The UPSURGE Project Final Conference

Guiding Cities to Deliver Regenerative Urban Transformation

Upsurge Innovations to support Fit-for-Purpose NBS design

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

Challenge & Objective

Contribute to NBS development:

- “Fit-for-purpose” consideration (functionality)
- “Fit-for-client” customization (practical - realistic considerations)

UPSURGE GOAL: provide a verified, challenge-led ecosystem of tools

Key focus: air quality and climate remediation

A Matchmaking matrix was developed

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UPSURGE TOOL: the matchmaking matrix

The Matchmaking Matrix:
A holistic approach combining multiple tools

Inputs:

- Self-assessment
- NBS Registry
- KPIs list
- Plants catalogue

Solution:

Expert review
Matchmaking Matrix

Select specific NBS tailored to the city's challenges, coupled with KPIs and plant species

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Input #1: NBS Registry

NBS Registry Overview

Synthesizes data on NBS potential to:

- Improve Air Quality
- Improve Climate neutrality
- Others benefits (e.g. water management, …)

Compilation & Focus

- Comprehensive review of scientific literature
- Quantifies NBS performance

Key Performance Domains

AIR QUALITY

- Removal of particulate matter (PM10, PM2.5)
- Gaseous pollutants (NO2, O3)

CLIMATE NEUTRALITY

- Carbon sequestration
- Thermal regulation

NBS Registry Overview

Categorizes NBS, highlighting their primary functions

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Input #2: KPIs

Keys Performance Indicators KPIs

Alignment of Urban Challenges with the evaluation framework

Measuring impact across 5 thematic areas:

Environmental quality
- Air quality
- Water pollution
- Soil contamination

Climate resilience
- Heat island effect
- Flood risk
- Water scarcity
- Drought risk

Social & Health
- Health and wellbeing
- Gender inequities
- Age-related vulnerabilities

Socio-economic
- Employment and jobs,
- Housing
- Property values
- gentrification

Planning & governance
- Mobility
- Crime
- Regenerative spatial planning
- Community involvement

Objective: show the benefits of using NBS in cities, using Key Performance Indicators: Hard data

Key focus areas: Specifically targeting air quality and climate neutrality

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Input #2: KPIs Selection Methodology

KPIs selection

Step 1: Literature review: Analysis of existing EU projects

Step 2: Selection of KPIs by RACER (Relevant, Accepted, Credible, Easy, Robust) methodology

Relevant
Closely related to the objectives of pollution alleviation and climate neutrality

Accepted
By local authorities, stakeholders, scientific community and users

Credible
Accessible to non-experts, unambiguous and easy to interpret

Easy to monitor
Data collected with reasonable effort and cost

Robust
Not easy to manipulate

Outputs:

- List of KPIs
- Standardized KPI Cards for assessment

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Input #3: Plant Species

Optimization by plant selection

Multi-criteria Assessment for Plant Selection

Technical characterization (bibliographic review and lab experiments)

- Particle removal (PM10, PM2.5)
- NO2 absorption
- Carbon sequestration
- Pollen
- BVOC emission

Database

140+ species characterized for their phytoremediation properties

Keys findings:

- Superior performers for particle removal
- Top performers for gaseous pollutants
- Strategic design tips
- Constraint management

Scientifically selecting the **right plant** for the **right pollutant.**

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Matchmaking Matrix

Self-assessment

Registry

Describes NBS benefits and functionalities

+

KPIs

How to assess, monitor NBS performances

+

Plant Catalogue

How to optimize NBS benefits by plant species selection

Matchmaking matrix

Propose appropriate NBS for specific city's challenges

Verified by assessments from demo cities like Belfast, Breda, Budapest, Katowice, Maribor, Patras and Prato

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Matchmaking Matrix

How it works

1

City Self-Assessment

Partners fill out a detailed questionnaire covering 40+ specific topics (Climate, Soil, Mobility, Social)

