UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH
Group of Environmental Engineering and Microbiology

Application of Nature-Based Solutions for water reuse

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WORKSHOP LIFE PHOENIX

WASTEWATER REGENERATION: NEW LEGISLATION, INNOVATIVE TECHNOLOGIES & SUCCESS CASES

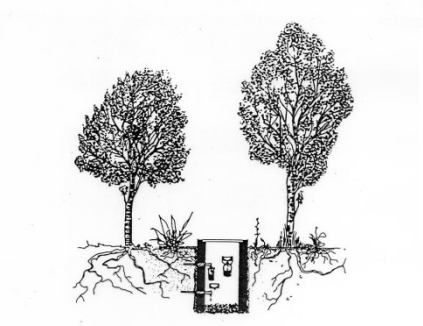
November 4th, 2021, La Coruña

Topics

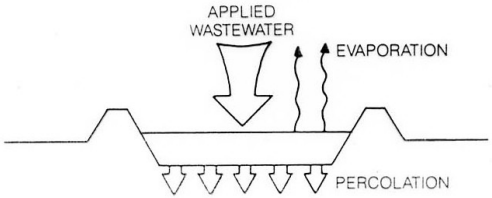
1. Natural wastewater treatment systems for reuse
2. The transition from nature wastewater treatment systems to nature-based solutions
3. Successful case studies

Natural systems

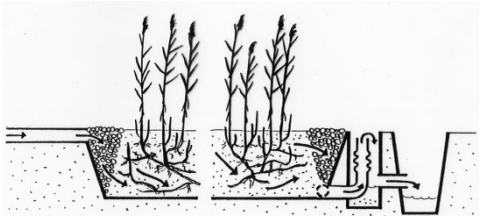
Soil based systems (land treatment systems)



Slow infiltration land systems

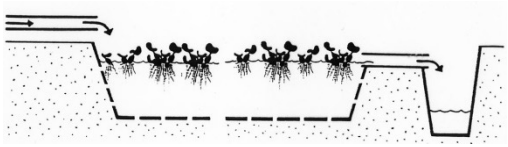


Rapid infiltration land systems

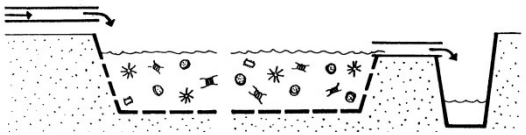


Subsurface flow constructed wetlands

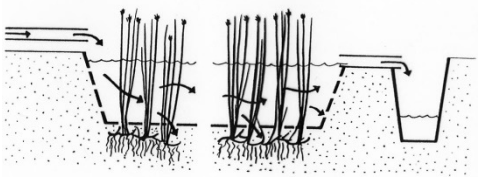
Water based systems (ponds, wetlands)



