WATER CONVENTION

Global Workshop on
Water, Agriculture and Climate Change

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Climate Change & Water – A Nexus of Reckoning for Agriculture

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Ministry of Infrastructure and Water Management

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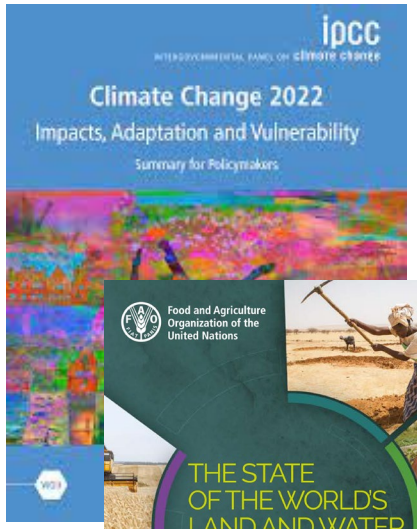
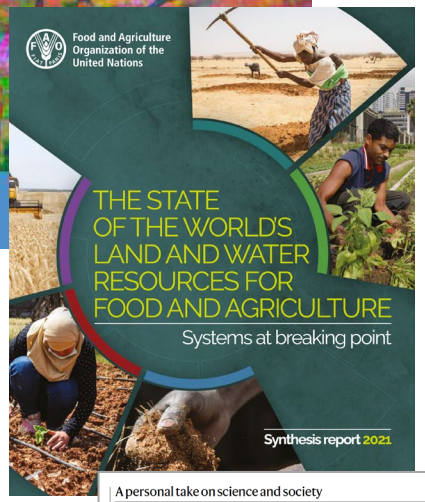
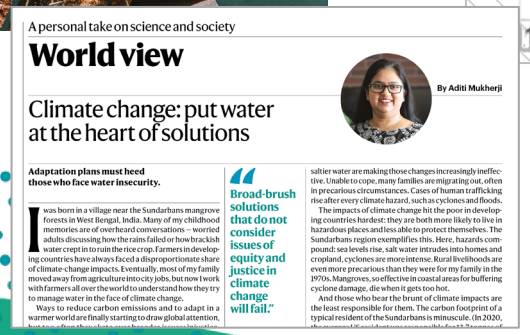
The future of water resources under climate change






A personal take on science and society

World view

Climate change: put water at the heart of solutions

By Aditi Mukherji

Adaptation plans must heed those who face water insecurity.

I was born in a village near the Sundarbans mangrove forests in West Bengal, India. Many of my childhood memories are of overheard conversations — worried adults discussing how the rains failed or how brackish water crept in to ruin the rice crop. Farmers in developing countries have always faced a disproportionate share of climate-change impacts. Eventually, most of my family moved away from agriculture into city jobs, but now I work with farmers all over the world to understand how they try to manage water in the face of climate change.

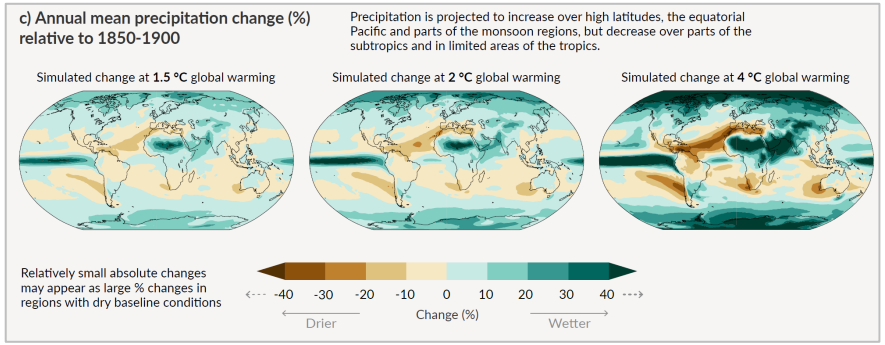
Ways to reduce carbon emissions and to adapt in a warmer world are finally starting to draw global attention,

