Full scale MET-assisted biolters for urban wastewater treatment: the H2020 METland project

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MEET-ME4WATER - Meeting Microbial Electrochemistry for water (AG110)

EIP Water Action Group
Pooling resources – Innovating water

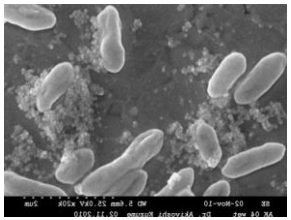
This page is currently under development. More will follow soon!

MEET-ME4WATER will focus on overcoming the barriers to scale-up and demonstration of microbial electrochemical technologies (METs) and bring them faster to market. These technologies treat waste water and, at the same time, produce value added products (chemicals, H2, and/or desalinate water at zero energy cost simultaneously) whilst producing energy. METs have a well explored innovation potential for sustainable development of waste water treatment systems. Further work is needed to fully control the engineering and biotechnological aspects of these systems at larger scale.

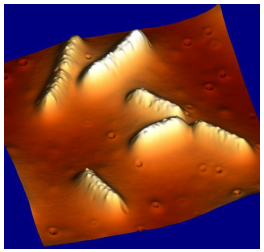
With this purpose, we have defined two lines of work:

- Line of work A: MET applied to urban and industrial waste water treatment (and desalinated water production) at zero energy and sludge production/disposal cost.
- Line of work B: MET applied to recovery and synthesis of added value products (i.e. compounds from urine, caustic soda, hydrogen) from waste water at zero energy and sludge production/disposal cost.

From nano to kilo:
Accelerating the technology transfer by scaling-up

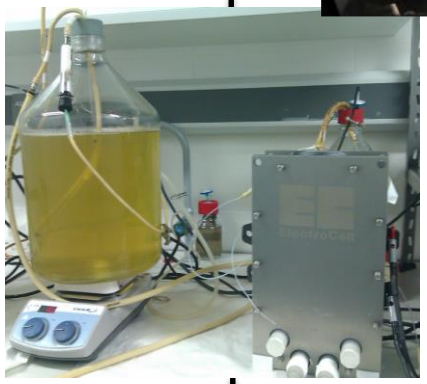


nano



micro

mili

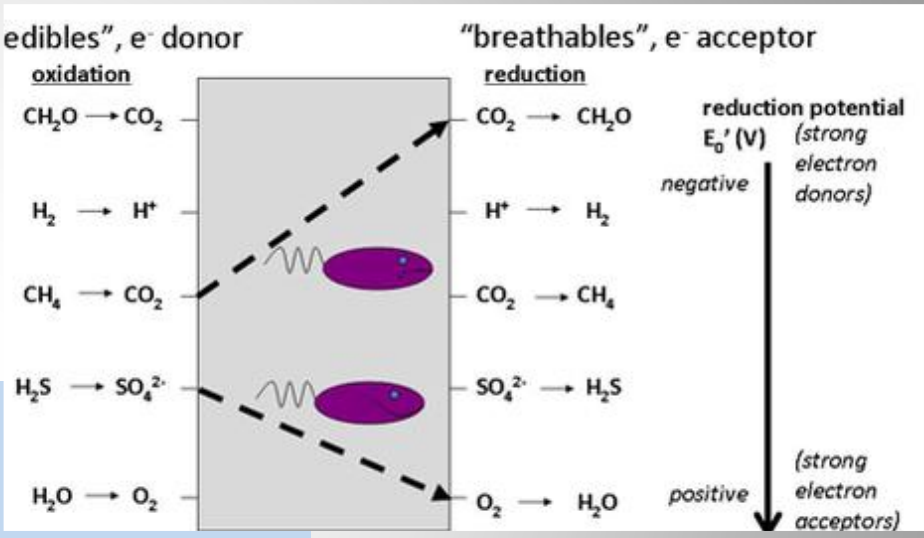


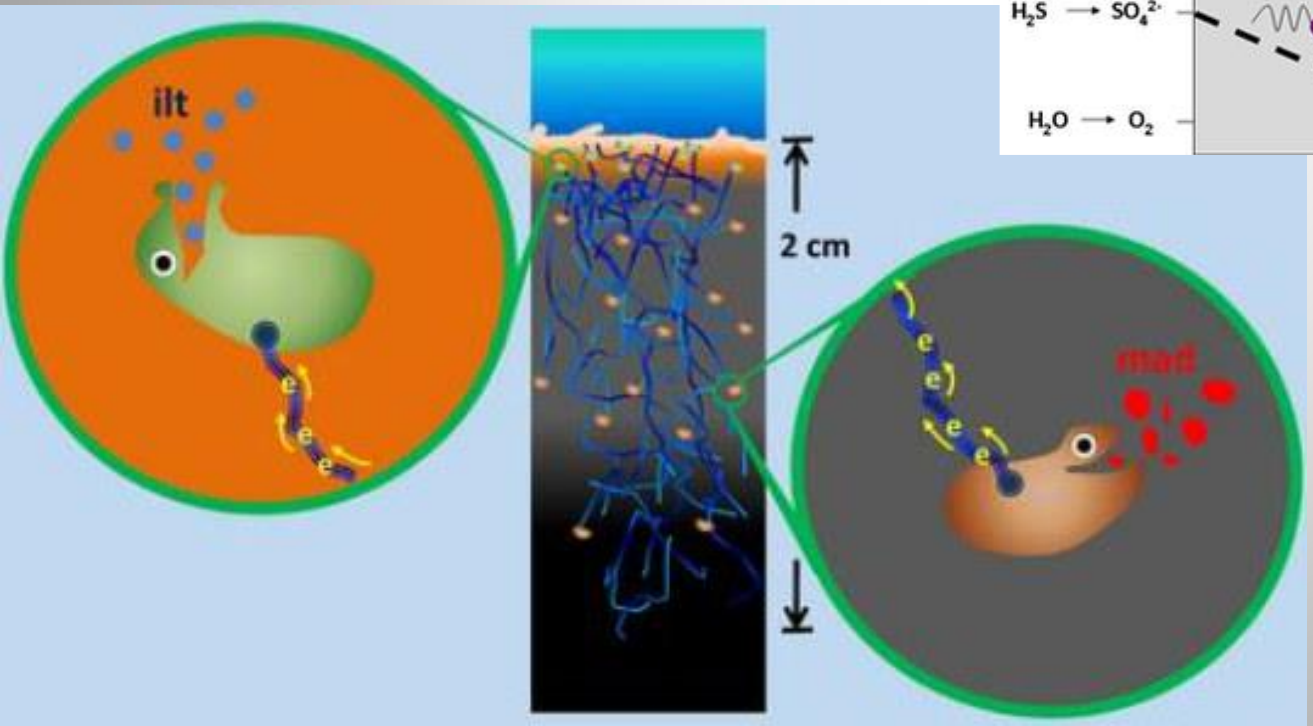
kilo

25m³/day

Redox tower controls bioenergetics in living cells

Electrons are the "flavor" of the redox reactions



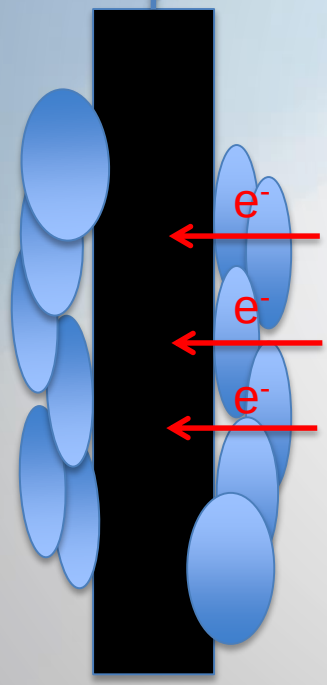


Some bacteria can harvest electrons and transfer them to other bacteria

Electroactive microorganisms can…

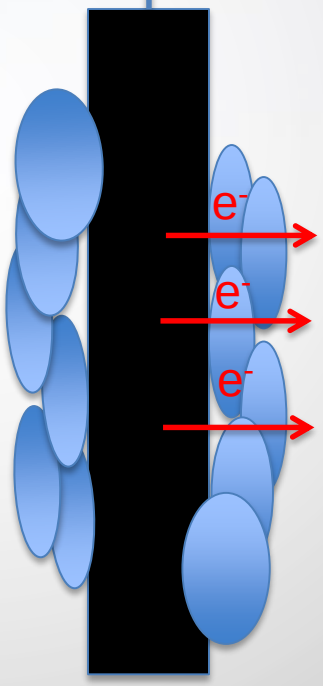
…transfer electrons
to electrodes:
Harvest electricity

