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The importance and challenges for nature based solution in urban water management

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„ Treatment wetlands for water pollution control”
2016-2020

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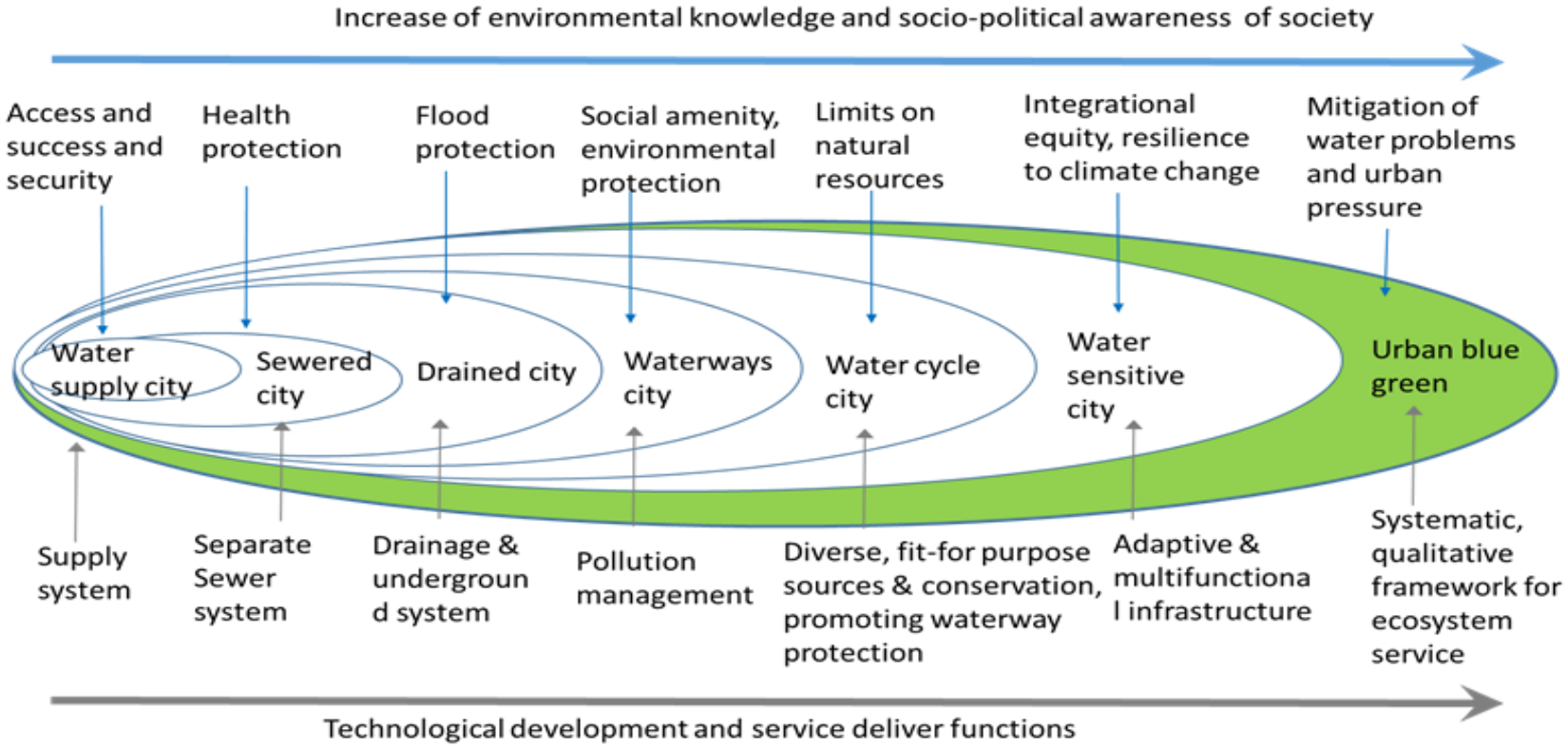
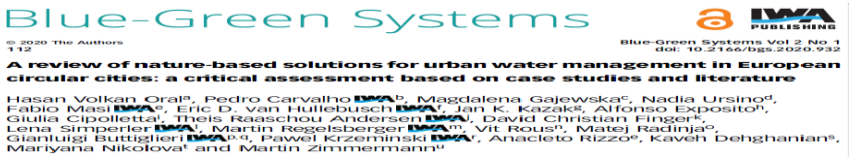
It’s always good to know where we are

Develpment of water managment



improved on Brown et al, 2009 and Blue Green Solution, 2017


Blue-Green Systems

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A review of nature-based solutions for urban water management in European circular cities: a critical assessment based on case studies and literature

