Urban adaptation to climate change - the role of nature-based solutions

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Stormwater Poland

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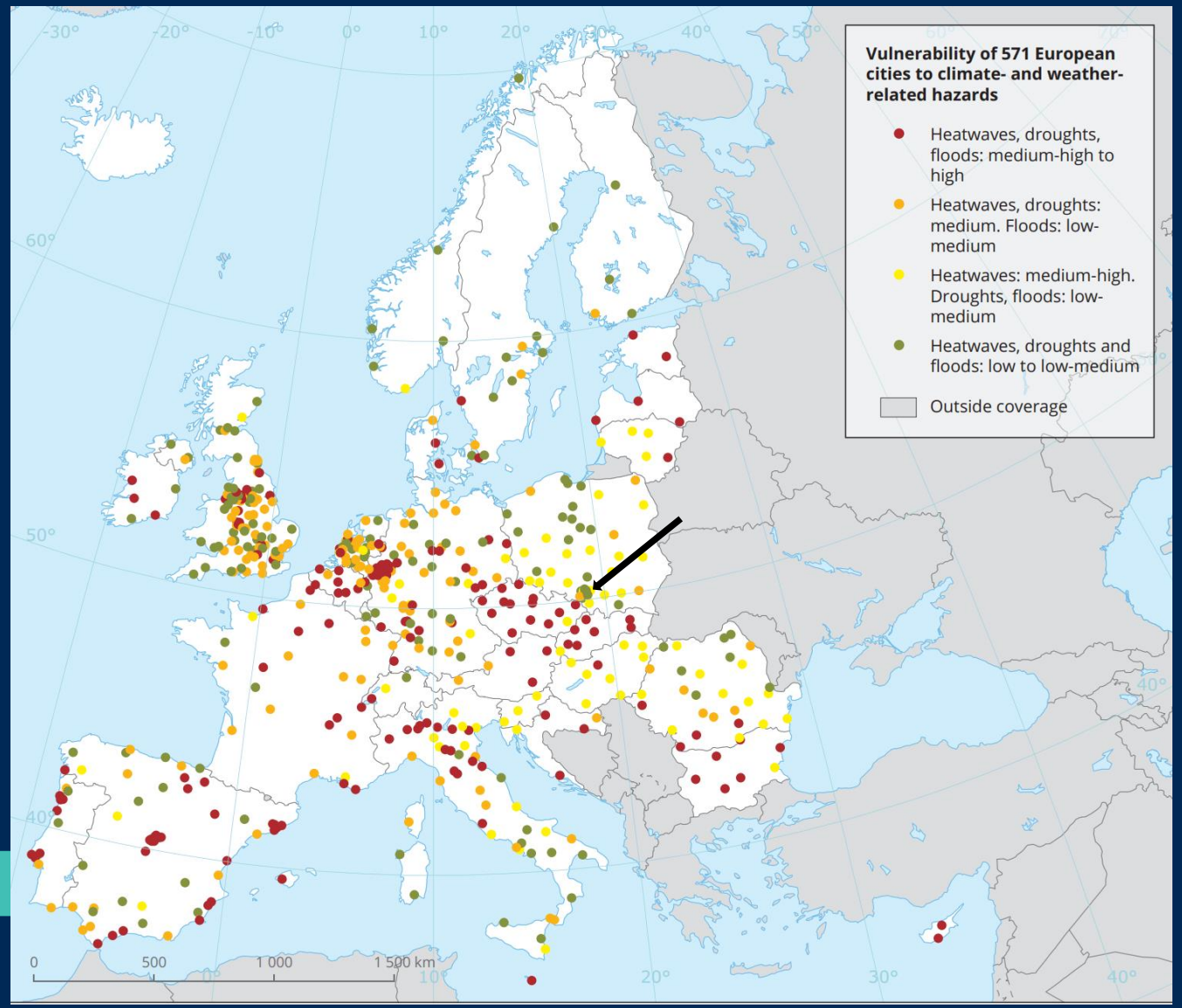
London mayor warns of 45C days and severe floods “in the foreseeable future”

The Guardian, Mon 18 Sep 2023 12.00 CEST



Source: EEA 2020

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Vulnerability of European cities

