The UPSURGE Project Final Conference

Guiding Cities to Deliver Regenerative Urban Transformation

UPSURGE innovations – for fit-for purpose NBS implementation and upscaling

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Simon Elliott, University of Antwerp

Katowice, Poland, Feb 10th 2026

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 101003818

The UPSURGE approach

- **The aim**: to co-create, implement, and deploy NbS on demonstration sites around Europe
- **The challenge:** to address the lack of evidence-based information on the effectiveness of NbS interventions under different climatic urban environments and in response to different challenges
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  - Iterative co-creation and deployment with 'Quintuple Helix' collaborators Place Labs across whole project (and beyond)
- **The goal:** to enable effective transfer of NbS approaches from pilot or project scales to significantly larger scales

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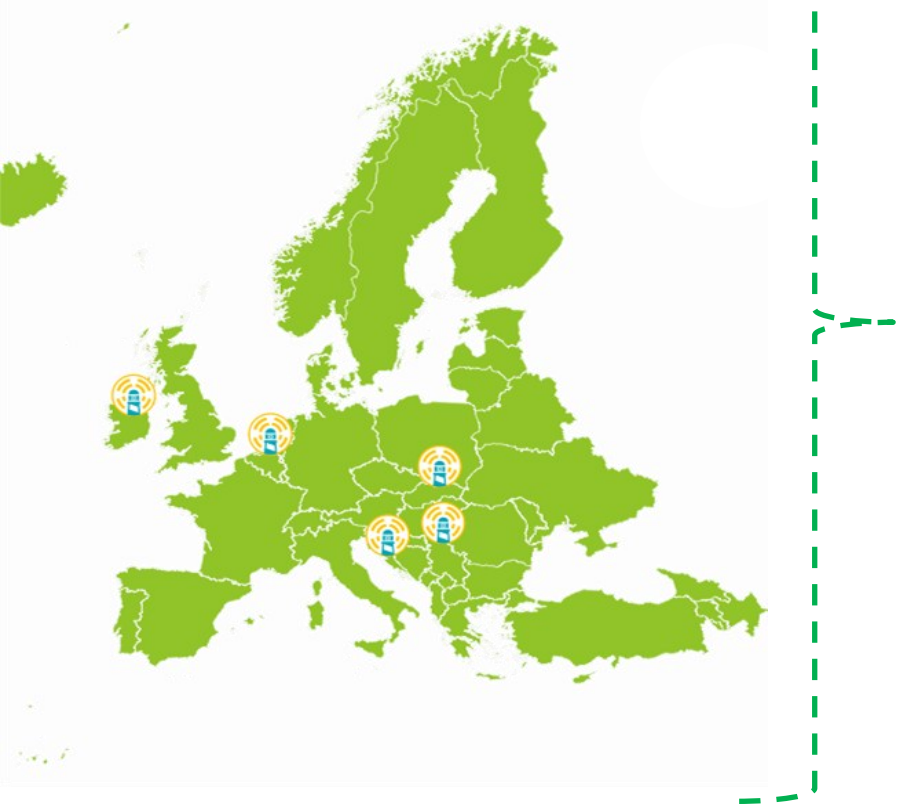
‘Urban Neighbourhoods’ - the Demonstration Cities

Demonstration City Innovative NbS Solutions



	Innovative NbS Solutions to Challenges
Belfast	A neighbourhood approach to building climate, biodiversity and urban food resilience
Breda	A city in a park - A Green Neighbourhood partnership-focussed model
Budapest	Developing a Sponge City through Climate Adaptive Raingardens
Maribor	Biophilic Urban Spatial Design: A green corridor neighbourhood approach
Katowice	Greening a city through Biophilic Urban Bus Stop Design

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Classification of Nature-based Solutions

- Nature of human intervention and ecosystem transformation
  - Engineering entirely new or modified ecosystems to address specific urban needs, such flooding, urban heat, air quality, social integration, quality of life, food security including agroecology.
    - Type III Classifcation Eggermont et al. http://dx.doi.org/10.14512/gaia.24.4.9
- Primary purpose
  - enhancing rivers (riverbank engineering), soils (bioremediation, carbon sequestration), or biodiversity (habitat conservation, urban green and blue restoration).
- Renaturation through urban jungles
  - through connected spatial units can form green corridors, greenways, green neighbourhoods.
    - Castellar et al. 2021 https://doi.org/10.1016/j.scitotenv.2021.146237