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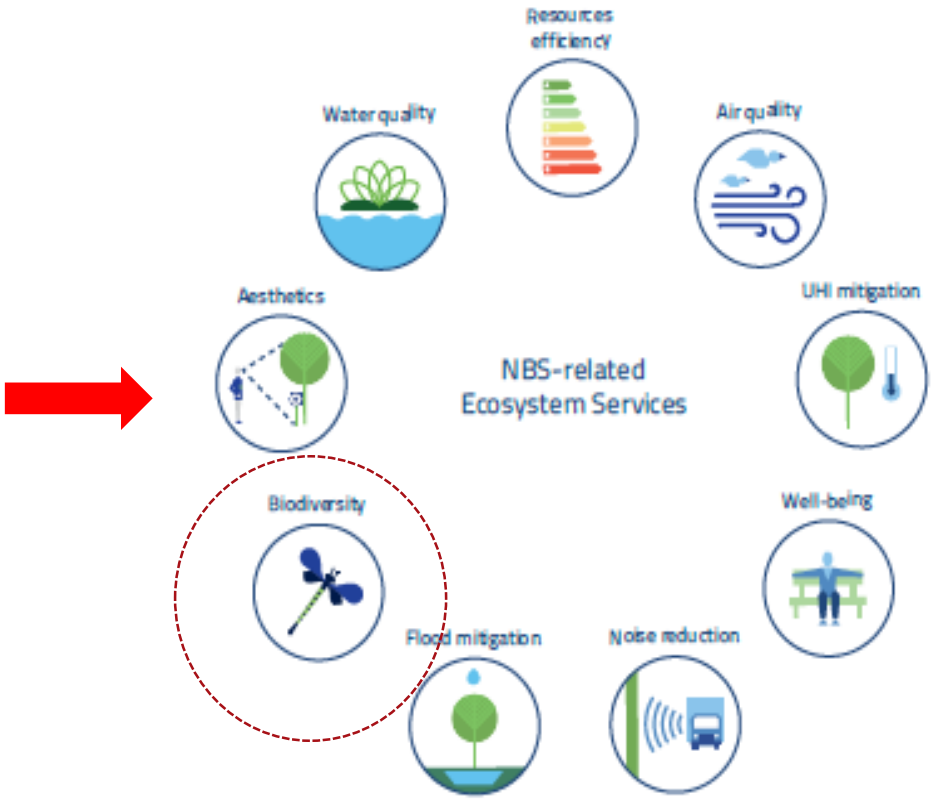
NBS - technical/ engineer solutions inspired by nature