Plant floating systems

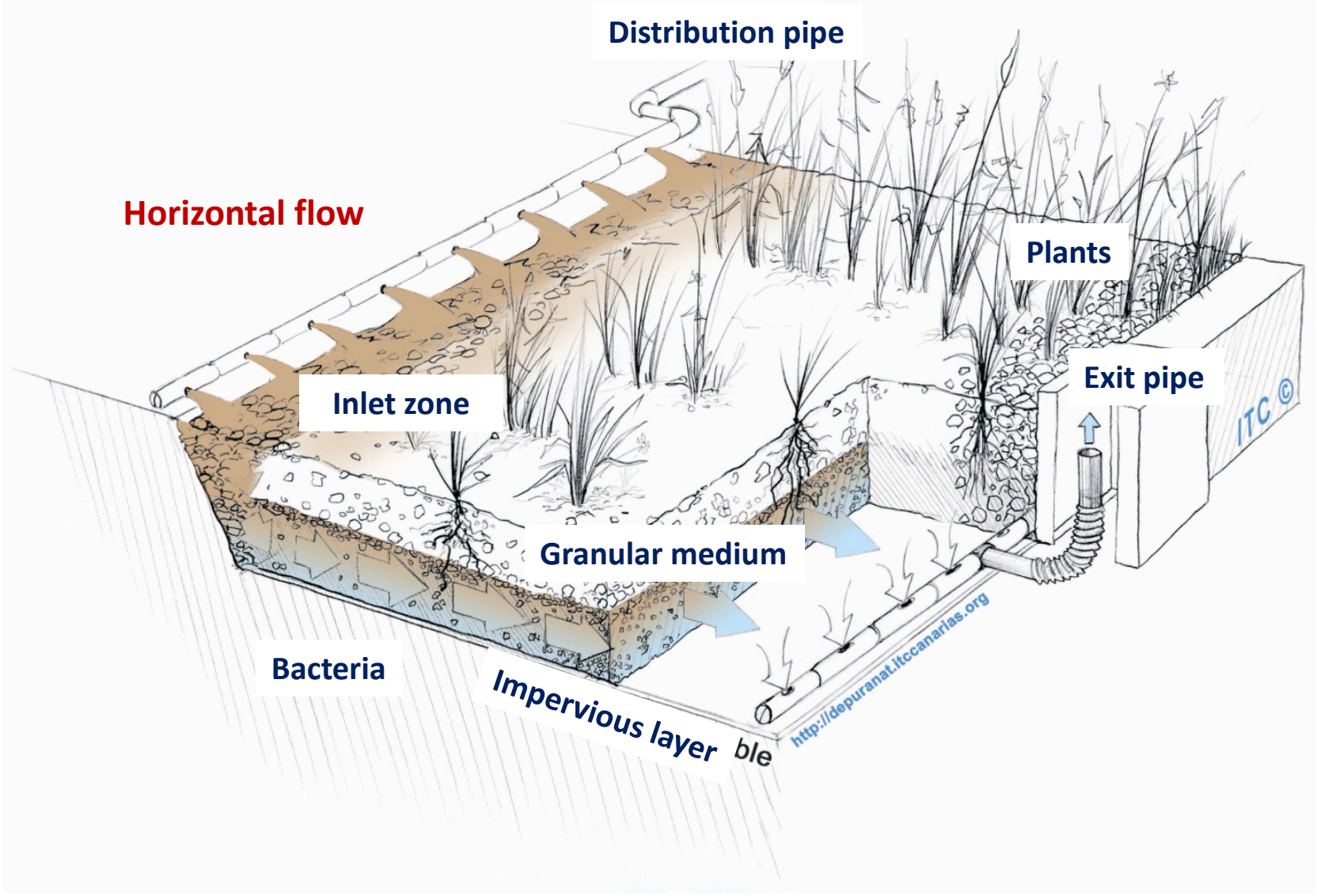


Waste stabilisation ponds

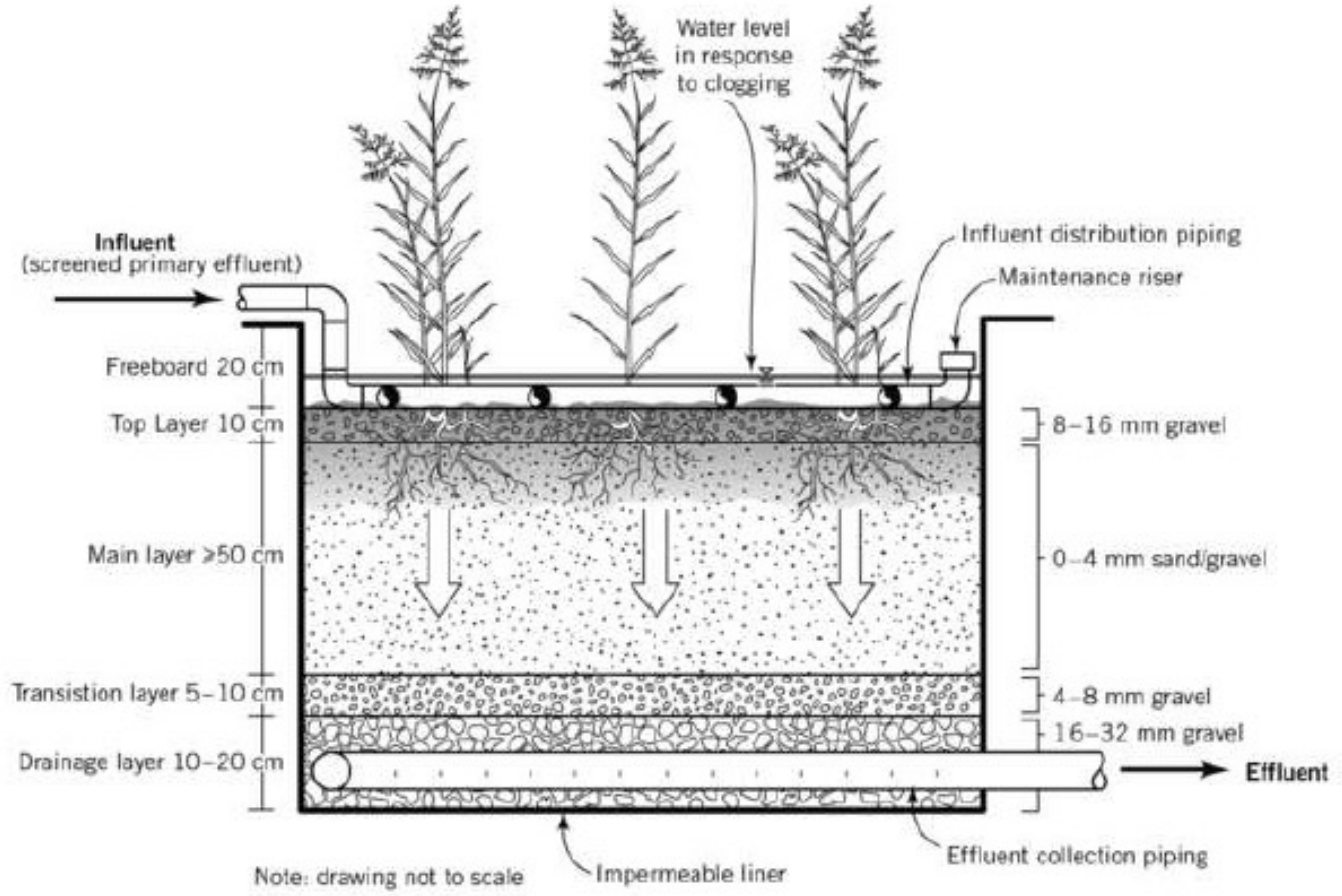


Surface flow constructed wetlands

