



An innovative design concept for the treatment of wastewater at an urban scale

Joana Castellar, Montserrat Bosch, Carlos Arias & Jordi Morató



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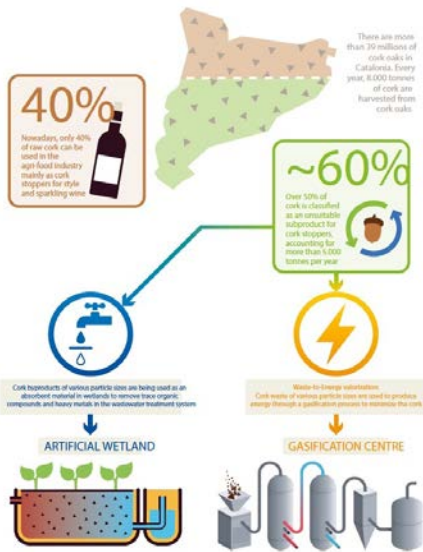


Previous Works

REAGRITECH LIFE (Plana de Lleida)



Removal 80-99% NO₃ - Granular Media = Cork



Nations Unies
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Càtedra UNESCO de Sostenibilitat

SITUACIÓN
Y EVOLUCIÓN DE LA
ECONOMÍA CIRCULAR
EN ESPAÑA

recnet.

