

#IndiaEUWater

Bio-mimetic and Phyto-technologies designed for low-cost water purification and recycling

INDIA-H₂O: Rubén Rodríguez Alegre (LEITAT)



- INDIA-H₂O will develop, design and demonstrate high-recovery, low-cost water treatment systems for saline groundwater and industrial wastewaters.
- The focus for developments will be in the arid state of Gujarat, where surface water resources are very scarce.
- Cost-effective technologies and systems are proposed with the aim of lowering energy costs improving the energy efficiency.
- New bio-based approaches to water recycling and Use of renewable energy.
- Reject waste streams will be minimized or reduced to zero, thus protecting the environment.



INDIA-H₂O activities include



Demonstrating new batch-reverse osmosis technology for specific energy consumption reduction and low operating costs



Forward osmosis membrane development and piloting for further reduction in energy consumption



Establishing a centre of excellence and training programmes in water treatment membrane technologies

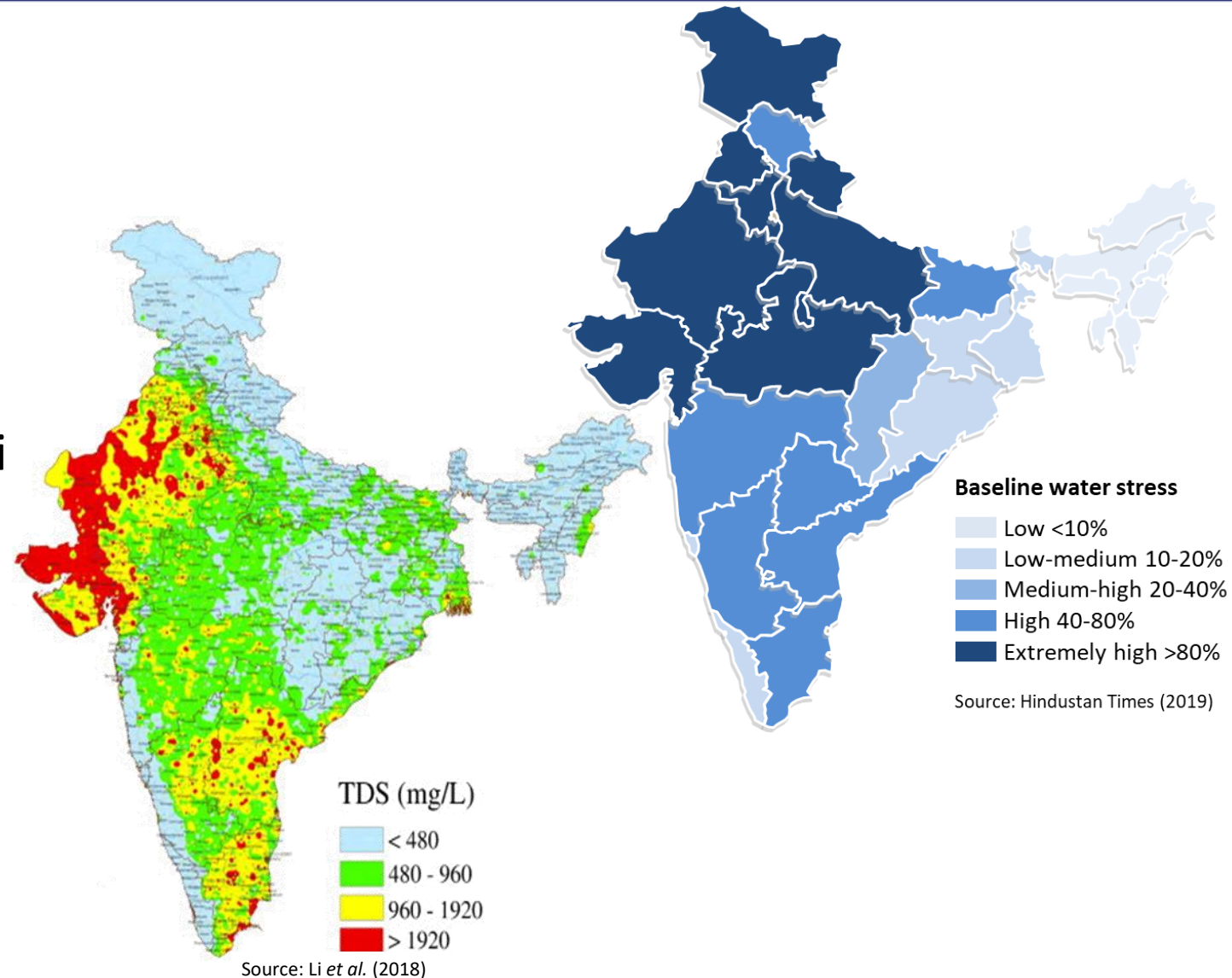