Subsurface flow constructed wetlands



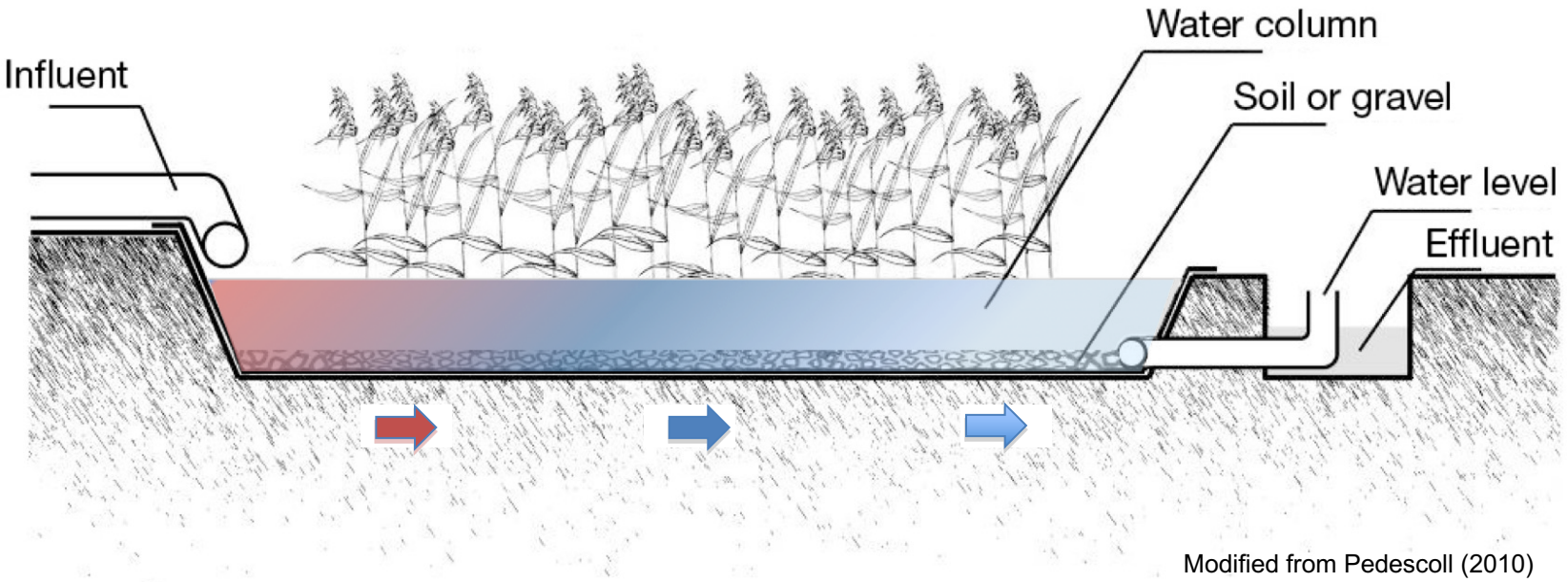
Vertical subsurface flow constructed wetlands



Knowles, Nivala, Dotro & García (2010). Ecol. Eng.

