Water scarcity assessment and multiple model intercomparison

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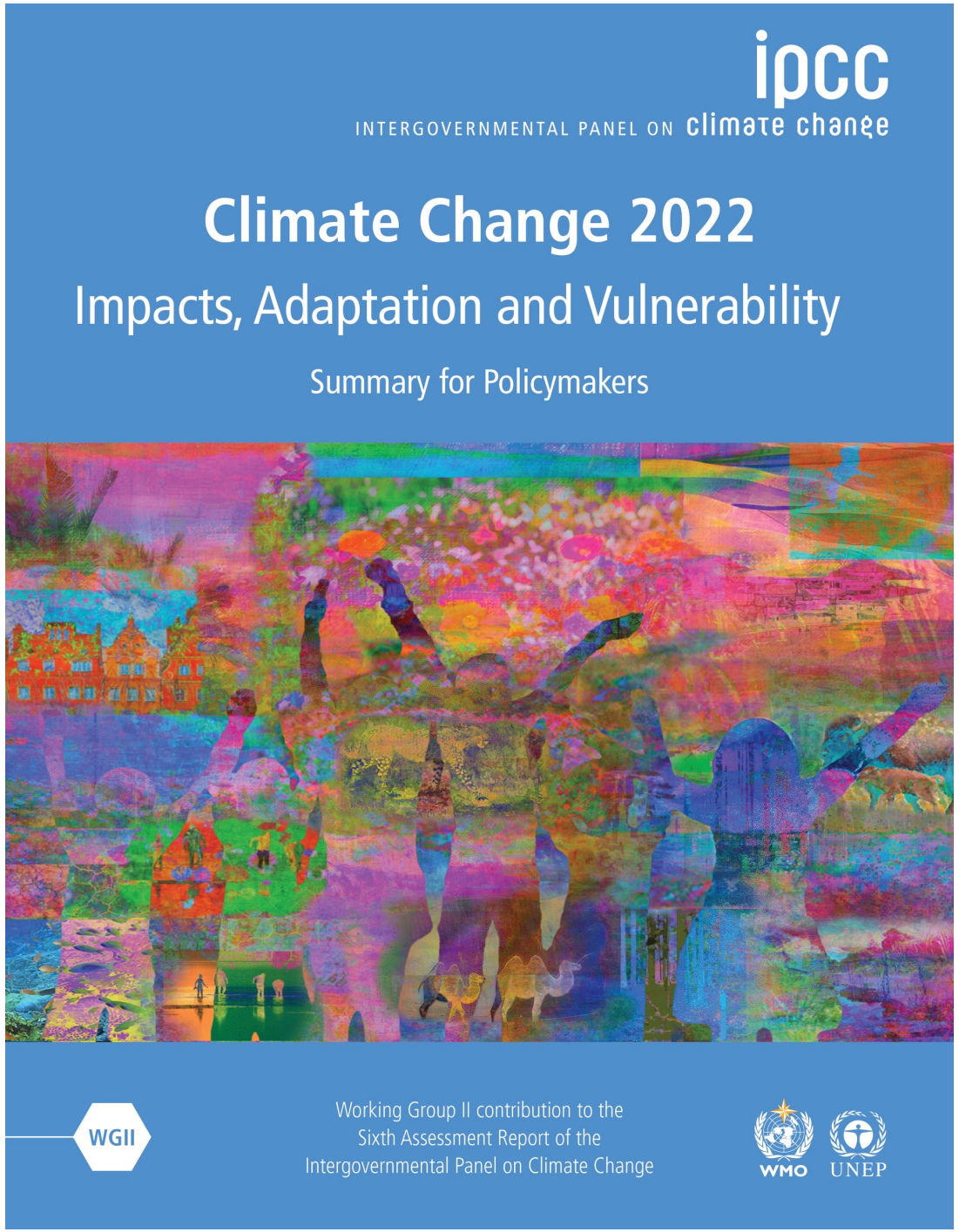