Analyses and production of policy briefs on economic models and governance arrangements for viable adoption of the developed systems



Focus on Gujarat

- Extremely high water stress
- Saline groundwater
- Low-moderate seasonal rainfall
- Only 3 perennial rivers: Narmada, Tapi and Mahi
- 3rd wealthiest Indian state
- 57% rural population
- Industries: Salt and marine chemicals, petrochemicals, fertilisers, cement, ceramics, dairy, textile, pharmaceuticals...



Water Governance and Management

Gujarat has a range of industries facing challenges of increasing water costs, difficulties of obtaining enough water, and of disposing of effluents. A higher level of water re-use is attractive to them to save costs and help meet environmental regulations. Often the effluents are actually very challenging to recycle by conventional technologies



Water Governance and Management

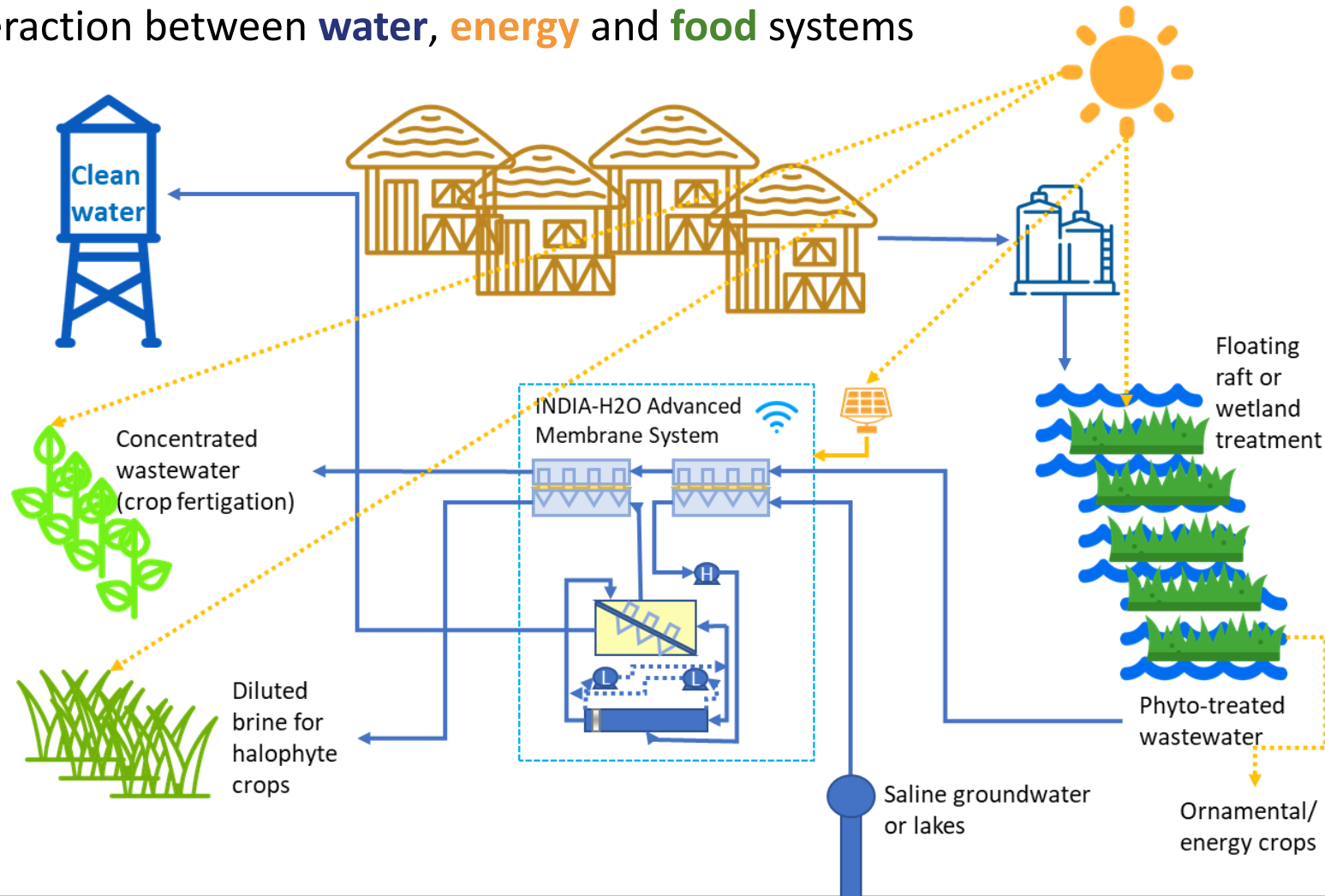
- 💧 Geo-hydrological baseline studies
- 💧 Socio-economic assessment
- 💧 Groundwater governance legal framework
- 💧 Mapping of enablers and constraints on technology uptake
- 💧 Engage with policy development and implementation processes