Constructed wetlands

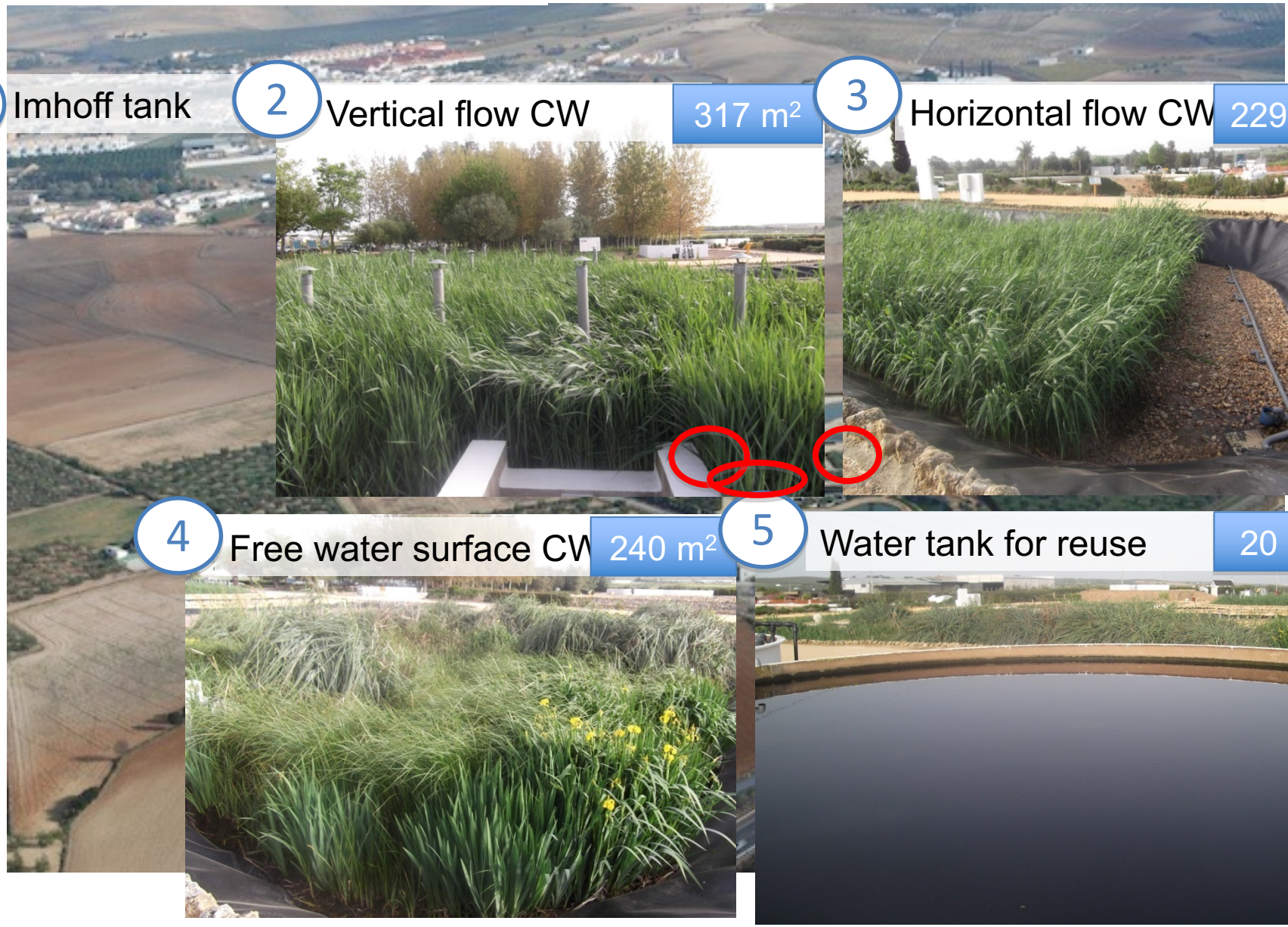
Surface flow constructed wetlands



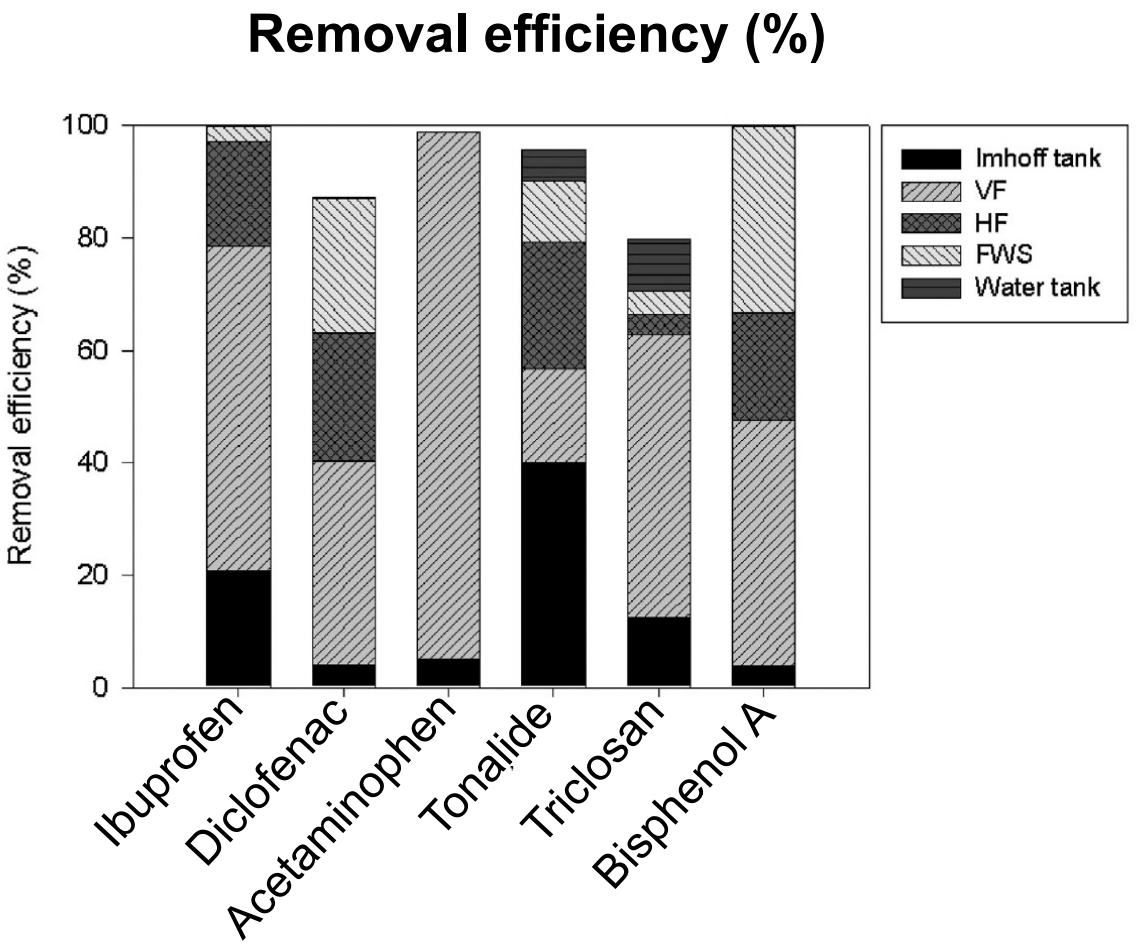
Modified from Pedescoll (2010)