- Actual vulnerability differs from city to city
- European cities need to prepare for extreme weather events.
- Urgent need to change the way we plan and construct our cities
- Local adaptation plans and actions are needed in the EU

Urban water management: Key challenges I

- Increasing frequency and intensity of heat waves
- Increasing risk of flooding from heavy rainfall, storm surges, and sea level rise → infrastructure, property, and ecosystems
- Increasing water scarcity and drought → water supply, quality, and demand
- Increasing air pollution and allergens → respiratory and cardiovascular diseases
- Increasing social and economic inequalities → the vulnerability and exposure of disadvantaged groups

Source: EEA 2012

Urban water management: Key challenges II

- Siloed policy and planning
- Top-down governance; lack of community engagement
- Lock-in thinking around innovative approaches
- Preference of short-term, single objective solutions
- Preference of end-of pipe solutions
- Limited consideration of local environmental conditions

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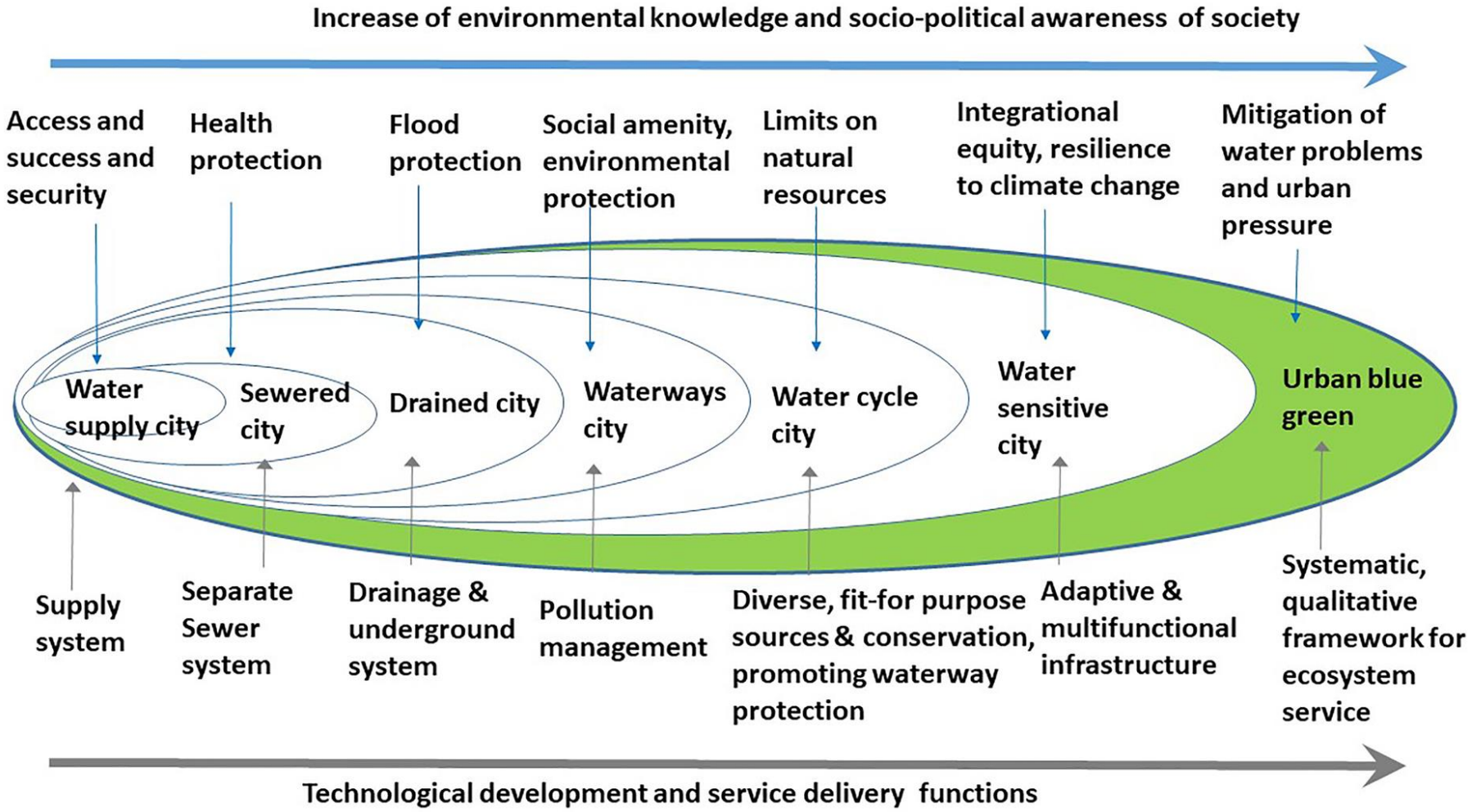
Source: Davis 2023

