



India-H₂O project launched

Water is an essential human need and over the next decade the number of people affected by severe water shortages is expected to increase fourfold. In developing countries that are most affected, 80-90% of all diseases and 30% of all deaths result from poor drinking water quality.

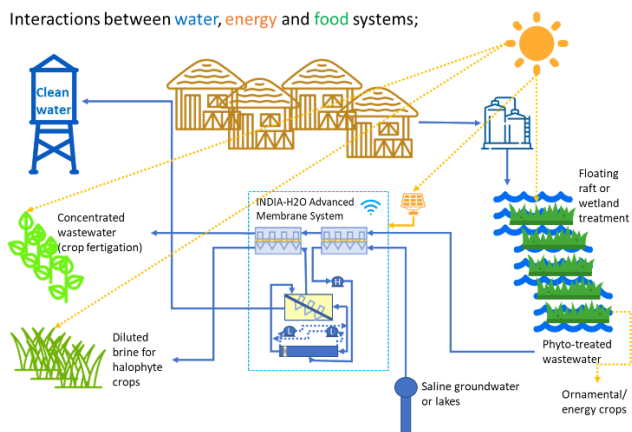
These challenges are acutely felt in India, where population growth, industrialisation and climate change exacerbate the crisis. Water quality, water shortage and accumulation of pollutants are threats which must be addressed to maintain sustainable development in both rural and urban areas across India and other emerging economies.

In July 2019 the European Union and India's Department for Biotechnology jointly funded INDIA-H₂O almost 4M€ or more than 3M Lakhs to develop, design and demonstrate high-recovery, low-cost water treatment and recycling 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.

We will develop new technologies to massively reduce energy consumption and use solar power to minimise water costs.

These solutions will be demonstrated in small-scale rurally relevant low-cost systems converting brackish groundwater for use as safe drinking water. To minimise water losses new plant-based solutions for recycling domestic wastewater and making use of salty brines in crop cultivation will be developed.

Interactions between water, energy and food systems;



For specific industrial wastewater in textile, desalination and dairy we will develop and demonstrate cost-effective high-efficiency hybrid technologies for water recycling with minimum liquid discharge, using advanced membrane technologies to achieve the required water quality for recycling.

A new Centre of Excellence will be established in water treatment technologies, design operation and monitoring to sustain the adoption and training in Indian of these new technologies.

The EU India collaboration will also support the development of business models to exploit the developed solutions to mutual EU/India economic advantage.



Professor Anurag Mudgal the India Coordinator welcomes the partners to the first IH₂O meeting at PDU

A Strong Consortium of EU and Indian Partners

The IH₂O project is led by Pandit Deendayal Petroleum University, Dr Anurag Mudgal and the University of Birmingham's Professor Philip Davies and includes a total of 16 partner organisations who came together in Ahmedabad in February 2019 to launch the project.

India's National Environmental Engineering Research Institute and Govind Ballabh Pant Agricultural and Technological University for their expertise in bio-based systems and detailed knowledge of India's water challenges. Specific EU expertise comes from Ben Gurion University, Israel world-leading expertise in salt-tolerant plants supporting the integrated bio-treatment concepts of the project.

Central to the INDIA-H₂O technology focus is *Aquaporin*, Denmark who have taken the research and development of new membrane technologies to new levels based on their life-science expertise in protein formulation and is an essential provider of knowledge and expertise in the design and piloting studies.

EU partners from Spain *LEITAT* and *CITEM* are experts in both desalination and industrial wastewater solutions and approaches to water management and recycling in arid regions threatened by water shortage and climate change. Spain's Energy, Environmental and Technological Research Centre is the home for Europe's largest concentrating solar technology research, development and test centre.

India's Central Electronics Engineering Research Institute, Pilani bring expertise in instrumentation technologies to provide drinking water and decision support system for water quality monitoring and can develop the web-based systems to ensure optimum management and reliability of INDIA-H₂O systems.

The consortium has a strong Indian industrial representation from Davey Products, the winners of the "MAKE IN INDIA 2016" Award for Membrane



Research and Development and Envirochem Services are active in the supply of water treatment systems in India.

Aston University and Jadavpur University together with Modus Research and Innovation will ensure opportunities for mutually beneficial exploitation of the projects are outputs are explored and supported. IHE Delft Institute for Water Education will provide water treatment expertise and socio-economic and policy analyses. Together this newly formed consortium has all the inter-disciplinary research excellence and expertise to deliver an exciting and highly innovative project to cement old and develop new relationships between India and the EU around the subject of water.

New Report shows groundwater stress is rising

Emphasising the importance of the India-H₂O project to help adaptation to climate change and mitigate the negative impacts of water abstraction from natural groundwater sources. A recent [report in the journal Nature](#) suggests that even under fixed industrial and domestic water demands and fixed irrigated area, increased irrigation demand due to climate change may have a major impact on future groundwater depletion volumes. The rate of depletion of aquifer water which already reached more than 4,000 km³ in 2010 could double according to climate change models. India is one of the countries identified where the problem could be most acute.

Forward Osmosis – a key new technology

Forward osmosis is a natural process, which takes place



Forward Osmosis is how trees draw large amounts of water to heights far above the ground

all around us on an everyday basis. Forward osmosis enables plants to transport water from their root systems to their leaves and it provides the primary means of transporting water in and out of cells across most organisms in Nature. The India-H₂O project plans to exploit the products developed by partners

Aquaporin, Denmark and Davey, India to help reuse and recycle water.

The main difference between forward osmosis membranes and reverse osmosis membranes is that reverse osmosis membranes require high amounts of energy whereas forward osmosis membranes require only osmotic pressures. This makes them an ideal component for development of low-energy water purification systems.

The perfect crop for saline conditions

Probably you have already eaten Salicornia, often called Samphire on a salad or in a stew.

Already, almost one third of farmed areas are affected by salinity (too much salt) making it is essential that new crops with greater salt tolerance



Gnocchi with butter and samphire which can grow in salty conditions

than conventional agricultural crops are farmed.

Salicornia is known across the world by many different names. Samphire (English), glasört (Swedish), zeekraal (Dutch), चट्टान पर उगनेवाला सुगंधित पत्तियों का एक पौधा (Hindi), ਮੈਂਦਾਇਰ (Punjabi), and hamcho (Chinese).

Dr Moshe Sagi from Ben Guirion University, Israel is a worldleading expert in this area and is collaborating in India-H₂O to support the development and establishment of Salicornia cropping systems in arid regions of Gujarat.

New technologies for water recycling in the dairy industry

The dairy industry is a huge consumer of water, mainly for cleaning to ensure our fresh milk and dairy products are safe. India-H₂O collaborator *Madhur Milk Dairy* has been working with LEITAT, Spain to design a new water treatment process to recycle the water and



cleaning chemicals used in the dairy. If successful this will save the use of more than 1,000 m³ of fresh water and reduce processing cost for the dairy. Madhur is a cooperative run by and for Gujarati farmers, so the development will put money back into the pockets of local people as well as reducing the strain on water resources.