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

Bringing nature back – biodiversity-friendly nature-based solutions in cities

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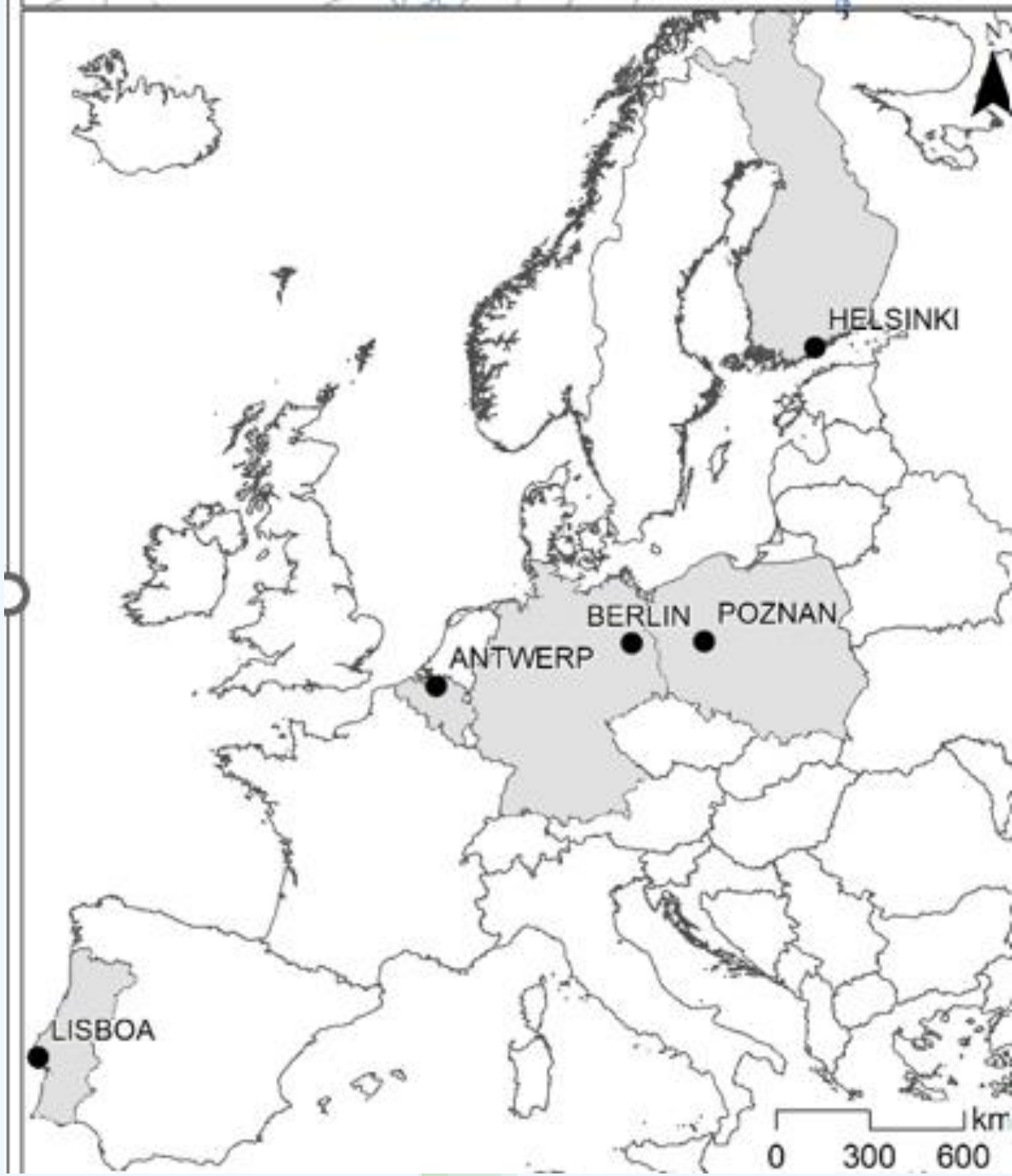

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Scientific and policy impact of the project

- Provide new scientific evidence on the role of biodiversity and its linkage with regulating ES in urban small water-body NBS (aquaNBS)
- Test SET framework in empirical research to guide the methodological design, data collection and analyses.
- Publish a Handbook for monitoring biodiversity, habitat and water qualities in small-scale urban aquaNBS
- Guide and give direct recommendations to local urban planners and practitioners during the project through meetings, consultations and fields trips.