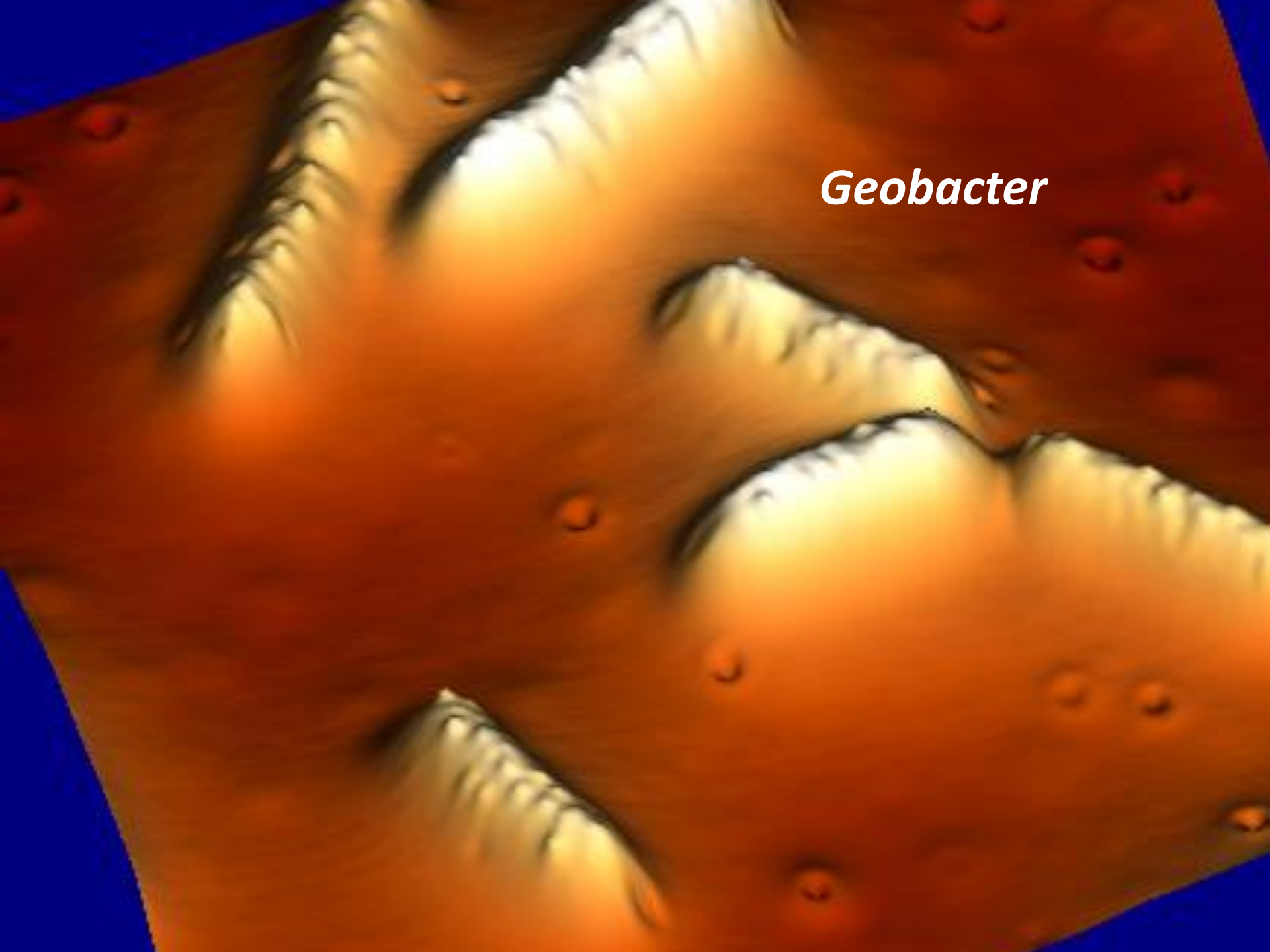
(+)



…accept electrons
from electrodes:
Electrcitiy comsumption

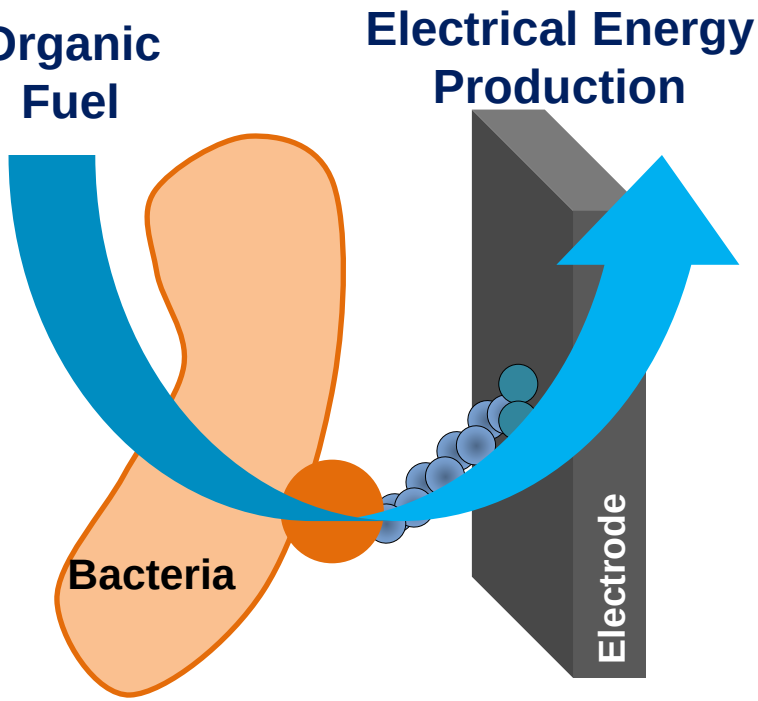
(-)