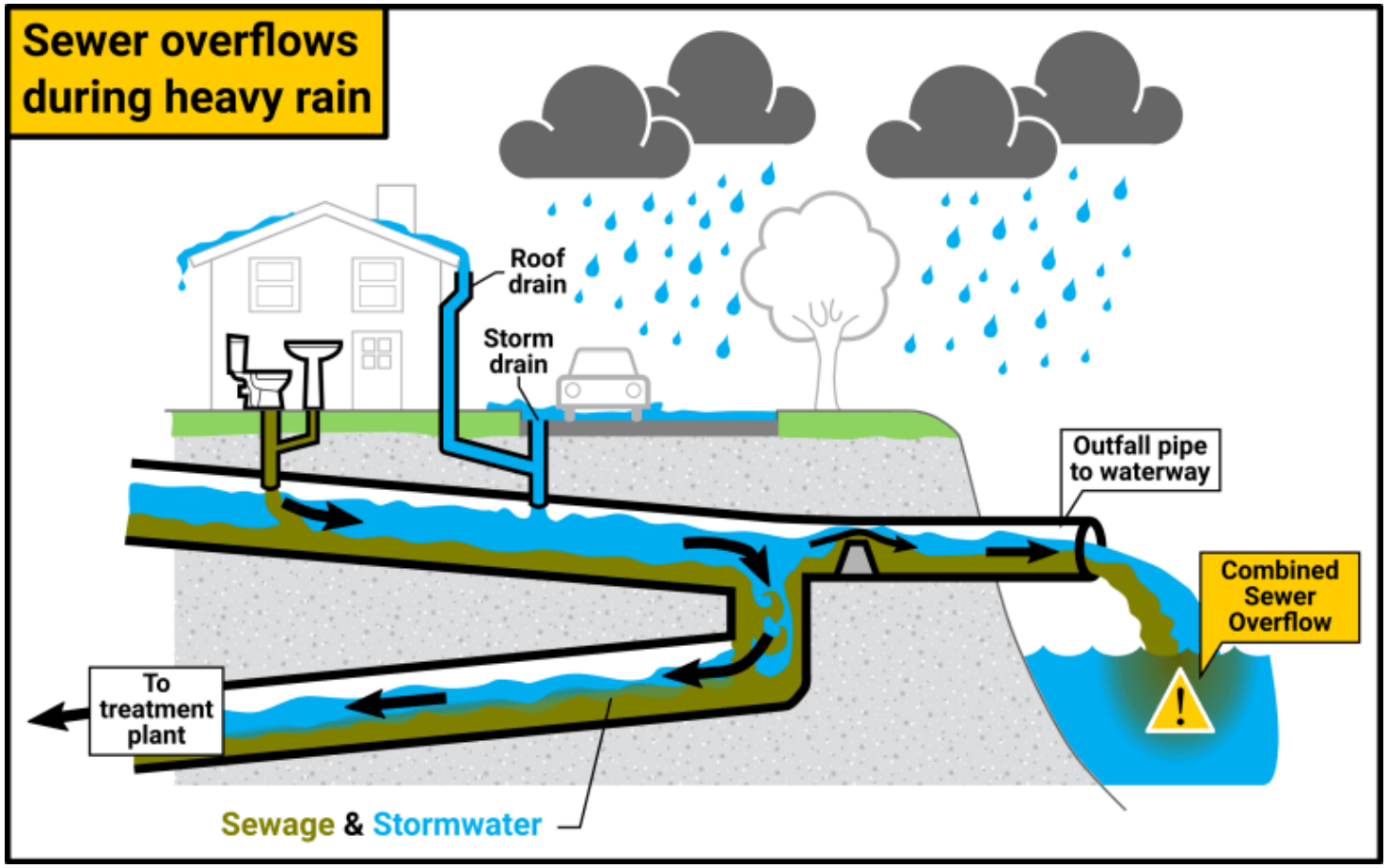
Shifting water supply and management approaches