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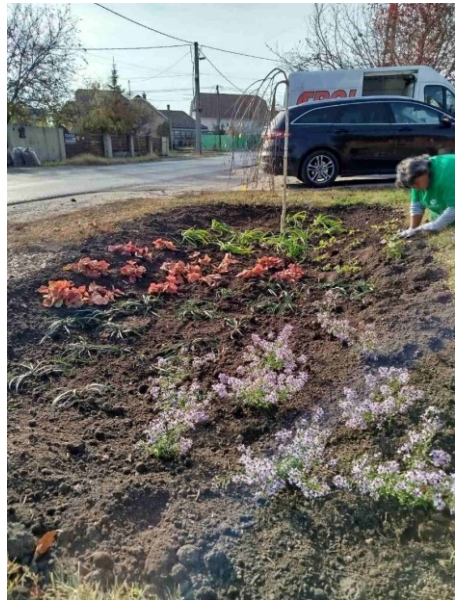
UPSURGE City NbS interventions to address Flooding and Water management

Budapest, Szálfa Street



Budapest, Tomory Museum Raingarden

Budapest, Private & Public Raingarden

Raingardens

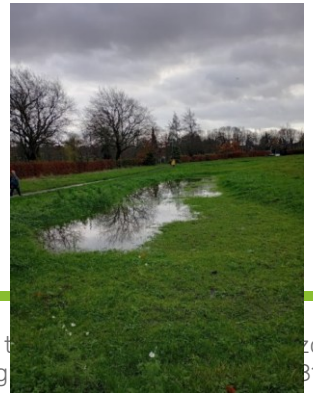
Bioswales

Flooding, Surface Runoff

Breda, Linie Zuid, Raingarden

Habitat Enhancement

Belfast



Stream bank regulation

Maribor

research and innovation program under g
318

Budapest: Developing a Sponge City through Climate Adaptive Raingardens

60 NbS interventions including:

- Public and private raingardens,
- Street-based tree trenches & bioswales,
- Gravel lawns for temporary parking spaces.

Rain Garden, Tomory Lajos Museum

Public Rain garden - Szálfa street

Challenges:

- Extreme heat and drought, followed by torrential flooding.
- Loss of plants due to heat and drought with replanting required.
- NbS rain garden structure eroded due to flooding

Response:

- Expertise in creation and adaption of raingarden approach (rainwater channels, structure, improved soil mixtures and mulching techniques, heat-resistant planting.
- Raingarden Maintenance booklet: UPSURGE resource for other cities to develop their own raingarden and bioswales NbS approach.

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UPSURGE City NbS interventions to address rising heat and air pollution: Greening the city

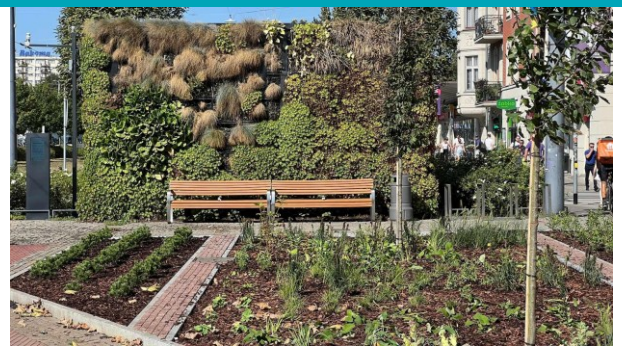
Rising Heat

Air Pollution

Breda, Linie Zuid

Budapest, Tomory Gravel lawn

Biophilic Urban Bus Stop Design



Katowice, Green Bus stop Infrastructure

Katowice, Green Market

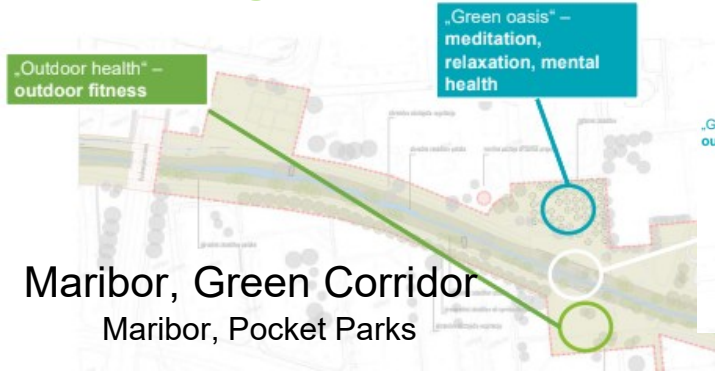
Greening neighbourhoods

Green Pervious Parking

Climate Adaptive Gardens

Belfast, A neighbourhood approach to building climate, biodiversity and urban food resilience

