

# Integrated Decision Support System for NBS: monitoring, modelling and planning



Promosso e co-organizzato da



con la co-organizzazione di



e con il patrocinio della



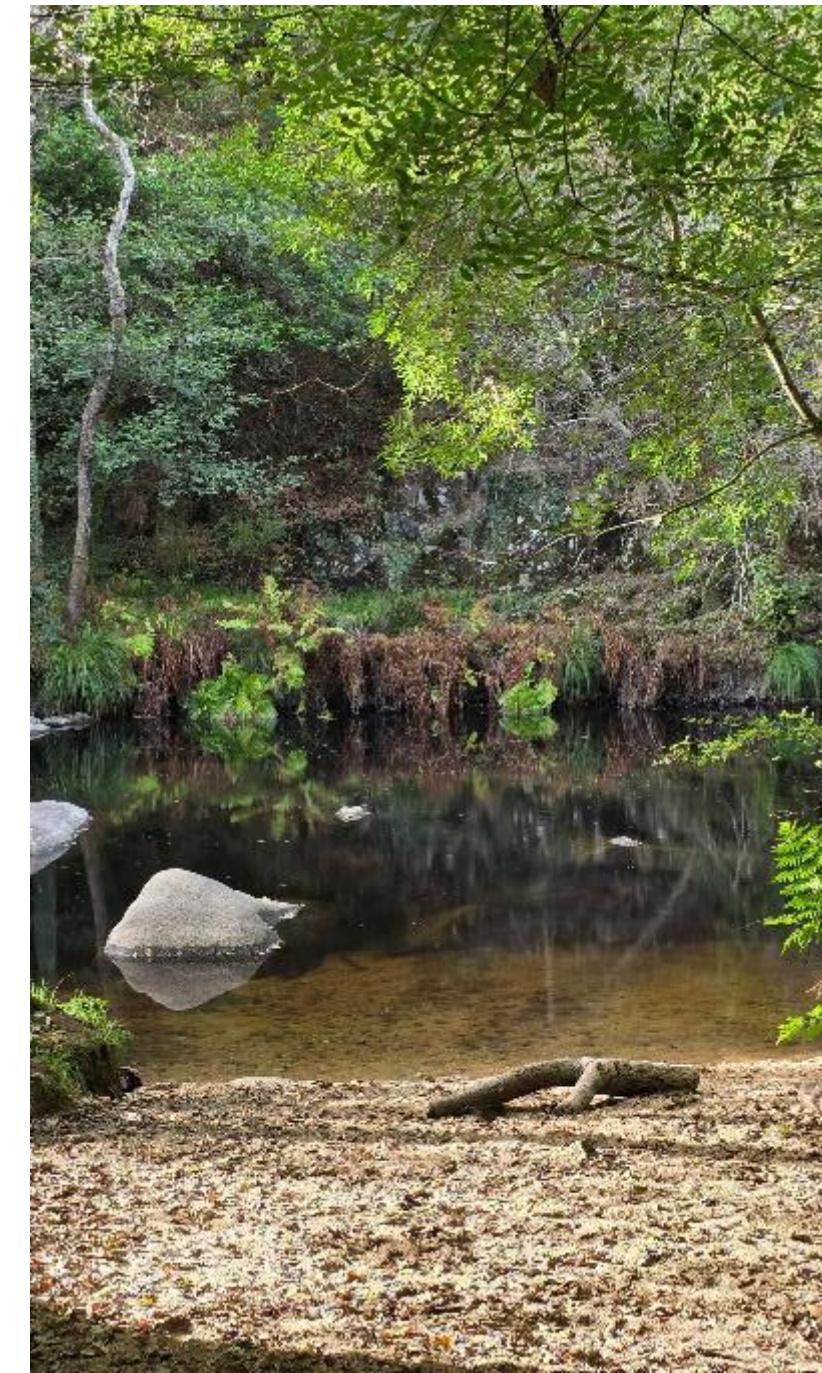
itg

. grow  
. transform  
. imagine

- Perception vs. Reality
- Legal Framework
- Perspective
- Experience
- The DSS in a Nutshell

Perception  
vs.  
Reality

**Triple Crisis & NBS**





+ Pollution



+ Extreme Events



- Biodiversity





Nature Base Solutions  
(NBS)

