

WASTEWATER TREATMENT AND REUSE TECHNOLOGIES – LAB2MARKET PITCH

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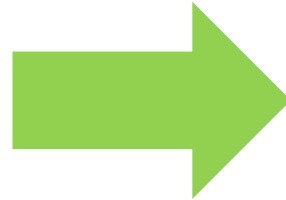
The Energy and Research Institute (TERI)

Identified problems and needs

Underperforming
wastewater treatment

Increasing demand for
(waste) water reuse

Contaminants of
emerging concern



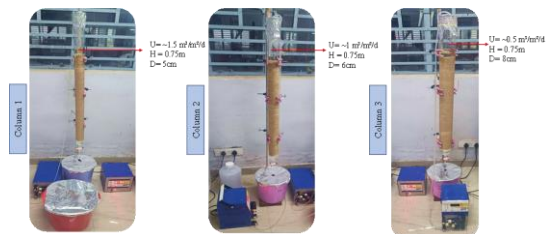
low energy and robust
secondary / tertiary
treatment technologies

Effective tertiary
treatment technologies
--> polishing

Technologies piloted – WW treatment (& resource recovery)



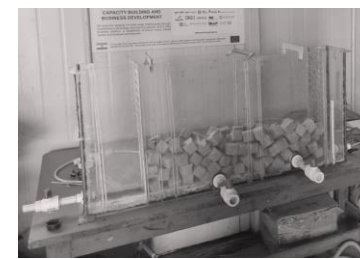
ANDICOS



Structured Adsorbents



Photo
Activated
Sludge



Clean Blocks



Self Forming Dynamic-
MBR



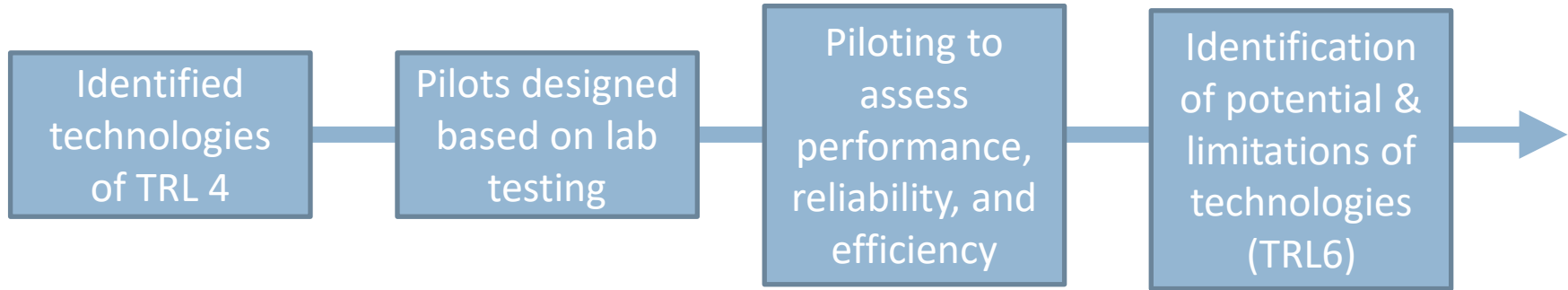
Constructed Wetlands +



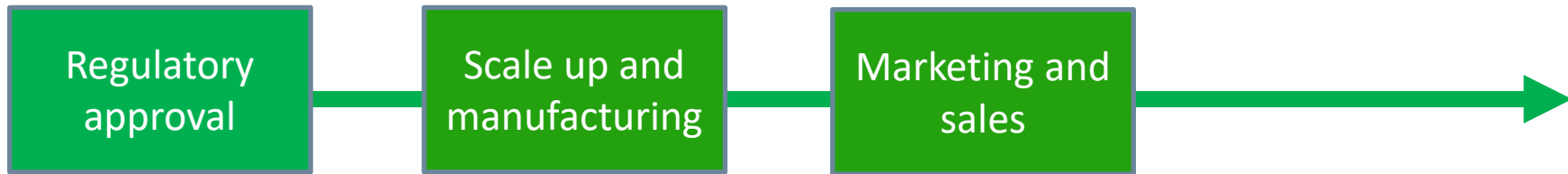
Aqua Track + Ozonation

From Lab 2 Market

- Exploitation process **during** Pavitra Ganga



- Expolitation process **beyond** Pavitra Ganga



SFD-MBR outcome, USP & outlook

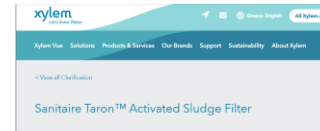


Outcomes

- MBR-like behaviour by **filtration thru cake layer**
 - **10% of energy consumption** of filtration unit of MBR
 - **Lower pressure gradient** compared to conventional MBR, suitable to gravity-driven operation
 - **Very low turbidity** effluent suitable for direct UV disinfection

USP and outlook

- Low energy system makes it suitable for providing both centralized and decentralized solutions
- Industry partner Xylem already commercializing technology (scientific support CNR, Italy and IIT Kanpur)



