

Under the Patronage of His Excellency **Eng. Abdulrahman bin Abdulmohsen AlFadley**  
Minister of Environment, Water & Agriculture

# منتدى المياه السعودي

saudi water forum **SWF 2024**



## Mission-driven innovation for future water security: Sustainable water reuse and recycling solutions

Dr. Mark Smith, International Water Management Institute (IWMI)



29 April – 01 May 2024



Hilton Riyadh Hotel & Residences  
Riyadh, Saudi Arabia

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وزارة البيئة والمياه والزراعة  
Ministry of Environment Water & Agriculture



المؤسسة العامة لتحلية المياه المالحة  
Saline Water Conversion Corporation (SWCC)



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General Water Authority



منظم المياه  
Water Regulator



المركز الوطني للأمن وإدارة الأزمات  
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NAECC



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# Five Wicked Water Problems



## Hunger

- **1.2 billion people** live in areas with issues of severe water shortages or scarcity in agriculture
- Climate change is projected to put **8 to 80 million people** at risk of hunger in mid-century, concentrated in Sub-Saharan Africa, South Asia and Central America



## Climate Beyond 2C

- Future projected adaptations are effective in reducing risks to a varying extent, but **effectiveness falls sharply beyond 2°C**
- By 2050, global demand for water is projected to increase by **50%** compared to 2000 levels



## Poverty & Exclusion

- Women and girls spend a collective **200 million hours** fetching water
- In the Asia and Pacific region, **one in three people** does not have safe drinking water

## Deep Uncertainty

- **Future water risk** is increasingly unknown because of climate change
- Water data and information are disconnected from the challenges that increasingly confront governance. This risks **lock-in to water insecurity**



## Ecosystem Breakdown

- According to the FAO, ecosystems are at **breaking point**
- **Over 80%** of wastewater is released untreated into the environment
- Over the last 50 years, water stored in nature dropped by **27,000 billion m<sup>3</sup>**



*What are high-ambition, collective actions that will create strong alignment of knowledge and research, policy, business and on-the-ground implementation to deliver future water security?*



# The TFWS Missions – Shared Framework for Collective Action



## Comment

<https://doi.org/10.1038/s44221-023-00049-w>

## Research and innovation missions to transform future water systems

**3 Increase freshwater availability** – through circular management of wastewater everywhere, new technologies for non-conventional water, and cutting non-revenue losses.

Too many of the images on our news feeds show the destructive power of water as droughts and floods ravage communities across the globe. The super-charging of the hydrological cycle from increased atmospheric greenhouse gas levels is adding stresses to water resource systems that are already challenged by over-exploitation, degradation and rising demand (Fig.1). Societies everywhere aspire to 'water security', in which our management of water resources meets the diversity of human health, livelihoods, nature, and production needs, while reducing water risks to acceptable and manageable levels. The urgency of overcoming the gap between aspiration and the reality of water insecurity for billions of people was recognized by heads of government and



Fig. 1 | Water systems across the globe are compromised by human actions.

investment trajectories are critical components in not only delivering Sustainable Development Goal Six (SDG6), but all seventeen.

**Mismatch between water research priorities and needs in the Global South**

# Water scarcity in MENA

## Water resources per capita

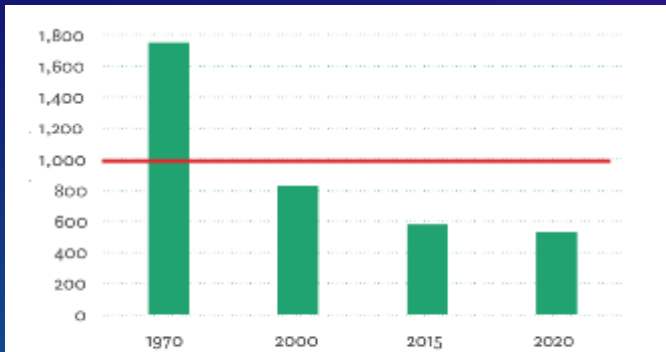
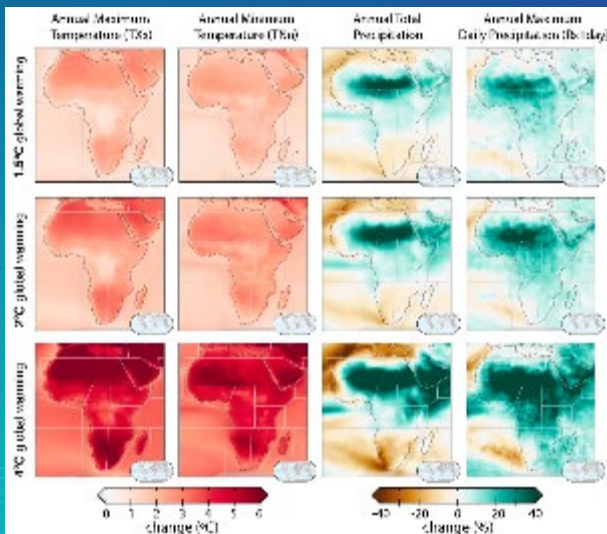