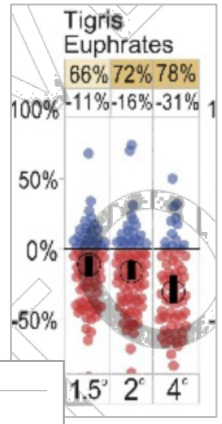
> "Broad-brush solutions that do not consider issues of equity and justice in climate change will fail."

saltier water are making those changes increasingly ineffective. Unable to cope, many families are migrating out, often in precarious circumstances. Cases of human trafficking rise after every climate hazard, such as cyclones and floods.

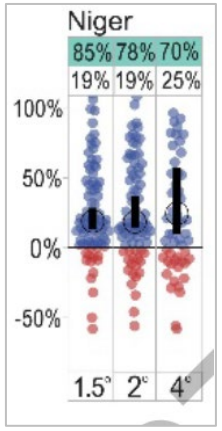
The impacts of climate change hit the poor in developing countries hardest: they are both more likely to live in hazardous places and less able to protect themselves. The Sundarbans region exemplifies this. Here, hazards compound: sea levels rise, salt water intrudes into homes and cropland, cyclones are more intense. Rural livelihoods are even more precarious than they were for my family in the 1970s. Mangroves, so effective in coastal areas for buffering cyclone damage, die when it gets too hot.

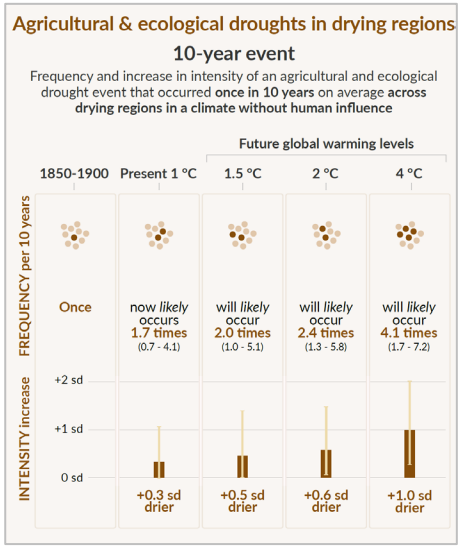
And those who bear the brunt of climate impacts are the least responsible for them. The carbon footprint of a typical resident of the Sundarbans is minuscule. (In 2020,