Reduction



Mitigation

Recycling





**Legal Framework**

**UE Legal Framework  
&  
Water**

Domain	Key Instrument
Integrated management	Water Framework Directive
Drinking water	Drinking Water Directive (2020)
<b>Sanitation</b>	<b>Urban Waste Water Treatment Directive Directive (UE) 2024/3019</b>
Bathing	Bathing Water Directive
Groundwater	Groundwater Directive
Chemicals	EQS Directive
Industry	Industrial Emissions Directive
Agriculture	Nitrates Directive
Marine	Marine Strategy Framework Directive
Reuse	Water Reuse Regulation
Floods	Floods Directive

**Perspective**

**Multistakeholder &  
Technical**



OPERATIONAL  
& STRATEGIC



RISK  
ASSESSMENT



POLICY-  
MAKING



SOCIAL

Perspective

The end Users

The analysis behind

## Perspective





The Analysis Behind

Technical - Engineering

What problem do they solve or mitigate?



**OPERATIONAL  
& STRATEGIC**

Behaviour

In terms of Pollutants

In terms of Water  
Retention

Selection

Objective & Purpose

Location & Preliminary  
Design

Impact

Environmental

Policy

Which ones are there?

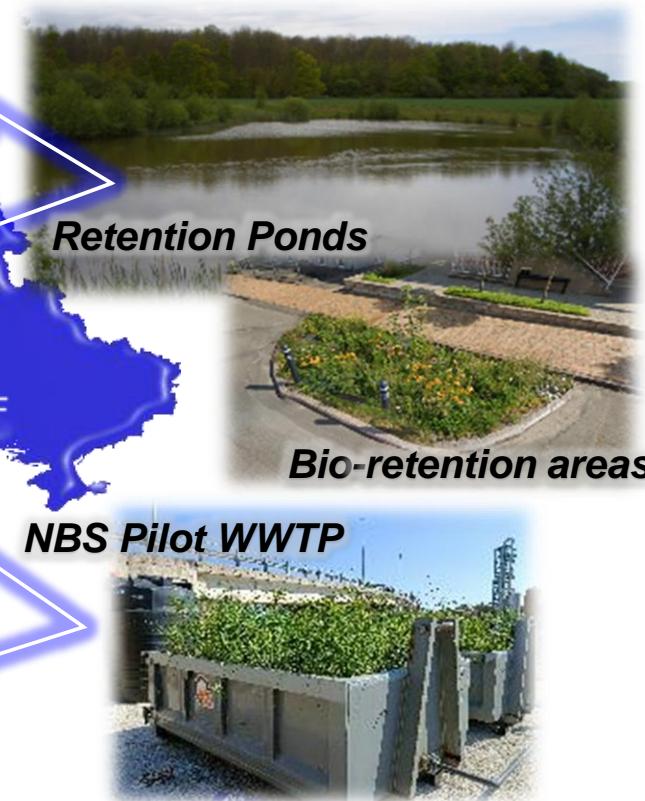
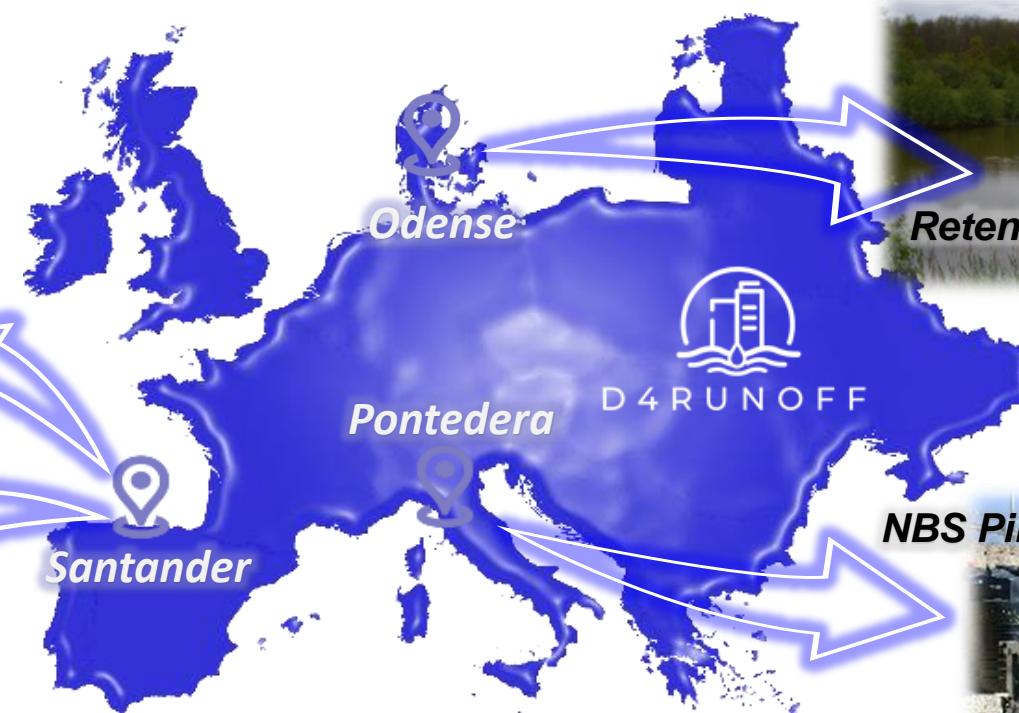
# Experience