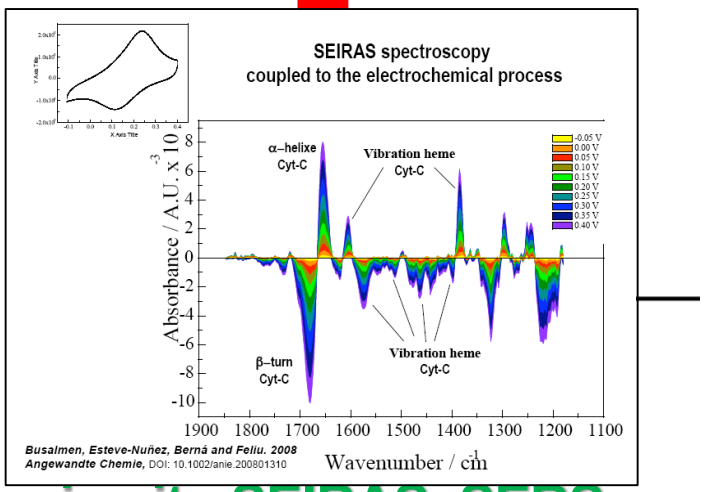

Geobacter

Mediating Electron Transfer Process

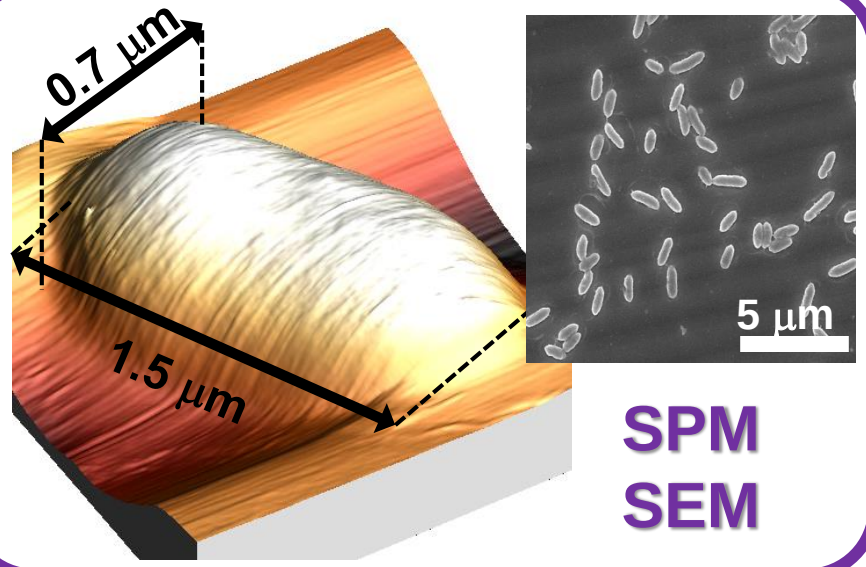
UNIVERSITY OF LIVERPOOL



Molecular Linker

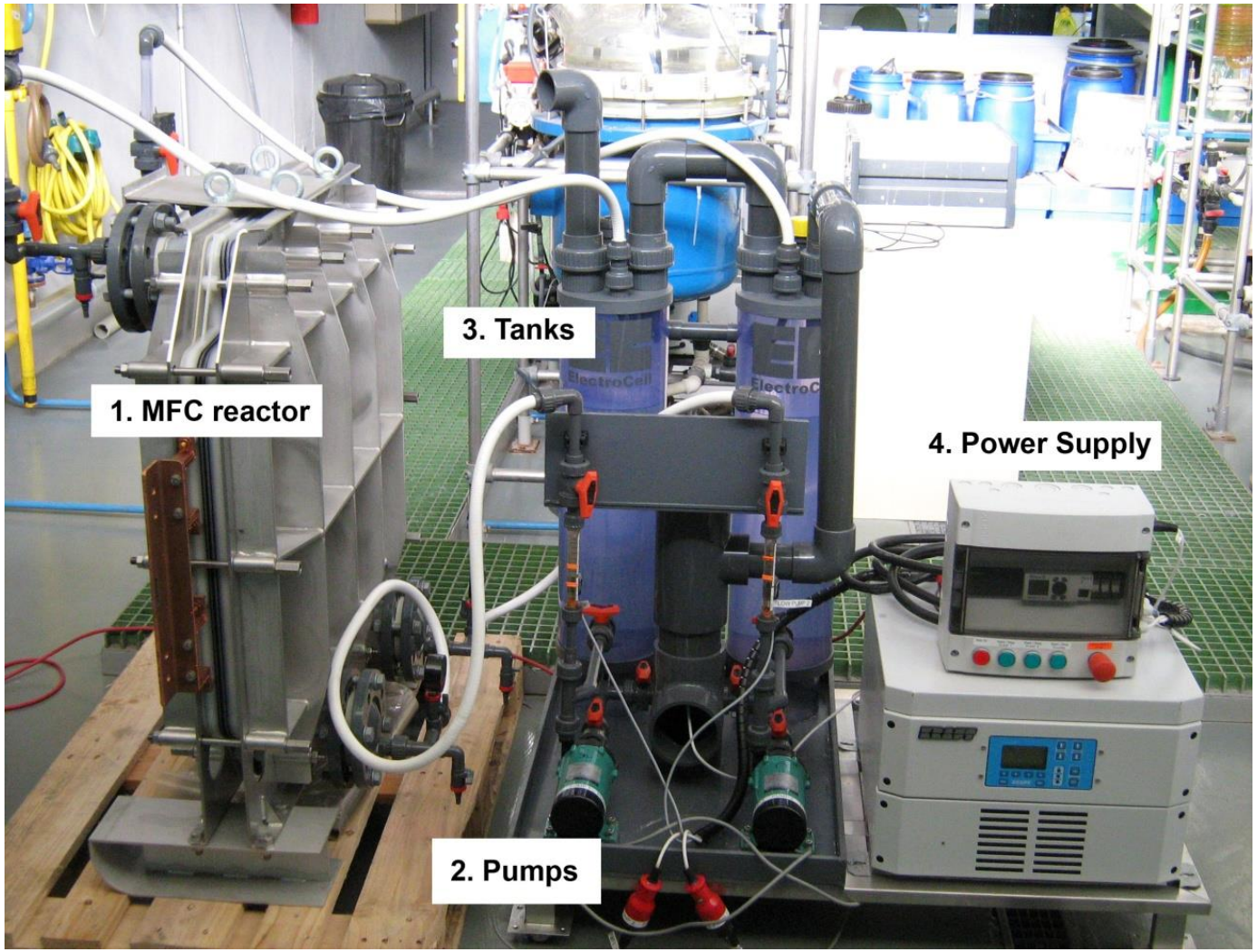


in situ SEIRAS, SERS



SPM
SEM

Optimisation and Characterisation of Electron Transfer Property through Mediating Linker Molecules



ElectroCell

Universitat d'Alacant
Universidad de Alicante


Area of Extensive technologies
METLANDS
Treated water reservoir
Area of Intensive technologies
Aquifer's recharge
Reuse plots

Nitrogen removal from low COD effluents without aireation

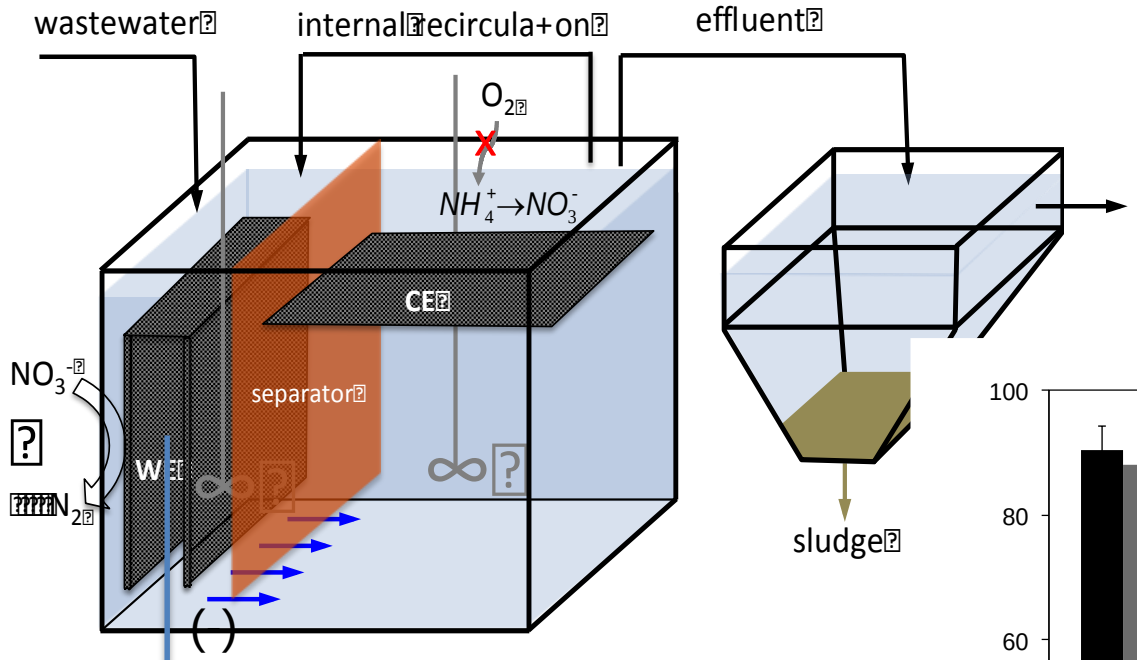
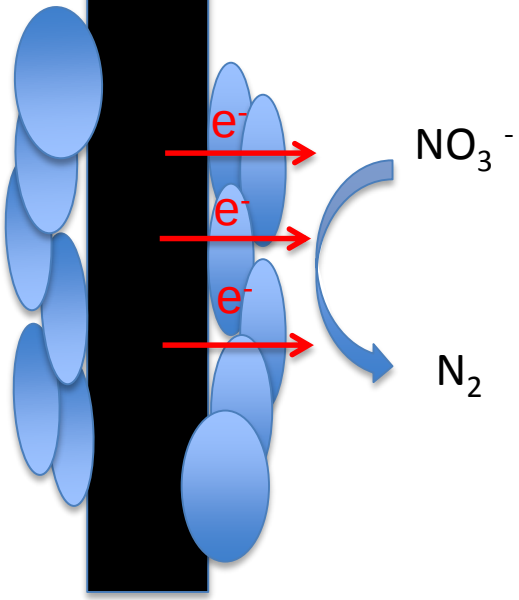
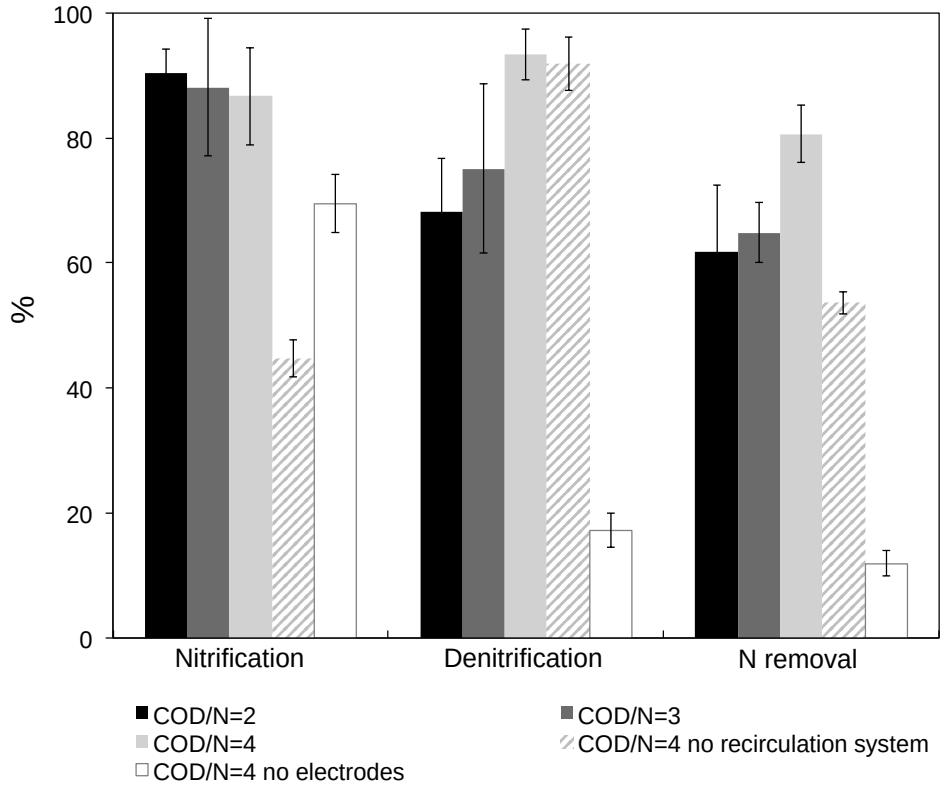