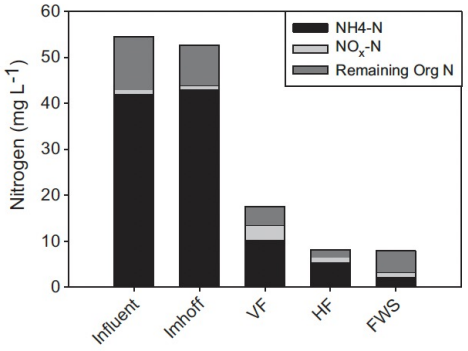
Hybrid systems

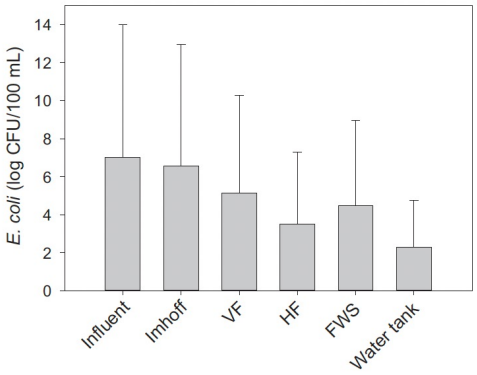
CENTA, Carrión de los Céspedes, Seville, Spain