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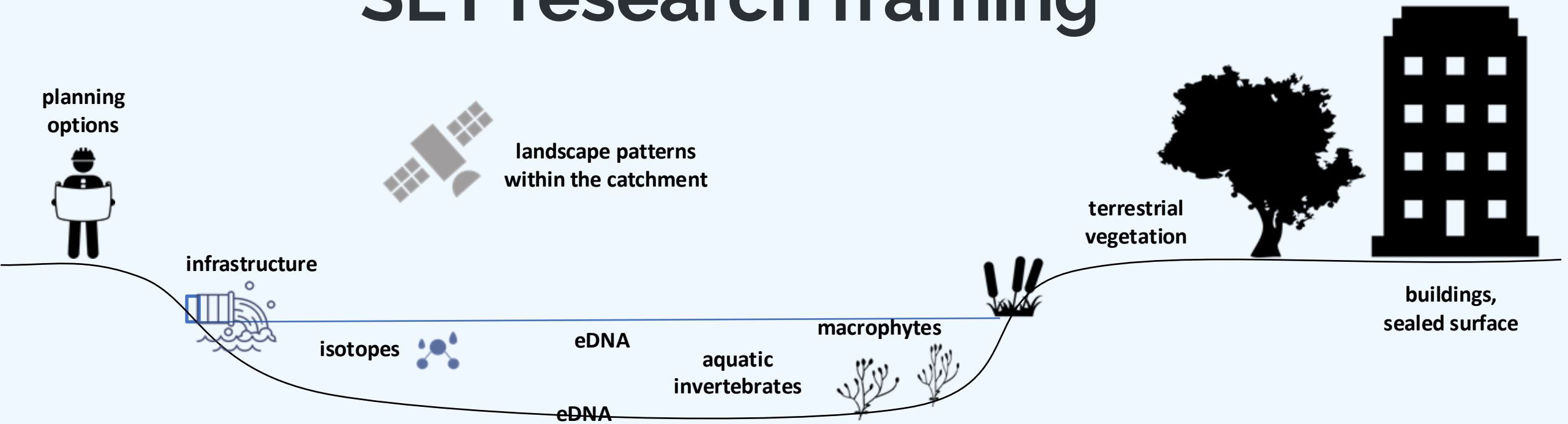
SET research framing



Social	Ecological	Technological
Is there a room for biodiversity in climate policies supporting NBS? What is the role of biodiversity in planning and maintaining aquaNBS?	What drivers and interlinkages there are between environmental factors and biodiversity? What kind of species richness and composition there are in aquaNBS?	How does surrounding built environment influence biodiversity and ecological quality of aquaNBS?