Figure 1: Schematic of the reactor design and experimental set-up.





Tejedor et al. 2016 *Env.Science: Water Research & Technology*

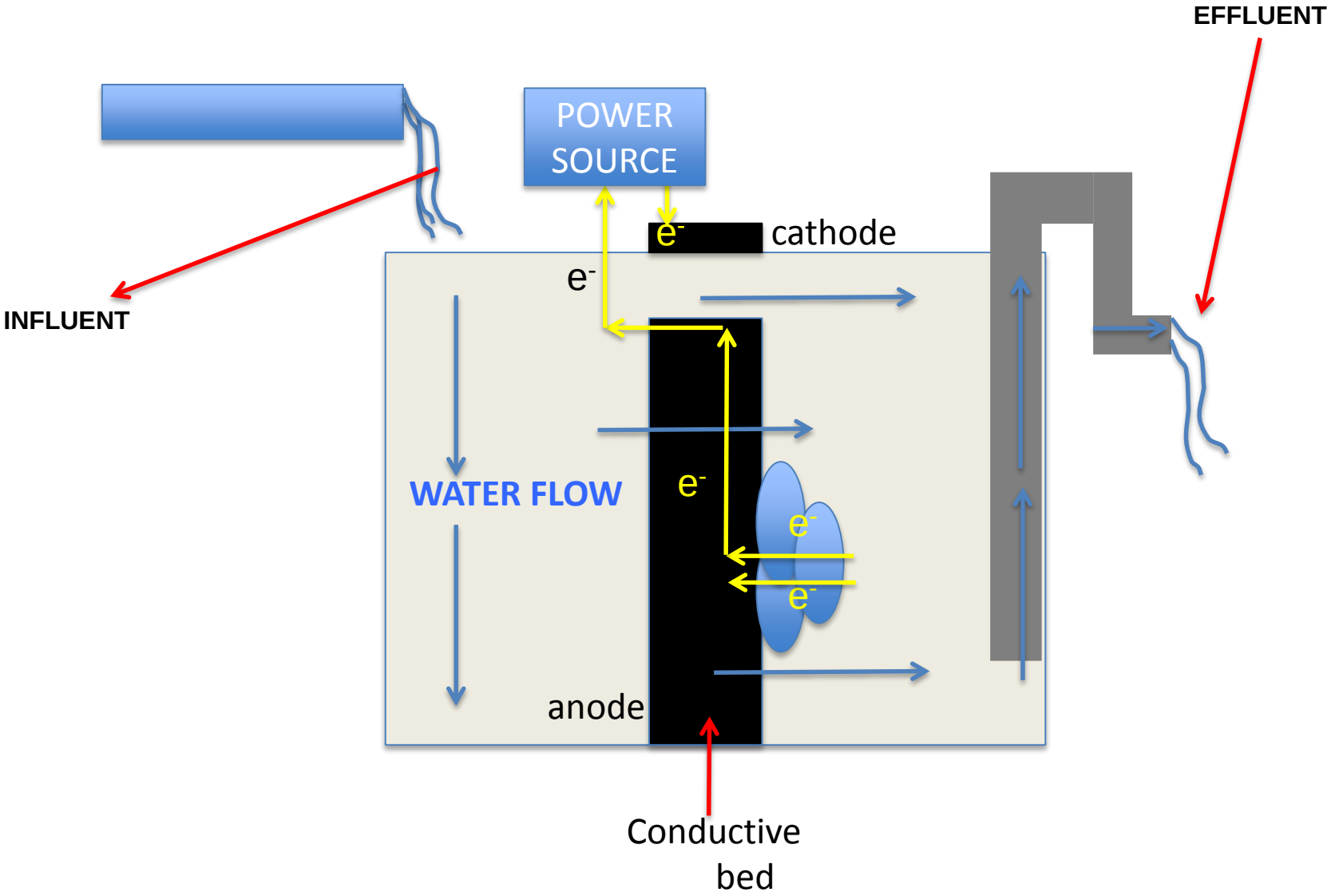








Our model for hybrid METland



>4mm

Full scale

Patent application

PCT/ES2012/070153

Dimensions 7x4x0.6m

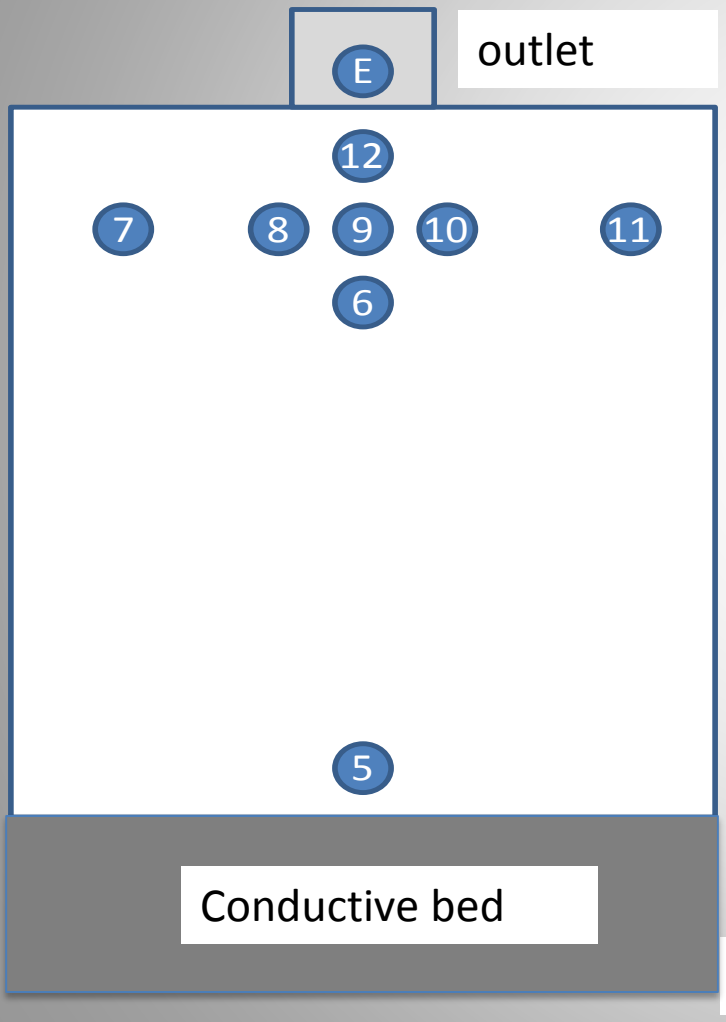