1) What is the area of your city? [km2]	• Urban: 125.4 • Metropolitan: 2,928.717	36	164,6
2) What is the population of your city? [person]	Population (2011) • Municipality: 213,984 • Urban 167,446 • Urban density 1,300/km2 • Metro 314,567	101.893 (2018 data)	290.553
3) Elevation above sea level /// m ///	A: 80 H: 1.926 L: 0	A: 130 H: 145 L: 115	A: 300 H: 357 L: 245
4) Yearly avarage temperature /// °C ///	2010 : 15,3 2015 : 15,8 2020: 16.3	12.7 / 11.0 / 11.4 / 13.3 / 13.2	9,3 / 8,9 / 9,1 / 9,7 / 9,9
4.a) Winter avarage temperature /// °C ///	2010 : 10,3 2015 : 11,1 2020: 10.8	1.7 / 0.6 / 0.9 / 3.6 / 4.4	5,3 / 4,6 / 2,8 / 4,3 / 4,5
4.b) Summer avarage temperature /// °C ///	2010 : 23,5 2015 : 24,2 2020: 25,7	21.9 / 20.4 / 22.0 / 23.9 / 22.7	13,4 / 12,2 / 13,3 / 13,7 / 15,2
5) Avarage relative humidity /// % ///	72	72	77.2
6) Yearly avarage precipitation /// mm ///	2010 : 16,8 2015 : 16,4 2020: 17,2	389 / 696 / 815 / 599 / 523	686
7) Monthly average precipitation (from Jan to Dec) /// mm ///	5,0 / 28,5 / 19,7 / 11,0 / 1,4 / 0,0 / 0,0 / 0,0 / 3,0 / 13,5 / 36,7 / 45,2	10.5 / 23.5 / 37.5 / 2.7 / 10.6 / 91.9 / 62.7 / 113.2 / 26.4 / 90.2 / 22.3 / 31.0	51.6 / 38.9 / 49.1 / 41.8 / 70.9 / 73.4 / 106 / 77.4 / 67.1 / 43.5 / 5 40.6
8) Total private & public green area in your area? [m2]	1.700.000	180,000	86.350.000
8.a) Total public green area in your area? [m2]	Patras small forest : 411.371,65 Agia Park : 437.248,86 Platanus forest : 71.537,72 South Park : 69.378,08 Skagiopoulleio : 35.019,81 Total : 1.024.556,12	23840000	36267000

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Matchmaking Matrix

How it works

1 **City Self-Assessment**

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2 **Challenge identification**

Analyzing responses to identify hotspots (e.g., “Soil Pollution Hotspot”, “High car usage”)

3 **The Matrix Match**

Mapping specific challenges to the NBS registry
Suggest potential green solutions

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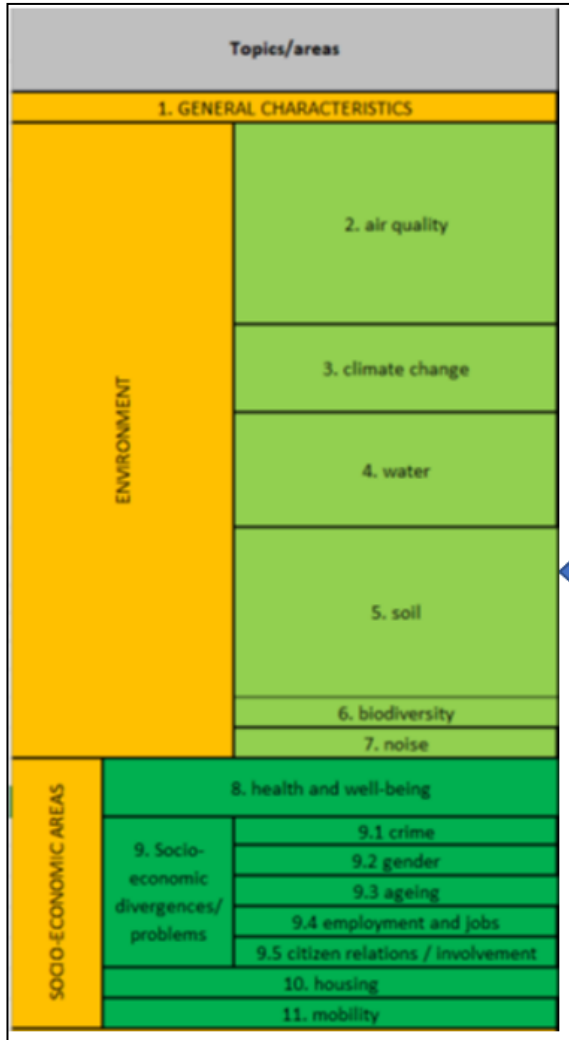
Matchmaking Matrix