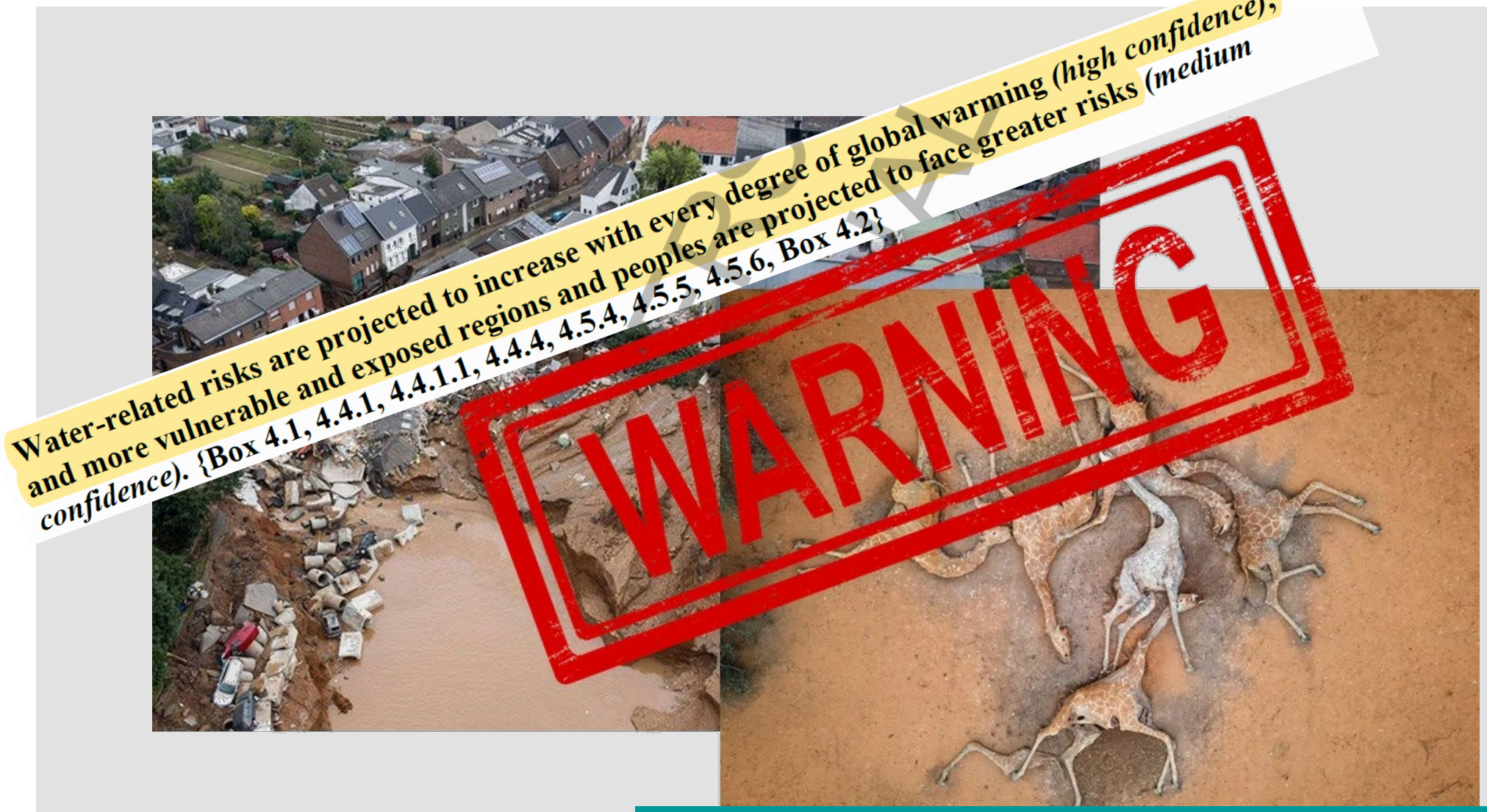
Projected changes in annual mean runoff





Projected Risks to Agriculture (IPCC)

- ~11% croplands vulnerable to climate-driven water scarcity by 2050
- ~12% yield reduction by 2100 (RCP4.5)
- increased flood losses
- Limitations to irrigation expansion
- 20% alternative water sources for snowmelt-fed irrigation (2°)



