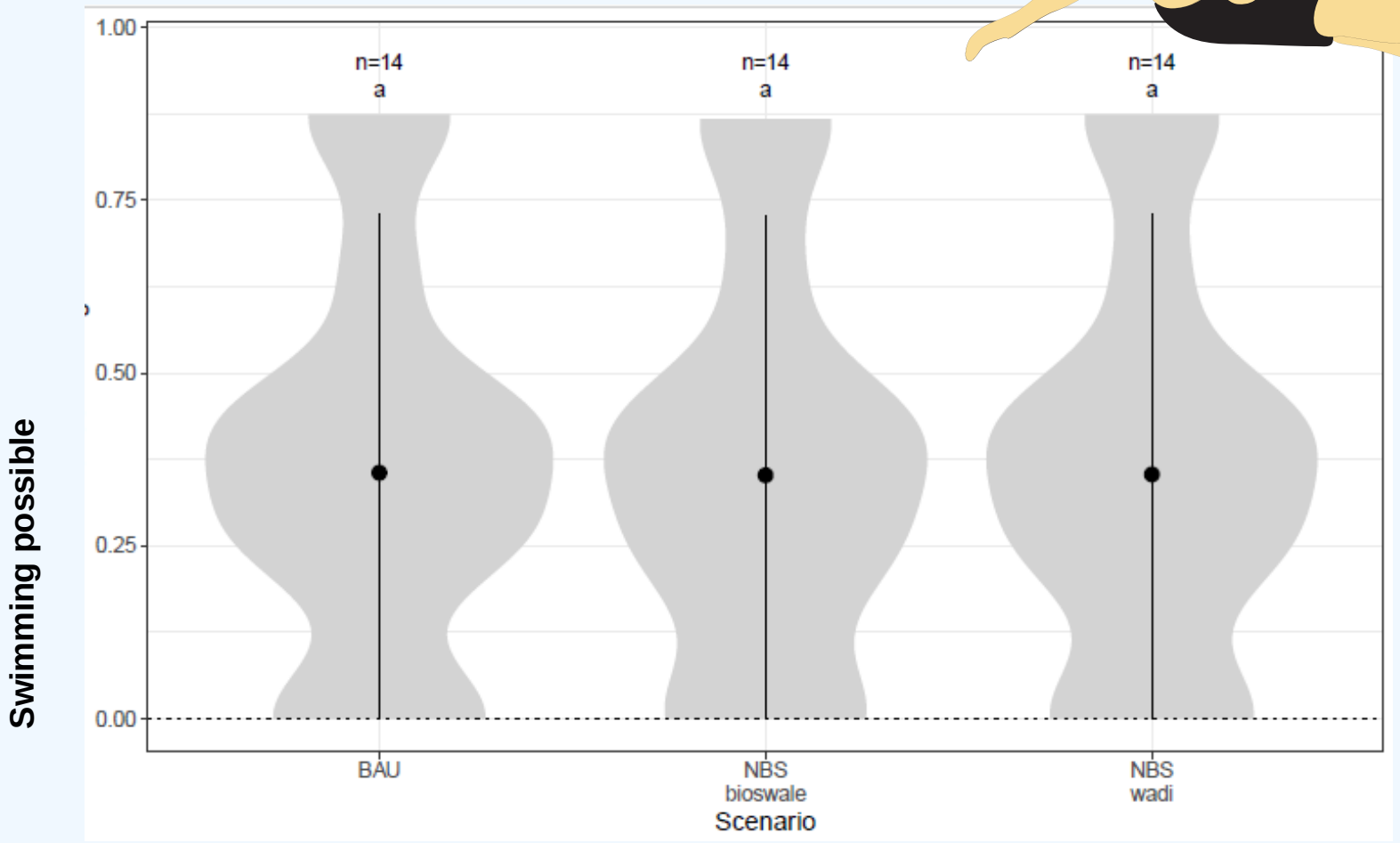
Some preliminary outcomes: ecosystem state





Some preliminary outcomes: ecosystem service





Next steps

Model validation and quality control

Upscaling to Europe

NICHES

Nature's integration in cities' hydrologies, ecologies and societies

Thank You!

l.desenerpontdomis@nioo.knaw.nl

niches-project.eu

NICHES Newsletter

ulf.stein@ecologic.eu

@NICHES_project

@nichesproject

Funded by the European Union

This project was funded through the 2020-2021 Biodiversa and Water JPI joint call for research proposals, under the BiodivRestore ERA-Net COFUND programme, and with the funding organisations: German Federal Ministry of Education and Research, Agencia Estatal de Investigacion espanola. Ministry of Agriculture. Nature and Food Quality of the Netherlands. NICHES is coordinated by the Ecologic Institute.