Nature Based Solutions (NBS) for water reuse in rural and urban context

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What are NBS ?

European commission

Solutions that are inspired and supported by nature, which are **cost-effective**, simultaneously provide **environmental, social and economic benefits** and help building **resilience**. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions.

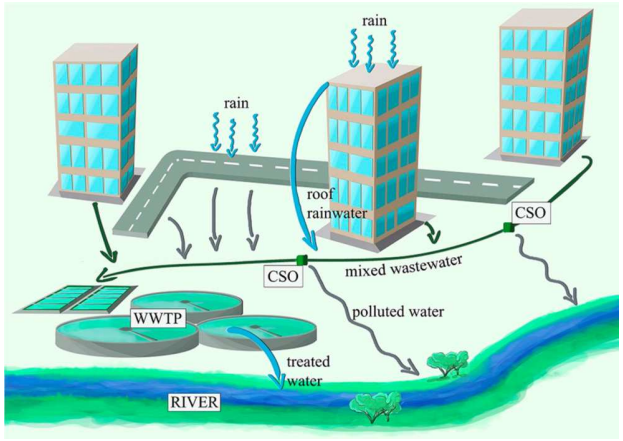
In rural context

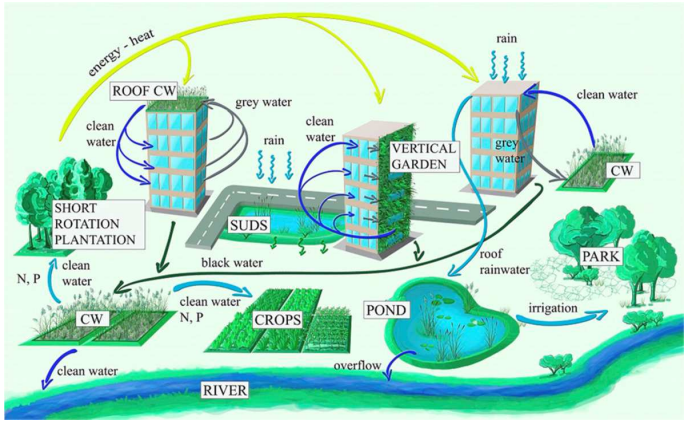
Centralized approach

REUSE issues :

- **Sanitary risk**
- **Treatment on demand**

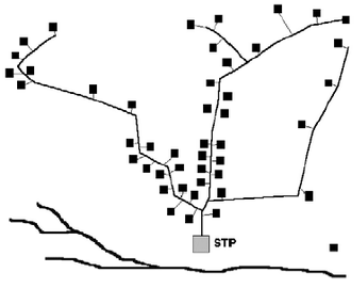
In Urban context : a paradigm change



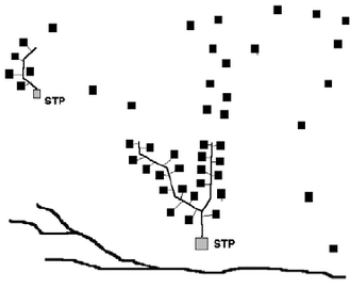


Masi et al. (2018) Journal of Environmental Management, Vol. 216, 275-284

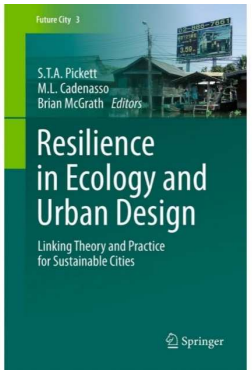
Why a decentralized approach ?