Urban preasure and NBS related ecosystem service



Blue Green Solution, 2017; Oral et all., 2020

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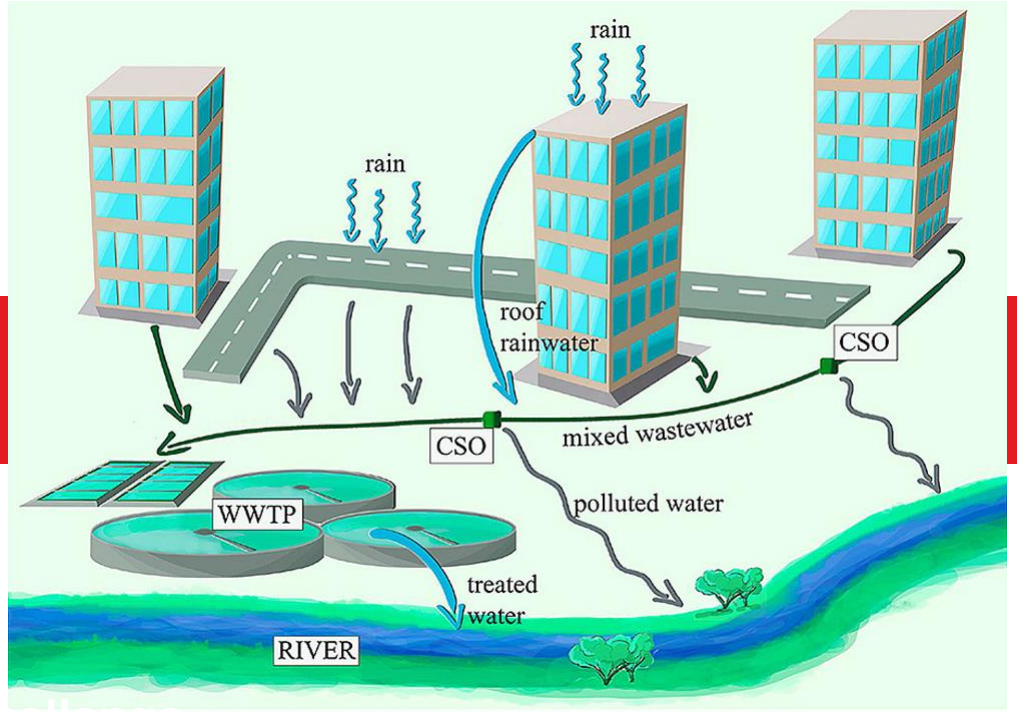
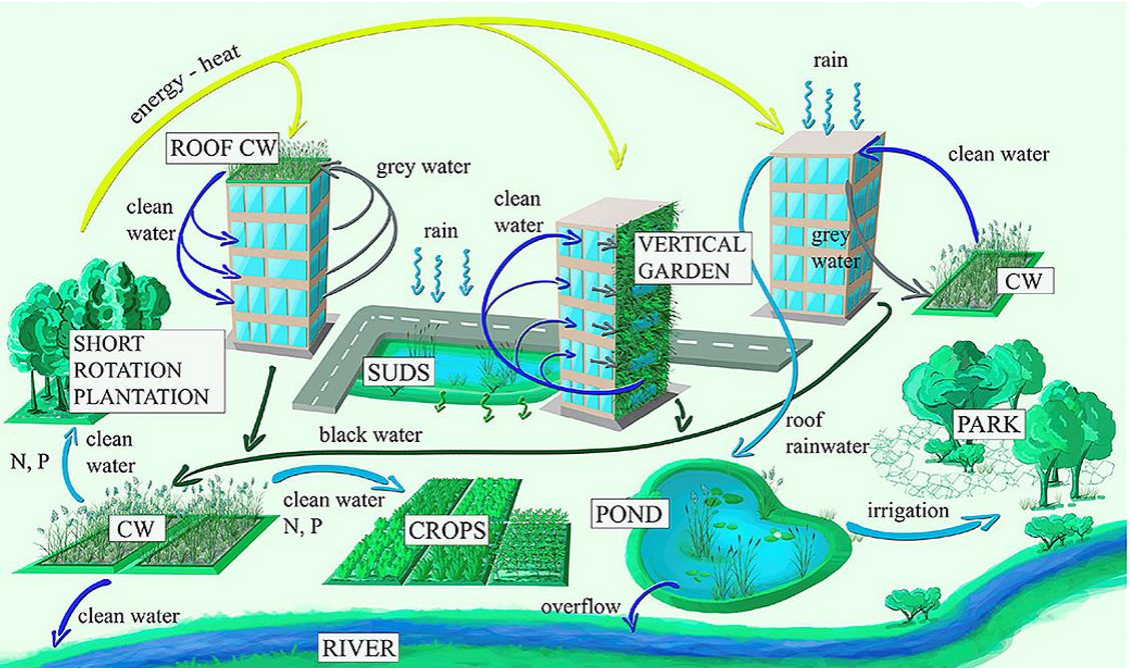
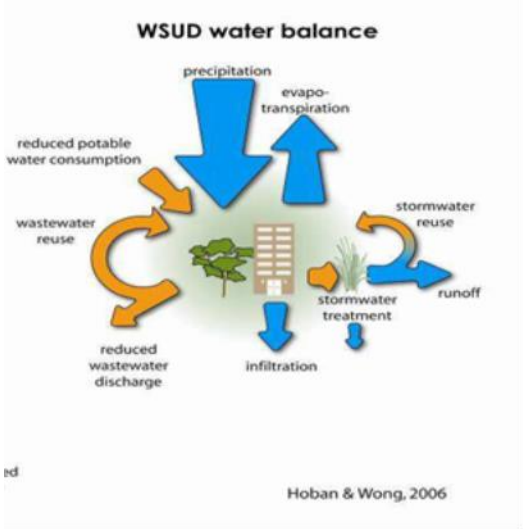
Challenges for NBS







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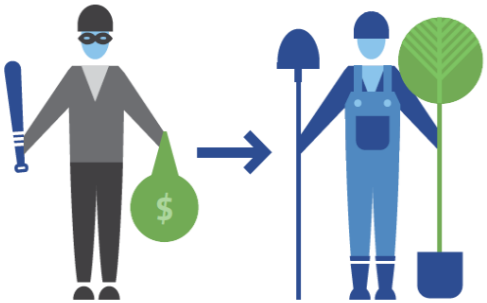
Examples of BG synergies and their benefits

Improved Urban Environment

Biodiversity



Job Creation

Living Environment Quality

Blue Green Solution, 2017

Grey and rainwater

Gray and rainwater - sustainable water management in BORGO VERDE, Italy

Design assumptions:

1. Gray wastewater - kitchen and laundry
Quantity - 15m ^{3} / d - single-stage HF -CW with an area of 230m ^{2}
After UV disinfection - recycled to flush toilets

2. Rainwater – 15m^3 / d – single-stage VF-CW with an area of 50m^2 – watering the greenery.

Possibilities

Green walls / VERTICAL GARDENS

Beirut, by Patrick Blanc

- Air filtration + O_2 production and CO_2 storage
- Reduced energy costs + positive microclimate effects
- Increased biodiversity
- Reduced noise pollution
- Increased building longevity
- Aesthetics

◆ Wastewater treatment?

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Scale of intervention

Urban

Peri-urban

Extra-urban

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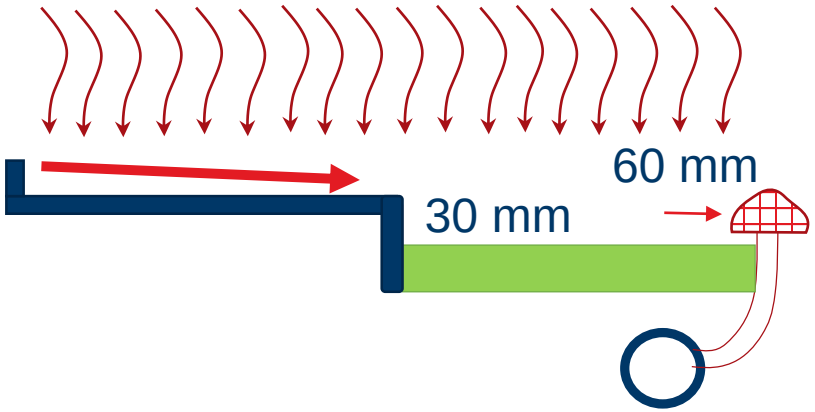
Smart stormwater management based on NBS

Efficient stormwater urban surface retention system must provide retention in many dimensions, in which all retention levels are equally important and complementary to one another.