ASYPS
Asociación para la sostenibilidad
y el progreso de las sociedades

COTEC
CONSEJO REGULADOR DE LA INDUSTRIA

<http://cotec.es/informe-economia-circular-2/>

Previous Works



Water
is too precious
to waste

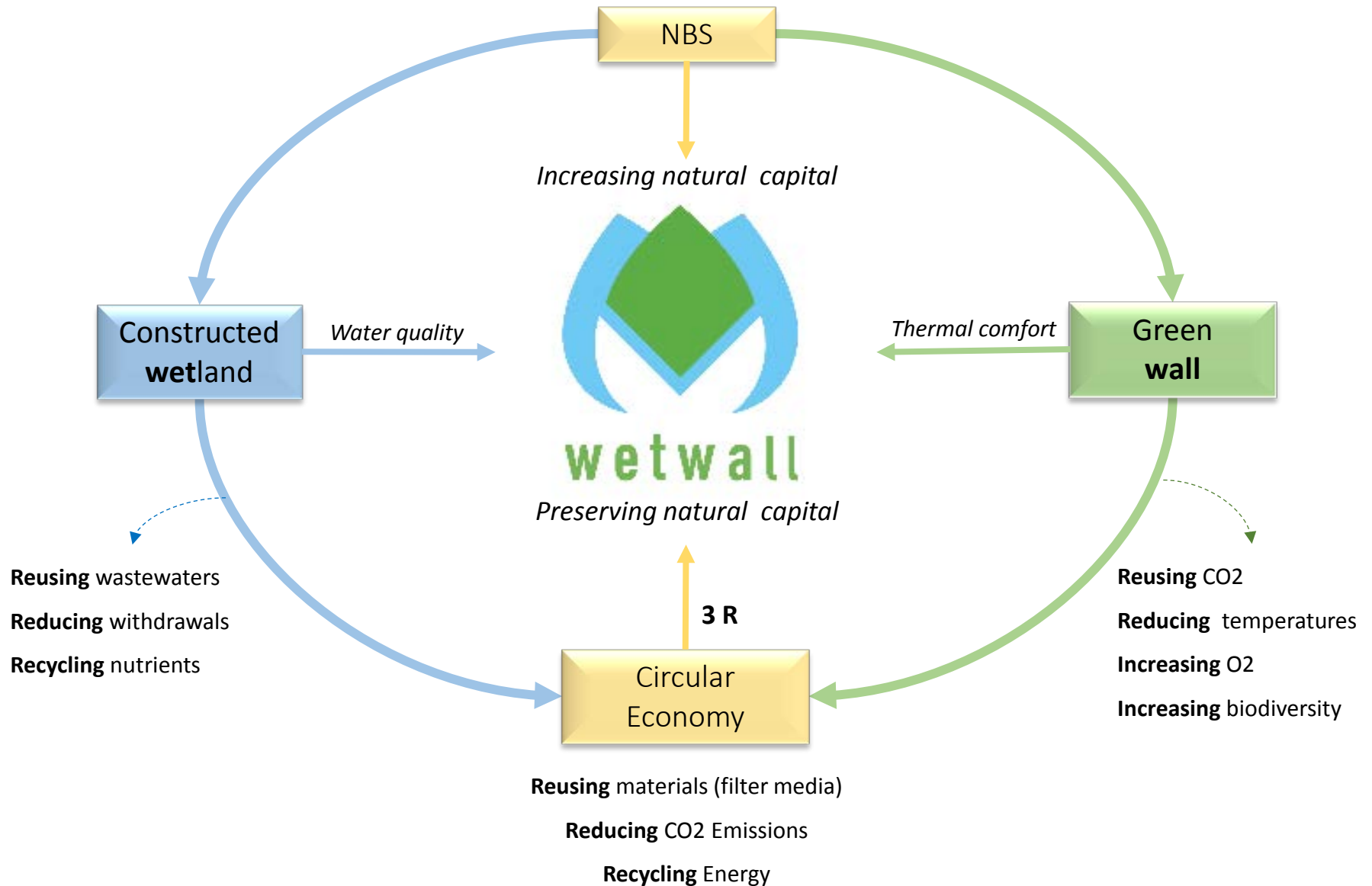
WATER IS A FINITE PRECIOUS RESOURCE

To reduce impacts on water quality and availability...

To mitigate climate change...



- Smart cities
Vertical surface
- Nature based solutions (NBS)
Green wall & Constructed wetlands
- Circular economy
Reusing, recycling and reducing





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Cork as a sustainable carbon source for nature-based solutions treating hydroponic wastewaters – Preliminary batch studies

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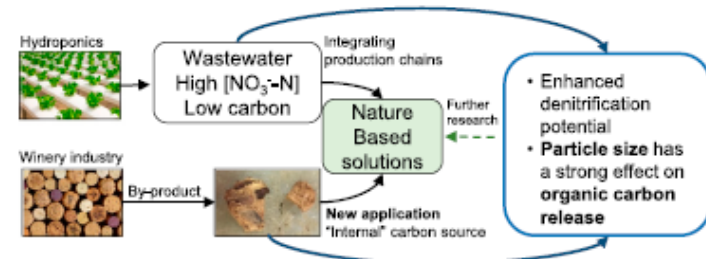
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HIGHLIGHTS

- The reuse of local by-products like cork allows preservation of natural capital.
- Cork has the potential to enhance denitrification in nature-based solutions.
- As particle size increases, the release of carbon becomes slower along time.
- Estimations showed that 1.8 m³–3.9 m³ of hydroponic wastewater could be treated.
- Cork particle size is a key parameter to design natural denitrification solutions.

GRAPHICAL ABSTRACT



ARTICLE INFO

ABSTRACT



CAAC (CRUSHED AUTOCLAVED AERATED CONCRETE) AN REACTIVE FILTER MEDIA TO ENHANCE P REMOVAL AND RECOVERING IN NATURE-BASED SOLUTIONS – PRELIMINARY BATCH STUDIES

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Horizontal Flow (HF)



Vertical Flow (VF)



Hybrid Flow (HF - VF)



Hybrid Flow (VF - HF)



Hybrid Flow (HF-VF and VF-HF)



Hybrid Flow (VF and HF)

“WETWALL” – an innovative design concept for the treatment of wastewater at an urban scale

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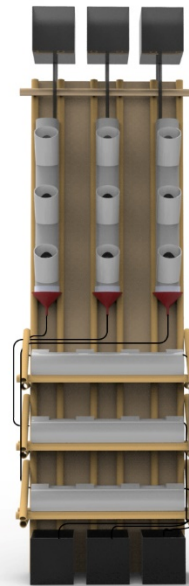
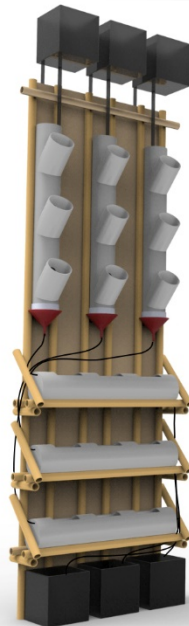
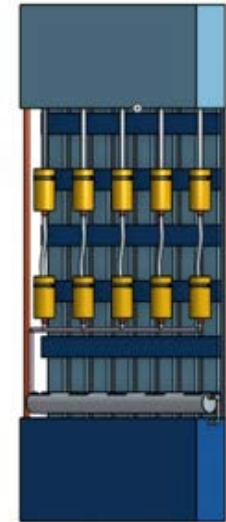
ABSTRACT