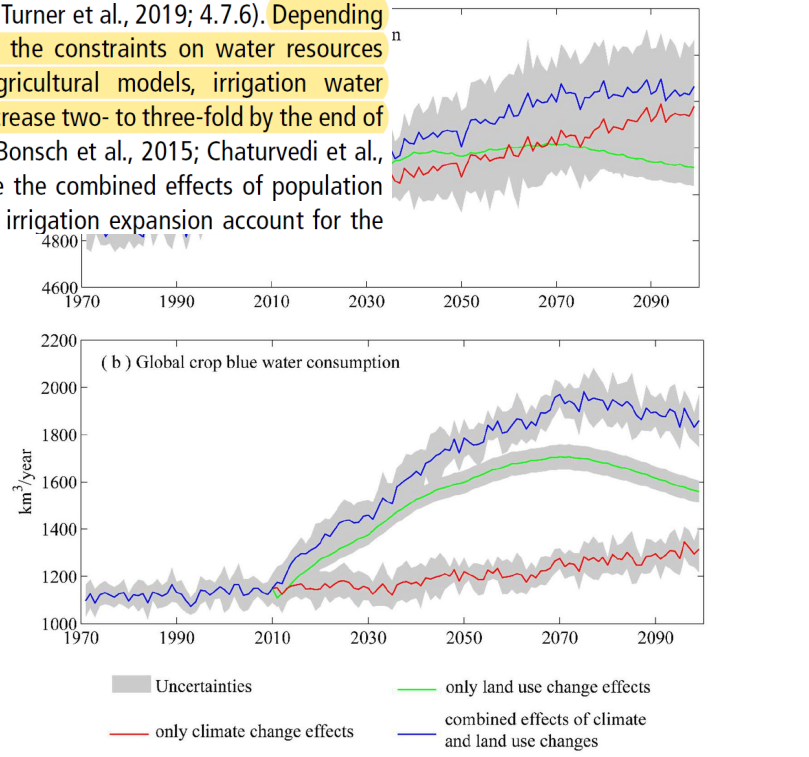
- There is a risk that warming outpaces adaptation
- Action and investment in future water security for agriculture is urgent.

The future of irrigation - contradictions

Bonanza

Source: Caretta et al. 2022. Water. WGII AR6. IPCC.

population growth, increased irrigated agriculture, cropland expansion and higher demand for bio-energy crops for mitigation (Chaturvedi et al., 2015; Grafton et al., 2015; Turner et al., 2019; 4.7.6). Depending on underlying assumptions and the constraints on water resources implemented in the global agricultural models, irrigation water requirements are projected to increase two- to three-fold by the end of the century (Hejazi et al., 2014; Bonsch et al., 2015; Chaturvedi et al., 2015; Huang et al., 2019). While the combined effects of population and land use change as well as irrigation expansion account for the

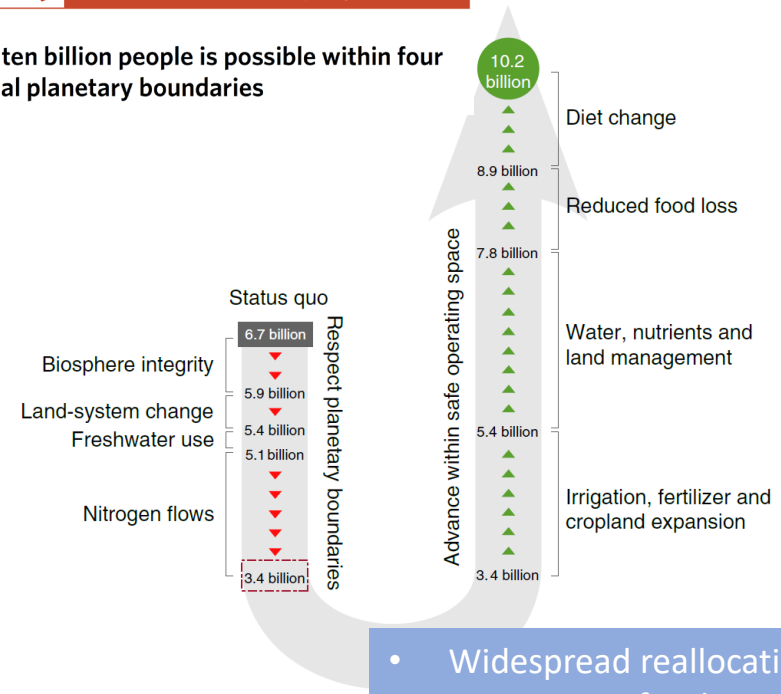


Source: Huang et al. 2019. J. Hydrol.

Parsimony

nature sustainability ARTICLES https://doi.org/10.1038/s41893-019-0465-1

Feeding ten billion people is possible within four terrestrial planetary boundaries



Source: Gerten et al. 2020. Nature Sust.

