

SOLUÇÕES INTENSIFICADAS BASEADAS NA NATUREZA PARA O TRATAMENTO E REUTILIZAÇÃO DE ÁGUAS: OS PILOTOS DO PROJECTO MULTISOURCE

Pedro N. Carvalho

Department of Environmental Science, Aarhus University, Denmark

pedro.carvalho@envs.au.dk



ModULar Tools for Integrating enhanced natural treatment SOlutions in URban water CycLEs

Soluções intensificadas baseadas na natureza para o tratamento e reutilização de águas

Os pilotos do projecto MULTISOURCE



This project has received funding from the European Union's Horizon H2020 innovation action programme under grant agreement 101003527.

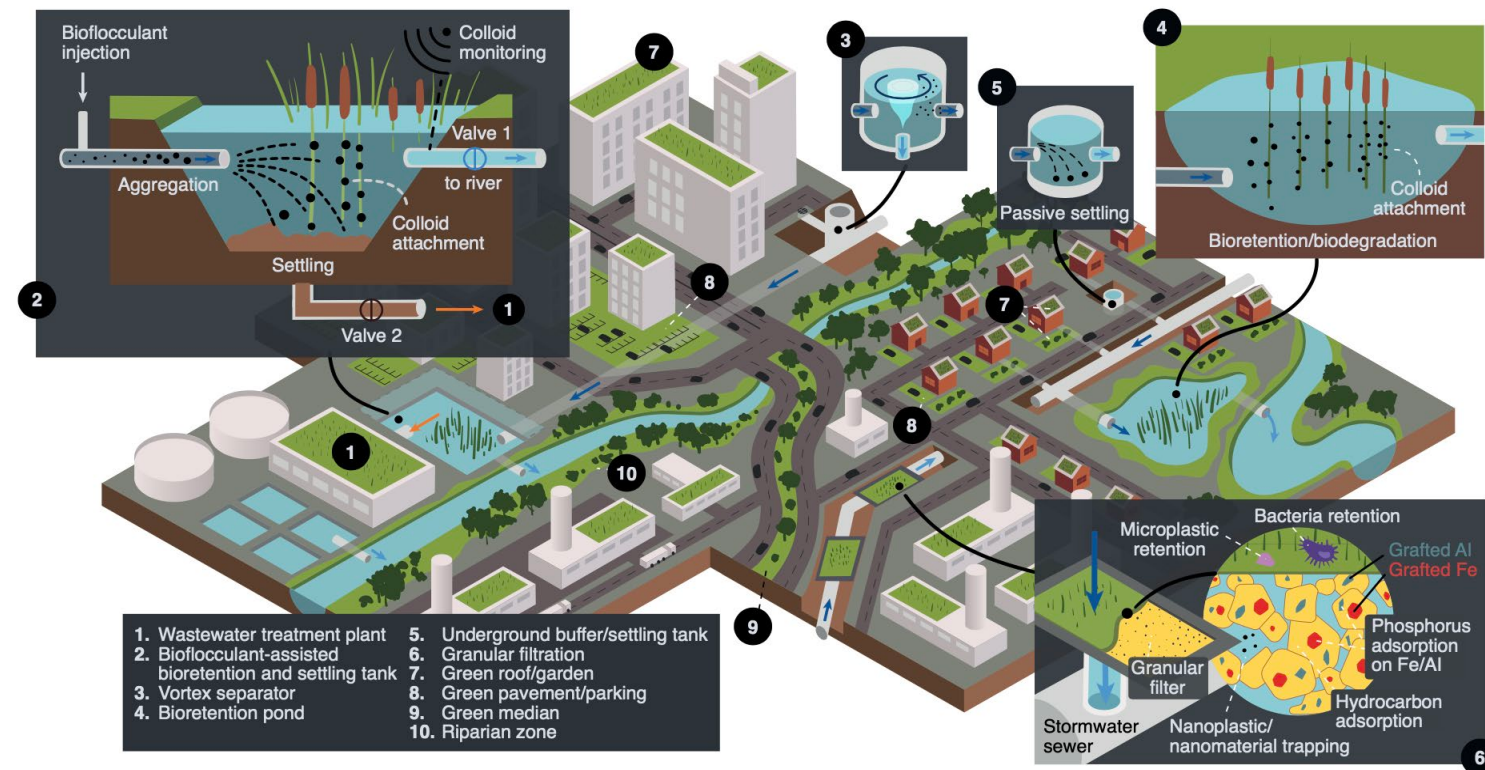
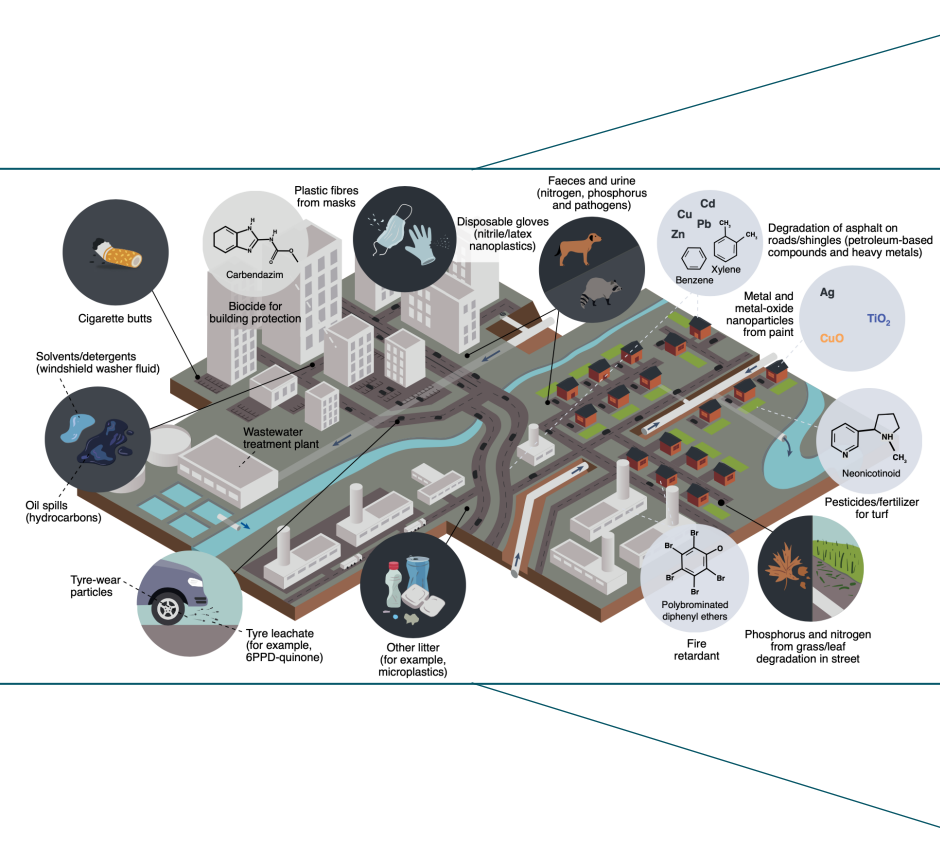
Facilitates systematic, citywide planning of NBS for urban water treatment, storage and reuse