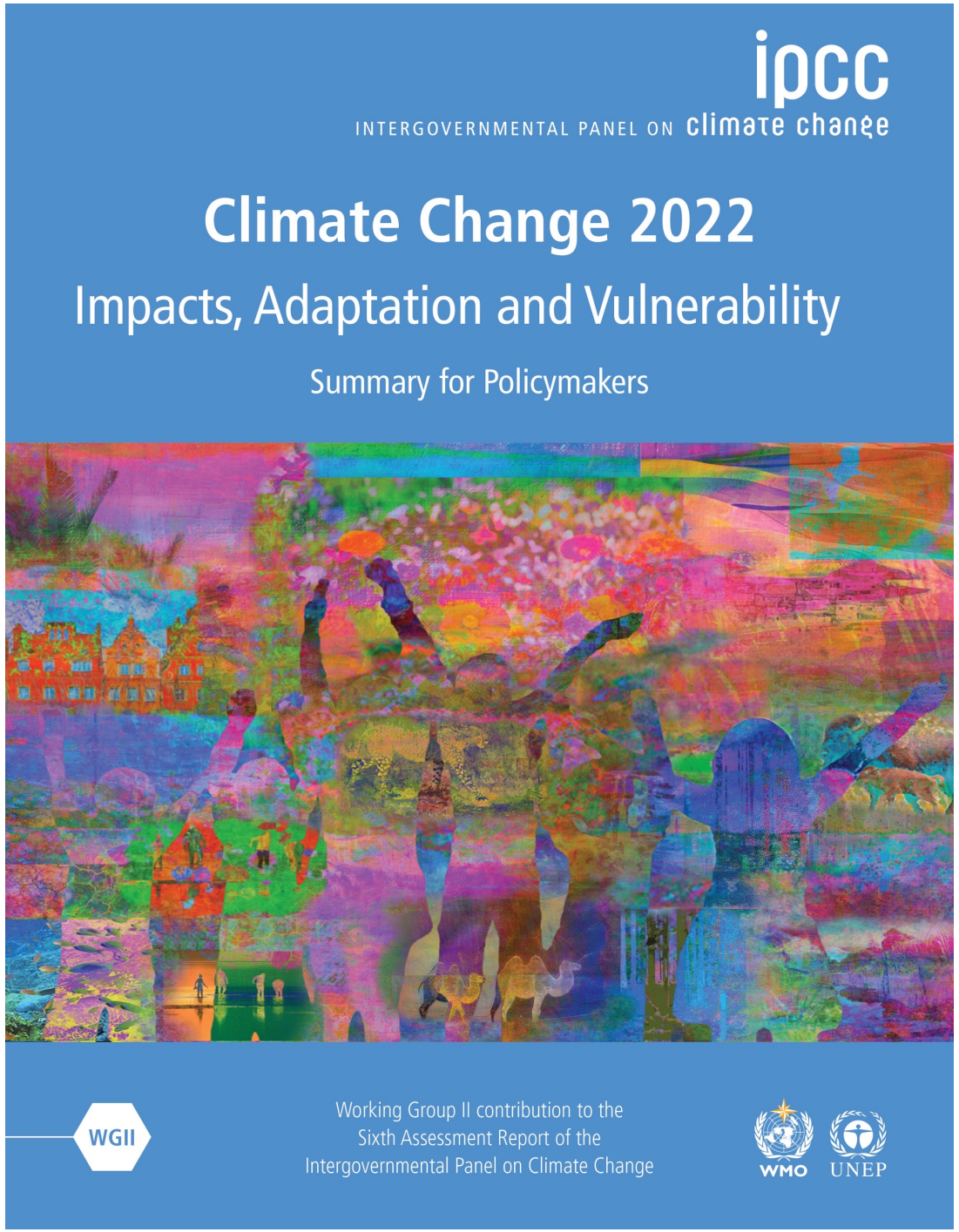
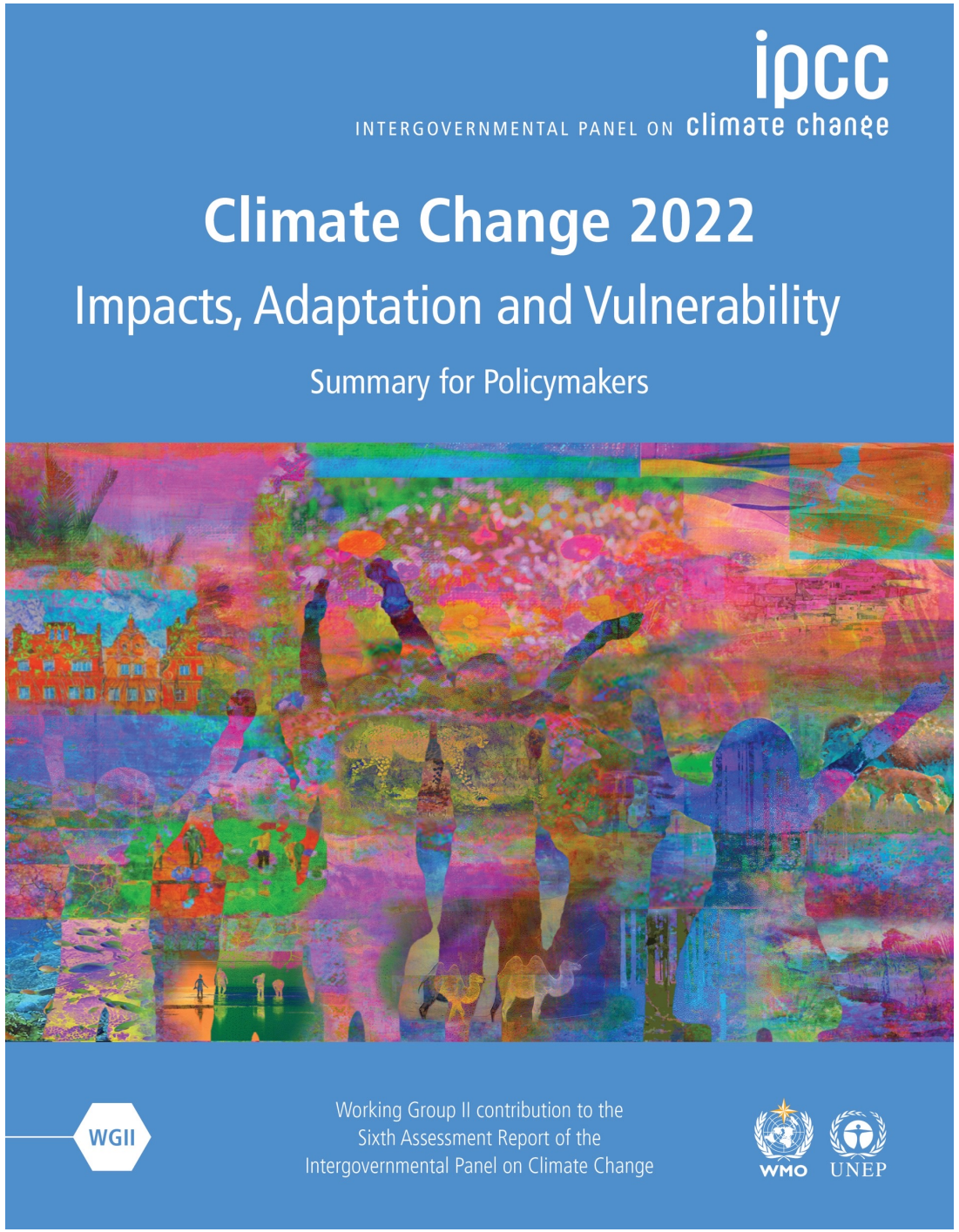