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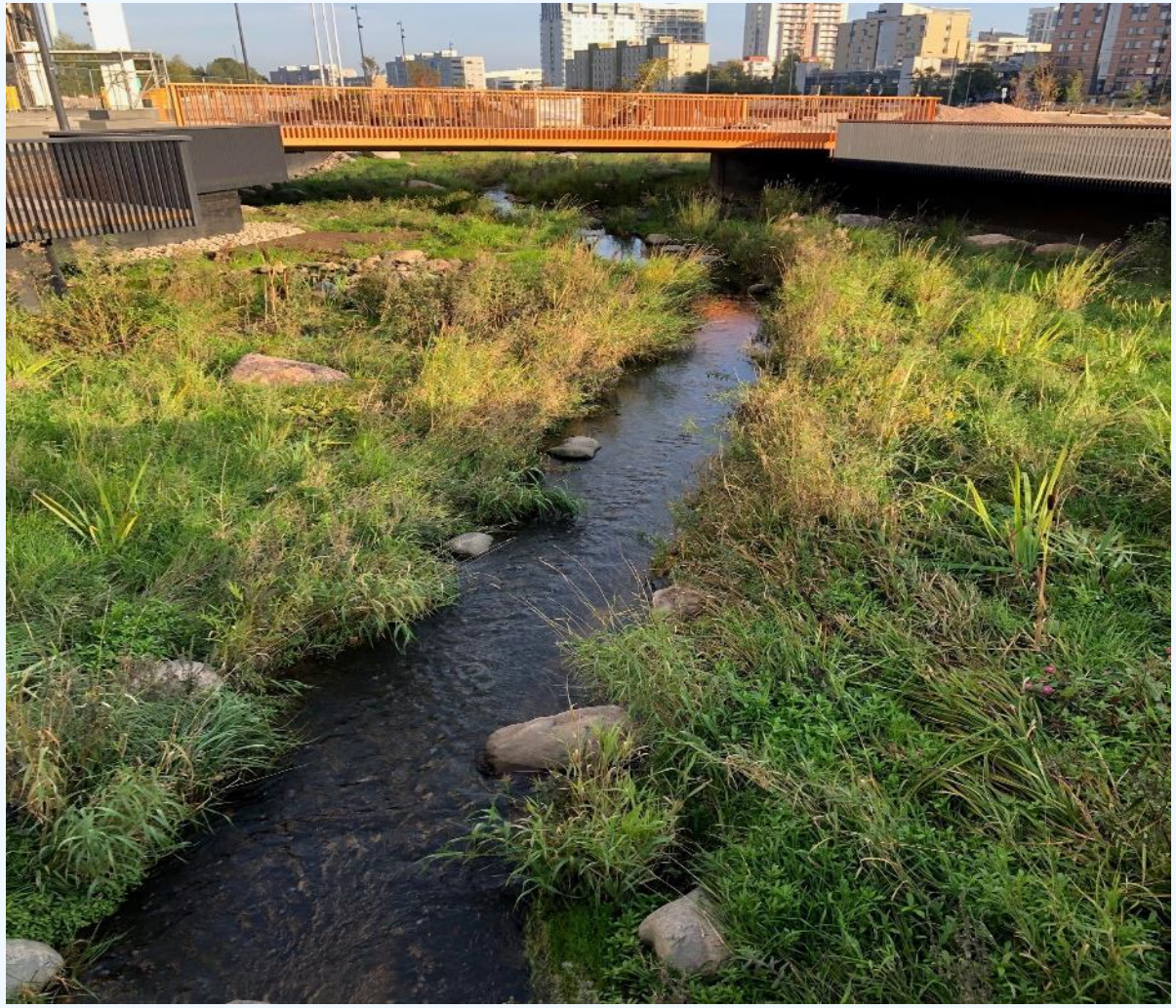
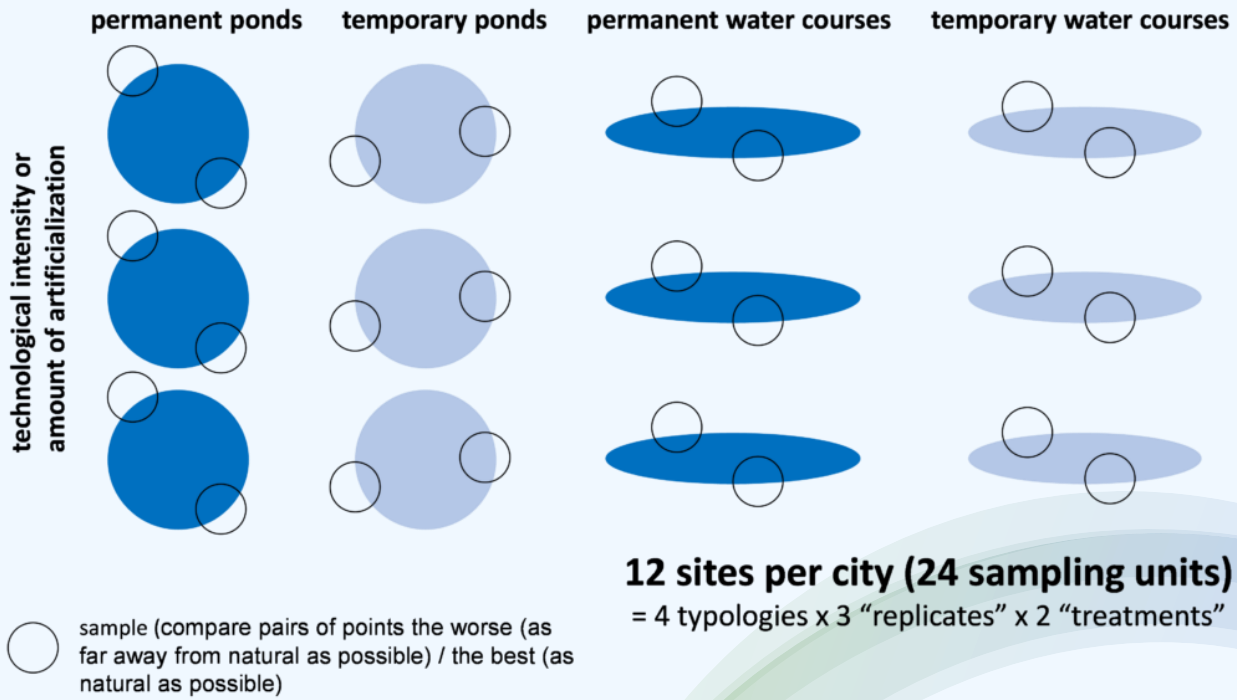
Aquatic nature-based solutions (aquaNBS)