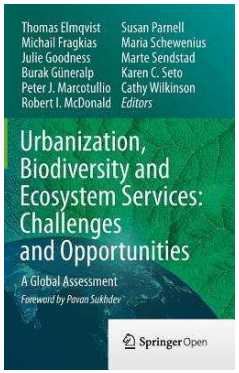


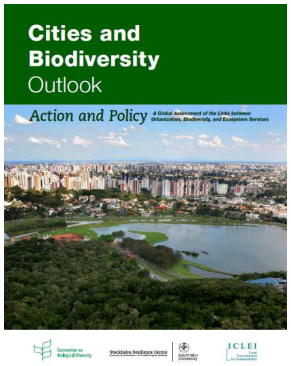
Centralized wastewater treatment



Decentralized approach







Water Research 84 (2015) 218–231

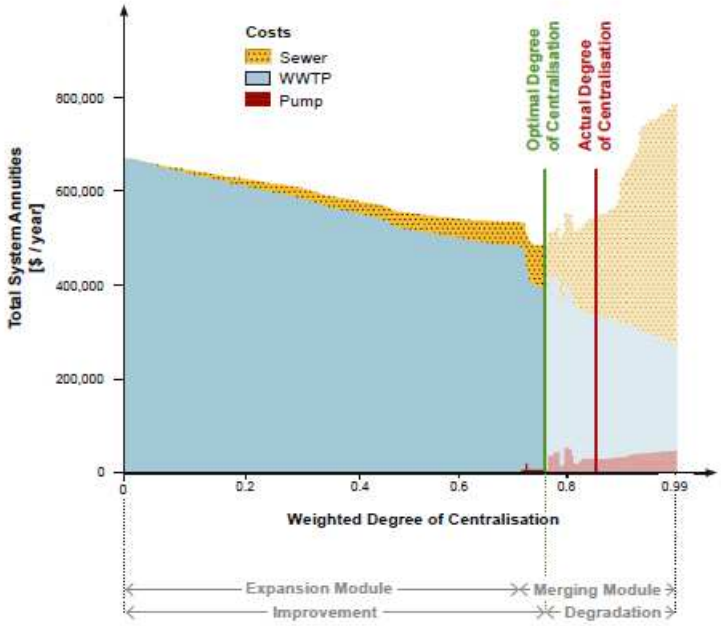
Contents lists available at ScienceDirect

Water Research

journal homepage: www.elsevier.com/locate/watres

To connect or not to connect? Modelling the optimal degree of centralisation for wastewater infrastructures

Sven Eggimann [a, b, *], Bernhard Truffer [a, c], Max Maurer [a, b]



Decentralized approach: issues

Technological, economical, environmental, societal, governance and regulatory issues for developing such an approach

Urban water reuse by NBS

Rain water – runoff water

- Limit run-off
- Favor infiltration
- Favor evapotranspiration
- Favor storage

… and limit economical impact while improving landscape

Urban water reuse by NBS

Domestic WW / CSO / Grey water / source separation

- Limit untreated WW reaching the water body
- Decrease sewer investment and maintenance
- Favor local reuse