Volume of conductive bed 1m^3

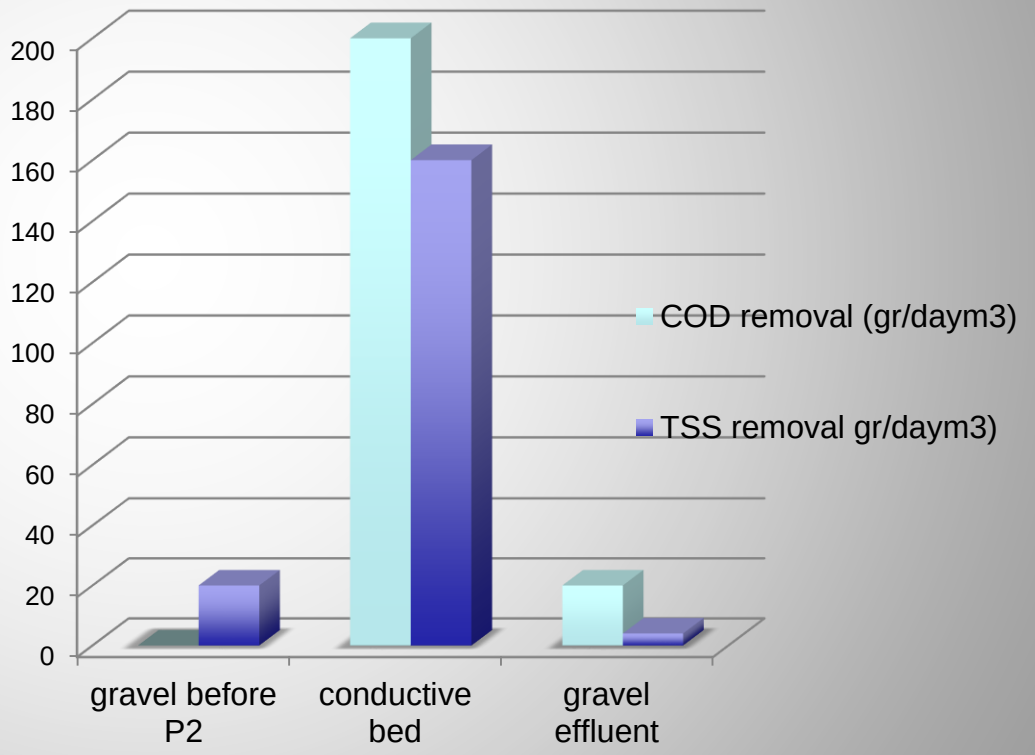
Flow ratel= 33 l/min

Inlet volume= 165 l/pulse

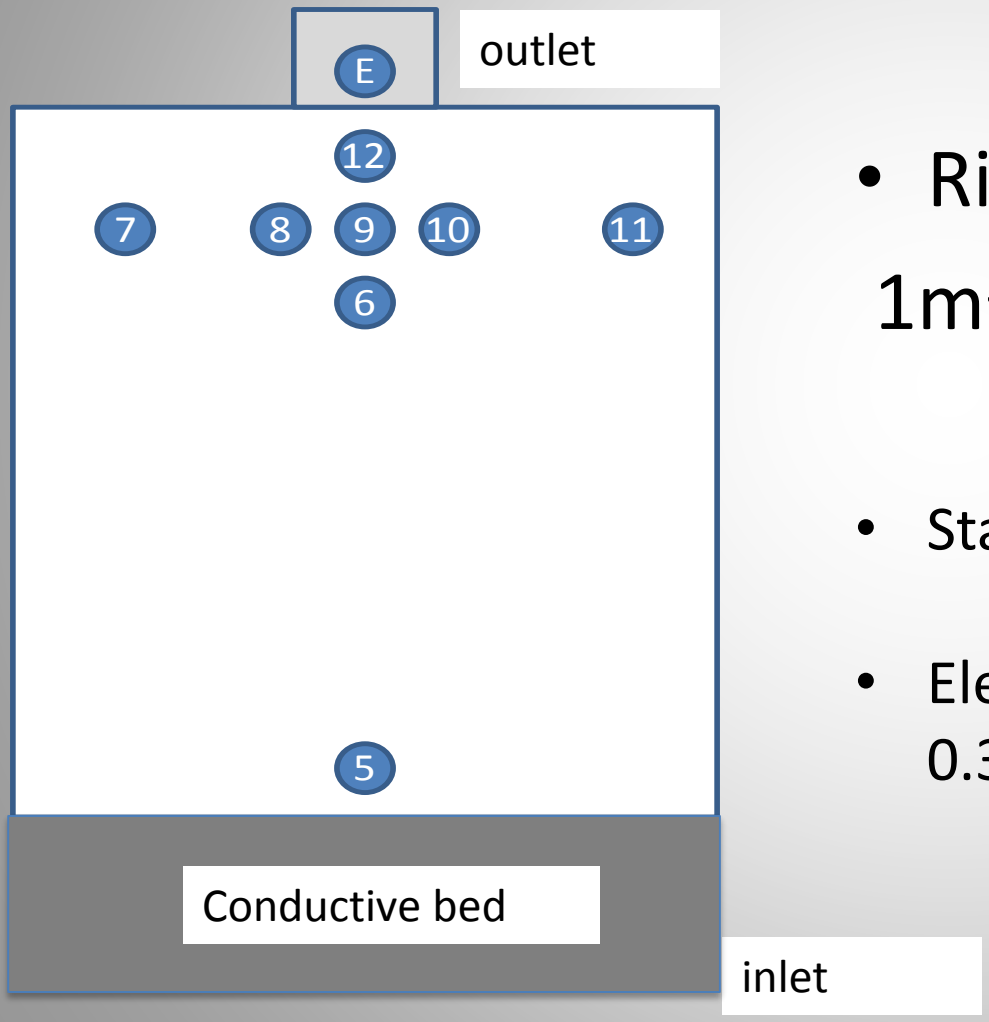
Total flow rate= 2m^3/day

COD&TSS removal per bed volume





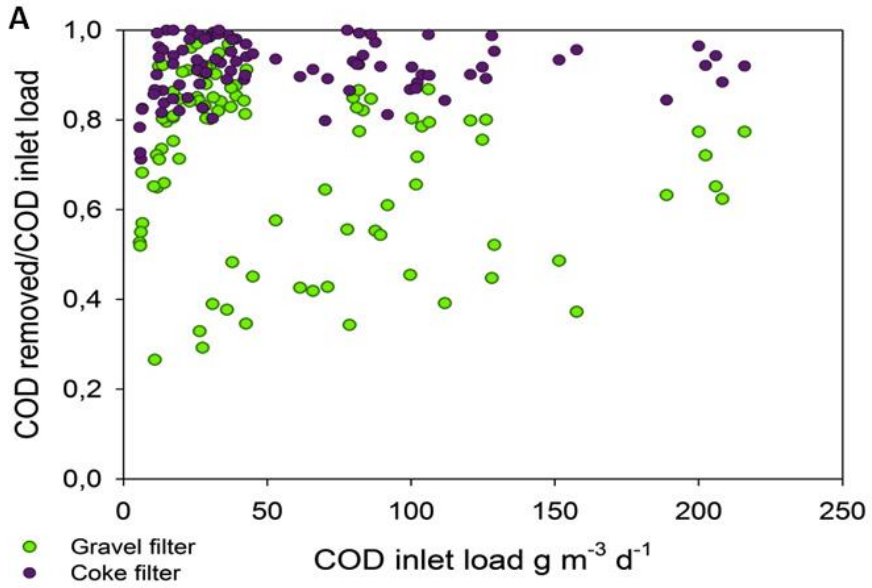
Let´s increase the conductive bed!