A green corridor approach



Maribor, Green Corridor

Maribor, Pocket Parks

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Katowice: Greening a city through Biophilic Urban Bus Stop Design



Challenge:

- Greening NbS concept based on a change from grey to green infrastructure
- Green roofs on bus stops across the city and unsealing the surrounding spaces.

Response

- Maturing plants offer increased shading, reduction in noise and wind, and mitigation against traffic and air pollution.
- Increased awareness and wellbeing through digital air quality information screens and events.

Air quality and environmental information board

Katowice Art exhibition on Biophilia

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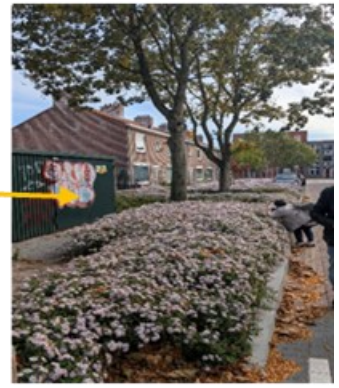
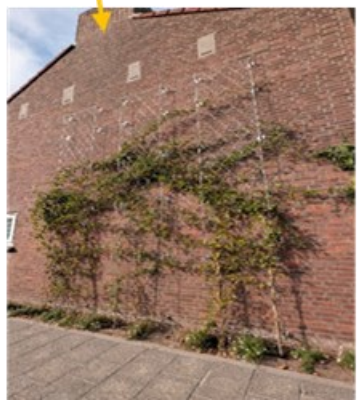
Breda: a city in a park – Renaturation through urban jungles

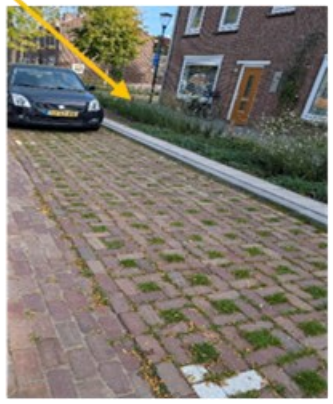
Infiltration zones/ rain gardens



Green squares and parks



Green façade or green walls



Grey to Green parking zones

A neighbourhood-focused approach

Challenge:

- Climate-Adaptive Green space design to address the challenges of heat stress and flooding,
- To increase the overall environmental quality of life for residents.

Response:

- Strengthened educational programs to foster environmental awareness from a young age.
- Facilitated schools and the municipality to explore creative ways to build social cohesion through green initiatives (Ceramic Course , City Safari , climate quiz, *Greenhopper)*.