Source: Oral et al. 2020

Example: Combined sewer overflows

- Heavy rainfall events
- Urban surface sealing / increase of impervious surfaces and reduction of green areas
- Frequency and volume of combined sewer overflows, resulting in high water pollution
- Economic, social and biodiversity/environmental impacts

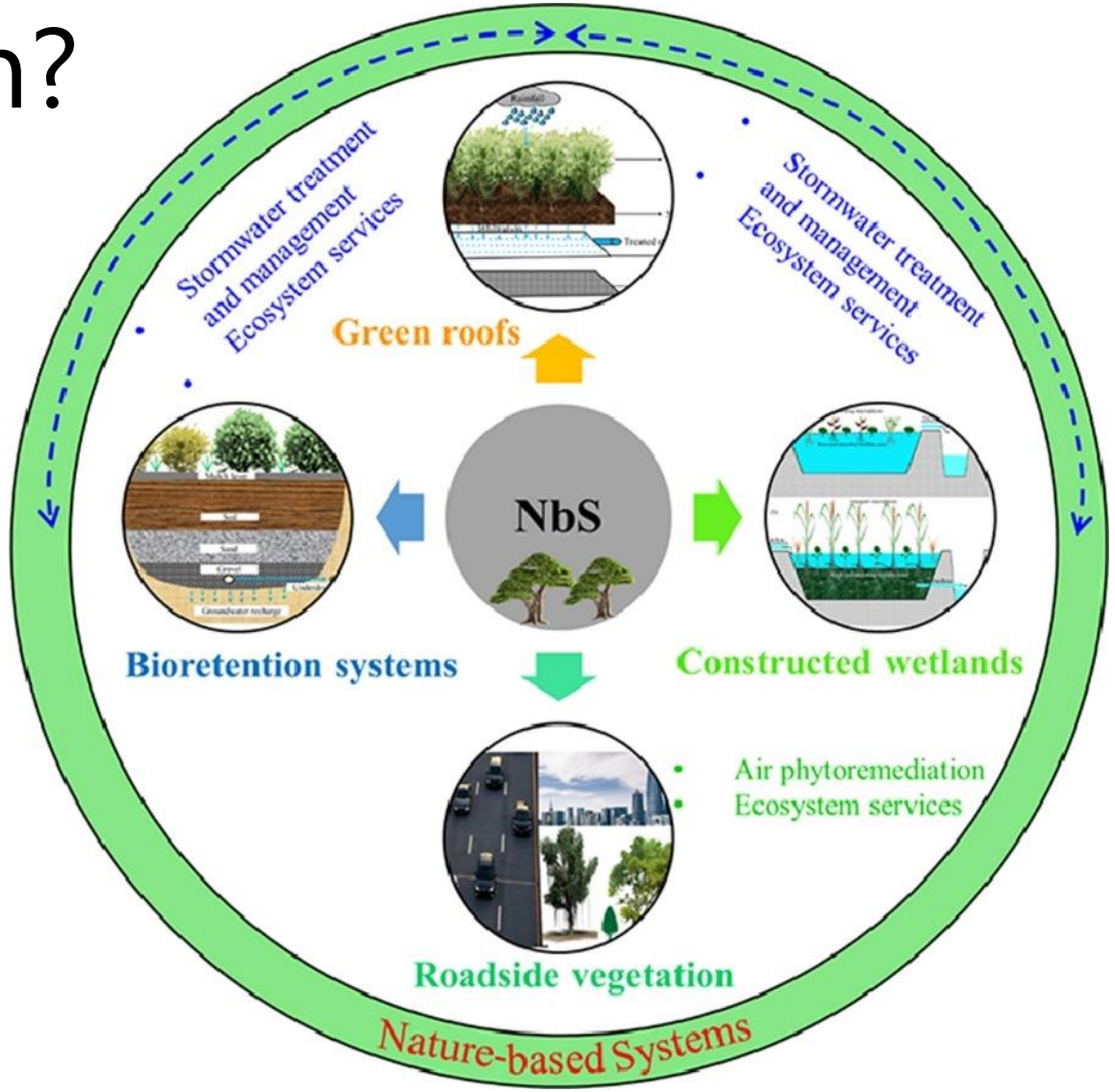


NICHES Nature's integration in cities' hydrologies, ecologies and societies

Source: ECOSS 2019

Nature as the solution?