2021 - 2025



- Urban challenges
- Green transition
- The European Green Deal
- Sustainable development goals



France – Raw domestic wastewater



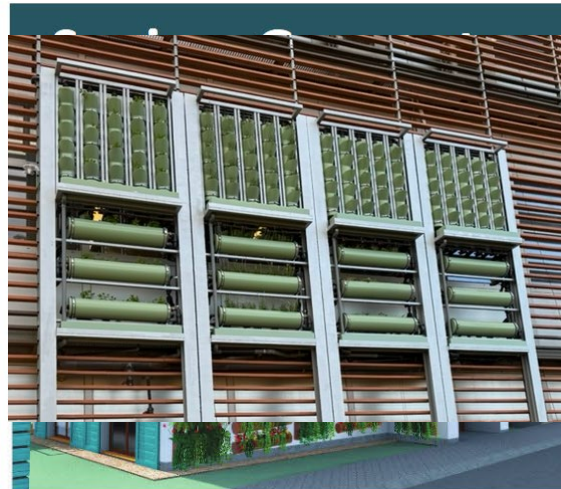
Belgium – Pretreated wastewater



Italy – Combined Sewer Overflow



USA – High-strength wastewater



Norway – Runoff

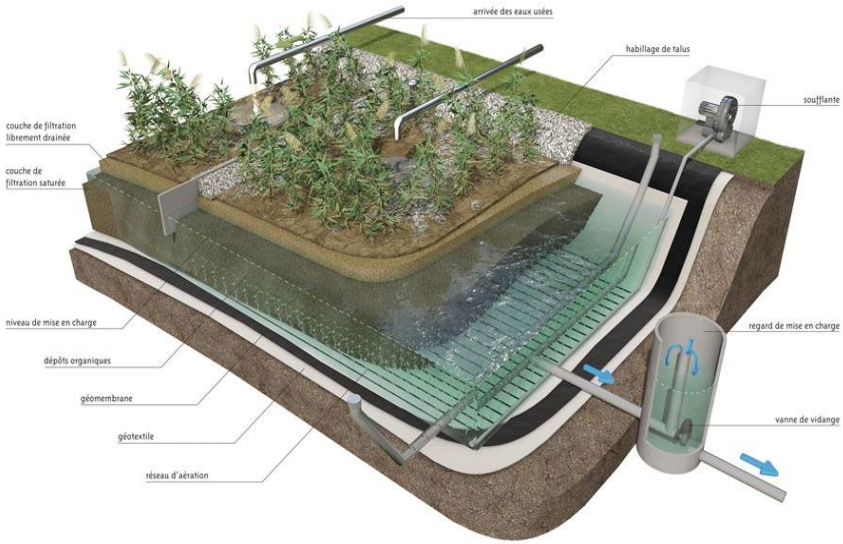


Germany – Rainwater



Pilot 1: France

Raw domestic wastewater (France)



1 December 2023



[Previous Article](#)

Article Contents

- Abstract
- HIGHLIGHTS
- INTRODUCTION
- METHODS
- RESULTS AND DISCUSSION
- CONCLUSION
- ACKNOWLEDGEMENTS
- DATA AVAILABILITY STATEMENT
- CONFLICT OF INTEREST
- REFERENCES
- Supplementary data

RESEARCH ARTICLE | DECEMBER 12 2023

Aeration strategies and total nitrogen removal in a hybrid aerated treatment wetland

Caroline Kimie Miyazaki; Ania Morvannou; Elodie Higelin; Jaime Nivala; Pascal Molle

[Check for updates](#)

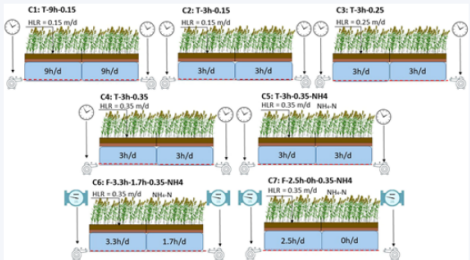
Blue-Green Systems (2023) 5 (2): 321–335.

<https://doi.org/10.2166/bgs.2023.045> [Article history](#)

[Views](#) [PDF](#) [Share](#) [Tools](#)

Abstract

[Listen](#)