# Case Studies

# D4Runoff Project: Preventing and managing pollution from urban water runoff

5 Case Studies

+5 replication analysis



D4RUNOFF has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101060638.

DSS in a Nutshell

**D4RUNOFF**  
**AI Assisted Platform**



# D4RUNOFF

AI-Assisted Platform



DATA  
GATHERING



OPERATIONAL  
& STRATEGIC



RISK  
ASSESSMENT



POLICY-  
MAKING



SOCIAL

**OPERATIONAL  
& STRATEGIC**

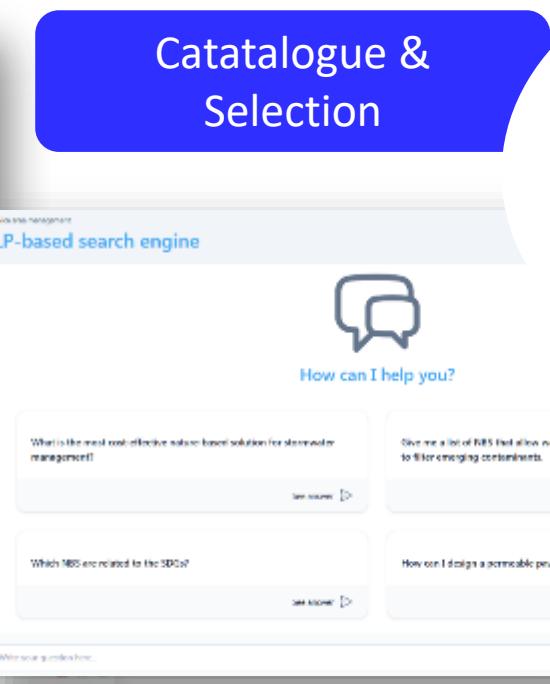


Funded by  
the European Union

This project has received  
funding from the European Union  
program



## Purpose



# Catalogue & Selection



How can I help you?

What is the most cost-effective value-based solution for stemcell reprogramming?

Save Resources ▾

Which 1405 are related to the 500s?

How can I design a permissible payment?

Review questions



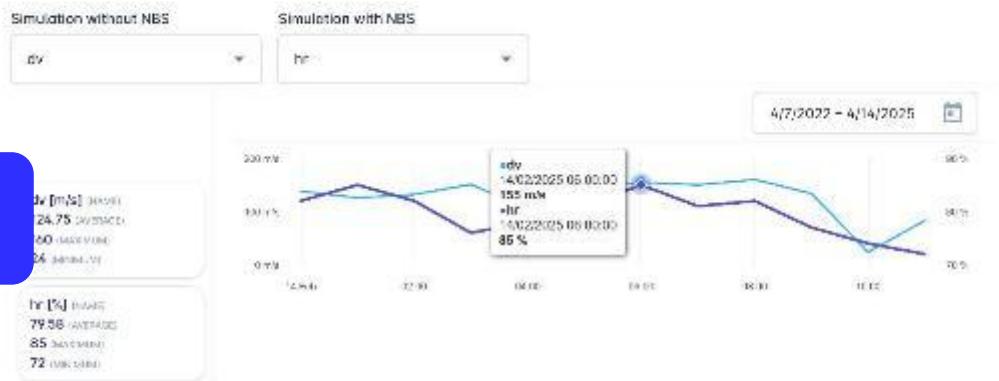
## OPERATIONAL & STRATEGIC



## Location



## Behaviour & Impact



## Selection

## Objective & Purpose

## Location & Preliminary Design

### *NBS Guidance module*

Module developed to assist in addressing urban runoff issues from a technical perspective, primarily focusing on mitigating the problem through the implementation of NBS in urban environments