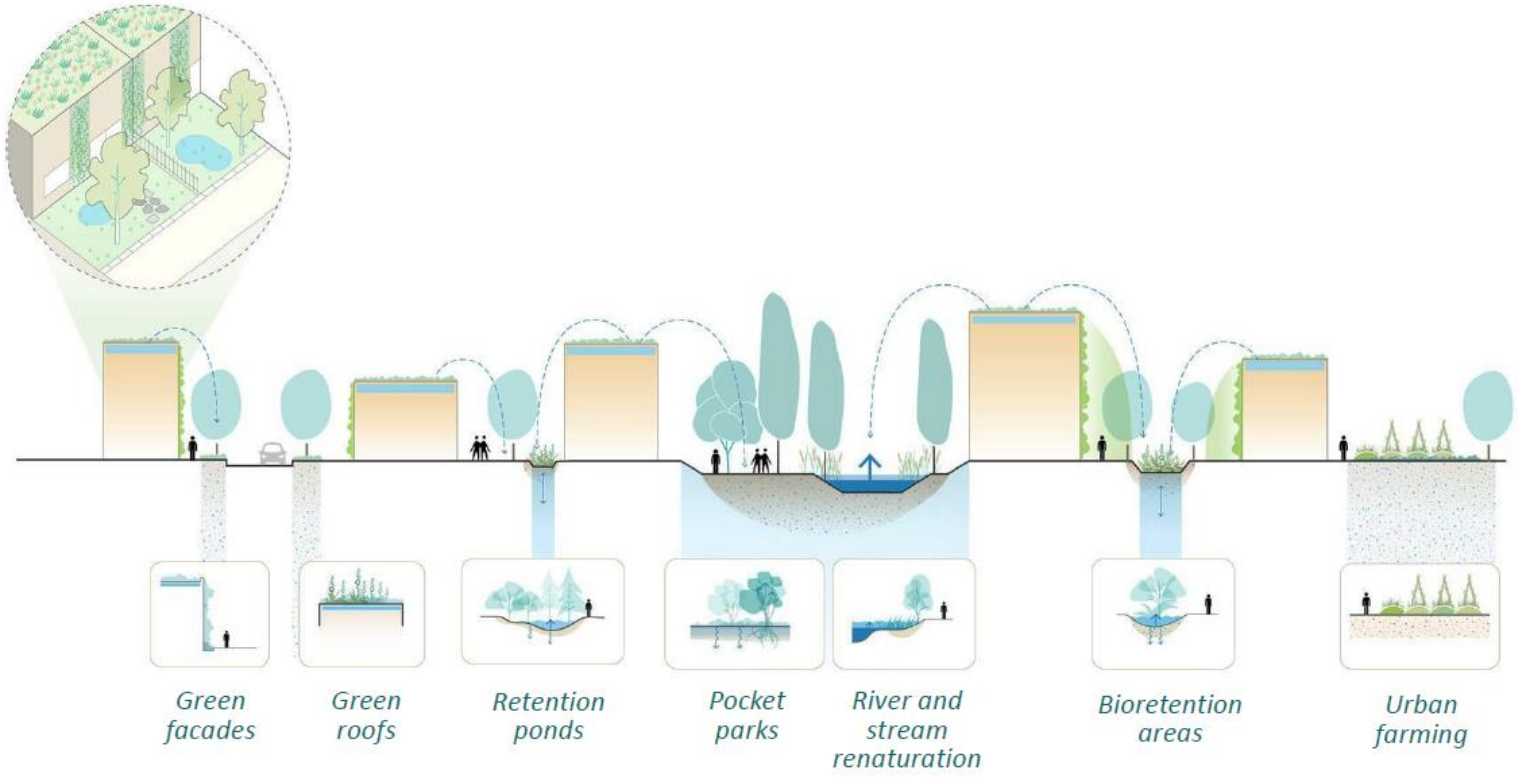
- Increase permeable surfaces
- Absorb rainwater to reduce runoff
- Treat contaminated water by collecting and removing pollutants
- Multifunctional to deliver wider environmental and societal benefits
- Locally adapted, sustainable, cost-effective