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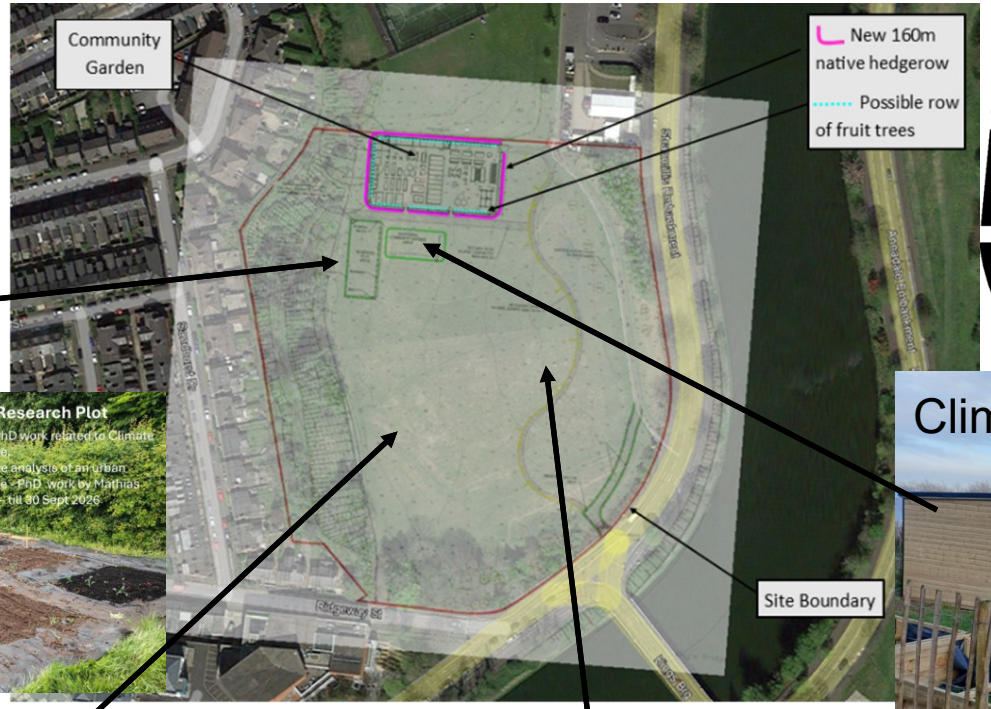
Belfast: A co-created neighbourhood approach to building climate, biodiversity and urban food resilience



GROW/CONNECT
RESEARCH/LEARN
NATURAL SYSTEMS

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Work by Dr Emma Campbell, Prof Greg Keeffe, Dr Sean Cullen

Maribor: Biophilic Urban Spatial Design: A green corridor neighbourhood approach

Planting of Green Corridor at Pekrski Potok stream bank and Green Learning Observatory in Maribor

Challenge:

- Green corridor and the Blue-Green NBS design to address the challenges of heat stress, air pollution and flooding.
- To increase the overall quality of life for residents.

Response:

- Strengthened educational programs through three pocket parks– Green Oasis, Outdoor Health and Green Learning Observatory.
- Stream regulation reduces risk of flooding Planting of vegetation with air-cleansing properties improves air quality.
- Monitoring and digital documentation for site maintenance and for public engagement Interactive map for public: Upsurge IntMap Maribor

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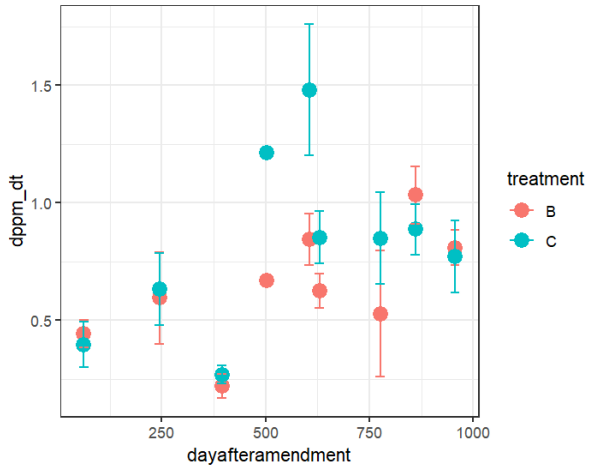
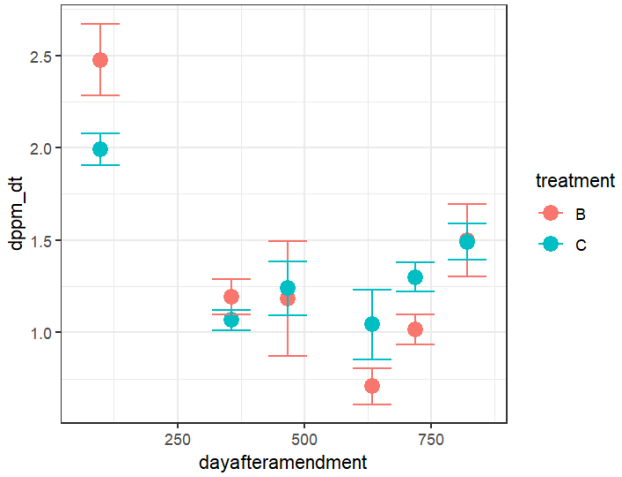
Carbon sequestration: CO_2 uptake by negative emission technologies