The **Working Group II contribution of the Sixth Assessment Report (AR6) of IPCC** was released on 28 February 2022



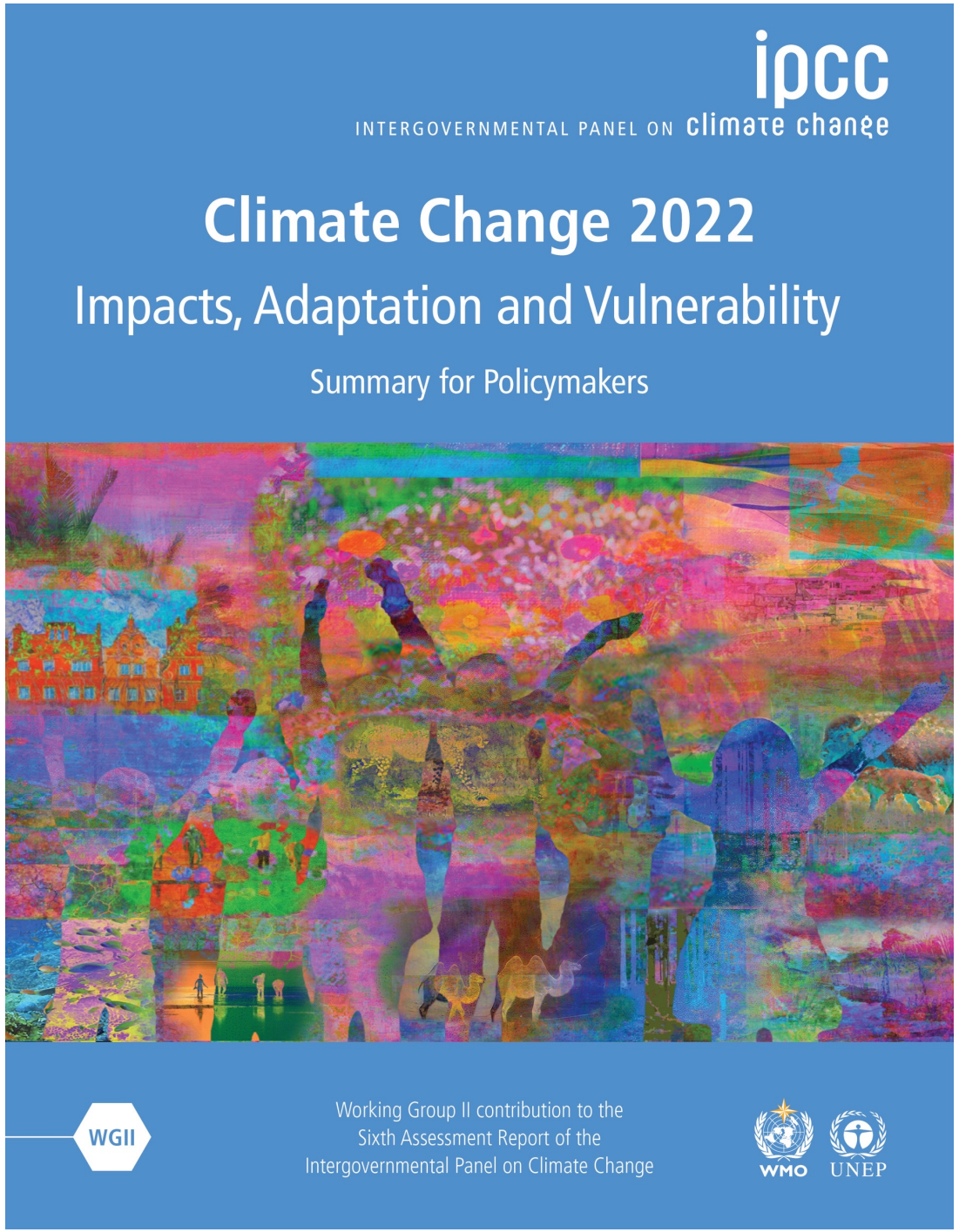
Working Group II contribution

- **18** Chapters, **7** Cross-Chapter Papers, and 2 Annexes
- **270** authors from 67 countries
- **34,000 +** scientific papers
- **62,418** review comments



Chapter 4 Water

- **12** Coordinating Lead Authors/ Lead Authors
- **2** Review Editors



Chapter 4 Water

- **12** Coordinating Lead Authors/ Lead Authors
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Farewell Meeting 16 March 2022