Figure 2. Water resources per capita in the region; red line shows threshold for water scarcity. Source: FAO 2022

## Climate change projections



# Wastewater challenges

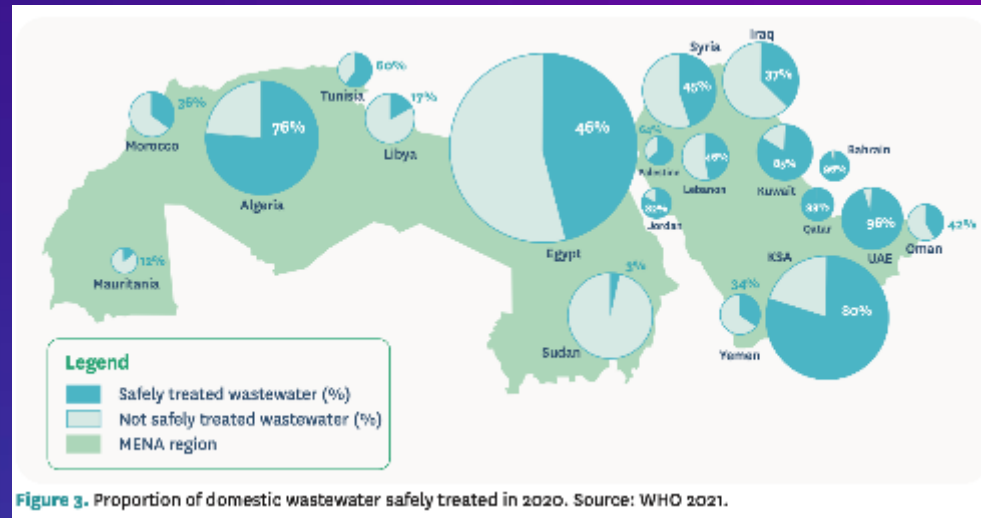
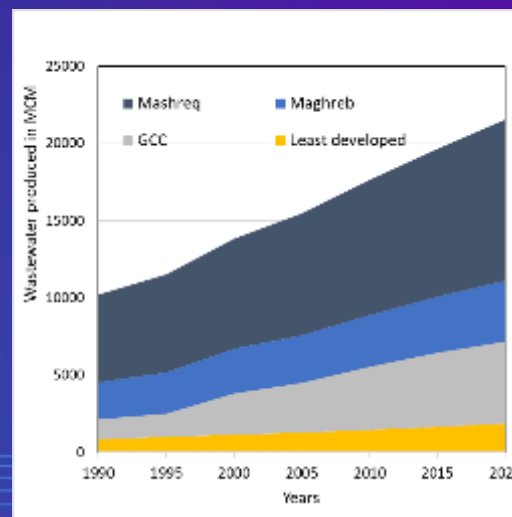


Figure 3. Proportion of domestic wastewater safely treated in 2020. Source: WHO 2021.