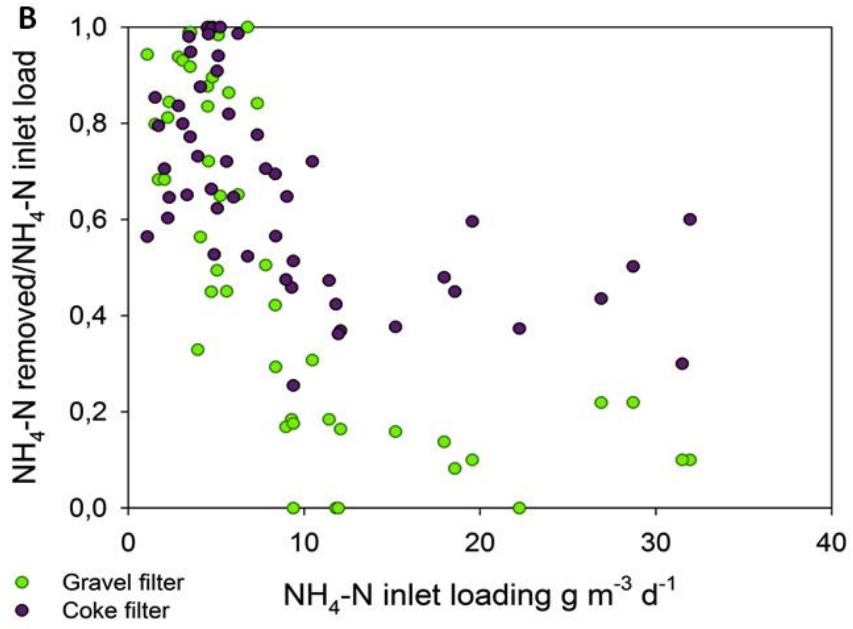


- Right now:

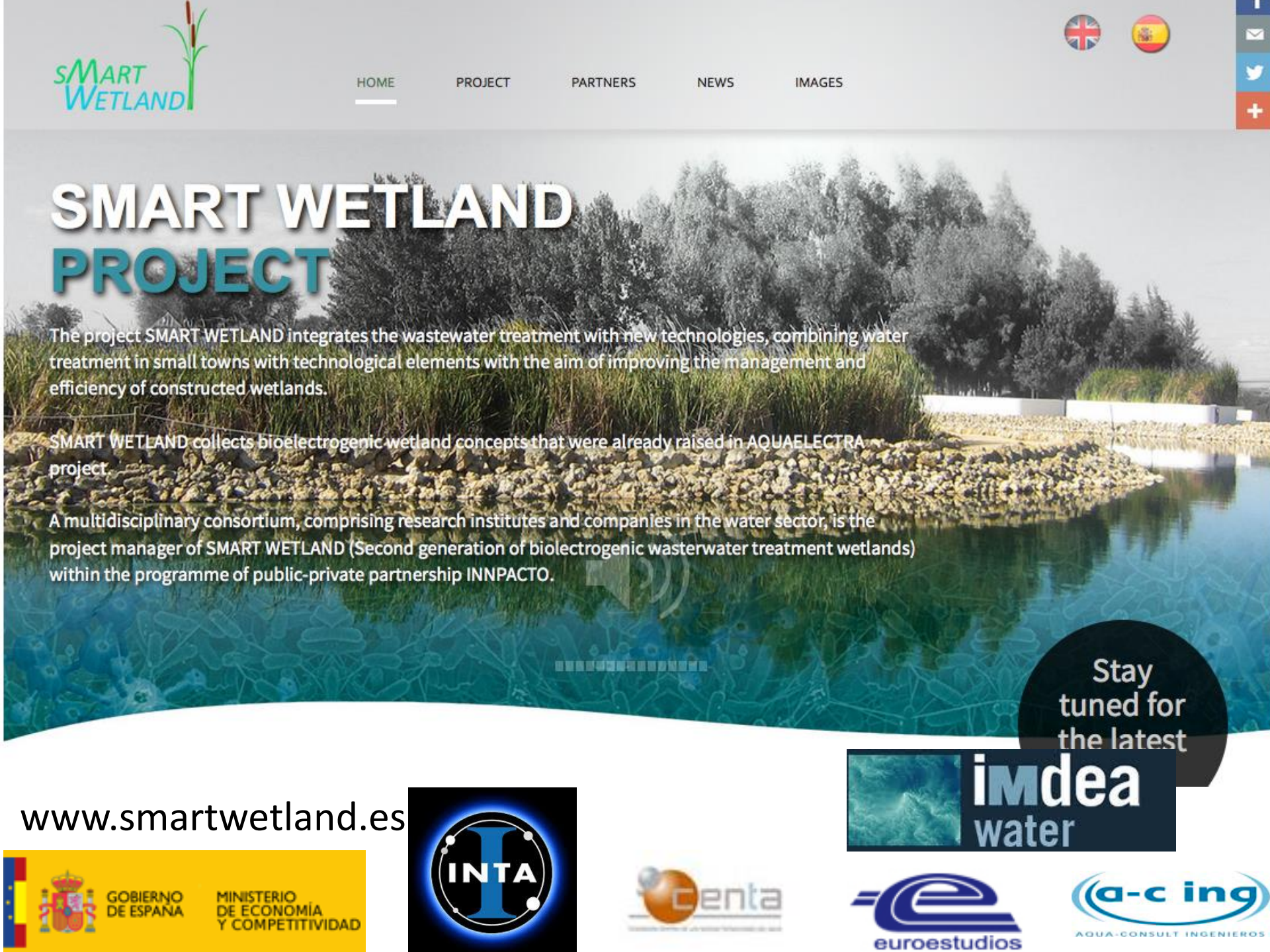
  $1m^3water/m^3bed$

- Standard wetland: $3m^2/hab$
- Electroconductive wetland: $0.33m^2/hab$.





Aguirre et al. 2016
Env.Science: Water Research & Technology


SMART WETLAND
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PROJECT
The project SMART WETLAND integrates the wastewater treatment with new technologies, combining water treatment in small towns with technological elements with the aim of improving the management and efficiency of constructed wetlands.
SMART WETLAND collects bioelectrogenic wetland concepts that were already raised in AQUAELECTRA project.
A multidisciplinary consortium, comprising research institutes and companies in the water sector, is the project manager of SMART WETLAND (Second generation of biolectrogenic wasterwater treatment wetlands) within the programme of public-private partnership INNPACTO.
Stay tuned for the latest
imdea water
www.smartwetland.es
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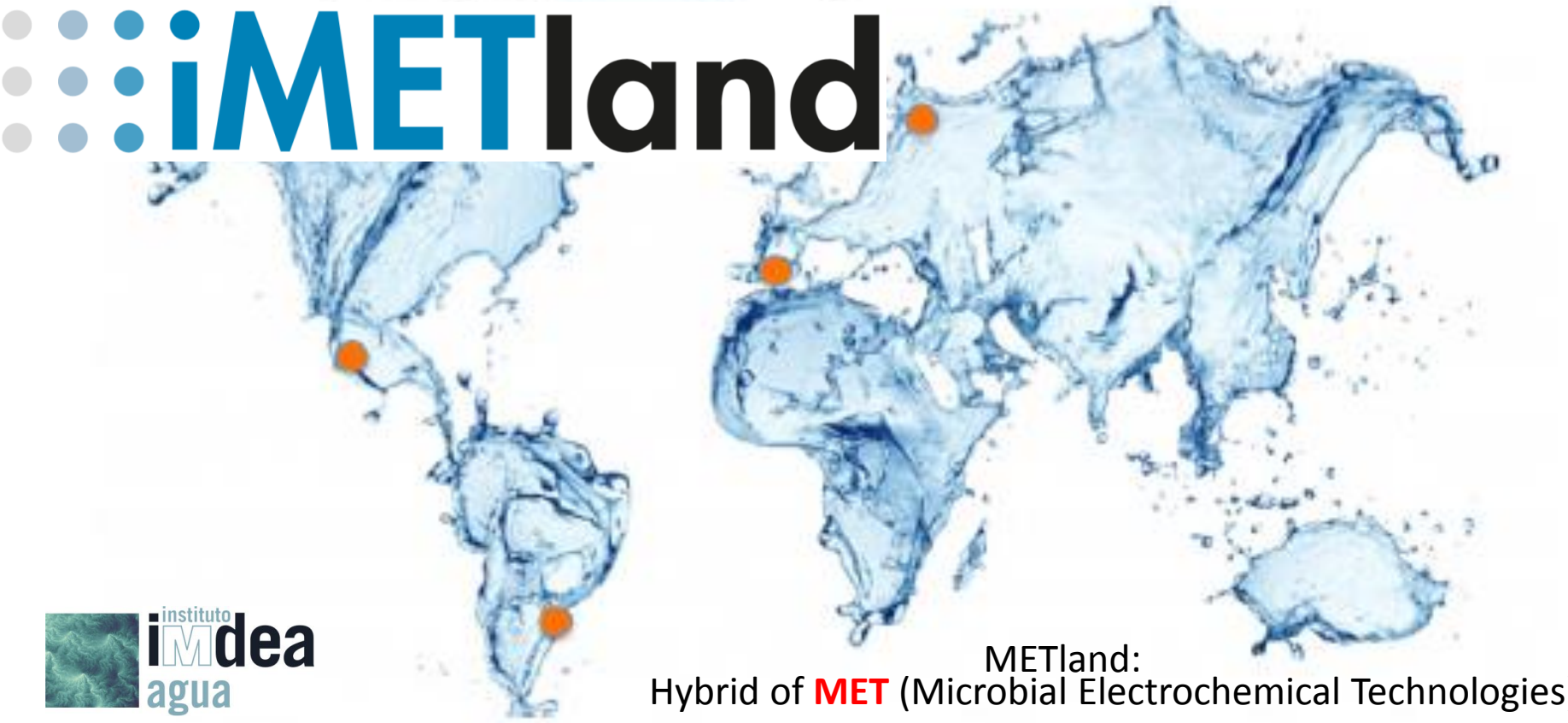
Smartwetland: Electronic rack