Start of water story in the IPCC Report

Distribution of Water Scarcity

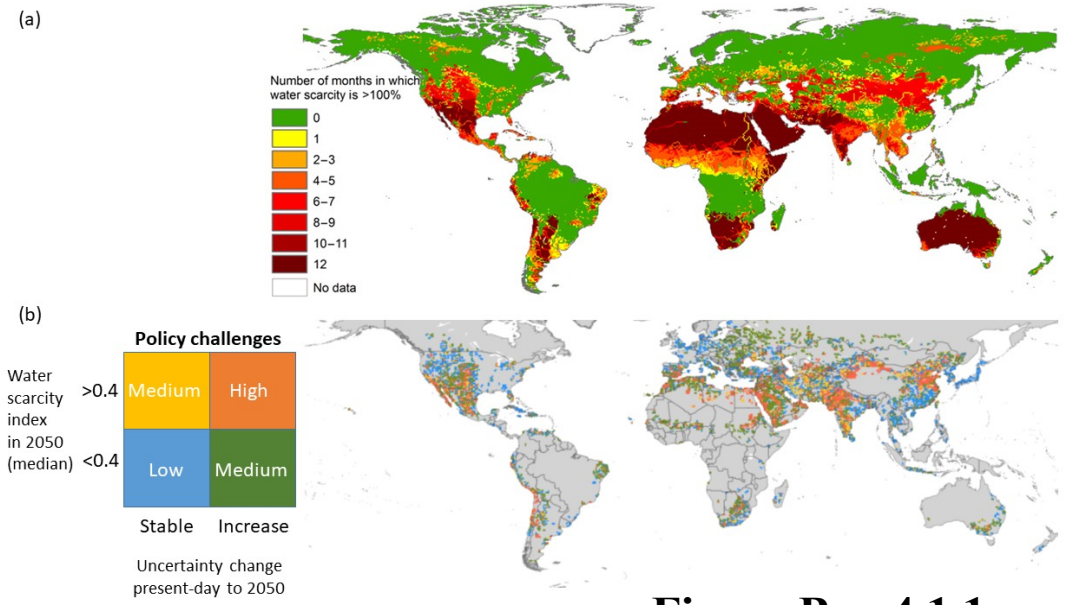


Figure Box 4.1.1

Global Water Security Index

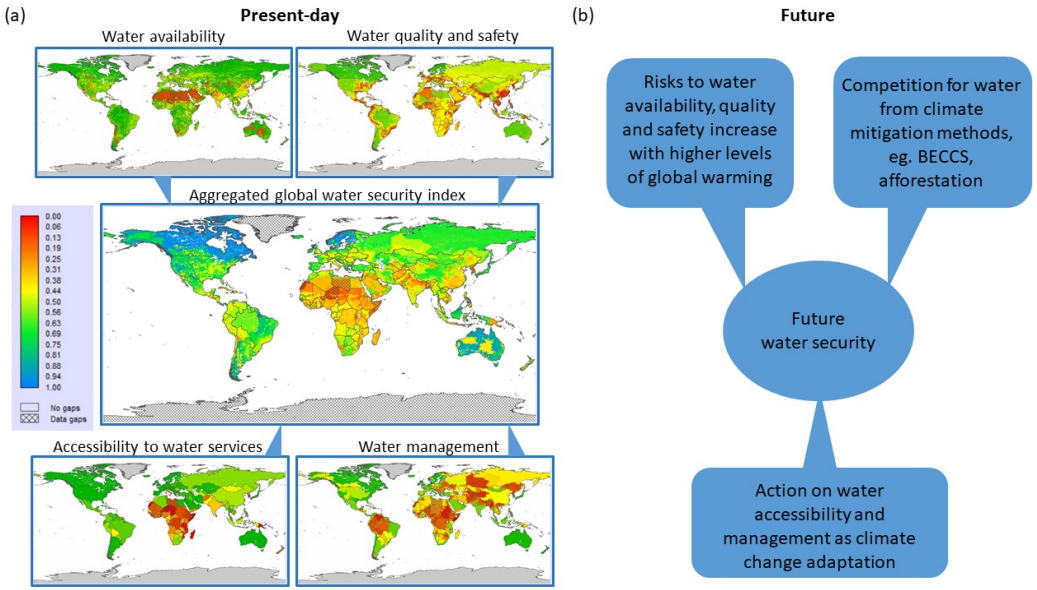


Figure Box 4.1.1:

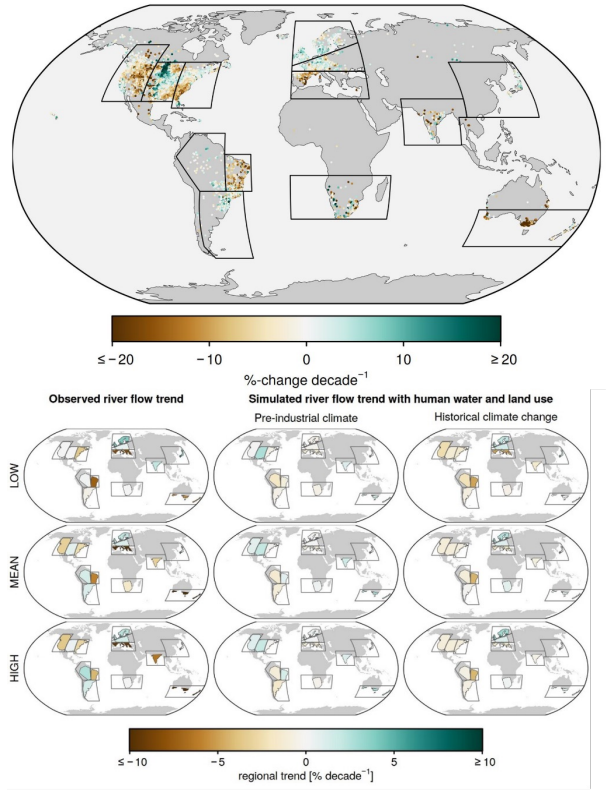
Box 4.1: Implications of Climate Change for Water Scarcity and Water Insecurity