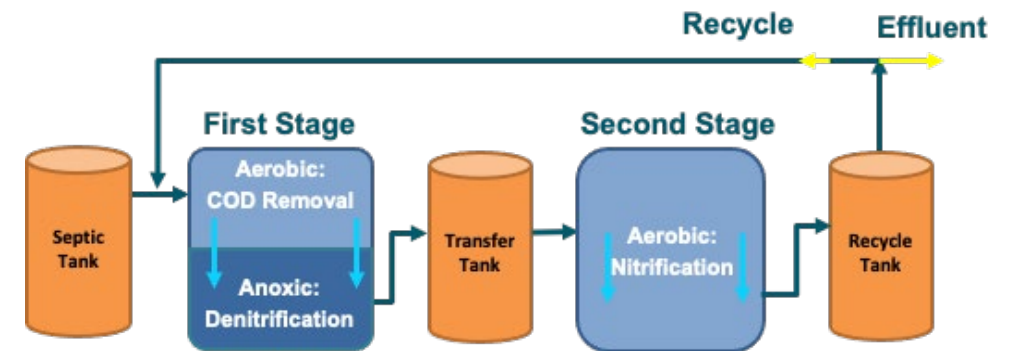


[VIEW LARGE](#)

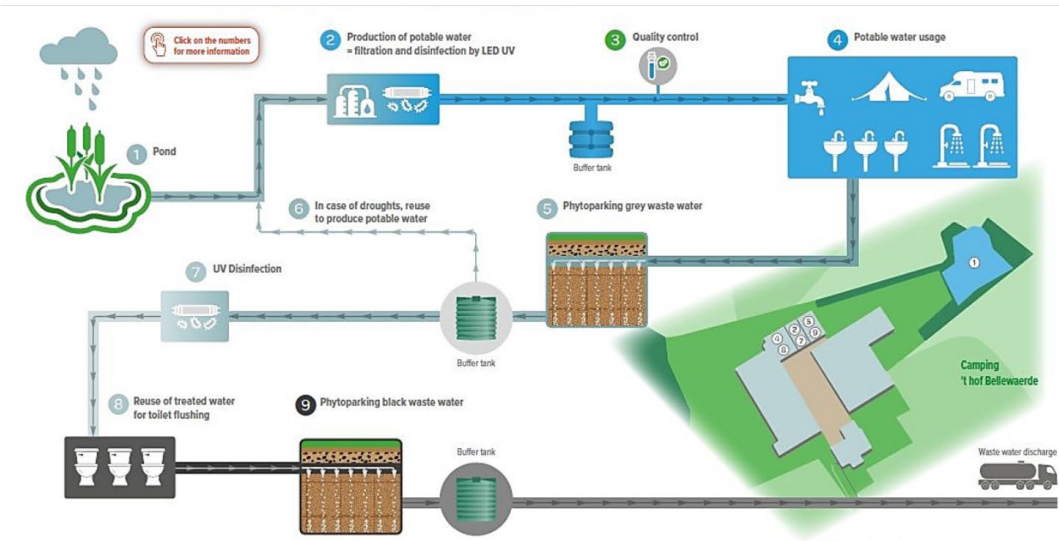
[DOWNLOAD SLIDE](#)

Pilot 2: USA

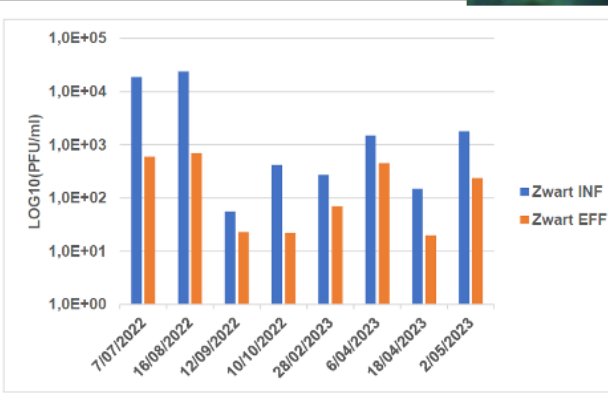
High-strength wastewater (USA)