Source: AQUASTAT, AWC 2029, GWI, WHO 2021



- 21.5 km<sup>3</sup> of municipal wastewater
- 60% safely treated

# Wastewater Reuse and Circularity

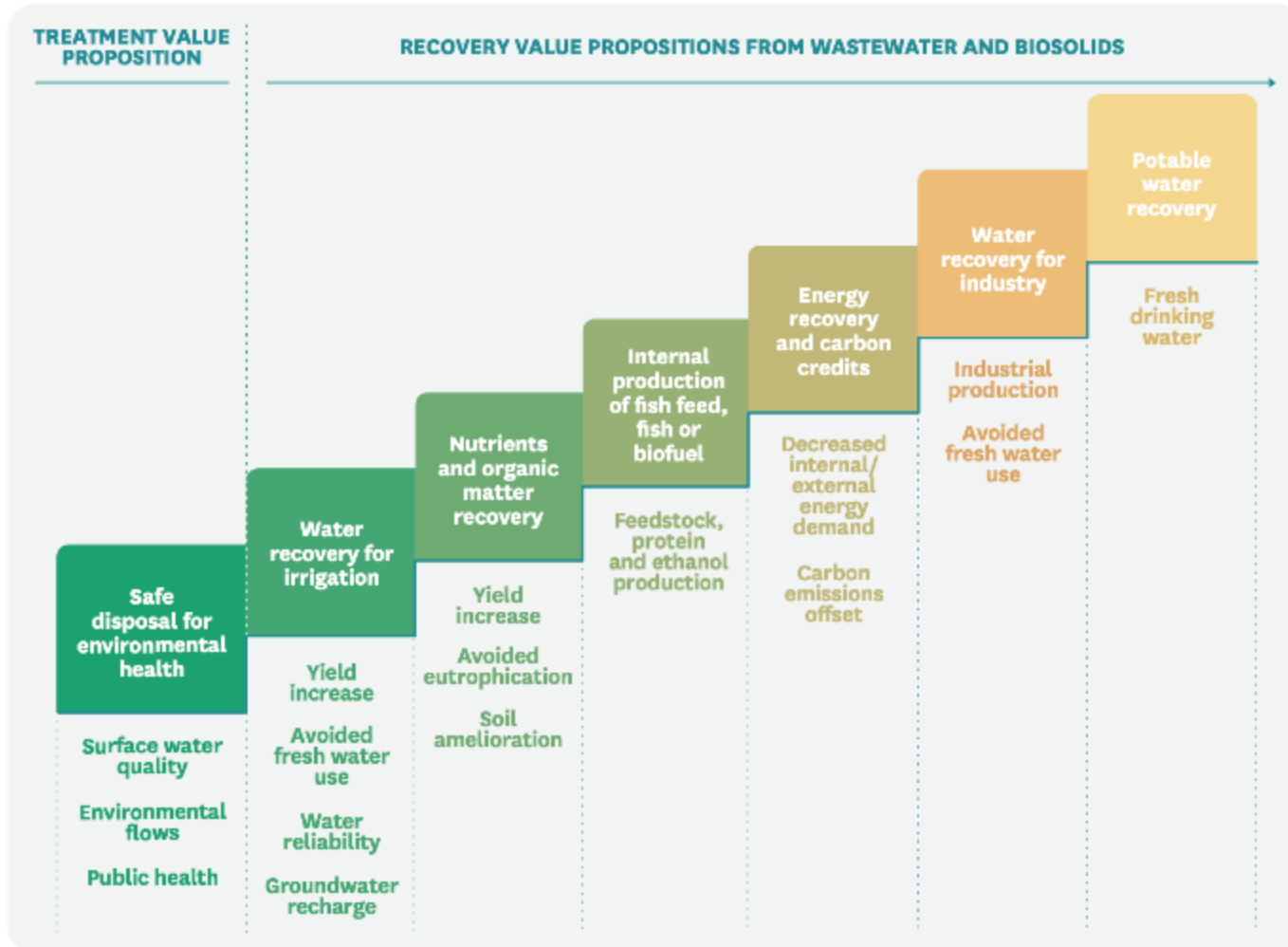


Figure 9. Ladder of increasing value propositions related to water reuse based on increasing investments in water quality and/or the value chain. Source: Drechsel et al. 2015