10 areas derived from the 17 topics defined in the proposal

+ Area 1 (general characteristics) is to take into account city specific aspects

Challenges are pre-defined for the matrix, cities are able to choose the relevant ones as a result of answering to the self-assessment questions of the matrix

	Challanges list	
1	general	very high population density
		elevation - very high so slopy or very law, so water problems
		temperature rise
		humidity increase/decrease
		precipitation decrease
		few green spaces
		decreasing rate of green spaces
		bad accessibility of green spaces
		few trees - low level of leaf area
		high rate of private greens without influence on management
2	air quality	no proper measurement network
		NO2 limit value exceedance / hotspot
		PM10 limit value exceedance / hotspot
		PM2.5 limit value exceedance / hotspot
		SO2 limit value exceedance / hotspot
		O3 target value exceedance / hotspot
		specific AQ problem related to domestic heating
		specific AQ problem related to traffic
		specific AQ problem related to industry
3	climate change	event of torrential rains
		events of flash floods
		event of destructive windstorms
		event of heat waves
		event of cold waves
		wildfire events
		drought
		heat islands
4	water	polluted surface water (lake, pond)
		eutrophication
		polluted surface water (stream, river)
		polluted groundwater lens
		irrigation problems (vandalism, high water consumption, high cost etc.)
5	soil	low water retention capacity
		soil pollution hotspot - CH
		soil pollution hotspot - heavy metals
		soil pollution hotspot - pesticides
		low organic matter content of soil
		soil compaction issue
		soil erosion hotspot
		high rate of sealed surfaces

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Matchmaking Matrix

Topics/areas		Identified challenges	Explanation on the matching NBSs
	air quality	no proper measurement network	If at a certain area no measurement points are established, complementary methods, such as bioindicators (e.g., moss) or alternative sensing (e.g., bee sensing) could be used to identify air quality problems
		NO2 limit value exceedance / hotspot	In general, all new green areas can contribute to decreasing air pollution levels; optimal solutions can be selected if the most relevant sources of the pollution can be identified. For example, hedges, fences, tree lines can be very useful in the case of traffic related pollutions and for certain industry pollutions; green facades and living walls are suggested to be helpful in PM pollution cases etc.
		PM limit value exceedance / hotspot	
		SO2 limit value exceedance / hotspot	
		O3 target value exceedance / hotspot	
		specific AQ problem related to domestic heating	
		specific AQ problem related to traffic	
		specific AQ problem related to industry	

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3 **The Matrix Match**

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4 **KPI Selection**

Assigning monitoring indicators (e.g., NO2 reduction, runoff coefficient) to ensure measurability

Plant Species Selection
optimization of air quality and climate remediation

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Conclusion

Process

The matchmaking process consists of the following steps:

1. Questionnaire for self-assessment: basis of the evaluation
2. Expert assessment of the environmental and socio economic status of the cities
3. Identification of the main potential challenges
4. Match process with NBS registry, KPIs and plant species

Results

- Assistance to cities to define challenges
- Suggestion of NBS, plant species and KPIs