Removal of emerging organic contaminants





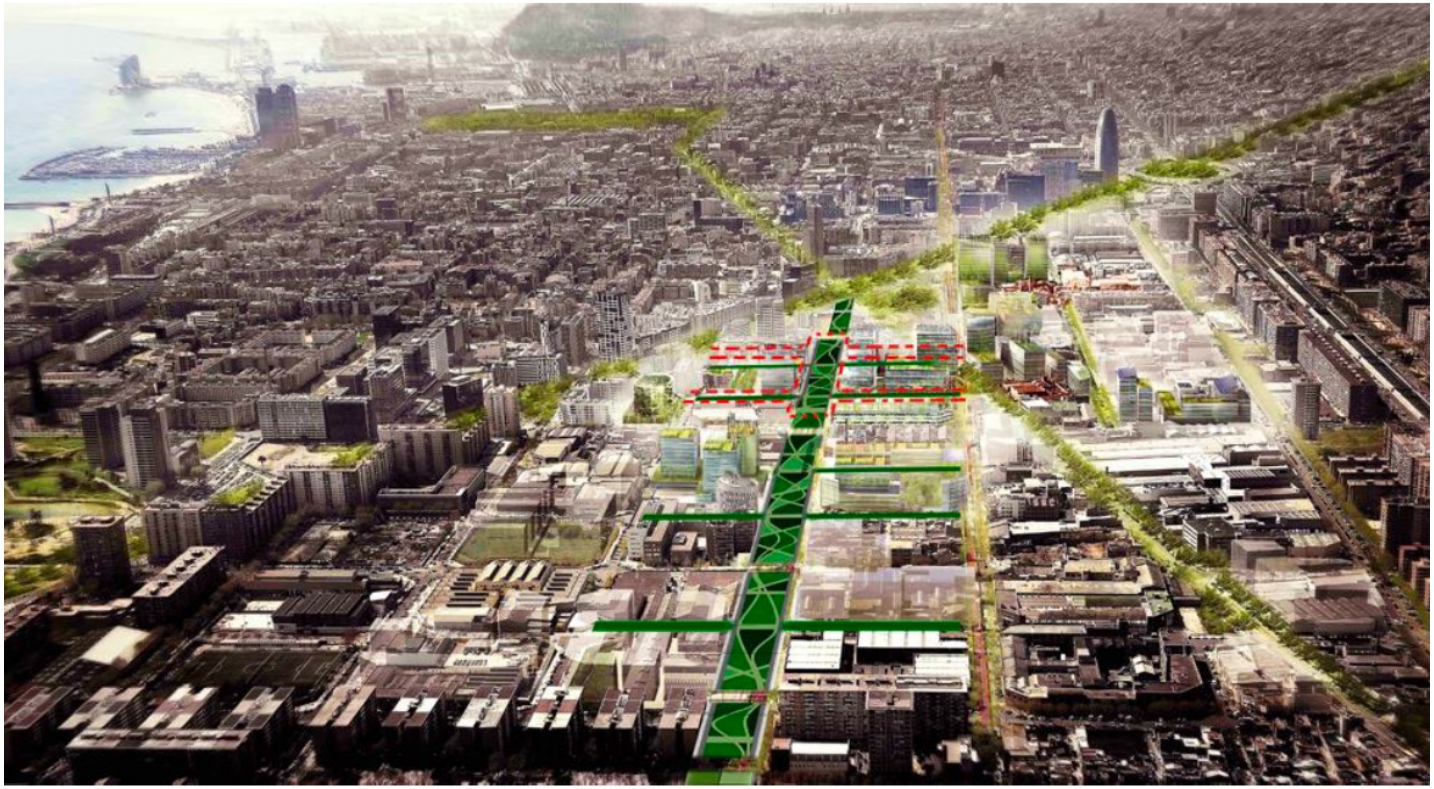


Ávila, Bayona, Martín, Salas & García (2015). Ecol. Eng.

Ávila, Salas, Martín, Aragón & García (2013). Ecol. Eng.

Linking Natural Treatment Systems to Nature-Based Solutions

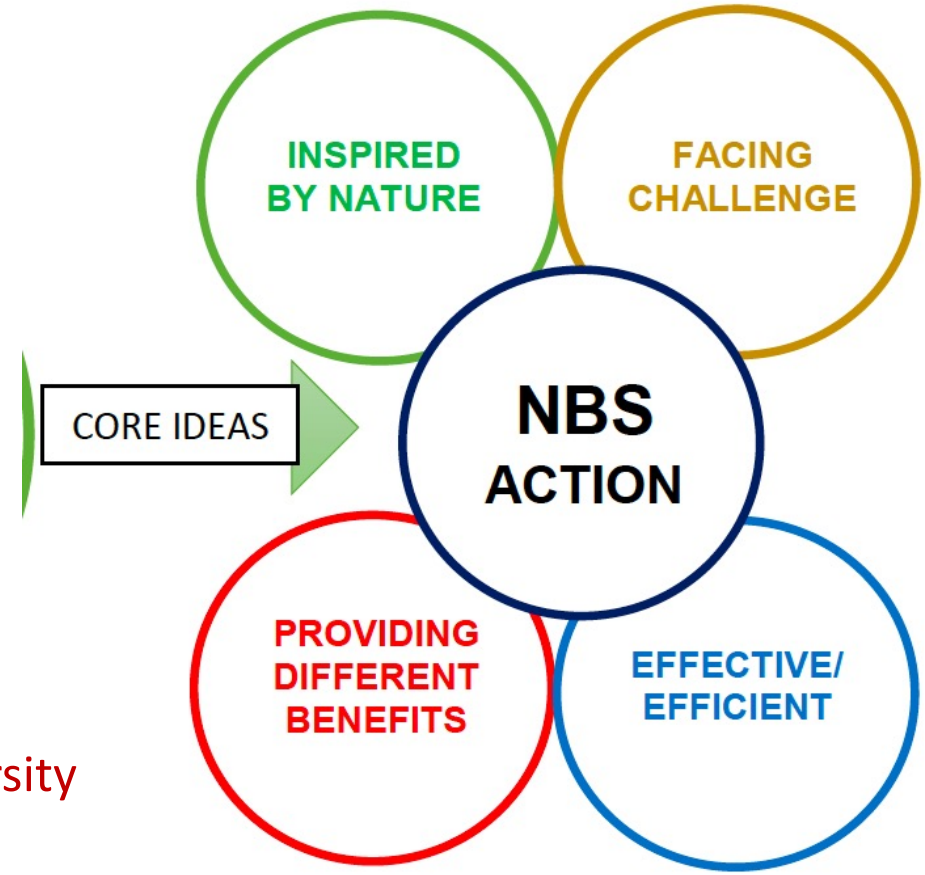
- Nature-Based Solutions
  1. *FROM EXISTING ECOSYSTEMS* → Conservation/natural restoration
  2. *NEW CONSTRUCTED ECOSYSTEMS* → Ecosystem services
     - Hybrid systems
     - Artificial ecosystems



Linear Park, Barcelona

Roberto Soto, IMU

What's the difference?