Such multi-level retention should provide as many ecosystem services as possible and create sustainable environment for human activities.



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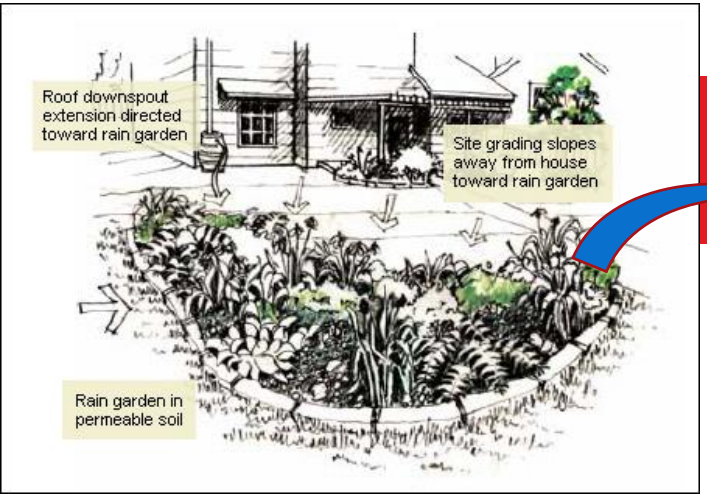
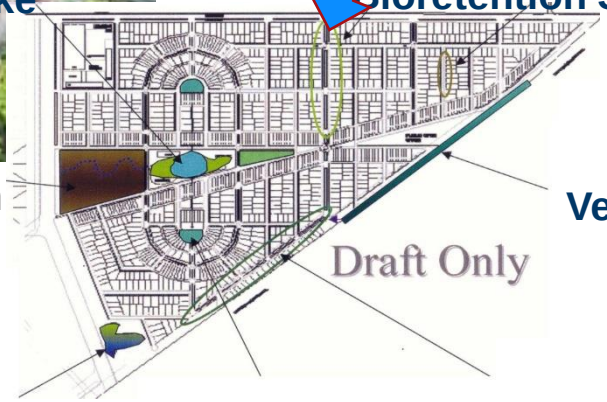
Multi-level retention retention form house to district



Commbined vessels

Lake

Bioretention System



Wetland System

Vegetated Swale

Wetland System

Rain Garden

Bioretention System

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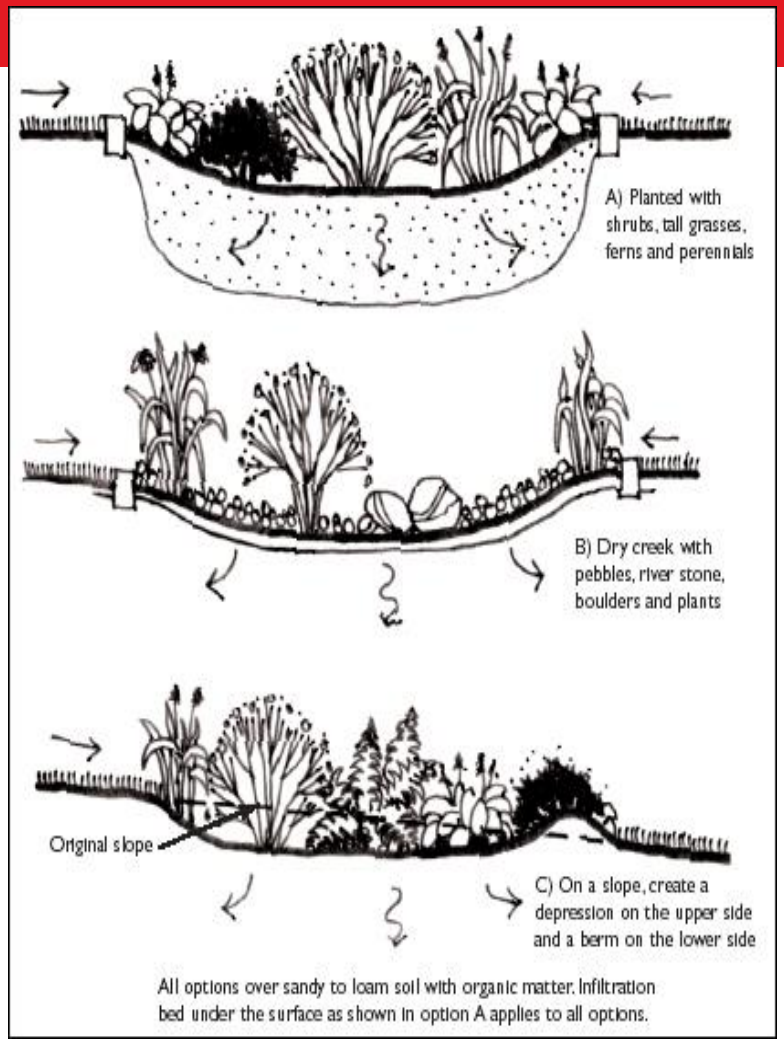
TYPES of Rain Gardens & proper PR & advertisement