Rising temperatures, increasing food demand and scarcity of water and land resources highlight the importance of promoting the sustainable expansion of agriculture to our urban environment, while preserving water resources. Treating urban wastewaters, such as greywater and hydroponic wastewater, may represent a strategic point for the implementation of urban farming, ensuring food security, reducing pressures on water resources and promoting climate change mitigation. The WETWALL design concept proposes a unique ecotechnology for secondary wastewater treatment at an urban scale, which brings the novelty of a modular living wall hybrid flow. This concept is based on the integration of two established nature-based solutions/ecomimetic designs: constructed wetlands and a modular living wall. First presented is an overview about the state of the art in the scope of living walls treating wastewater, in order to identify the main design aspects related to the performance of such systems, which mainly concerns the removal of nitrates and phosphates. Second, the WETWALL design concept is presented. A scheme regarding the selection of the main components, such as plants and substrate, is proposed, and potential structure developments and operation strategies are discussed. In addition, considering the scope of integrating the circular economy with the design process, potential interactions between this technology and the urban environment are discussed. The main goal of this article is to substantiate the potential of the WETWALL design concept as an innovative wastewater treatment at an urban scale.

Keywords: Wastewater; Circular economy; Living wall; Constructed wetland; Nature-based solutions



WETWALL Design process





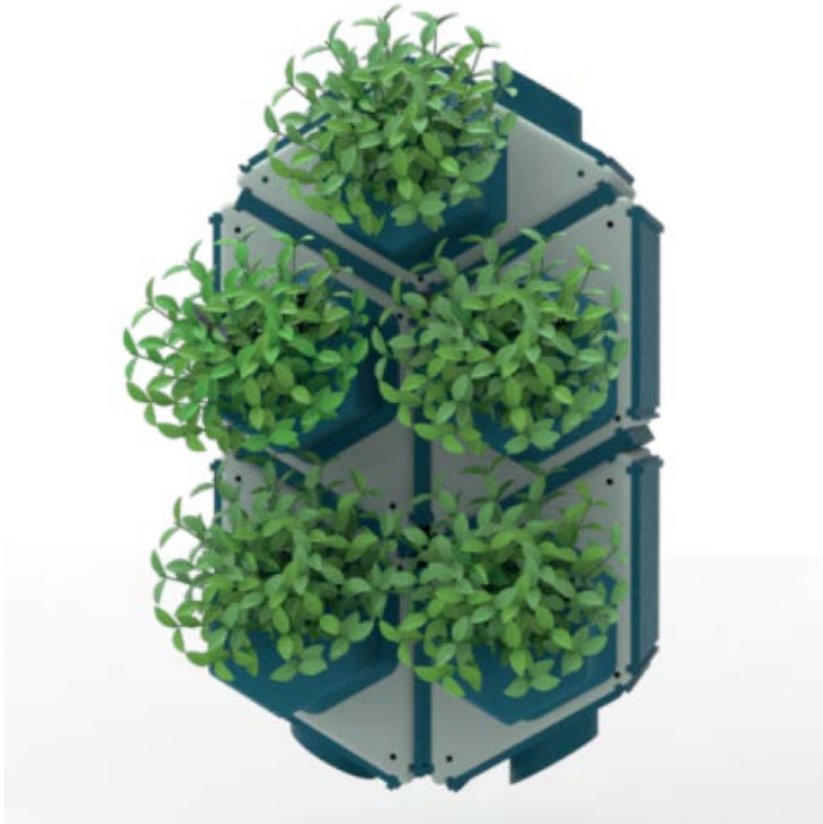
WETWALL Design process





BOD	→	51 %
$NO_3^- - N$	→	15 %
$NH_4^+ - N$	→	64 %
$PO_4^{-3} - P$	→	54 %

HYDRID FLOW
VALIDATED!!!



Water and thermal analysis
Final validation

Print modules
Implement at real scale



Collaborator



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BARCELONA



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Pompeu Fabra
Barcelona



Eixverd

Cobertes vives. Cel blau.

YTONG[®]

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