Increase biodiversity

Barbara Sowińska-Świerkosz and Joan García (2021)

Water reuse in the “Aiguamolls de l’Empordà” Park

Description of the Park

- Founded in 1983
- Emblematic marshland
- Surface area of 4,824 ha of which 850 ha are of integral nature reserve
- Very important for birdlife (Ramsar)

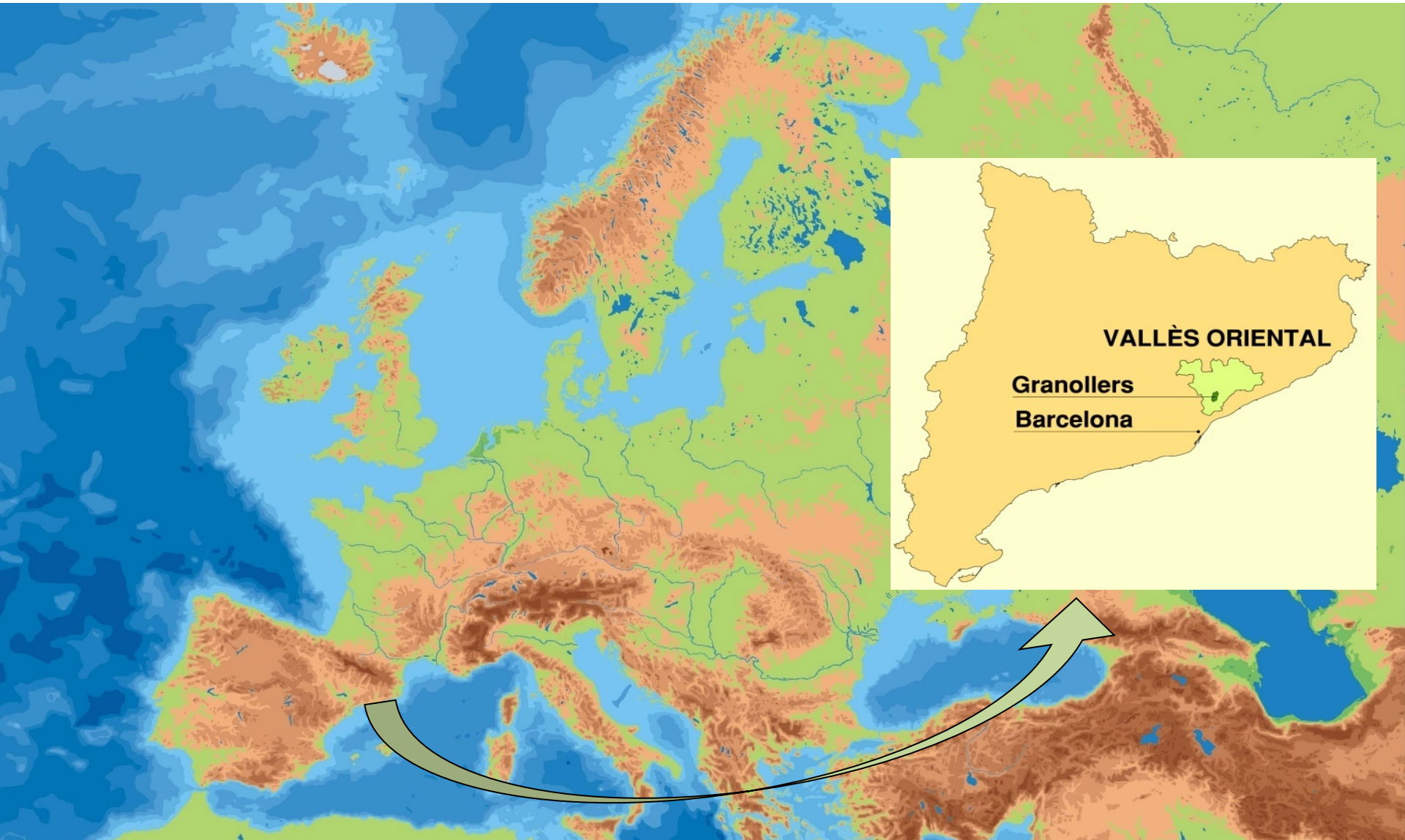
The problem

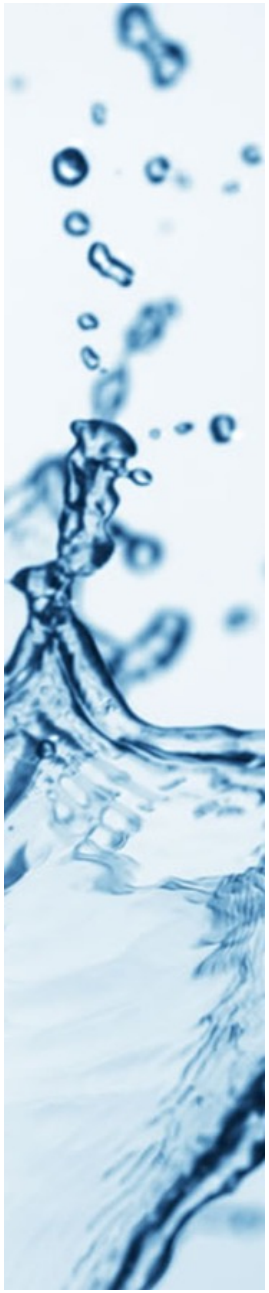
- **Visitors centre with a 18 h artificial pond (Cortalet)**
- **Pond is artificially fed with a stream that dries out in summer**
- **Visitors dissapointed**