creating a demand for NBS



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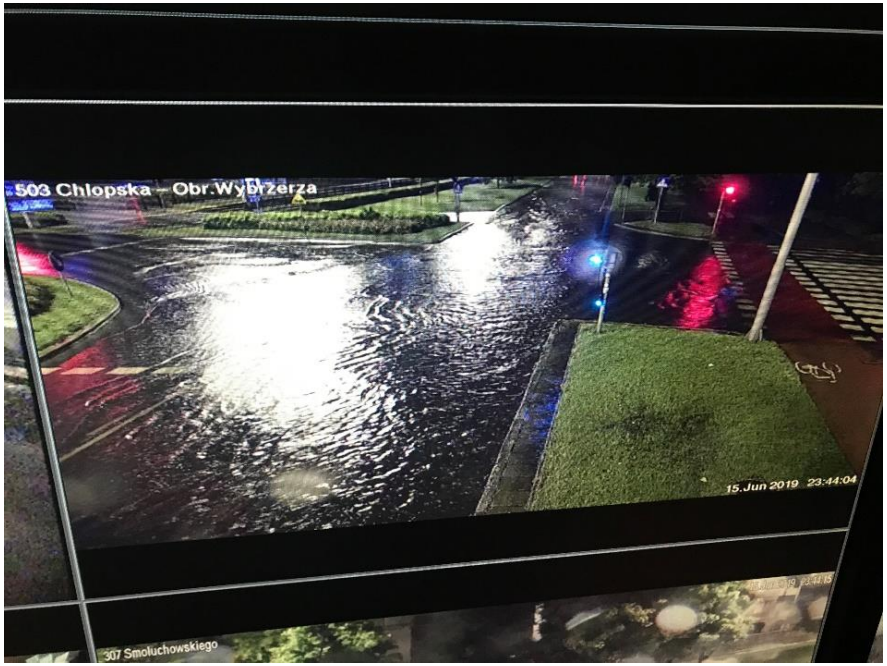
Gdańsk, streets , 15/06/2019 at 23.44 III degree heavy rain, Gdańsk Brzeźno Station 21.7 mm in 30 minutes

STREET AND ROAD DESIGN IS STILL A PROBLEM



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Rainwater and retention reservoirs' in Gdańsk , over 50 in Gdańsk

Only rain water from stormwater network

Retention reservoirs' on streams', wet and semi-wet

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Single , simple action matters

FLOWER MEADOWs in Gdańsk - 7500 m ^{2} maens 50m ^{3} which is 3 times more and equal to buliding one new reserwuar

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Construction of rain garden in place of monoculture like green grass

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Visualization (2019) and construction (2020)

Different plant species +insect houses

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CONCLUSIONS

The maximum use of BG infrastructure like rain gardens, green roof, grassy troughs for rainwater retention.

Turning the urban greenery into blue –green infrastructure

No monoculture in the city

The approach to storm water management in the road and streets must be changed – green infrastructure should be use to retain and delay the effective outflow of storm water

Creating a mod for NBS and in consequence a biodiversity

AND tools to implementation

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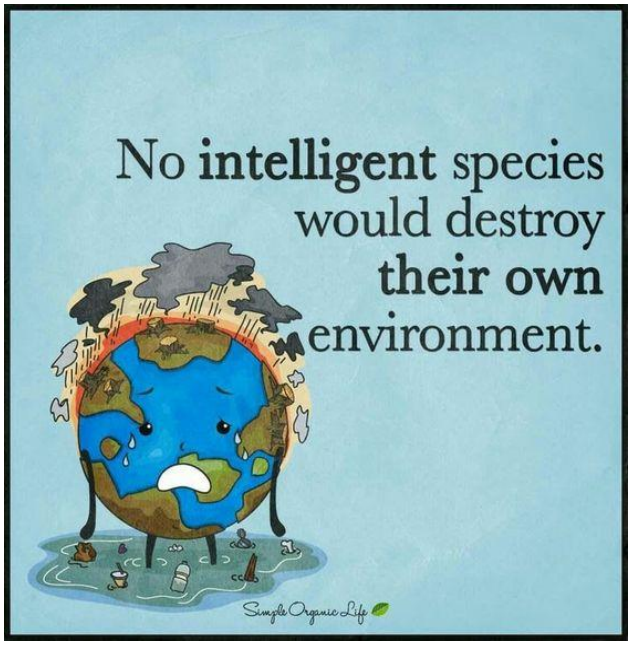
HISTORY IS WISDOM
FUTURE IS CHALLENGE