- Key functionalities developed to:
  - 1 ✓ Consult, complete, and update the **NBS/EDS Library**
    - ✓ Suggest suitable NBS/EDS types based on user context and needs through:
      - Classical filtering of solutions
      - Interact through a Natural Language Processing (NLP) assistant
  - 2
  - 3

1

2

3

## Selection

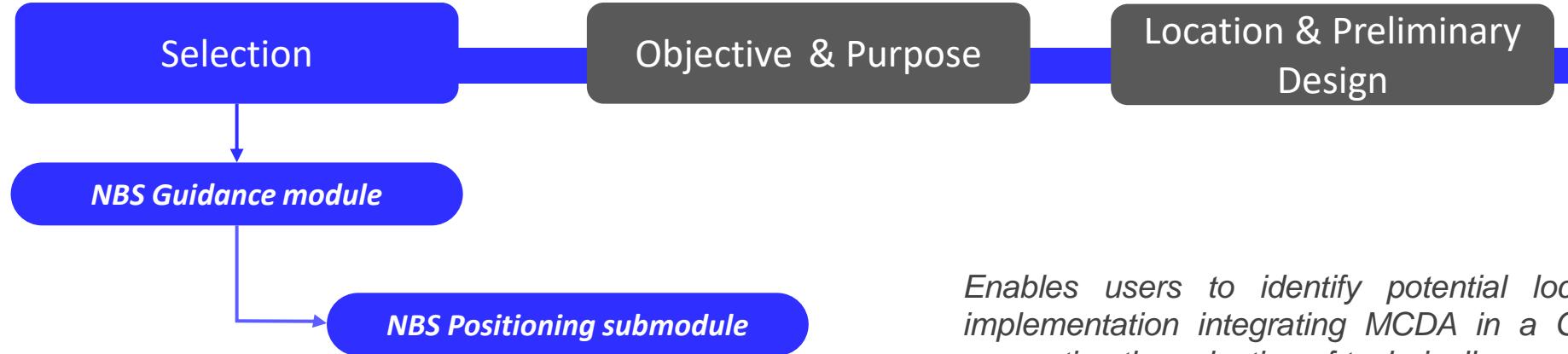
## Objective & Purpose

## Location & Preliminary Design

### *NBS Guidance module*

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  - 1 ✓ Consult, complete, and update the NBS/EDS Library
  - ✓ Suggest suitable **NBS/EDS** types based on user context and needs through:
    - 2 ○ Classical filtering of solutions
    - 3 ○ Interact through a Natural Language Processing (NLP) assistant
  - 4 ✓ Apply three **MCDA** methods to rank **NBS** alternatives based on user-defined criteria and support to positioning
  - 5 ✓ **Generate preliminary NBS designs directly from the platform**

The image shows a screenshot of the NBS Guidance module interface. At the top, there is a navigation bar with links for 'Service area management', 'Filters', and 'Multi-Criteria Decision Analysis (MCDA)'. The 'MCDA' section is highlighted and contains two methods: 'Entropy Weigh Method (EWM)' and 'Analytical Hierarchy Process (AHP)'. The 'AHP' method is selected, and its details are shown in a box: 'Assigns weight priority order proportions'. Below this is a table comparing the three methods: EWM, AHP, and AHP. The table includes columns for 'Image', 'Name', 'Ranking position', 'Ranking punctuation', 'Entropy position', 'Entropy punctuation', 'AHP position', 'AHP punctuation', and 'Template'. The 'AHP' row is highlighted. The 'Preliminary design' section is also visible, showing a 3D model of a detention basin with dimensions: Total Depth: 1.2 m, Top Depth at WWS: 1 m, Growing Medium Thickness: 0.05 m, Top Length (rectangular): 24.57 m, Top Width (rectangular): 13.16 m, Base Length (rectangular): 18.77 m, and Base Width (rectangular): 5.38 m. The total volume is 255.99 m³ and the surface area is 323.87 m².