Source: Biswal et al. 2022

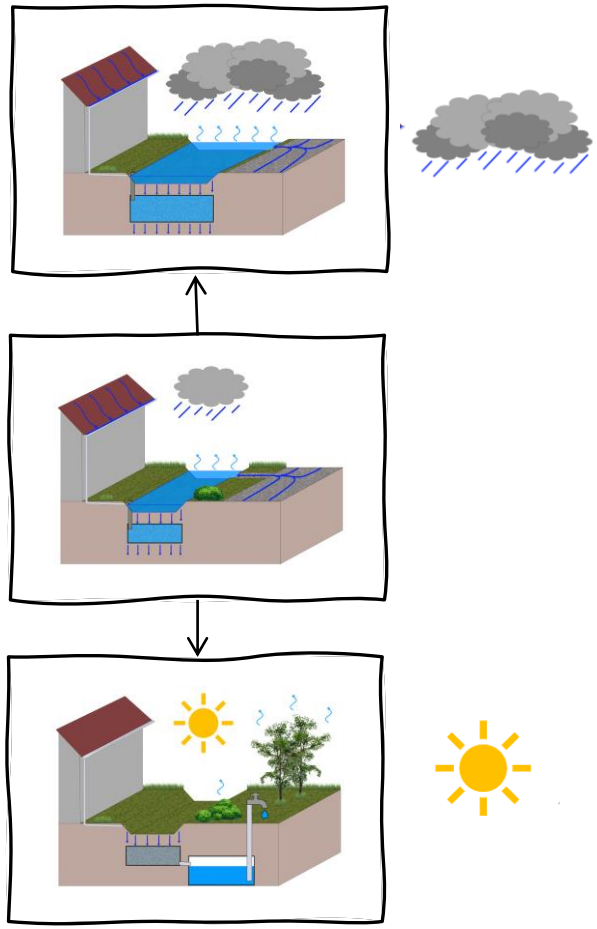
https://doi.org/10.1016/j.resconrec.2022.106578

Nature-based solutions in stormwater management



Source: World Bank 2021

Example: Through Infiltration trench system



AMAREX

AMAREX: Socio-economic assessment

Impacts water management

- Rainwater retention
- Local flood production
- Rainwater filtration
- Evotranspiration
- Infiltration

Further ecological impacts

- Climate mitigation
- Air quality
- Noise protection
- Habitat quality & biodiversity
- Ecological connectivity

Social impacts

- Urban green & recreation
- Microclimate
- Land requirements

Economic criteria

- Investment costs
- Maintenance costs
- Innovation potential

Synergies / Trade-offs

- Synergies and conflicts with other policies
- Synergies and conflicts with other measures

Implementation oriented criteria

- Implementability, political support
- Acceptance
- Flexibility re climate scenarios
- Robustness

Development of impact chains for municipal stormwater management

Multi-criteria analysis of local stormwater management options

Economic assessment of options' effects

Development of a tool for socio-economic assessment

Source: Tröltzsch et al. 2023

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Example: Impact map for nature-based solutions related to heavy rainfall and drought