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Tools for implementation

Flood Screener - The program is a simplified product and does not take into account the hydrological processes as infiltration, evapotranspiration or interception, the presence of rainwater drainage and retention reservoirs in the analysis

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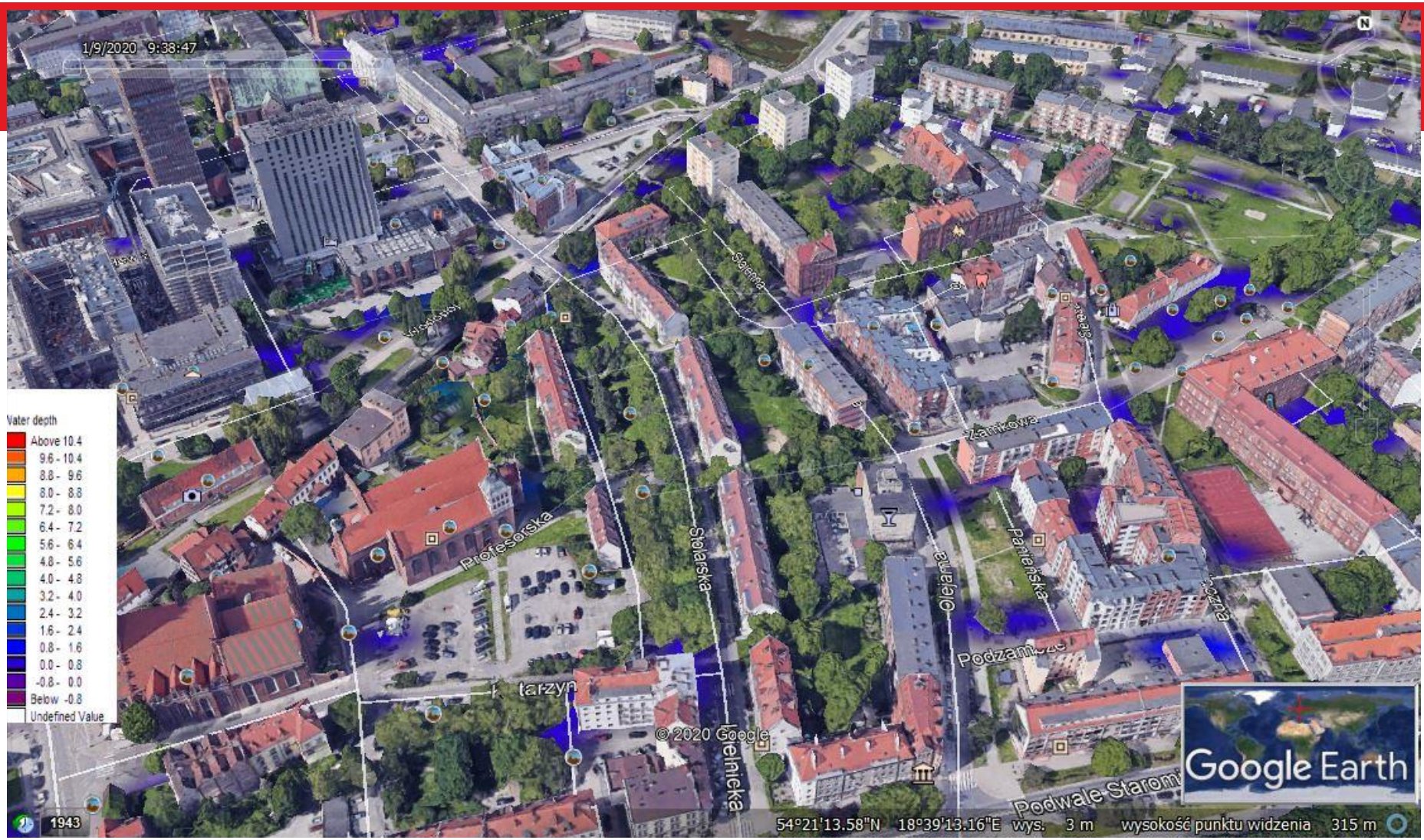
Tools for implematation



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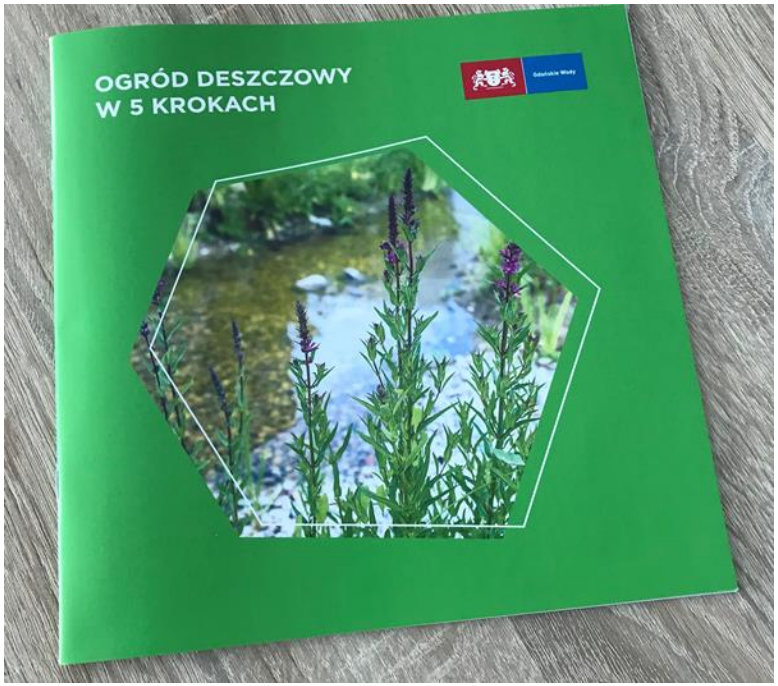
Educations