- The selected study sites are frequently designed to address urban challenges such as water regulation (buffering and infiltration of runoff), recreational use, aesthetic enhancements (planted cultivars), or urban cooling.
- Habitats are potentially more extreme conditions regarding water quality, water level fluctuations, management frequency, and human disturbance.



Selection of aquaNBS in our project

- Study sites were stratified per type of aquaNb (stream or ponds) and
- Water availability throughout the year (temporary or permanent)
- Study sites were selected within along a gradient of artificialization (from near natural to heavy wholly artificial) With stabilized vegetation (built for more than 5 years)
- With small to medium to small size (streams up to 50 m wide, ponds up to 500 m maximum dimension)




Belgium

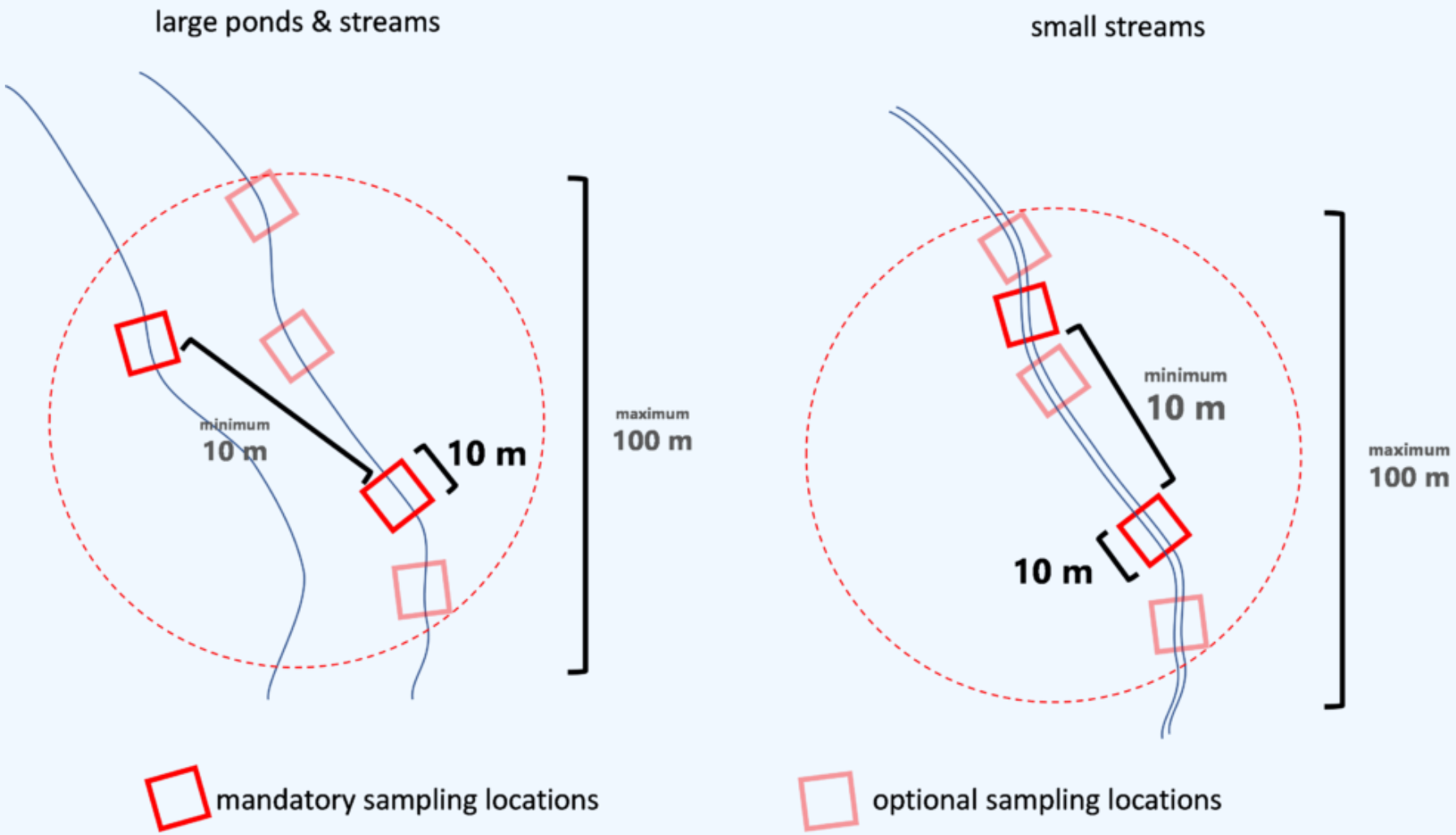

Finland


Germany


Portugal


Poland

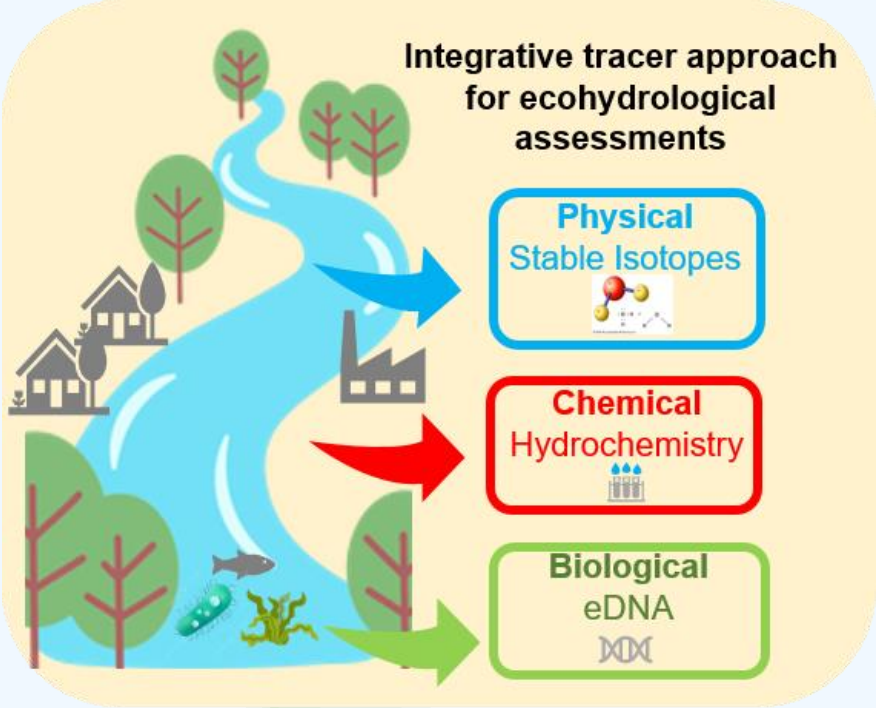
Methodological design for biodiversity monitoring



Understanding interlinkages between ecohydrology and biodiversity in aquaNBS

Integrated multi-tracer approach to link hydrology and biological functioning in aquaticNBS