- Enhanced Weathering (EW) does not decrease soil CO2 in short-term

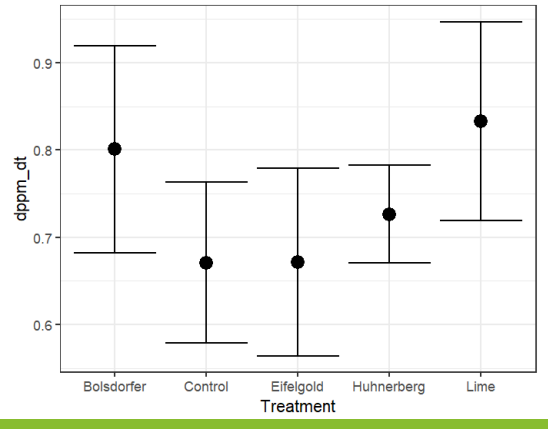
Letterbos (Belgium)

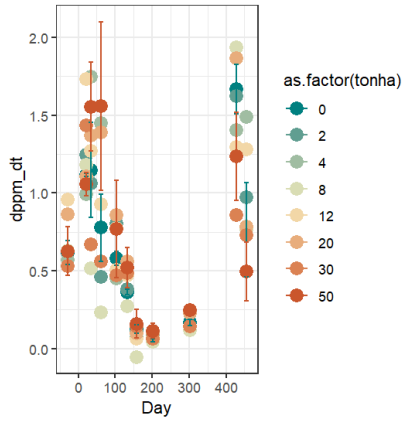


Breda (The Netherlands)



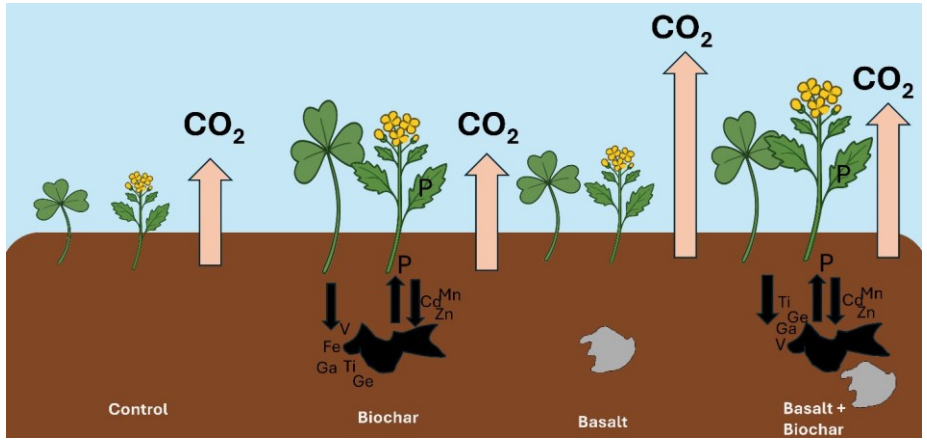
Westmalle (Belgium)





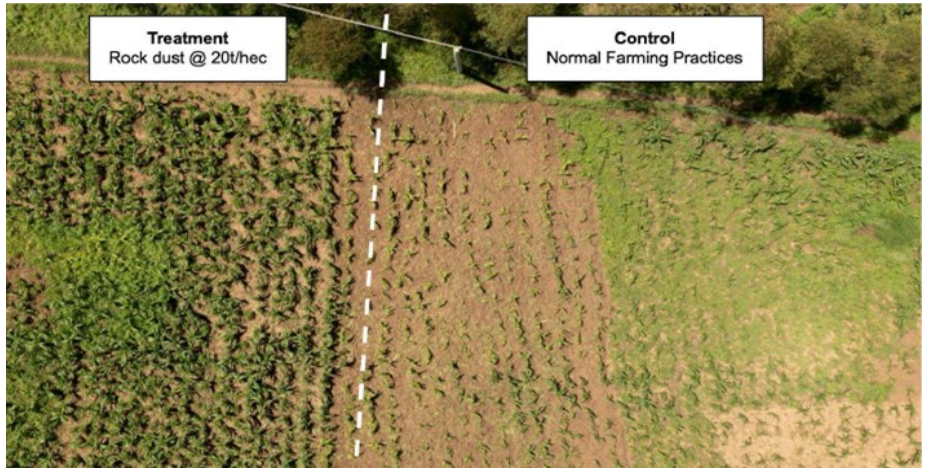
Basalt + Biocha r Paper

Belfast (Northern Ireland)