iMETland:A new generation of Microbial Electrochemical Wetland for effective decentralized wastewater treatment systems

iMETland

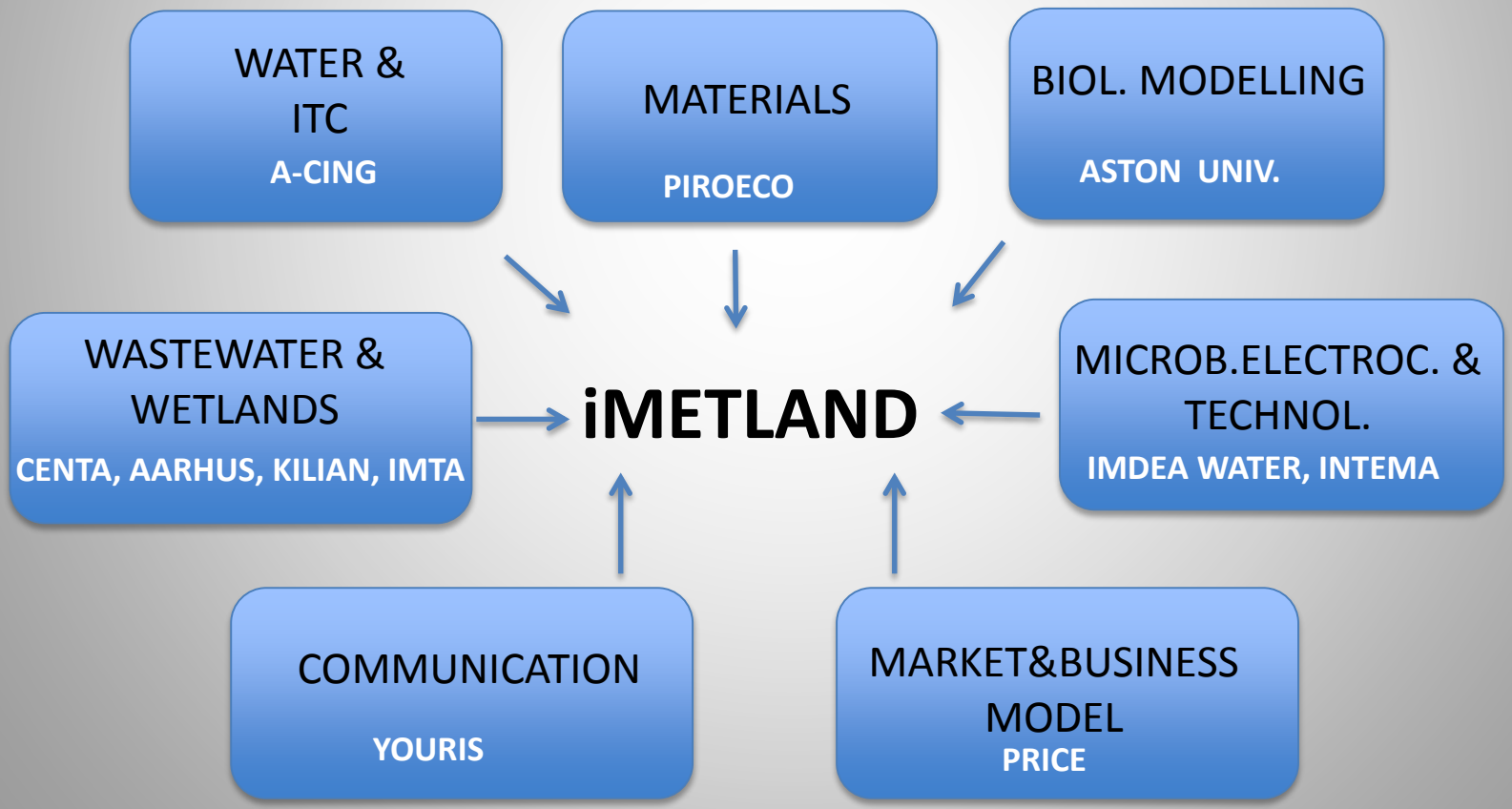


METland:
Hybrid of **MET** (Microbial Electrochemical Technologies) and wet**land**

www.imetland.eu

iMETland

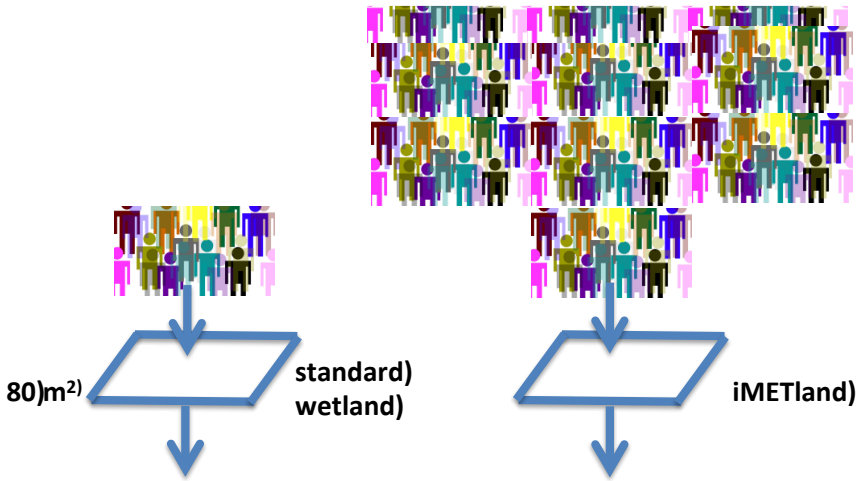
A new generation of Microbial Electrochemical Wetland for effective decentralized wastewater treatment systems