The solution

- **Reuse the effluent of a nearby wastewater treatment plant**
- **But N content in the secondary effluent was too high**
- **Construct a 7 ha treatment wetland in order to reduce N and create an ecosystem with great potential for waterfowl attraction.**
- **Benefits: <u>reuse, suppress the discharge, new habitats, recreation</u>**

WATER REUSE IN CAN CABANYES (GRANOLLERS) URBAN PARK



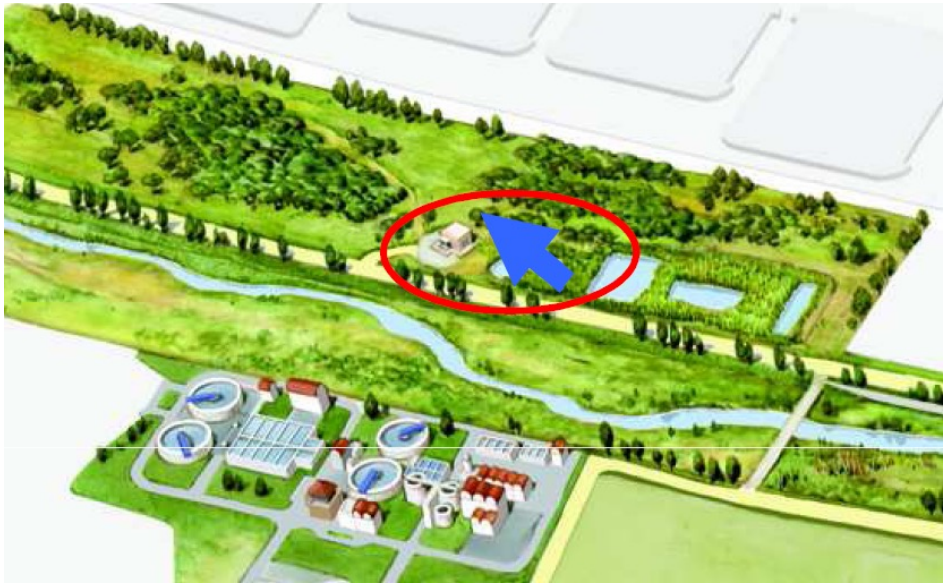


DESCRIPTION OF THE PROBLEM

- **Can Cabanyes is a highly human-impacted area near the river Congost in the municipality of Granollers.**
- **At the beginning of the 2000 in this area there were:**
  1. **Old landfill**
  2. **Uncontrolled orchards**
  3. **Wastewater treatment plant**
  4. **Solid waste treatment plant**
  5. **Industrial park**
  6. **Highway AP7**
  7. **Circuit of Catalunya**
  8. **River channeled**

THE PROPOSAL

- Clean up and restore the river environment with a series of measures which can reconcile enviromental improvement with the use of the area for leisure and education
- One of the measures was to build a 1 he constructed wetland which is fed with the effluent of the Granollers wastewater treatment plant



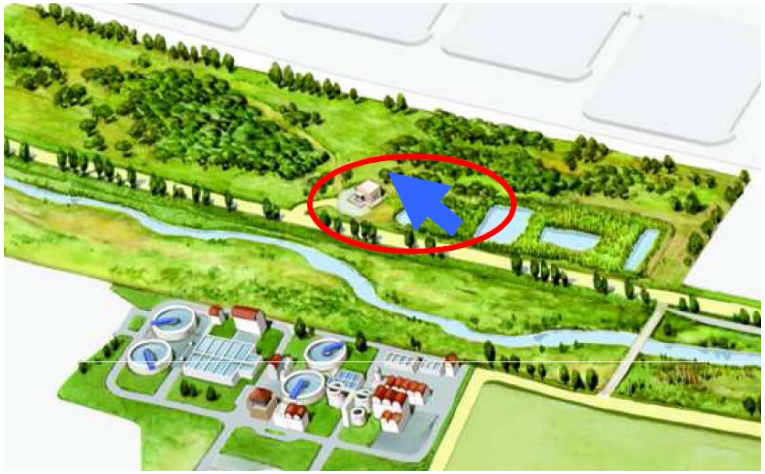
Source: Ajuntament Granollers

2002

CONSTRUCTED WETLAND

Source: Ajuntament Granollers

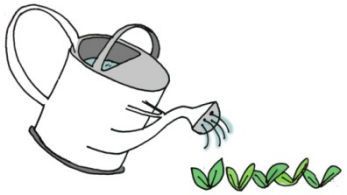
FILTERING PLANT FOR URBAN REUSE



2008

URBAN REUSE

Current uses

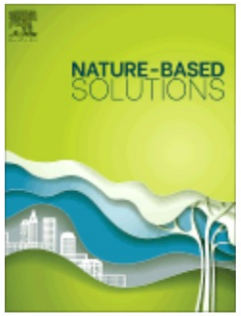


Green areas

Street cleaning

Landscape

Source: Ajuntament Granollers



Nature-Based Solutions

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