- However, in other conditions… Kisumu (Kenya)

Basalt - a good ~~fertilize~~ r



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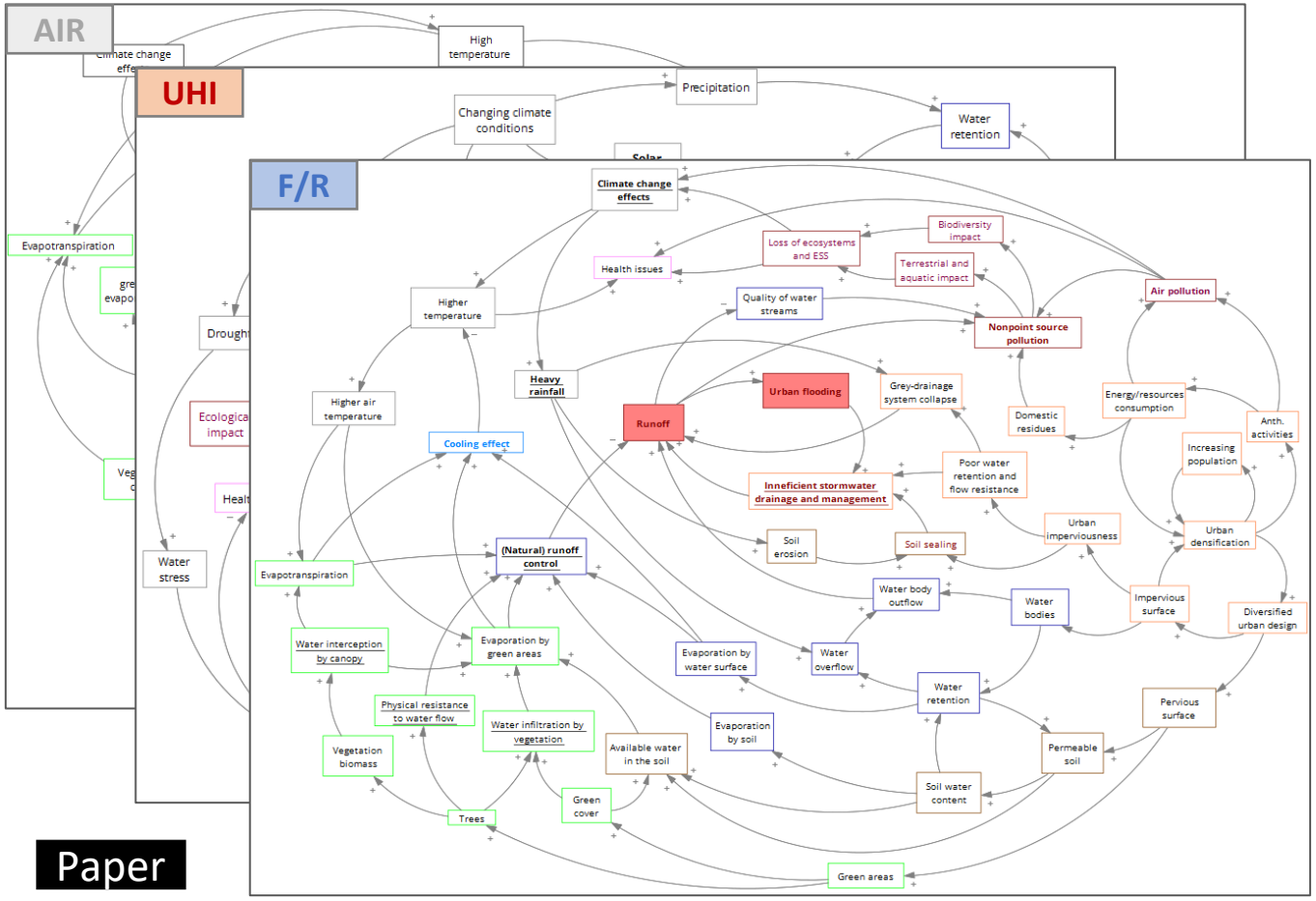
ESS – System thinking analysis of urban hazards

- Conceptual qualitative models - CLD



- Decision-making support
- Co-creation
- Promoting – common ground – decisions, and actions

What are our problems?
How can we address them?
What factors can we control?
Where should we start?