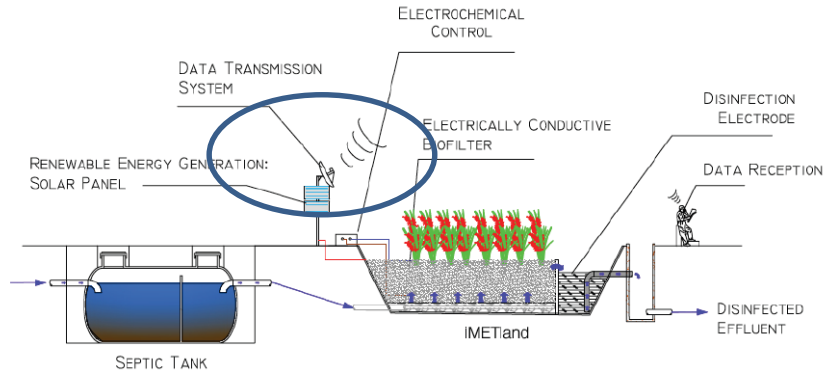


Changing the paradigm for treating wastewater

Electricity production for Monitoring and control through ICT

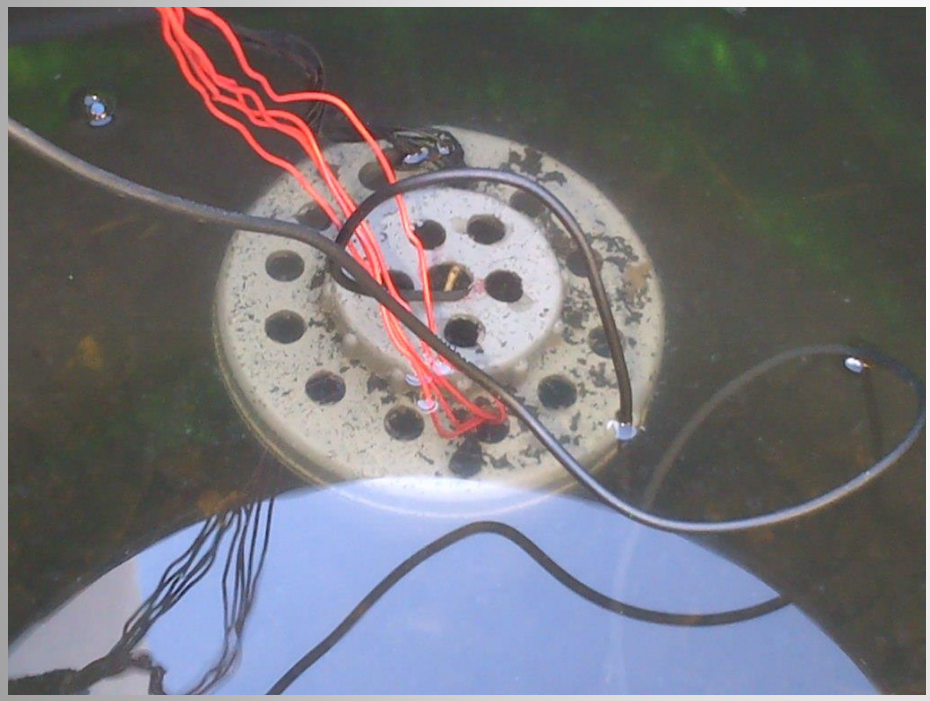
Reducing area by 10-fold

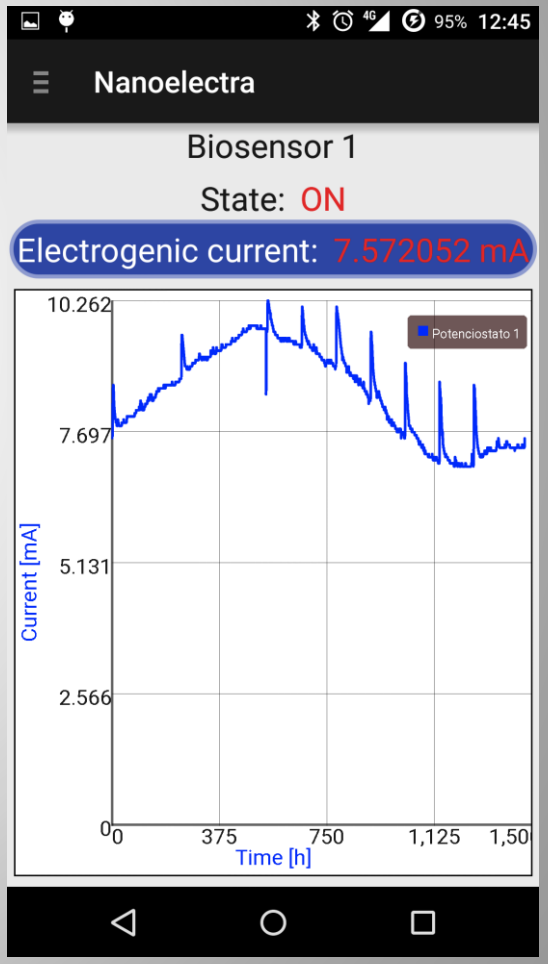




Landing Beautification

App for cellphone to monitor the current from biosensors





iMETland

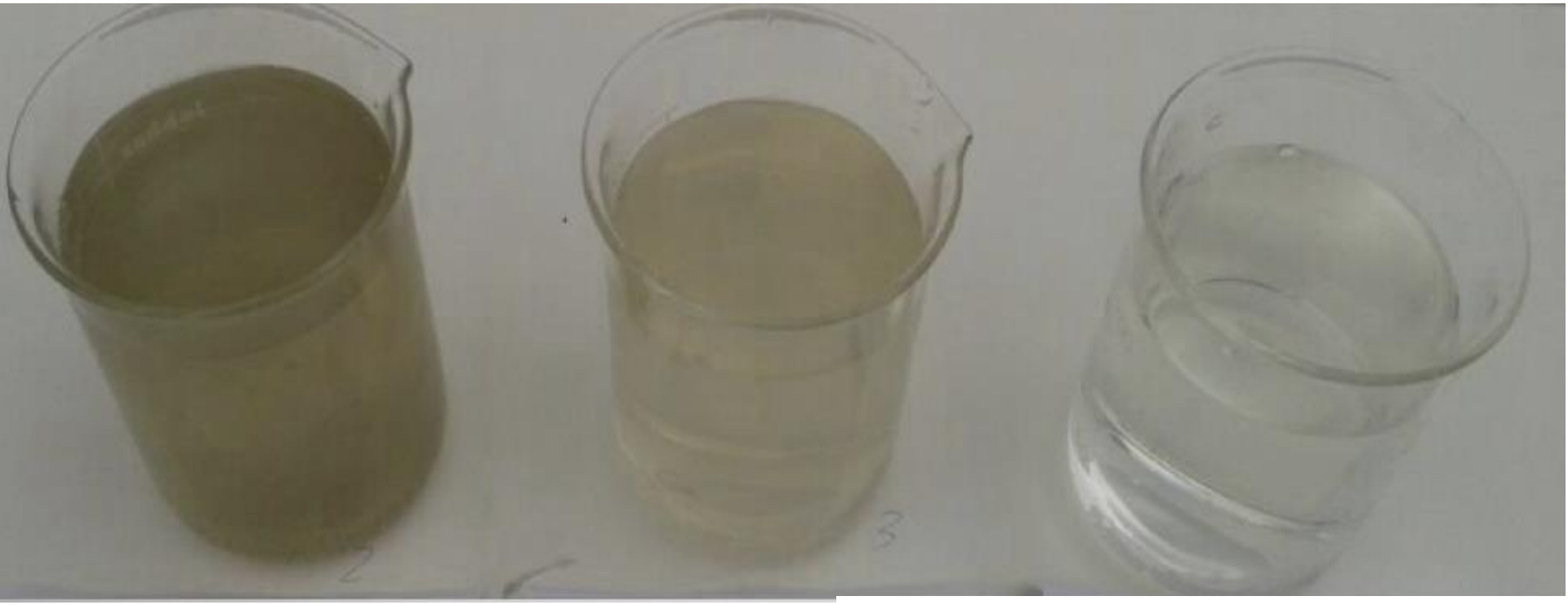
Inlet ww

outlet

overload4x

Standard wetland

METland



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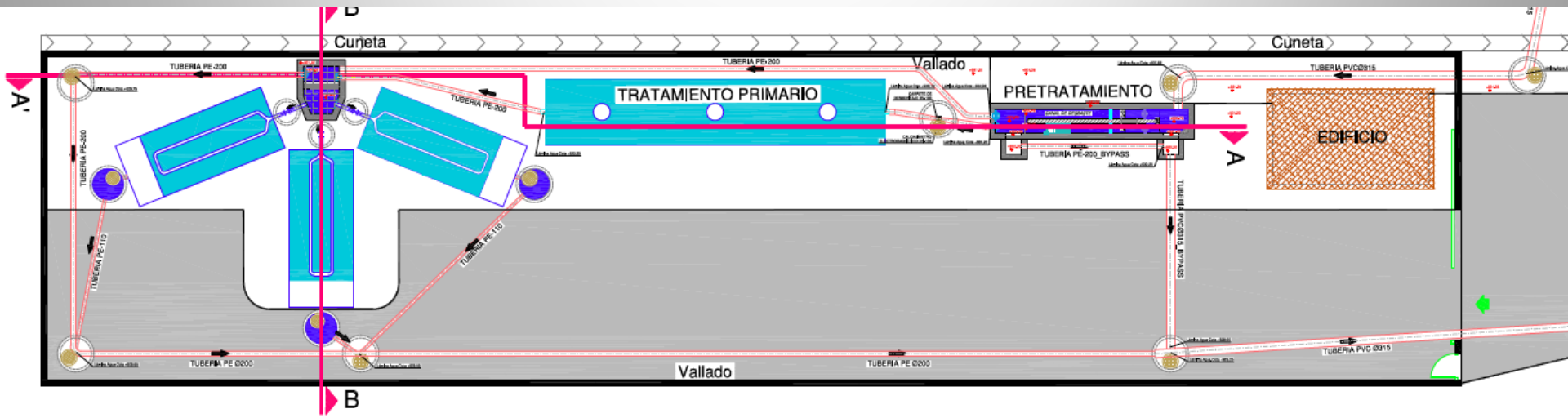
ESAMUR: FULL SCALE APPLICATION FOR A SMALL COMUNITIES IN MURCIA (SPAIN)

200 hab
25m^3/day
1000m aLtitude



iMETland

at

centa

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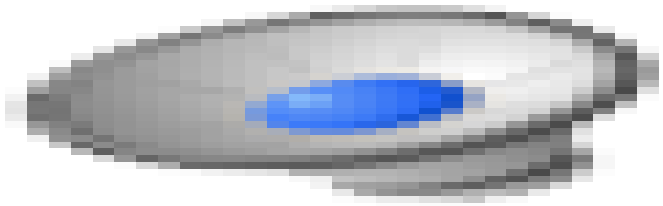

Acknowledgements

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Unión Europea
Fondo Europeo de Desarrollo Regional
"Una manera de hacer Europa"

Mahou

DAM

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