Technologies to remove and manage pollution

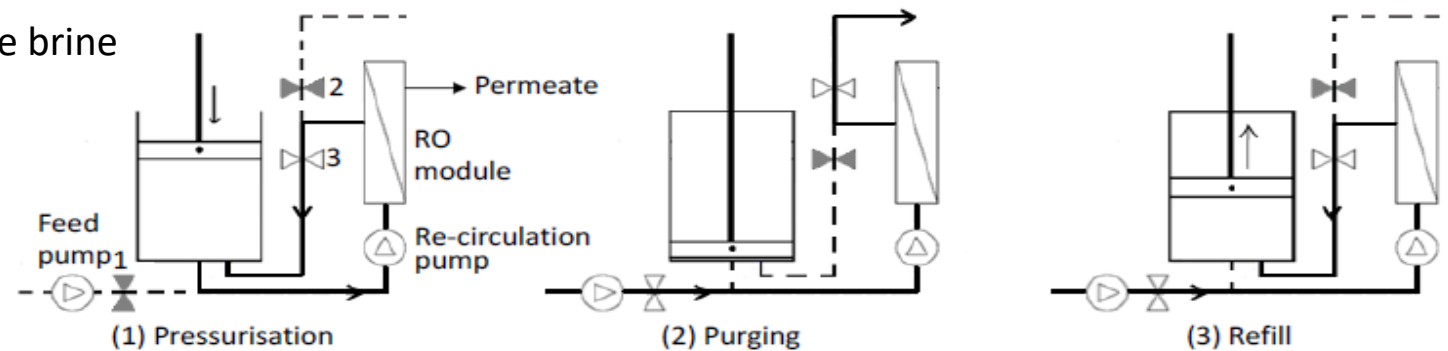
OUR VISION- How is INDIA-H₂O addressing these issues?