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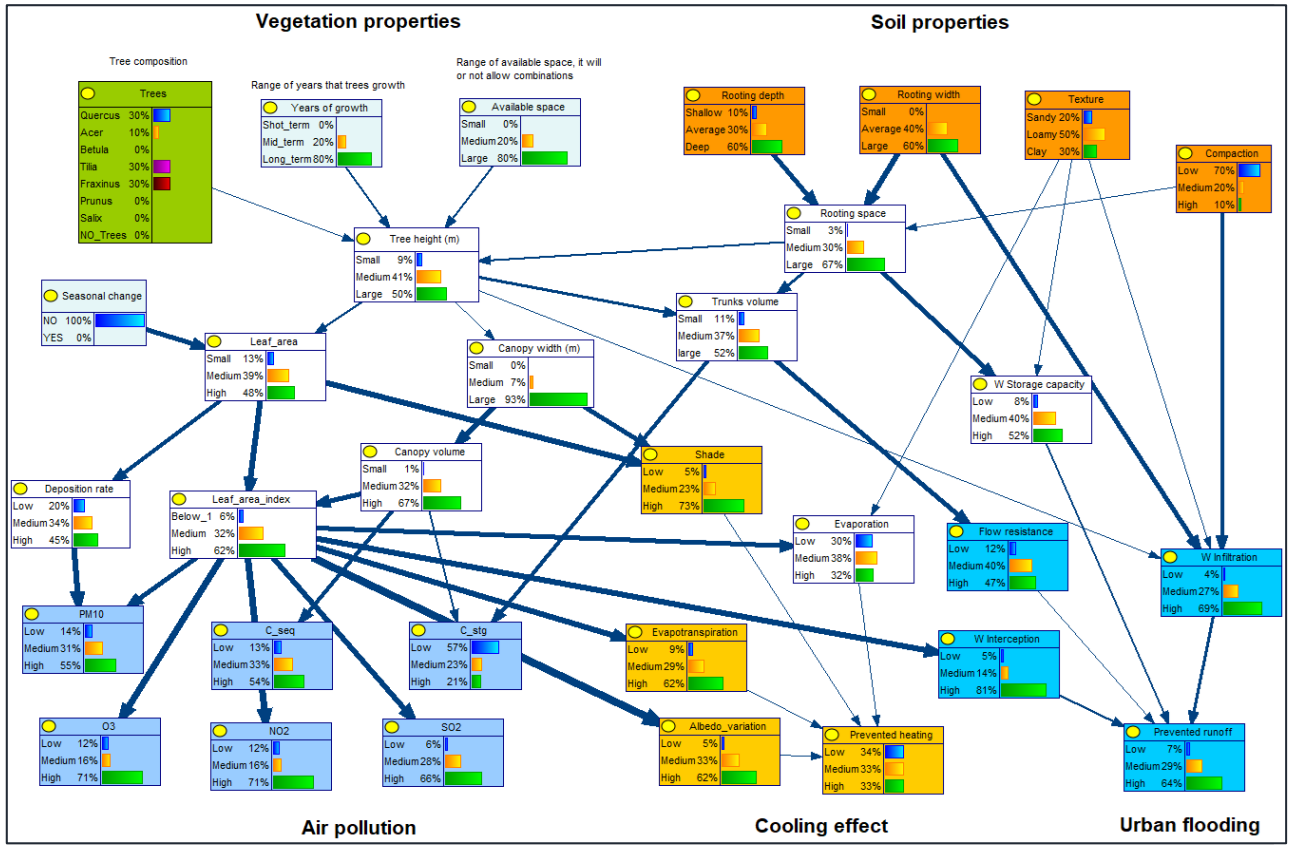
ESS – Ecosystem-supply mechanisms

- Semi-quantitative model - BN



- Modelling key regulating ESS functions
- Trade-off analysis
- Scenarios (uncertainties)
- Local conditions and context

practical use

Contribute to greening design and planification by: ESS prioritization (max desired benefit), and CBA.