… Decentralized approach to limit economical impact while improving landscape

Common technical needs for reuse

P. Molle

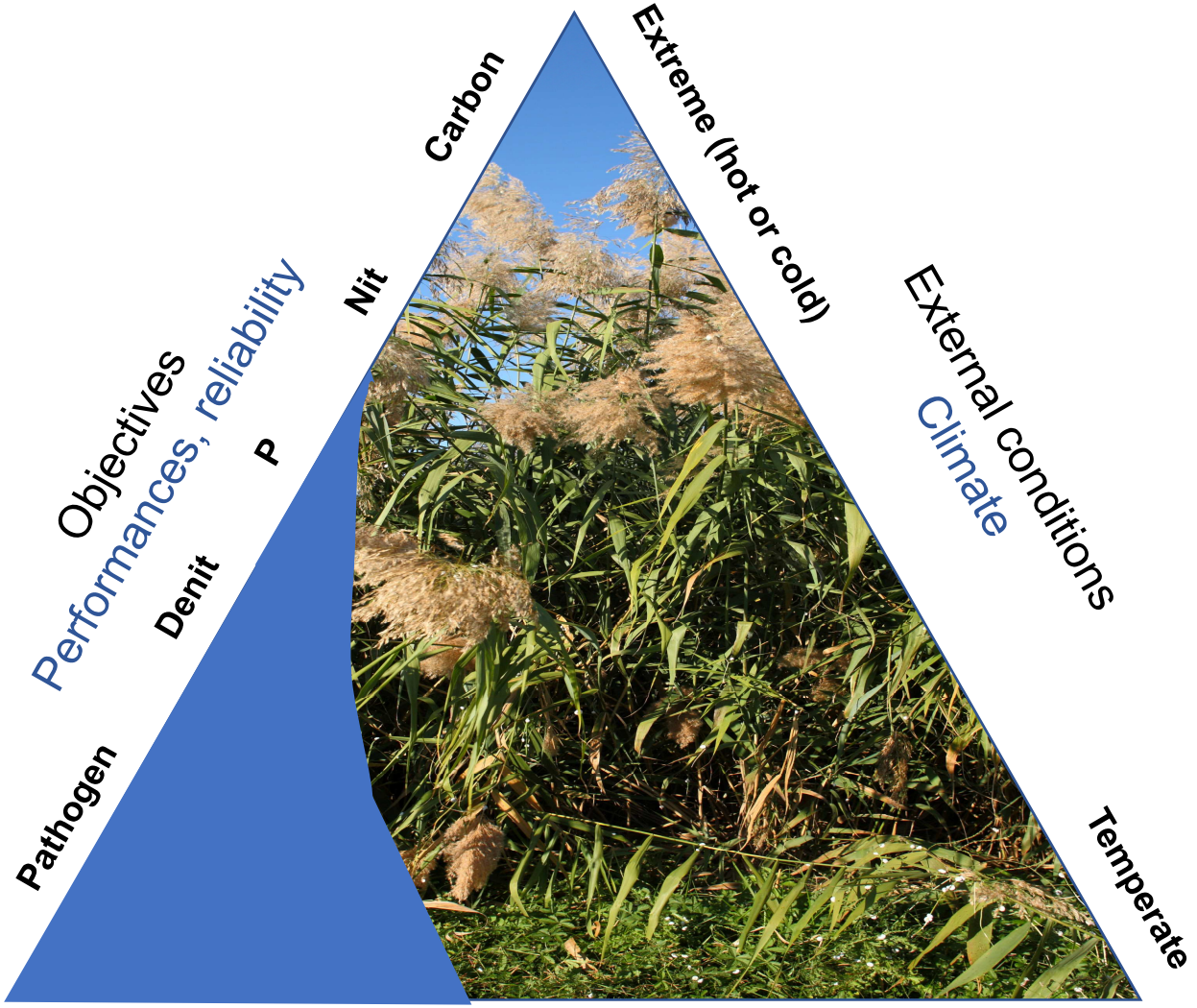
Water storage for reuse

Pathogen (and emergent pollutant ?) treatment

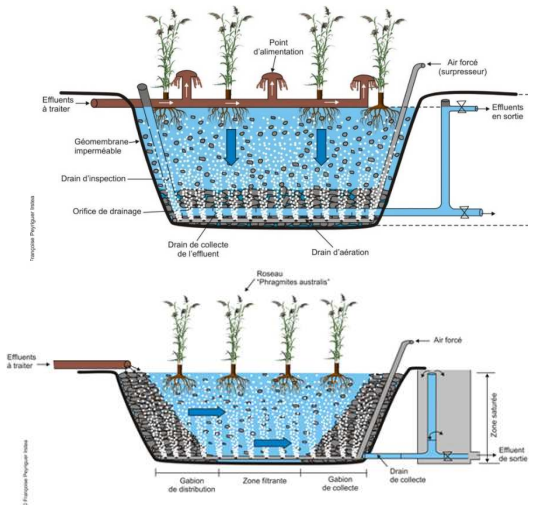
Treatment on demand

Compact solutions

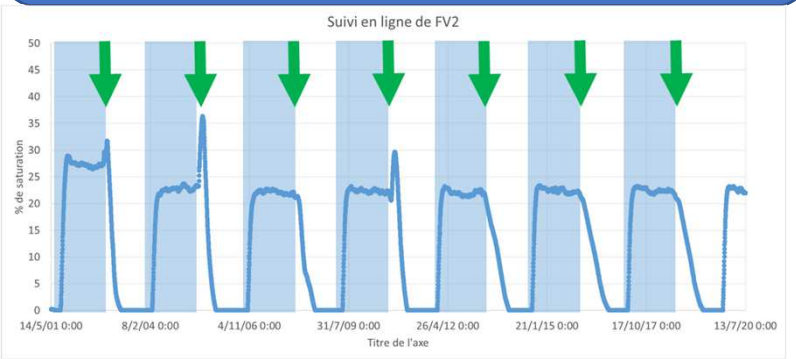
Technical aspects for WW management by NBS