*Enables users to identify potential locations for NBS implementation integrating MCDA in a GIS environment, supporting the selection of technically appropriate solutions*



Name	Status	Last edition	Source layers
TestPosit_Custom	Planned	23/03/2025	D4RUNOFF
TestPositioning	Planned	24/03/2025	D4RUNOFF
NBS_Positioning_CUSTOM	Planned	17/09/2025	D4RUNOFF
TESTPOSITIONING	Planned	13/04/2025	Custom
NBS Positioning 250414	On develop	14/04/2025	D4RUNOFF
NBS Positioning Odense	Planned	14/05/2025	D4RUNOFF

Items per page: 10 | < > | 1-6 of 6

Version 1.1.0

Funded by the European Union

Behaviour

In terms of Pollutants

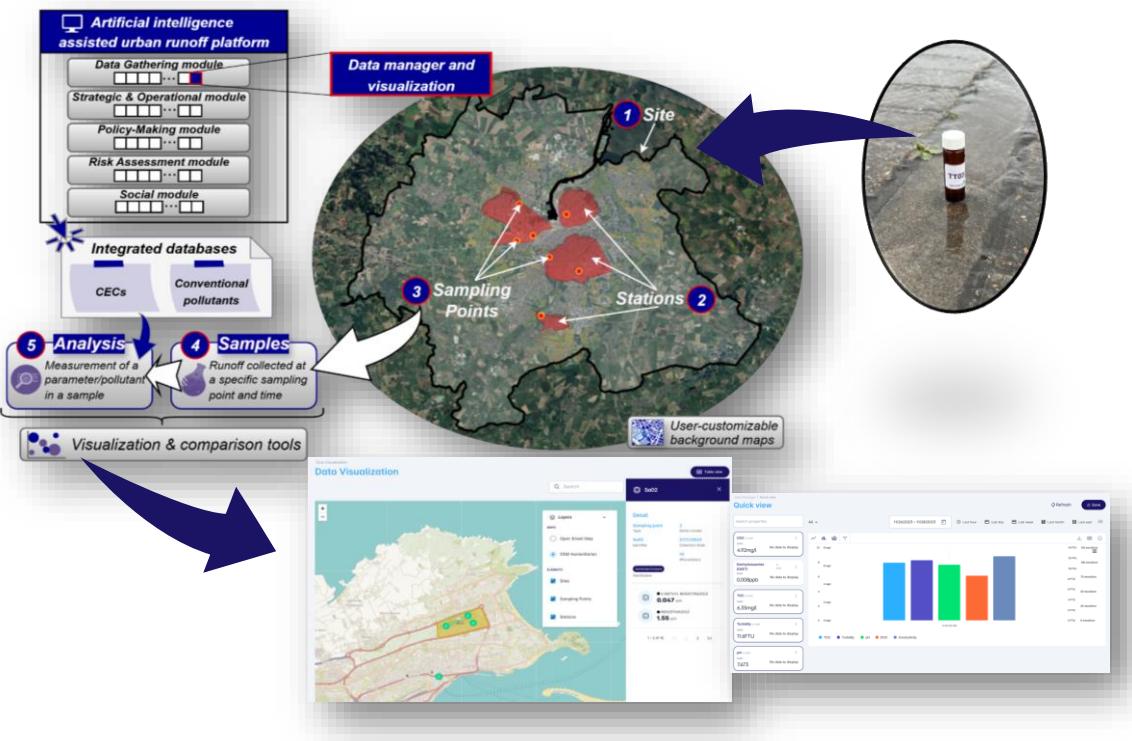
In terms of Water  
Retention

### IoT & Data Gathering

IoT and Data Collection. Module developed to store, process, and display data generated within the D4RUNOFF project, as well as external data required for the overall operation of the platform (e.g., meteorological services)