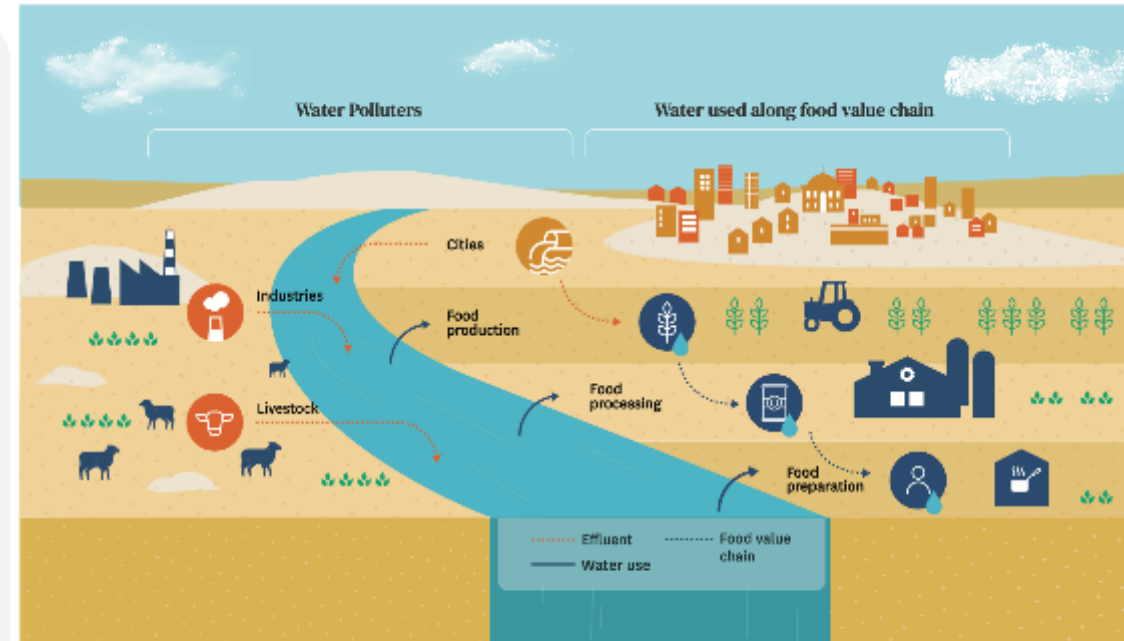
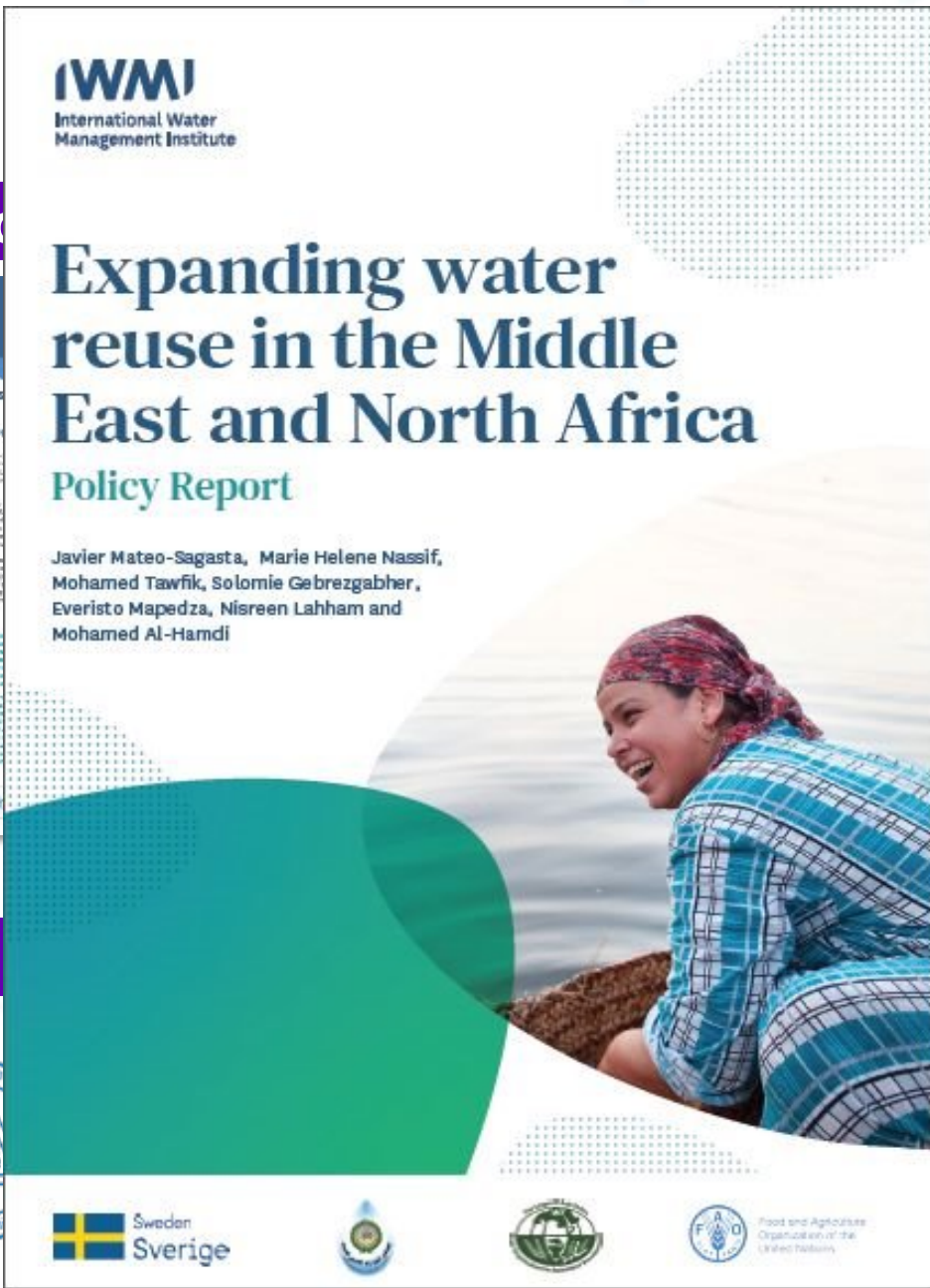


