Transforming the water cycle

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Our purpose: transform the water cycle

- evaporation
- discharge
- water
- energy
- chemicals
Our purpose: transform the water cycle

- less water
- energy
- chemicals
- less evaporation
- nutrients
- energy
- minerals
- reuse
Vision and Mission

Vision
• To enable a water secure future that will enable social and economic prosperity in the Kingdom and beyond.

Mission
• To undertake fundamental and applied research that will deliver innovative solutions to the global challenges of water security, safety, sustainability and supply.
Water Desalination and Reuse Center

Three flagship themes:

- **Greener Desalination**
  - Less energy, chemicals, discharge

- **Water Security**
  - Sufficient & safe for all

- **Waste to Resource**
  - Recovery of water, nutrients, minerals and energy
Greener desalination

Biofouling
- Early warning
- Feed spacer design
- Cleaning strategies

Hybrid processes
- Energy savings
- Brine reduction

Solar desalination
- New materials
- Hybrid with existing
- Feasible in rural areas
Biofouling of RO membranes

Lab scale
- Fouling simulator
- Evaluate water/chemicals
- Predictive/representative

Pilot
- Cleaning strategies
- Early warning monitoring

Field
- Membrane autopsies
- Cleaning advice
- Chemical selection
Membrane desal pilot

- First phase translation from lab to full scale
  - Novel fouling monitoring and remediation
  - Innovative membrane spacer designs
  - New pretreatment technologies

- Important educational tool
  - Student exposure to ‘large scale’ equipment

- Link to industry
  - Collaboration opportunities
Water Security

Agriculture
- Improving irrigation
- Hydrophobic mulch

Water quality during distribution
- Biostability
- Asset management

Water safety
- Safe reuse
- Emerging pathogens
Ministry for Environment, Water and Agriculture (MEWA) project

- Agricultural groundwater use KSA
- Basis of compliance framework
- New digital platform for food security monitoring
- Key to MEWAs Vision 2030 Objectives
WDRC collaborations exploring the impact of impaired quality (i.e. brackish) waters on crop production and the application of hydrophobic sands to reduce water use (McCabe, Mishra, Ghaffour, Hong and Tester).
Waste to Resource

Tailor made Water
- Irrigation
- Industry
- Cooling

Energy Recovery
- Energy Neutral
- Energy Positive

Materials Recovery
- Nutrients (N,P)
- Minerals
Recovery of water

Lab
- Proof of principle
- Batch processing

Lab scale-up
- Anammox
- New populations

Pilot & demonstration
- On wastewater site only!
In Kingdom partners
Global academic partners (selection)

• Penn State University
• Yale University
• MIT
• University of Technology Sydney
• Princeton University
• EAWAG
• Wetsus
• Delft University of Technology
• University of Western Australia
• University of Aveira
• National University of Singapore
• University of Illinois at UC
• City University of Hong Kong
• University of New South Wales
• NASA JPL
• Ghent University
Center Industry Affiliates Program
Industry projects

• Short term:
  • 1-5 days
  • Expert opinion, analysis

• Medium term:
  • 3-24 months
  • PI, PostDoc, PhD

• Long term:
  • Full PhD research
The Red Sea Project aims to be the world leader in environmental sustainability across all phases of development – planning, construction and operation – pushing the boundaries of innovative standards & technologies and leveraging local & global partnerships; in order to achieve net positive impact on biodiversity and prove that human development and nature can successfully coexist.

Sustainability Vison
To be launched on World Water Day:

Brains for Brine

International challenge for Protecting the Marine Habitat from Brine Discharge