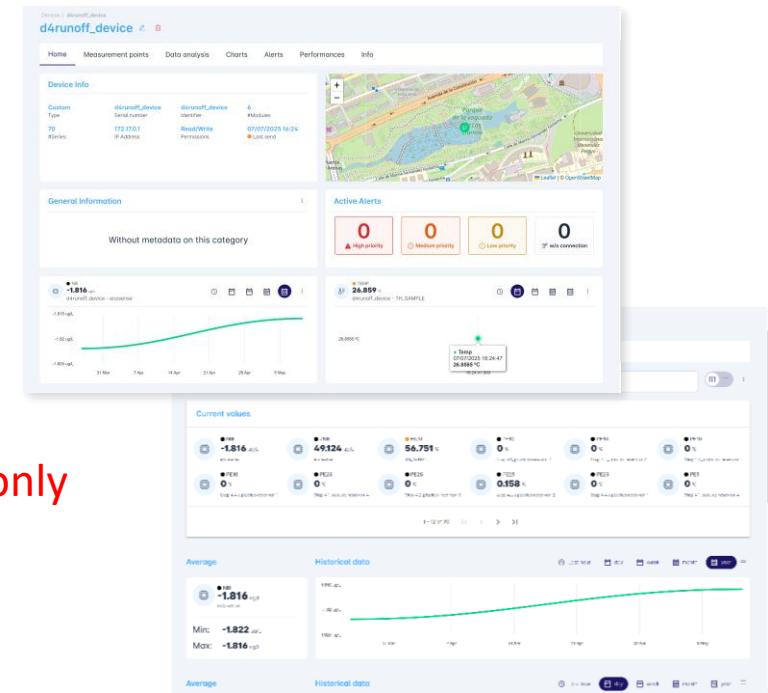
Storage and display of **lab results from a novel detection method** for water contaminants

Real-time connection with innovative sensors for in situ CEC detection



Data ...

... but not only



## Behaviour

## In terms of Pollutants

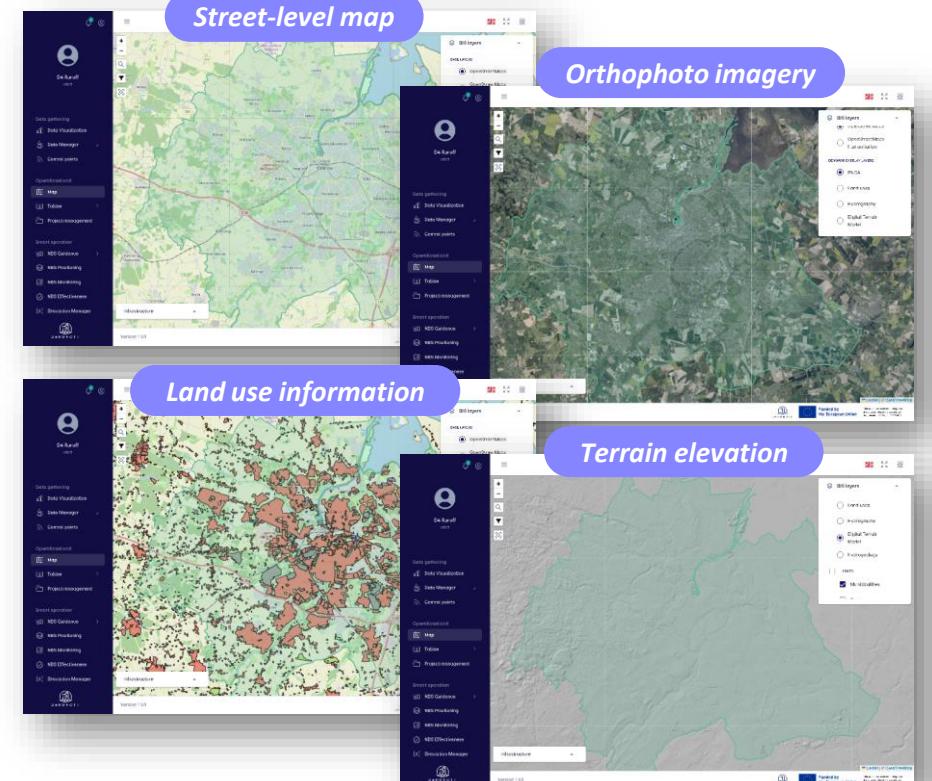
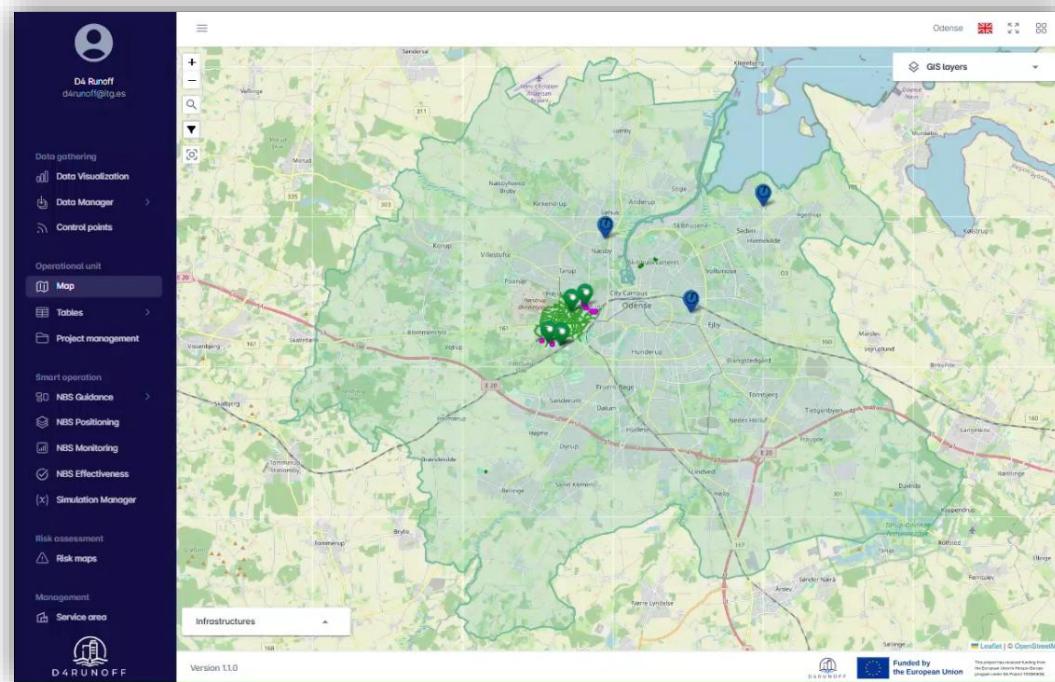
## In terms of Water Retention