Impacts water management

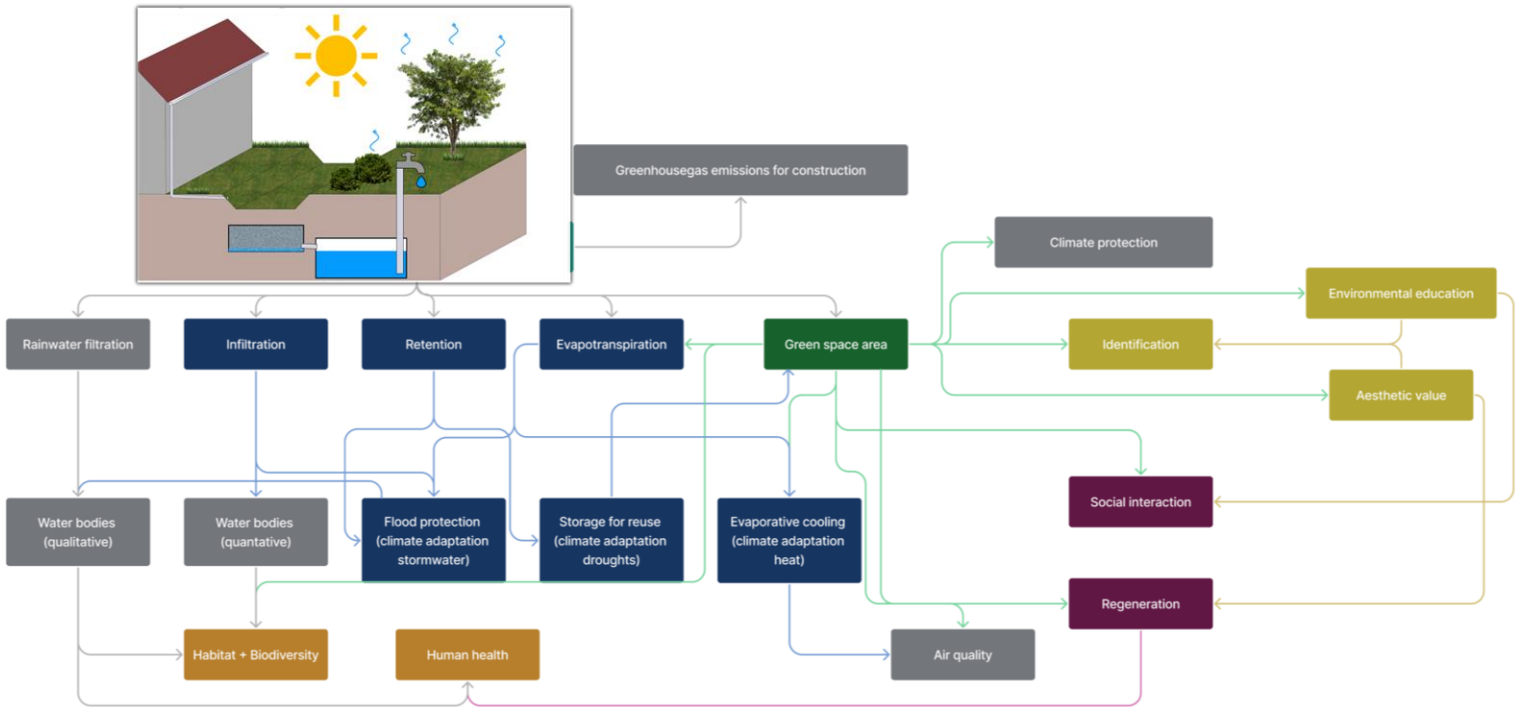
- Water regulation
- Rainwater retention
- Local flood protection
- Sediment retention
- Water quality

Further ecological impacts

- Climate mitigation
- Air quality
- Microclimate
- Habitat & Biodiv
- Pollination

Social impacts

- Urban green & recreation
- Living environment
- Scenic quality
- Health, quality of life & wellbeing
- Space for environmental education & cultural events
- Space for community activities



Source: Tröltzsch et al. 2023

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Knowledge gaps and evidence needs