Interaction between **water**, **energy** and **food** systems



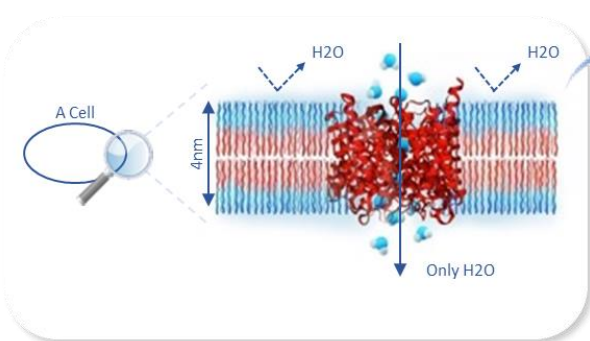
Batch-reverse osmosis (BRO) for groundwater desalination

- High-recovery: conserve groundwater, minimise brine
- Near thermodynamic ideal efficiency
- Solar-powered option
- Use with low-pressure membranes

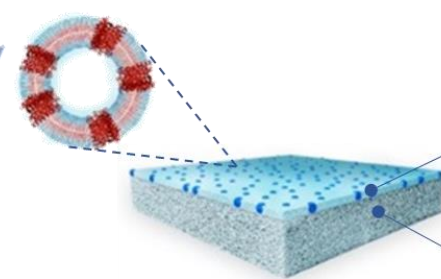


Biomimetic membrane technology

THE NATURE BEHIND THE AQUAPORIN PROTEIN



THE AQUAPORIN INSIDE™ MEMBRANE



- Thin active layer with aquaporins
- Aquaporin proteins formulated into a thin rejection layer
- Customised support substrate

- allow water (H₂O) to pass through the channel, blocking all other impurities, regardless of molecular weight
- Use for forward osmosis (FO) and RO
- Draw solution crucial aspect

Phytoremediation by Glycophytes

- Plants that prefer freshwater not salt water
- Can be used in various ways to treat domestic water



Halophytes to manage brine

- Tolerate and absorb salt
- To cultivate Salicornia and Salicornia which are actually very high yielding and high value if the market outlets can be found

Dairy industry

- Water separation using membrane technologies
- Water purification and reagents recovery with electrochemical technologies



Textile industry

- Wastewater pretreatment by electrochemical technologies
- Reagents recovery through membrane technologies
- Water purification applying advanced oxidation processes

Summary



सत्यमेव जयते

DEPARTMENT OF BIOTECHNOLOGY
Ministry of Science & Technology
Government of India



सत्यमेव जयते

Department of Science and Technology
Ministry of Science and Technology
Government of India

Consortium Partners for the Project



European Commission

bIo-mimetic and phyto-techNologies DeSIGNED for low-cost purificAtion and recycling of water (INDIA-H₂O)

Funded by

European commission, UK and Department of Biotechnology, Department of Science and Technology, India

Under the Call

EU-India Cooperation on Research and Innovation



UNIVERSITY OF
BIRMINGHAM



Academic/Research Partners:



CSIR-NATIONAL ENVIRONMENTAL
ENGINEERING RESEARCH INSTITUTE



सीएसआईआर - केन्द्रीय इलेक्ट्रॉनिकी अभियांत्रिकी अनुसंधान संस्थान
CSIR-Central Electronics Engineering Research Institute



IHE
DELFT



Industrial Partners:



GCCI





Photo-irradiation and adsorption-based novel innovations for water treatment. paniwater.eu

PANIWATER: Grant Agreement No. 820718



Co-creation of a versatile multiparameter real-time sensor for water quality, based on nanotechnologies. lotus-india.eu

LOTUS: Grant Agreement No. 820881



Bio-mimetic and phyto-technologies designed for low-cost purification and recycling of water. india-h2o.eu

INDIA-H2O: Grant Agreement No. 820906



Unlocking wastewater treatment, water reuse and resource recovery opportunities in India. pavitra-ganga.eu

PAVITRA GANGA: Grant Agreement No. 821051



Cost-effective and sustainable technologies for water & wastewater treatment, monitoring and safe water reuse in India. pavitr.net

PAVITR: Grant Agreement No. 821410



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