### IoT & Data Gathering

- Ability to store drainage and sewer infrastructure data, providing a comprehensive view of the sanitation system in the study areas through GIS functionalities

**Data model** designed for uploading information on different elements of the **drainage/sewer network**

**Connection with external GIS layer services** to provide contextual information



Behaviour

In terms of Pollutants

In terms of Water Retention

### NBS Monitoring

Enables users to register implemented NBS at real pilot sites in the AI-Assisted Platform to support monitoring and performance assessment

The image displays the NBS Monitoring interface, showing three main panels:

- NBS Monitoring (Top Left):** Shows three pilot sites: Helsingborgsgade (Retention Areas), Trykstakken (Retention Basins), and Risingsvej/Boulevard (Retention Basins). It includes a sidebar with navigation links for Data gathering, Data visualization, Data Manager, Control points, Operational unit, Tables, Project management, and a login section.
- Control point: Parking (Top Right):** Shows a map of a parking area with a green highlighted region. It includes a sidebar with Home, Measured data, Simulation, Dashboard, Sketches, and Alerts.
- Detailed View (Bottom Right):** An aerial view of a parking lot with a green overlay. Real-time monitoring data is displayed for four parameters:
  - Temperature: 16.489 °C
  - Redox: -339.487 pV
  - pH: 7.613 pH
  - Salinity: 0.173 gKgThe data is timestamped as 08/07/2025 10:02:34.