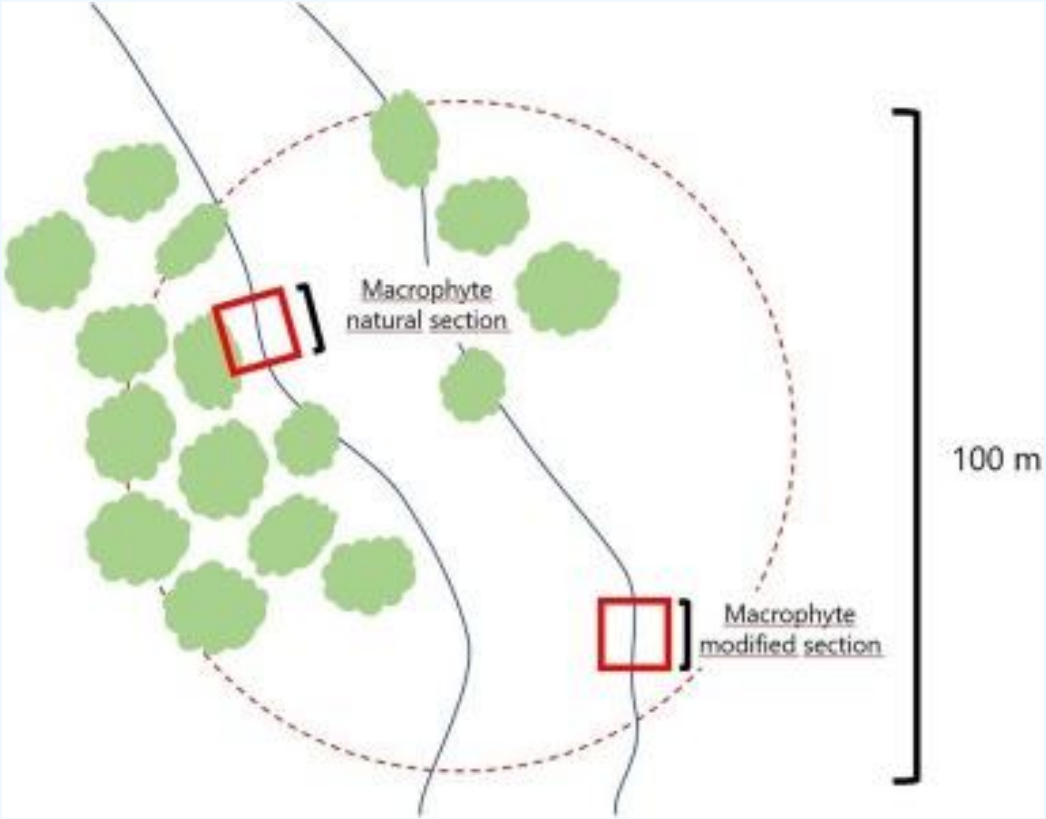
- Stable water isotopes: Water origin, water age, transit times, storage in the landscape
- Hydrochemistry: Anthropogenic influences, pollution, stressors
- Environmental DNA: Bacterial communities & Diatoms as indicators of water quality, nutrient dynamics, diversity