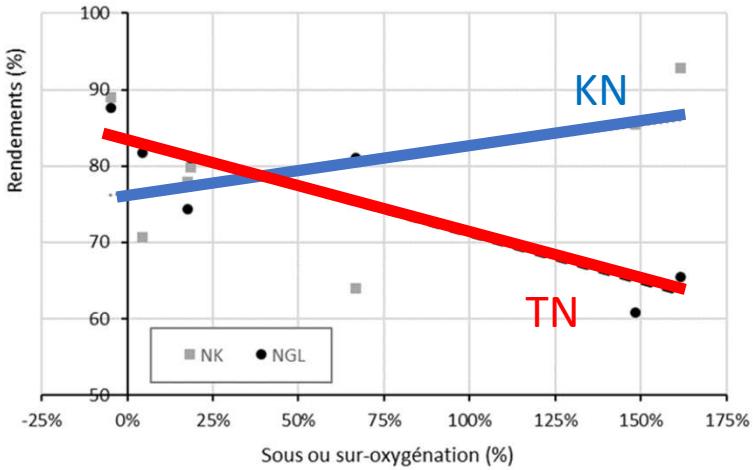


Domestic WW management by NBS

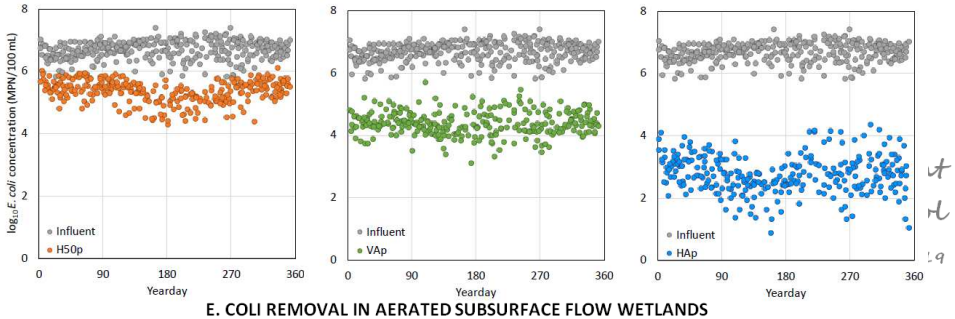


Air furniture is forced mechanically to a saturated system





Treatment on demand

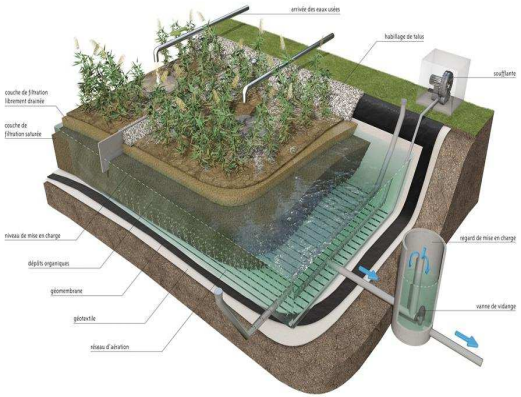


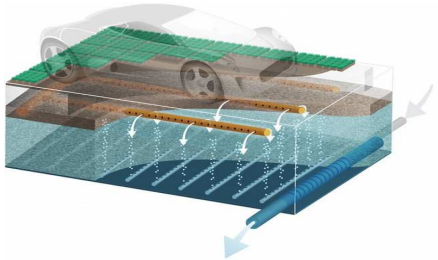
E. COLI REMOVAL IN AERATED SUBSURFACE FLOW WETLANDS

Jaime Nivala[1], *Manfred van Afferden*[1], *Roland A. Müller*[1]
[1]Helmholtz Center for Environmental Research – UFZ, Department Center for Environmental Biotechnology

Pathogen removal

Domestic WW management by NBS





Hybrid Flow (VF and HF)

Compact, improved performances, integrated into landscape for REUSE purposes.