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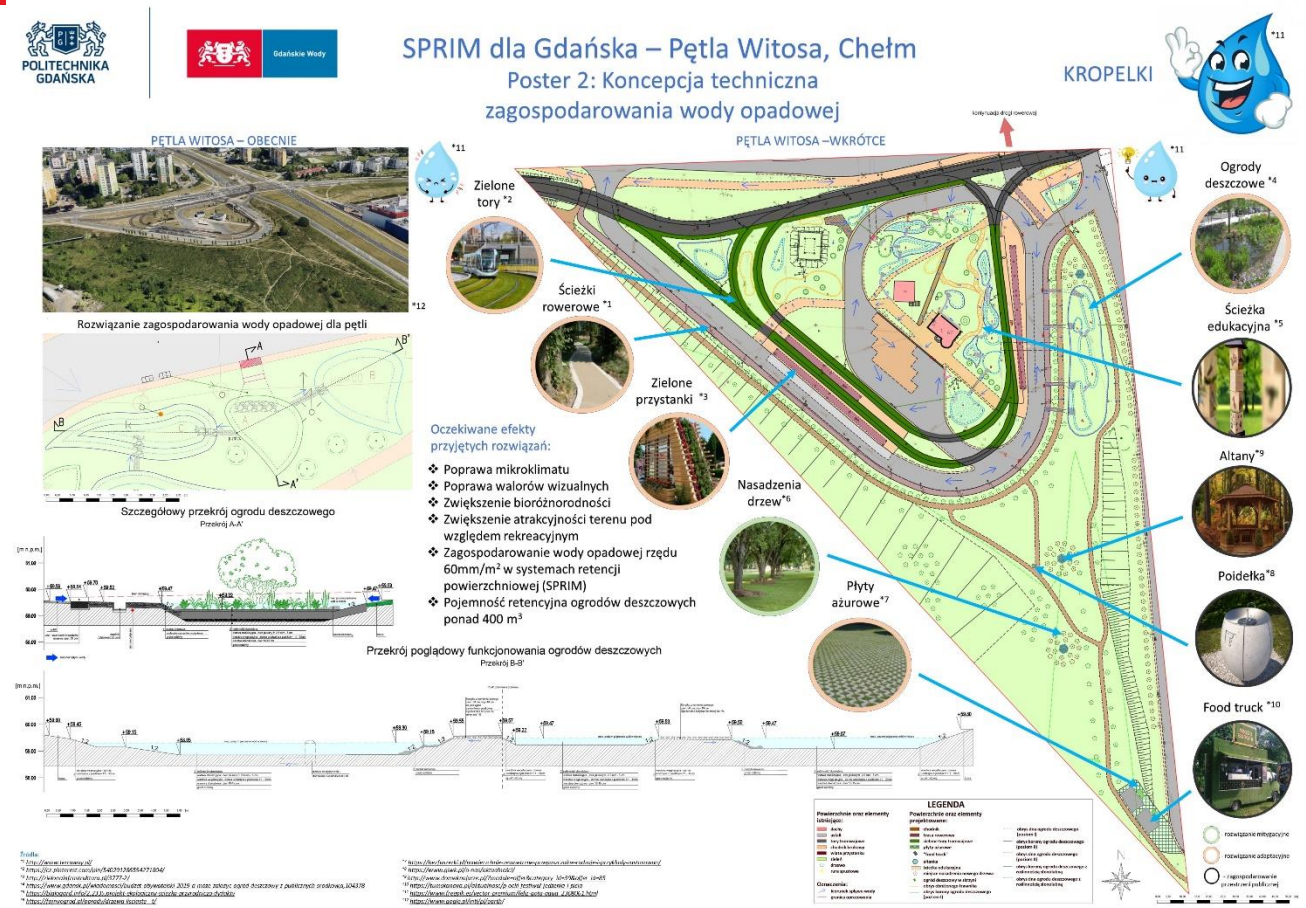
Educations

student group projects -specific task solved under the supervision of teachers and the company