ANDICOS outcome, USP & outlook



Outcomes

- IPC membranes perform well for direct sewage filtration for water-reuse
- Modular set up flexible
- Biogas production potential reduced by:
 - changed organic content of influent
 - biodegradation of organics
 - Reluctance to mix fecal and non waste streams

USP and outlook

- Net producer of Green Energy + reduction of GHG emissions
- Business model - new decentralized solutions (or industry applications)
- Industry partner Ion Exchange already on-board for further exploitation (scientific support VITO, Belgium and IIT Kanpur)

Pilot setup of ANDICOS technology

Total membrane area: 25 m², Working Volume of Membrane tank: 5000 L, Treated water storage: 2000 L, Anaerobic Digestor: 5000 L



IIT
Kanpur



Constructed Wetland Plus & Structured Adsorbents outlook

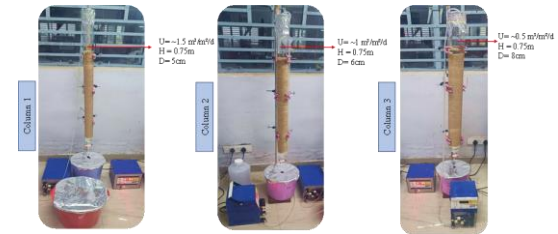


Constructed Wetland+

- TRL 3 to TRL 6 during project
- Modifications in several layers
- combined GAC/zeolite adsorbent approach removed trace organics and Cr (III)
- polishing decentralised systems (<1000 population equivalent)

Structured Adsorbents

- TRL 3 to TRL 5 during project
- Layered double hydroxide clay (LDH) combined with Bentonite (VITO technology)
- 80%LDH:20% Bentonite ratio best performance to remove Cr (III)
- Needs to be piloted (industrial applications)



IIT
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Hochschule Bochum
Bochum University
of Applied Sciences



Technology Readiness & Exploitation



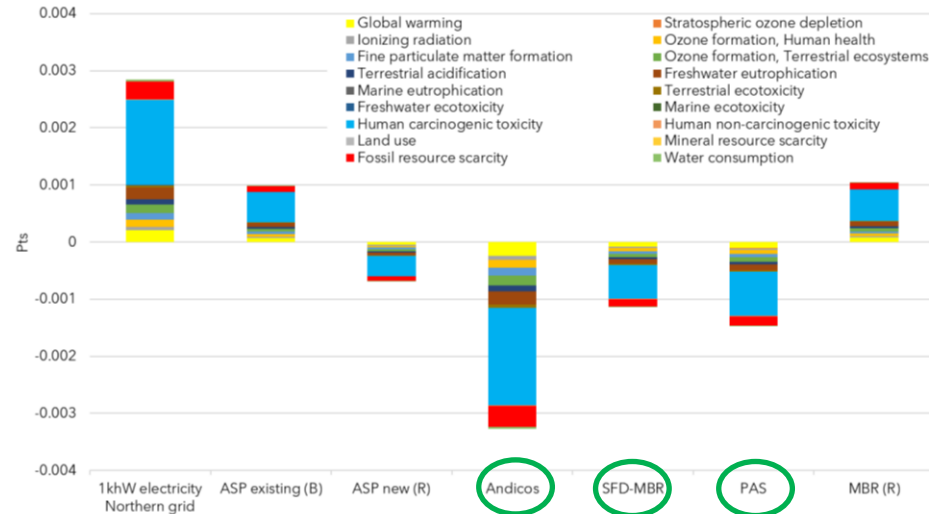
Technology	Applications	TRL @start	TRL achieved	Exploitation partners	Next steps for exploitation
SFD-MBR	Secondary treatment, Water re-use	4	8	XYLEM TARON®	Verifications in centralized and decentralised settings
ANDICOS	Secondary treatment, Water re-use, Energy production (bio-gas)	4	6	BLUE FOOT MEMBRANES ION EXCHANGE	STPs plus sludge from septic tanks (e.g. urban/rural)
Constructed Wetlands +	Removal & recovery of CECs and HMs	4	6	Open Domain	Decentralised settings where CECs and HMs are critical
Structured Adsorbents	Removal & recovery of metals (from industrial effluents)	4	5	VITO	Integration and demonstration in decentralized industrial effluent (pre)treatment



Impact on Energy

- **Energy recovery** through **sludge digestions (biogas)** has positive environmental impacts
- **Avoided burden** of using electricity of Northern grid (> 60% generated from coal power plants)
- Co-digestion of sewage sludge and other organic wastes (Andicos) to be further explored

LCA – Environmental impacts due to energy requirements per m³ of treated wastewater



Summary



- Exploitation key driver through project:
 - SFD-MBR / TARON® already being commercialized and branded - **Xylem**
 - ANDICOS partially demonstrated, most relevant for new decentralised situations (link to industrial waste streams) – **Ion Exchange**
 - CW+ is an **open domain technology**, allows rapid uptake as a NBS measure
 - Structured Adsorbents recoverability demonstrated, particularly relevant for targetted contaminants of concern, **needs to be piloted**
- Technology integration needs optimisation in all cases before next exploitation steps



Thank you for your attention !



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Photo: Lindner / Pixabay



This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 821051.
This project has been co-funded by Department of Biotechnology (DBT), Government of India.