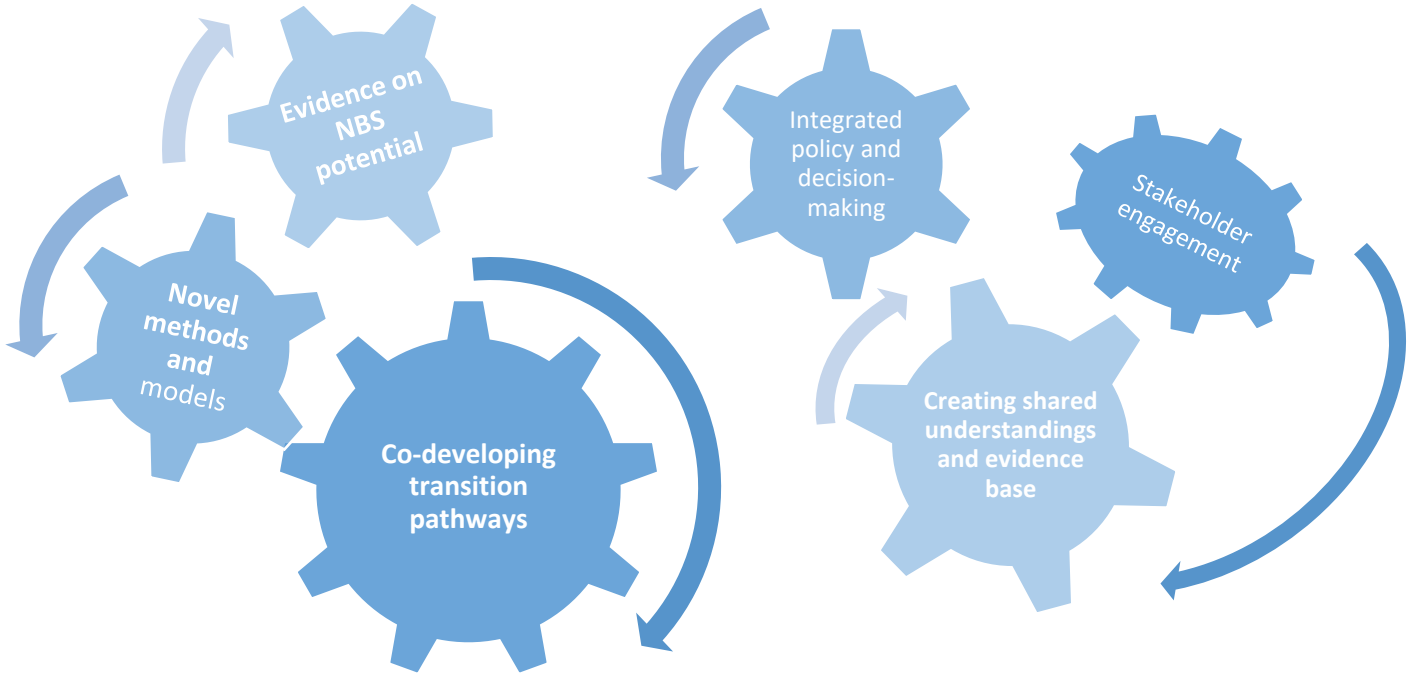
- What is the relative performance of NBS compared to conventional, 'hard' or traditional infrastructures?
- How can NBS **benefits** be quantified and monetized in different contexts and modes of implementation?
- **Upscaling**:
  - What are common economic, financial and governance challenges?
  - What are the pathways to greater implementation?
  - How can integrated socio-economic decision support systems, tools, and models be developed and tested to support NBS implementation?

Source: EC 2020

Final remarks

Speed up efforts to make our cities more resilient and adaptive!

NBS are part of the solution.



Source: Davies 2023

Thank you for your attention!

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References

Biswal, B. K. et al. (2022): Nature-based Systems (NbS) for mitigation of stormwater and air pollution in urban areas: A review. Resources, Conservation and Recycling. Volume 186

ECOSS (2019): Combined sewer overflow: how stormwater became Puget Sound's #1 source of pollution. [online] Available at: https://ecoss.org/combined-sewer-overflow-stormwater-pollution-gsi-explainer/.

EEA (2020): Urban adaptation in Europe: how cities and towns respond to climate change, EEA (2020): Urban adaptation in Europe: how cities and towns respond to climate change; EEA Report No 12/2020.

European Commission (EC), Directorate-General for Research and Innovation, Bulkeley, H., Naumann, S., Vojinovic, Z. et al., Nature-based solutions – State of the art in EU-funded projects, Freitas, T.(editor), Vandewoestijne, S.(editor), Wild, T.(editor), Publications Office of the European Union (2020) https://data.europa.eu/doi/10.2777/236007

European Environment Agency (EEA). (2012): Urban adaptation to climate change in Europe. [online] Available at: https://www.eea.europa.eu/publications/urban-adaptation-to-climate-change.

Tröltzsch, J. ; Schritt, H.; Stein, U. ; Dicke, F. (2023): Climate adaptation and urban water systems: Fostering nature-based solutions and resilient governance systems. ECCA Conference.

Davis, M. (2023): Nature-based solutions for improved water management and biodiversity conservation. Digital Blue Green Event, 14 March 2023

Oral et al. (2020). A review of nature-based solutions for urban water management in European circular cities: a critical assessment based on case studies and literature. Blue-Green Systems, [online] 2(1), pp.112–136.

World Bank (2021): A Catalogue of Nature-based Solutions for Urban Resilience. Washington, D.C. World Bank Group.

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