Urban water management by NBS

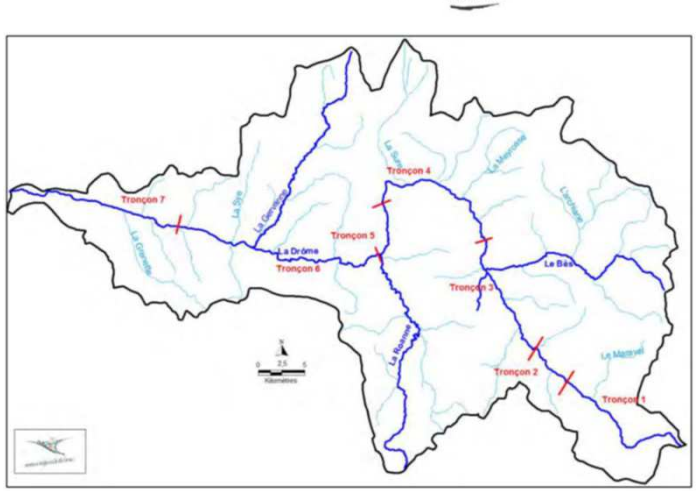
Need of planification tools

Where to disconnect ? Source segregation/CSO/ WW, rain water, runoff …)
Which volumes and loads to treat?
Which system?

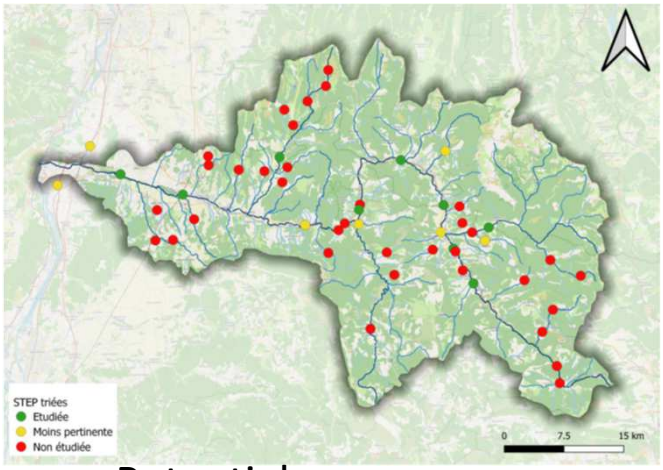
Integrated approach for water resource preservation and reuse

Rural water management by NBS

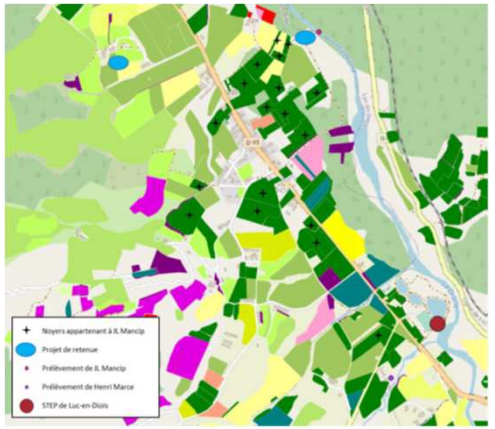
Need of planification tools



Keep water in the river



Potential reuse resources



Potential uses

3 new projects on the use on BS for urban water reuse

Projet TONIC

MULTISOURCE
ENHANCED NATURAL TREATMENT SOLUTIONS

NICE
innovative and enhanced nature-based solutions

H2020-SC5-27-2020
"Enhanced natural treatment systems for water security and ecological quality in cities"

Développer des technologies et des outils intégrés de planification et de dimensionnement pour accompagner les collectivités dans une gestion durable des eaux urbaines incluant les aspects économiques, environnementaux et sanitaires.