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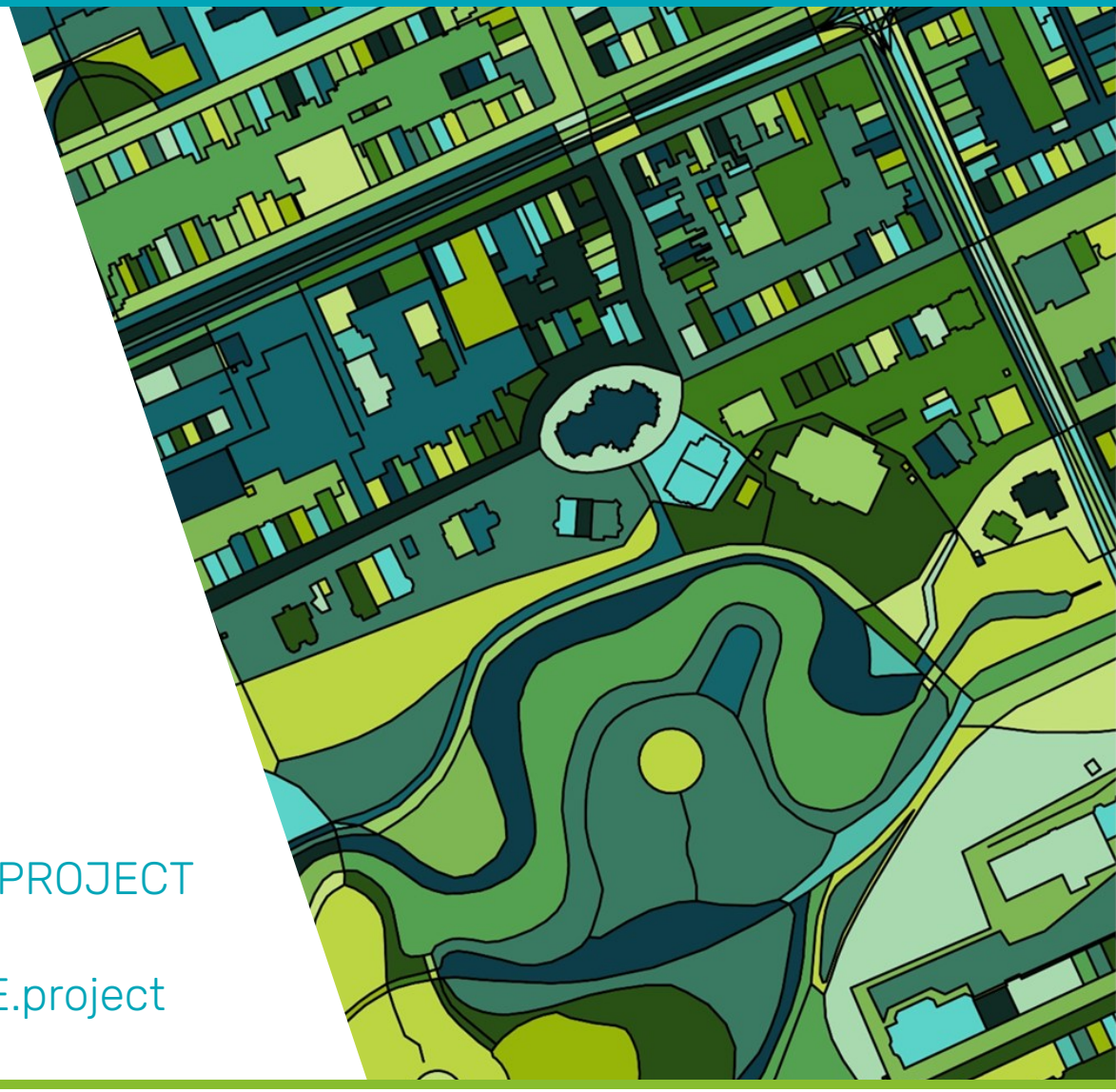
City-centered approach to catalyze nature-based solutions through the EU Regenerative Urban Lighthouse for pollution alleviation and regenerative development

UPSURGE



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