Figure 5. The fate of wastewater showing the sources of wastewater and its uses along the food value chain. Source: Mateo-Sagasta et al. 2022b



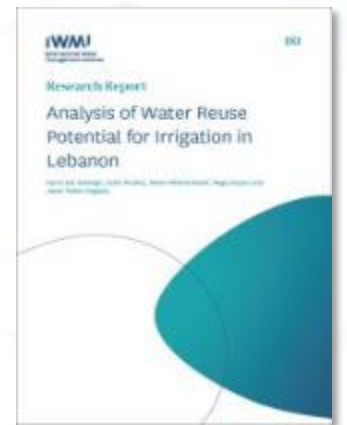
# ReWater MENA

## Awareness and acceptance



## Policies and investment

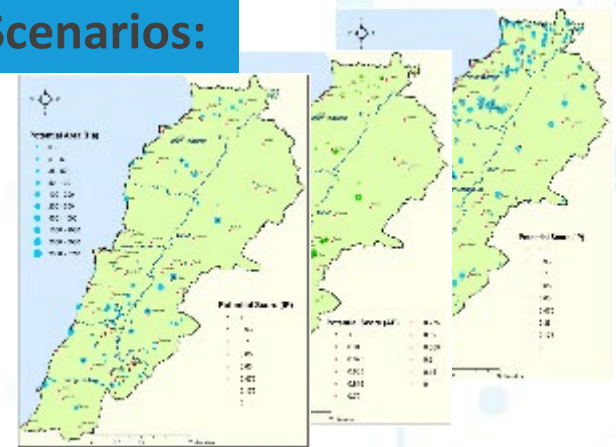
Comprehensive assessment of reuse potential for Lebanon revealed 2,202 ha of potential reuse



## Informing regulations and policy

- Informed the first-ever standards in Lebanon
- Make water reuse safer
- Offers legal protection for investors

## Scenarios:



# E-ReWater: AI for Wastewater Reuse

Refining the models and approaches used in ReWater MENA to promote the adoption of wastewater reuse

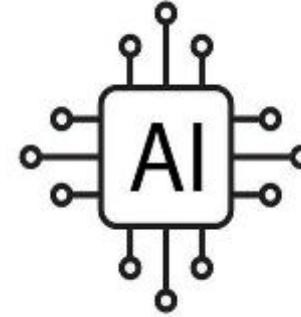
## Comprehensive Information Dashboard for:

- Improved Decision Making
- Policy Development
- Public Education
- Climate Resilience

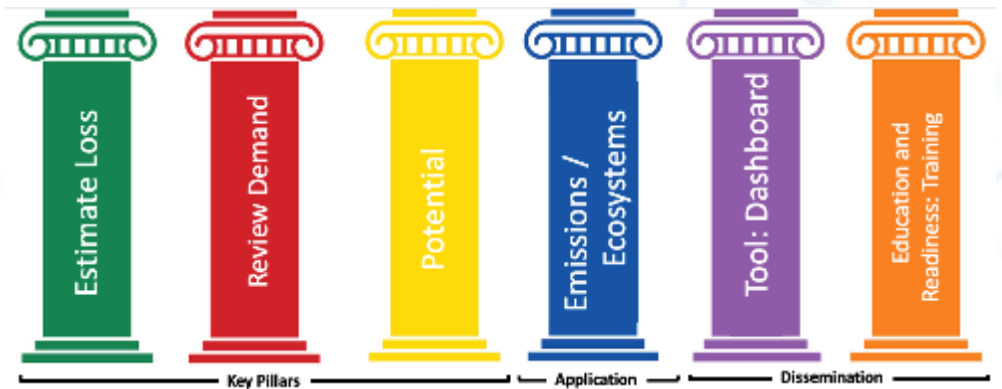
## Utilizes AI to:

- Facilitate data collection and analysis
- Understand wastewater generation dynamics and water demand
- Assess water loss before treatment
- Identify investment scenarios and fill treatment gaps

## AI and remote sensing data



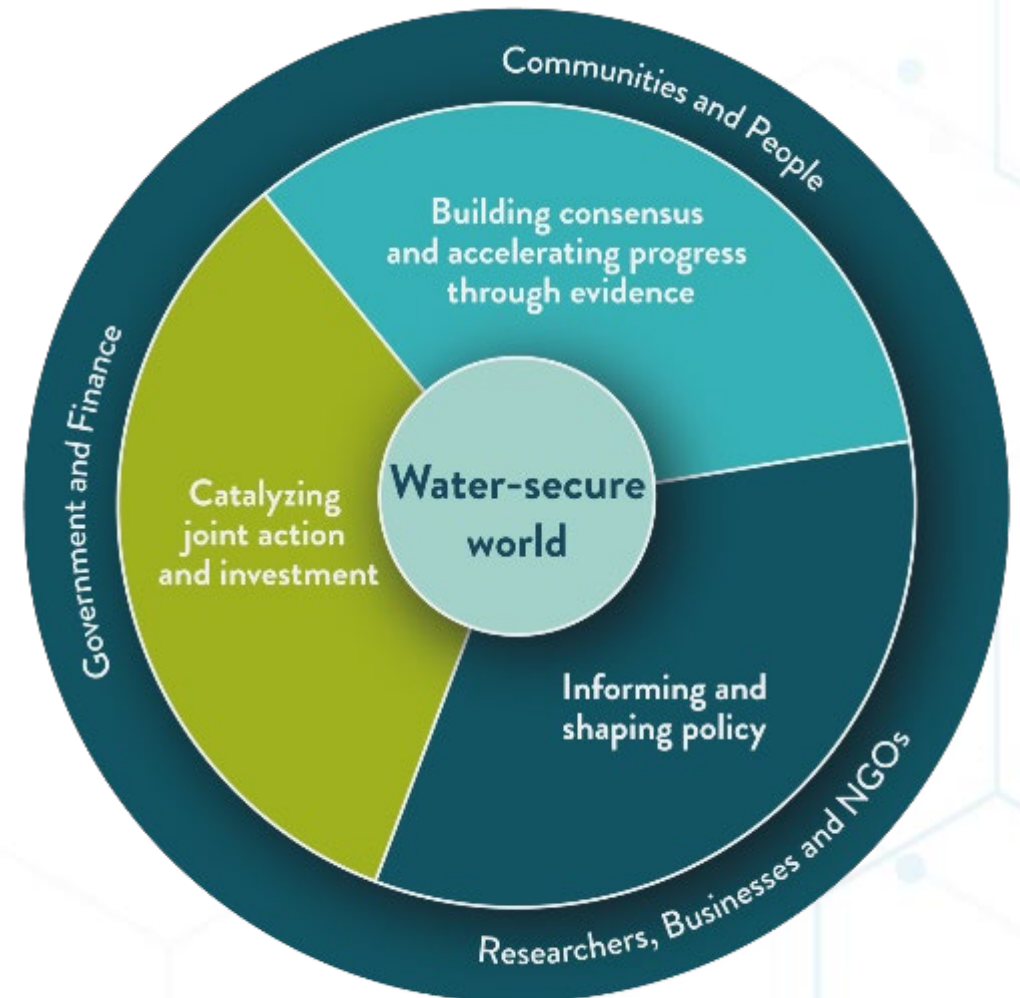
## Key pillars of the project





# Conclusions

- Complex ‘wicked’ water problems
- Transformative Futures: **high-ambition missions** for science-based action on water security
- ReWater MENA and e-ReWater - tackling **social acceptance and policy to spur investment** in wastewater reuse
- **Collective action** is key to paving the way for transformative, sustainable change





International Water  
Management Institute

# Thank you

**Innovative water solutions for sustainable development**

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