Impact

Environmental

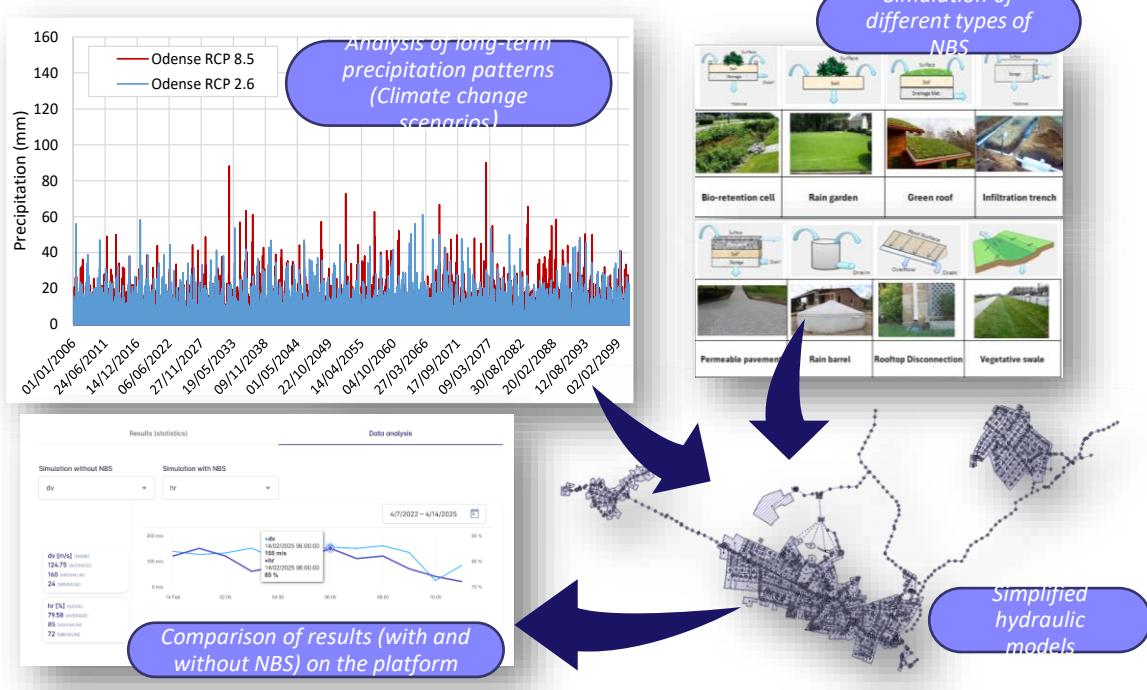
Policy

NBS Monitoring

- Module developed to assist in addressing urban runoff issues from a technical perspective, primarily focusing on mitigating the problem through the implementation of NBS in urban environments

NBS Effectiveness submodule

Comparative analyses of the potential effects of NBS implementation and climate change using simulations from simplified hydraulic models



Artificial Intelligence simulations

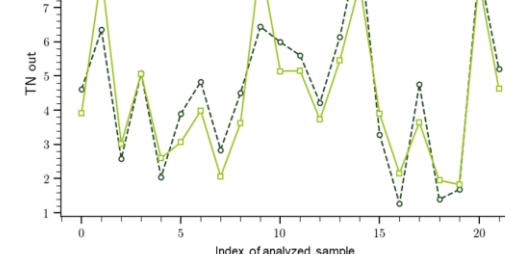
Development and integration in the platform of AI-based models to predict key variables for urban runoff management

Model inputs (examples)

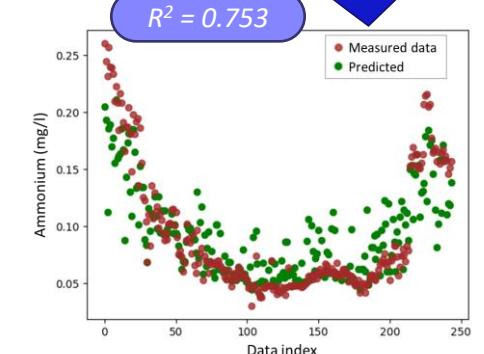
Temperature, Flow, Precipitation, Humidity, Evapotranspiration, Runoff, ...

AI algorithms

$R^2 = 0.833$



Predictions of key variables (NBS performance)



# Acknowledgment

**Acknowledgement:**

**D4Runoff Partners, specially:**

- **University of Cantabria:** ->>> MCDA
- **University of Copenhagen:** ->>> Pollution & No – Targeted Analysis
- **Mitiga:** - >>> Risks Asssesment
- **Three O'Clock:** ->>> Co-creation workshops
- **And Klink:** ->>> Policy Making, Strategic Thinking and Support



# ¡Gracias!

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