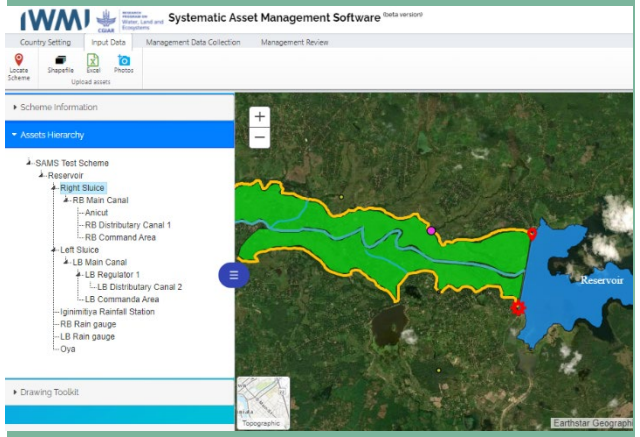
- Widespread reallocation of cropland, irrigation, N fertilizer
- 7% Global net decrease of irrigation water use
- ~50% increase in food production

AWM for a water-secure world – farm level

Rainfed agriculture

- Soil & water conservation
- *In situ* soil moisture storage
- *Ex situ* storage
- Rainwater productivity
- Multiple use systems for water productivity

Irrigation system performance



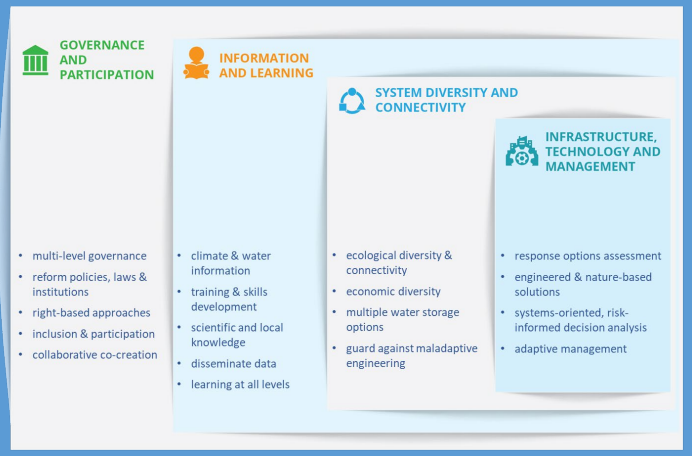
- Break the build – neglect – rehabilitate cycle
- Irrigation service delivery
- Asset management – SAMS
- Performance benchmarking
- Private sector operators

Irrigation transitions

- Dislocation in areas with high-risk water futures
- Farmer-led irrigation development
- Innovation bundles, finance and value chains
- Technologies and sustainability