A. COMPACT DENSE | B. COMPACT SPARSE | C. LONG DENSE | D. LONG SPARSE

Pictures from Kirschner et al. 2023

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Thank you

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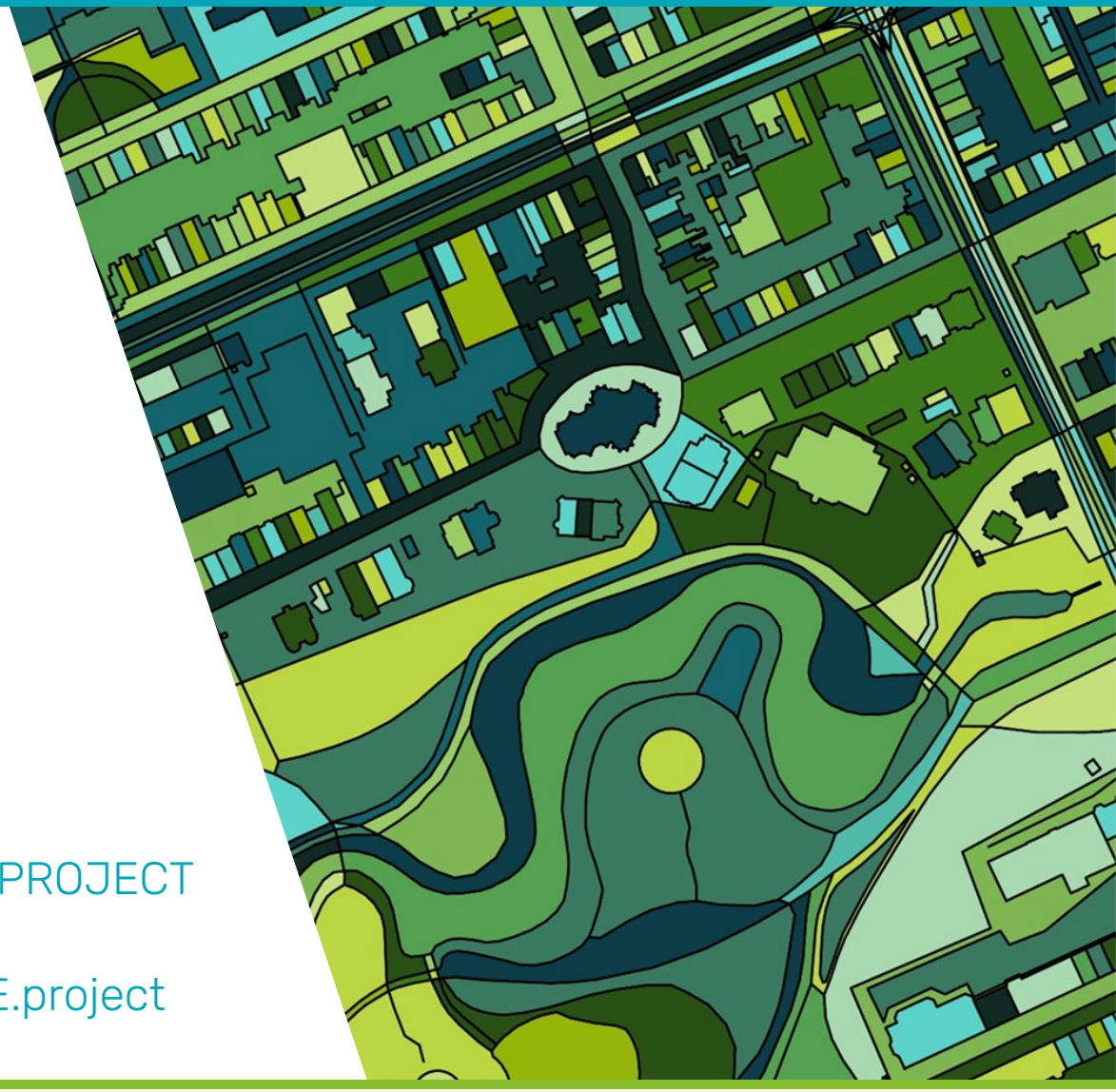
City-centered approach to catalyze nature-based solutions through the EU Regenerative Urban Lighthouse for pollution alleviation and regenerative development

UPSURGE



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