Warter et al. 2024

Diversity of macrophyte communities in aquaNBS across Europe

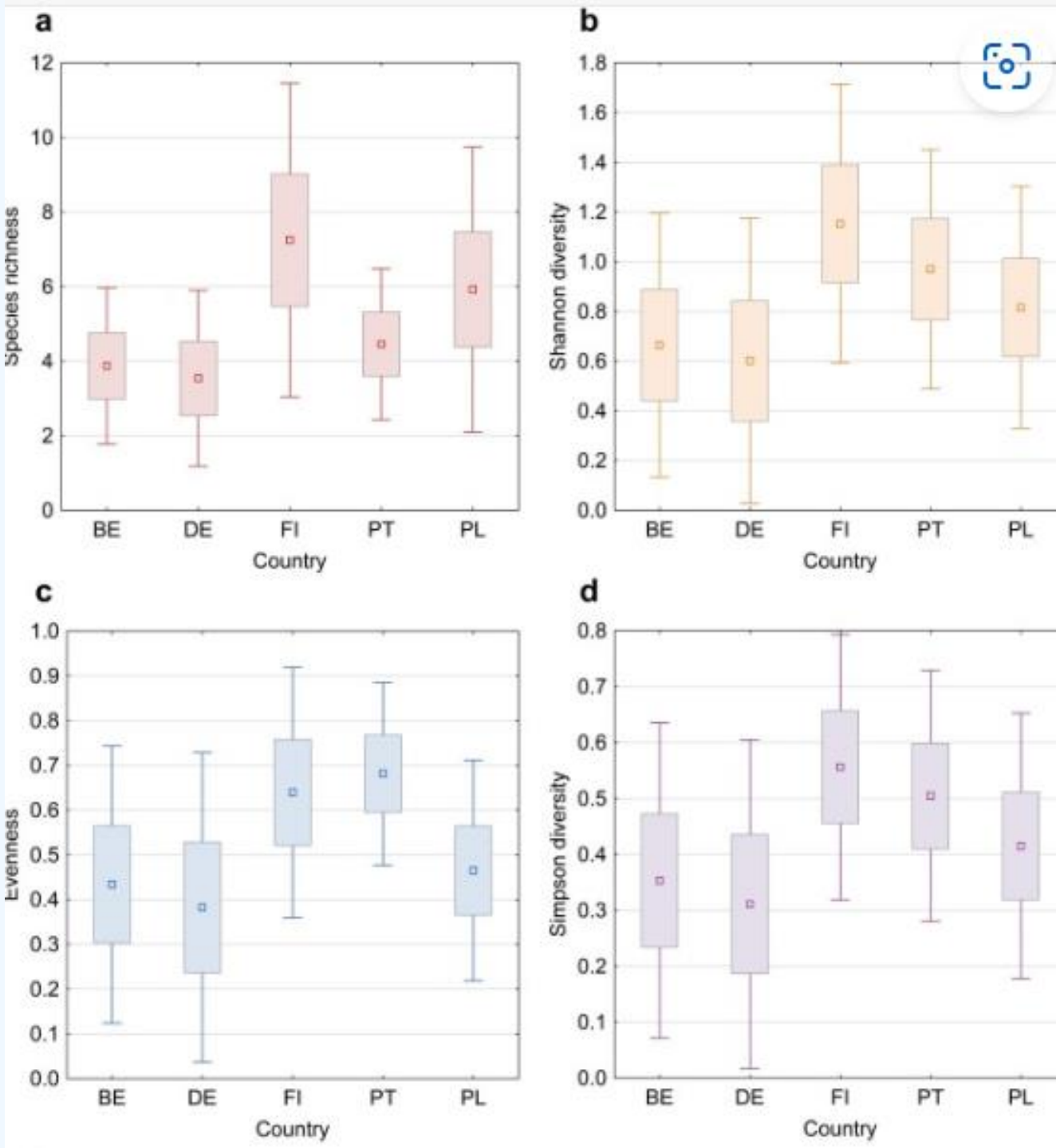
- Macrophytes play an important role in aquatic environments by providing physical structure, food and shelter.
- They can accumulate and transform pollutants e.g. heavy metals
- Plants are sensitive indicators of the aquatic environment.
- We analysed species richness, abundance, and plant ecological characteristics of macrophytes in five European cities and



Source: Szoszkiewicz et al. 2025

Macrophyte diversity in five European cities

- Significant differences in macrophyte richness were observed between the cities
- The macrophyte biodiversity was diversified between studied cities, number of species ranged from 30 to 47 within a single city
- Comparing types of aquaNBS, 64 taxa were found in running waters and 90 in standing waters



Drivers of macroinvertebrate communities in aquaNBS

- Macroinvertebrates contribute to many processes in freshwater ecosystems, including nutrient cycling and food webs
- They are commonly used as indicators for the ecological status of freshwater habitats
- We used sampling methodology from the EU Water Framework Directive 2000/60/EC (WFD, 2003)
- Macroinvertebrate samples were collected by kick-sampling method using a D-frame kick-net (500 µm mesh size)
- Five drivers were considered to assess the effects of environmental drivers: (a) climate related variables, (b) vegetation related variables, (c) water related variables, (d) aquaNbS related variables, and (e) other variables
- Water stable isotopes expressed as d-excess to indicate potential evaporative effects


A
BugGuide.Net


B
BugGuide.Net


C
iNaturalist UK


D
lifeinfreshwater.ne


E
istockphoto.com


F
wikipedia.org


G
pbase.com


H
jungledragon.com


I
Macroinvertebrates.org


J
Macroinvertebrates.org


K
shetlandlochs.com


L
shetlandlochs.co

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Maintaining biodiversity in urban aquaNBS

- AquaNBS can support urban biodiversity
- Understanding which environmental factors impact species communities is critical to improve construction, restoration and management of aquaNbS and their biodiversity
- Take climate conditions into account - especially climate seasonality of drought and ice - important for management since extreme events increase due to climate change

Thank you for your attention

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Read more about our project: Bringing Nature Back - biodiversity-friendly nature-based solutions in cities

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References and publications

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