AWM for a water-secure world – landscape and basin level

Building Resilience



Water-energy-food-ecosystem nexus

Non-conventional water – wastewater reuse

Real (vs apparent) water savings

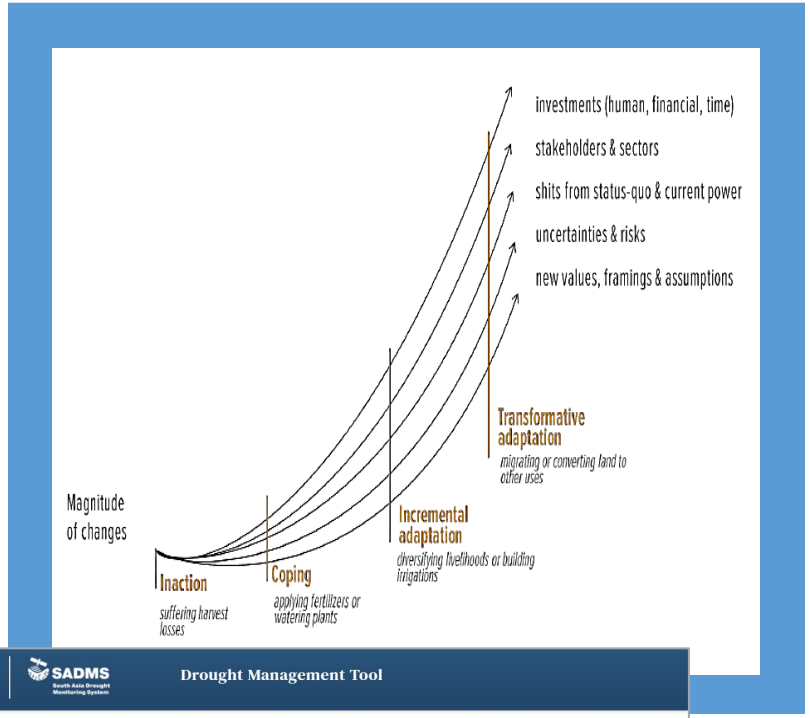
Managing complexities in AWM adaptation

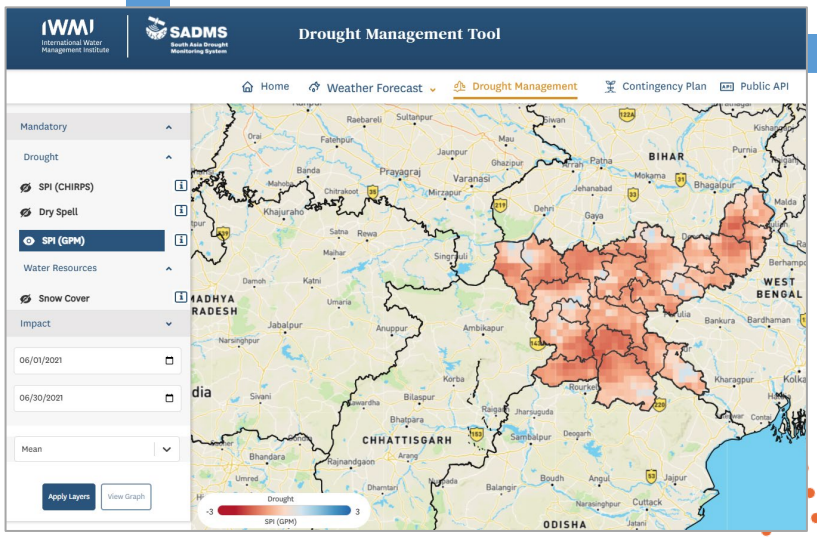
1. Governance and institutions
   - policy coherence – e.g. across sectors and Ministries
   - partnerships and networks
   - cooperation and integration platforms