Pilot 3: Belgium



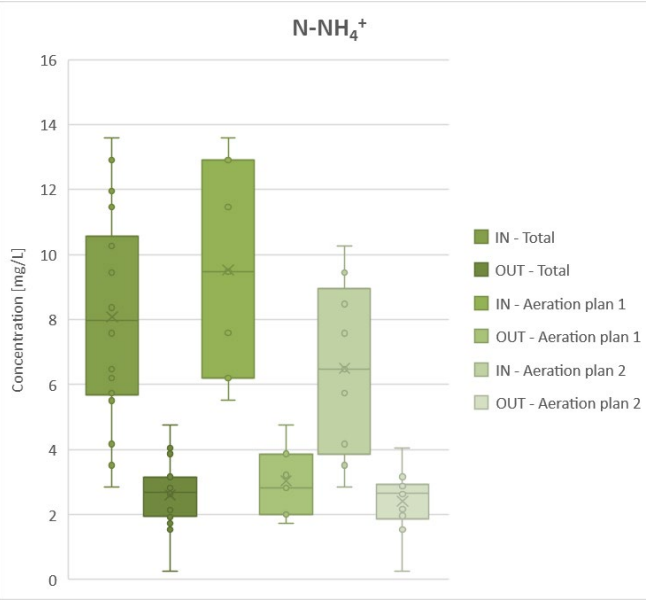
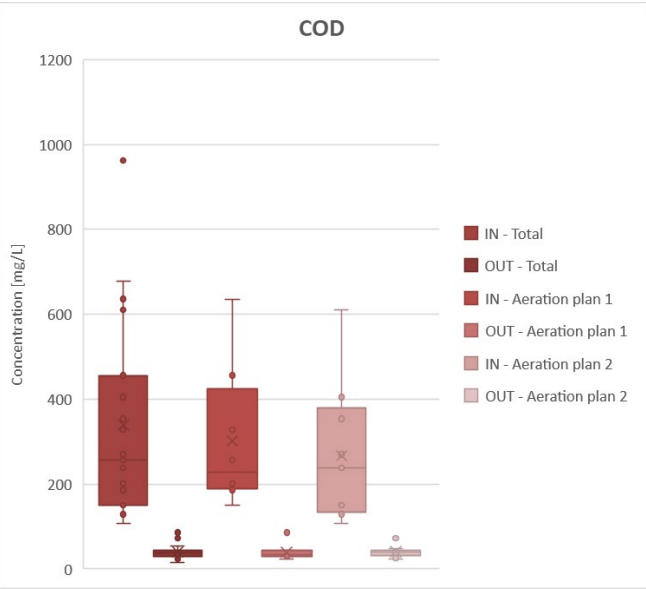
Somatic coliphages



1-2 log steps
EU 2020/741 requires min 6 log

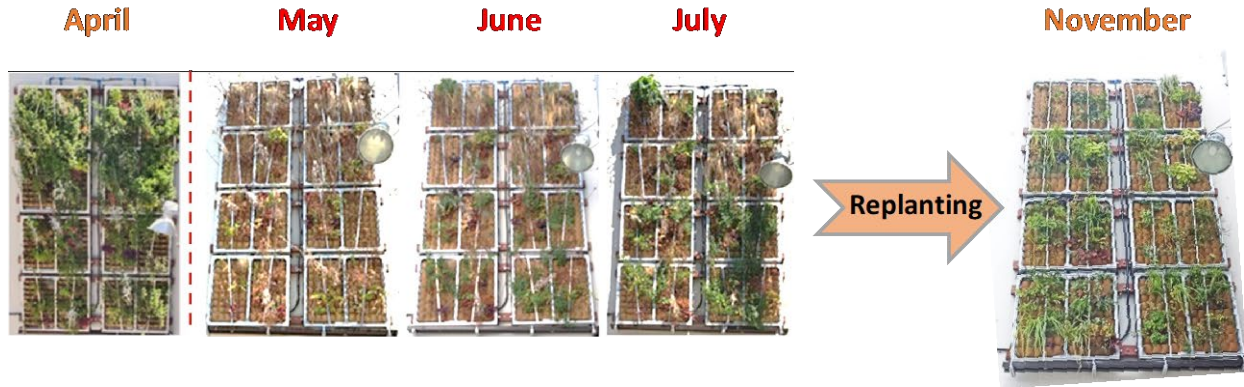
Pilot 4: Italy

Combined Sewage Overflow (CSO) (Italy)



Pilot 5: Spain

Greywater (Spain)



Social acceptance:

✓ Surveys: 19 occupied dwellings out of total of 30:

Individual factors:

- Low level of knowledge: of the water footprint and the origin and destination of water.
- High understanding of the problem: drought.