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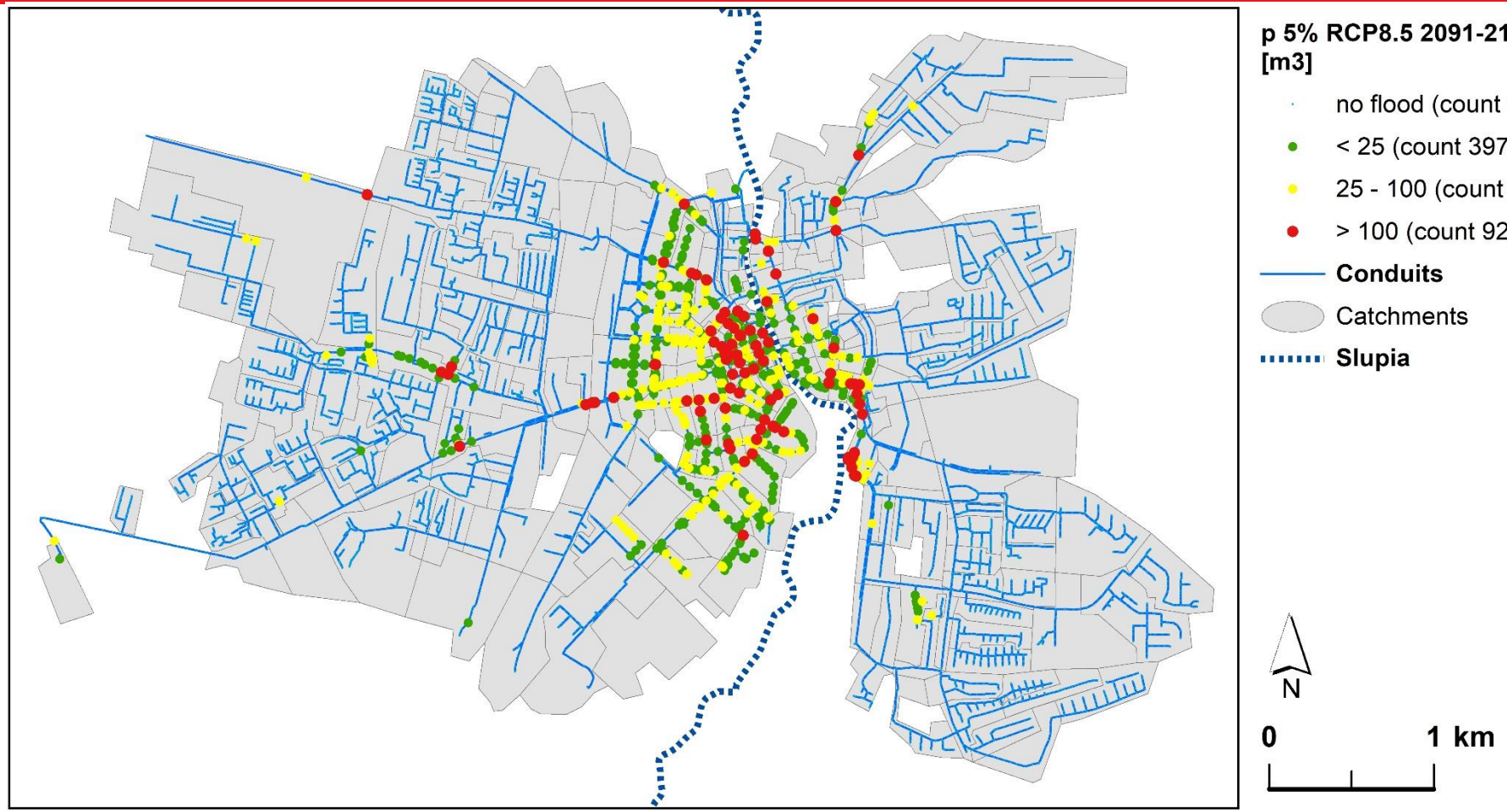
EWL – Extreme Weather Layer result from NOAH project welcome to seminar 9-10 June 2021



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CONTRA 6b- FERTIWRACK, final seminar 1 & 2 June 2021

Converting Beach Wrack into Product by means of Reed Treatent Beds

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Challenge

The IWA Principles for Water Wise Cities

17 Principles for Water-Wise Cities

4 Levels of Action

1 Regenerative Water Services

- Replenish Waterbodies and their Ecosystems
- Reduce the Amount of Water and Energy Used
- Reuse, Recover, Recycle
- Use a Systemic Approach Integrated with Other Services
- Increase the Modularity of Systems and Ensure Multiple Options

2 Water Sensitive Urban Design

- Enable Regenerative Water Services
- Design Urban Spaces to Reduce Flood Risks
- Enhance Liveability with Visible Water
- Modify and Adapt Urban Materials to Minimise Environmental Impact

3 Basin Connected Cities

- Plan to Secure Water Resources and Mitigate Drought
- Protect the Quality of Water Resources
- Prepare for Extreme Events

4 Water-Wise Communities

- Empowered Citizens
- Professionals Aware of Water Co-benefits
- Transdisciplinary Planning Teams
- Policy Makers Enabling Water-Wise Action
- Leaders that Engage and Engender Trust

5 Building Blocks

Vision | Governance | Knowledge & Capacity | Planning Tools | Implementation Tools

Figure 1: The "Principles for Water-Wise Cities" Framework: four Levels of Action and five Building Blocks for urban stakeholders to deliver "Sustainable Urban Water" in their cities