2. Enabling transitions
   - locating future irrigation
   - lowering production and planetary boundary risk

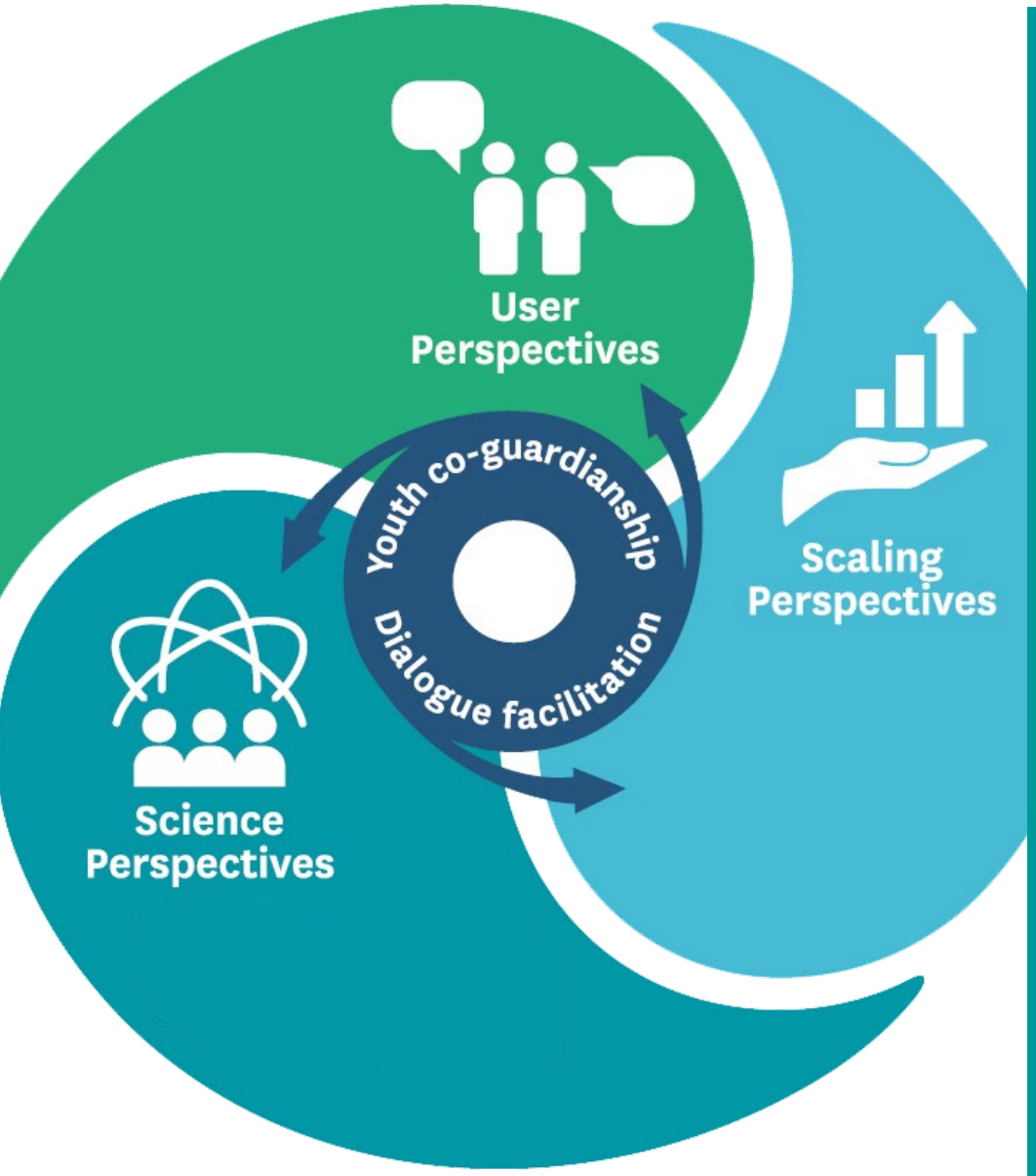
3. Managing water risks
   - monitoring, early warning, insurance

4. Social justice
   - gender equality, social inclusion
   - water security – for the most vulnerable





6. Transformative Futures for Water Security



- Bottom-up, rooted in South-South dialogue
- Youth co-guardianship
- Policy, business, development + science
- Oct/Nov – Online dialogues – scenario exploration
- February – Final conference (South Africa)
- *Missions* – 5-6 high-ambition missions for science-based action on water security
- *Coalitions* – Mission-driven alliances

7. Conclusions

1. Reconciling contradictory storylines for a water-secure world
   - meet growing demand within planetary boundaries

2. Research and innovation
   - maximizing water productivity for a constrained and contested resource
   - (radical) improvements in system performance
   - managing risks and building resilience
   - optimizing in the WEFE nexus – and across sectors
   - enabling and targeting irrigation transitions across scales

3. Managing complexity
   - governance, institutions and platforms
   - inclusion and water security for all

4. High ambition
   - fostering boldness, ambition and speed

International Water Management Institute

Thank you.

Innovative water solutions for sustainable development

Food · Climate · Growth

CGIAR