Social factors:

- Relationship of distrust with the administration on the part of vulnerable groups.

Technology factors

- Generally aware of the benefits towards technology.
- Connected neighbors have noticed a reduction in their water bill.

Pilot 6: Norway

Road runoff
(Norway)

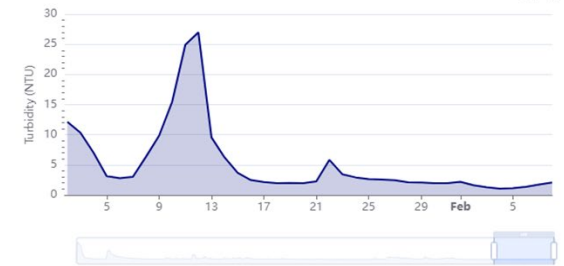


Rain Garden Real-time Sensor Data

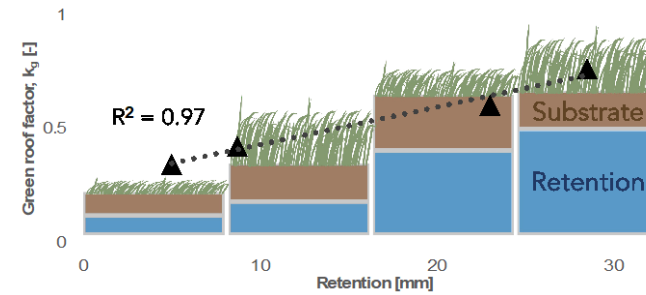
Inlet Conductivity



Inlet Turbidity



Pilot 7: Germany



Rainwater (Germany)



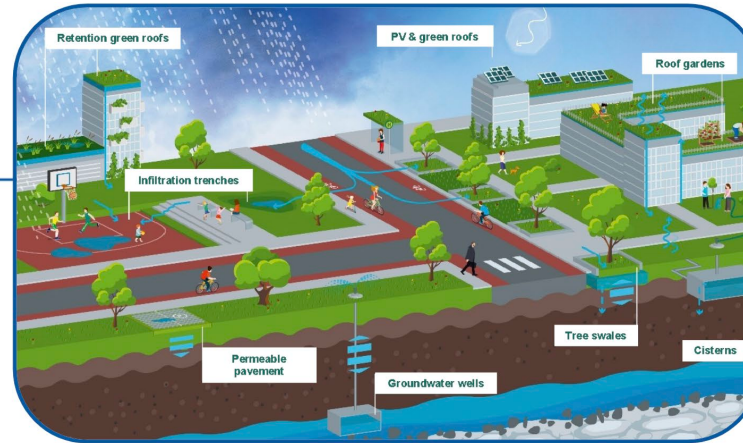
- Ökosystemleistungen
- Klimaanpassung und -minderung
- Wasserressourcenmanagement
- Luftqualität und Schadstoffreduktion
- Gesundheits- und Sozialwirkungen
- Bauwerksmanagement und -schutz



On the tools: planning platform

Planning platform modules for urban stormwater management

- **Pre-planning | Masterplan** urban water management



Green Infrastructure incorporates natural landscapes into urban (public) spaces.

Blue-Green Infrastructure combines green spaces alongside water management.

- Along the **Centralisation gradient**

- Along the **Technology**

Decentralized

- On-Site infiltration/storage
- Roof | Streets
- Decentralized treatment

Centralized

- Combined | Separate sewer
- Sewer

Grey | Conventional

- WWTP/ Sewer
- LIDs / Storage / Infiltration

Blue Green | NBS

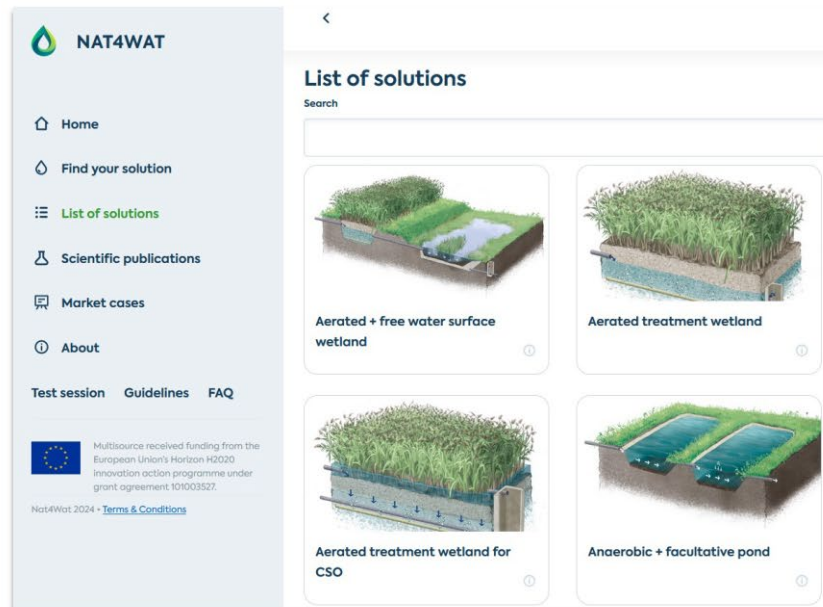
- BRC / Greenroof
- Raingarden

On the tools: Nat4Wat



Using nature for water treatment, storage and reuse

Select the most appropriate nature-based solutions for your water management needs



<https://nat4wat.icradev.cat>

Challenges & Opportunities

Challenges

- Technology transfer
- Regulation:
 - NBS mainstreaming vs disconnection from water legislation in EU
 - E.g. new EU wastewater treatment directive does not mention NBS
 - E.g. EU water reuse legislation only considers agriculture uses – disconnected from the urban setting
 - Different NBS implementation will be regulated by different authorities (which might not be connected with the water management)

Challenges & Opportunities

Opportunities

- Wide interest in NBS
- Climate adaptation
- New regulation

Take home message

- MULTISOURCE NBS pilots can achieve wastewater treatment to pre-defined regulation thresholds
 - MULTISOURCE NBS pilots enable water reuse in several cases
 - MULTISOURCE NBS pilots support local adaption to extreme events
 - MULTISOURCE NBS pilots provide additional co-benefits
-
- NBS can be effective tools for water pollution control, *but for water reuse purposes might require additional post-treatment depending on reuse purpose*

<https://multisource.eu/>



20 partners • 9 EEA Countries • 3 International Countries

Individual Municipalities

GIRONA (ES)
OSLO (NO)

Metropolitan Municipalities

CMM (IT)
GLYON (FR)

Small and Medium-sized Enterprises (SME)

ALCN (AT)
IRIDRA (IT)
RIETLAND (BE)

Non-Profit Organizations

FER (SI)
WE (BE)

Non-Profit SME

ICLEI (DE)

Universities

AU (DK)
HCMUT (VT)
INSA (FR)
MSU (US)
UFSC (BR)

Research Institutions

ICRA (ES)
INRAE (FR)
NIVA (NO)
UFZ (DE)

Consultancy

IT (FR)

France



Spain



Belgium



Norway



Italy



Germany



Slovenia



Austria



Denmark



Brazil



USA



Vietnam



SOLUÇÕES INTENSIFICADAS BASEADAS NA NATUREZA PARA O TRATAMENTO E REUTILIZAÇÃO DE ÁGUAS: OS PILOTOS DO PROJECTO MULTISOURCE

Pedro N. Carvalho

Department of Environmental Science, Aarhus University, Denmark

pedro.carvalho@envs.au.dk