- Currently, **~4 billion people** are estimated to experience severe **water scarcity** for at least one month per year *(medium confidence)*
- Since the 1970s, 44% of all disaster events have been **flood-related**
- ~60% **adaptation interventions** is forged in response to water-related hazards *(high confidence)*

Ten Key Findings: Finding 1

Intensification of the hydrological cycle due to human-induced climate change is affecting physical aspects of water security *(high confidence)*, thereby exacerbating existing water-related vulnerabilities

- There is a clear trend of increases in streamflow in the northern higher latitudes (high confidence), with climatic factors being more important than direct human influence
- Nearly half a billion people live in unfamiliarly wet areas, and **~163 million people live in unfamiliarly dry areas now**
- During last two decades, global glacier mass loss rate exceeded 0.5 meters water equivalent year^{-1} *(high confidence)*



Observed changes in river flows and attribution

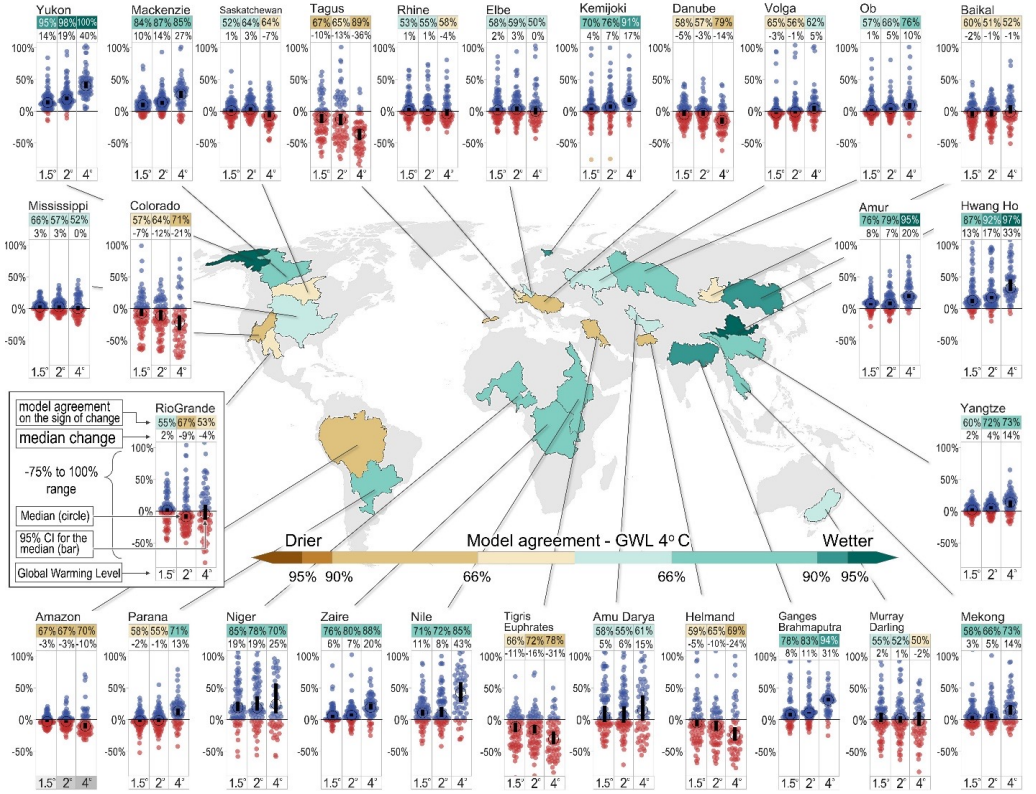
Gudmundsson L., …, **Liu J.,** et al., 2021. *Science* 371: 1159-1162

ISIMIP Writing Workshop 2015

Ten Key Findings: Finding 4

Water-related risks are projected to increase with every degree of global warming (high confidence), and more vulnerable and exposed regions and peoples are projected to face greater risks (medium confidence)

- Climate change impacts via water availability changes are projected to increase
- **Between 3 to 4 billion people are projected to be exposed to physical water scarcity at 2℃ and 4℃ GWL, respectively** *(medium confidence)*
- Streamflow in 42% to 79% of the world's watersheds is projected to be affected by 2050 *(medium confidence)*

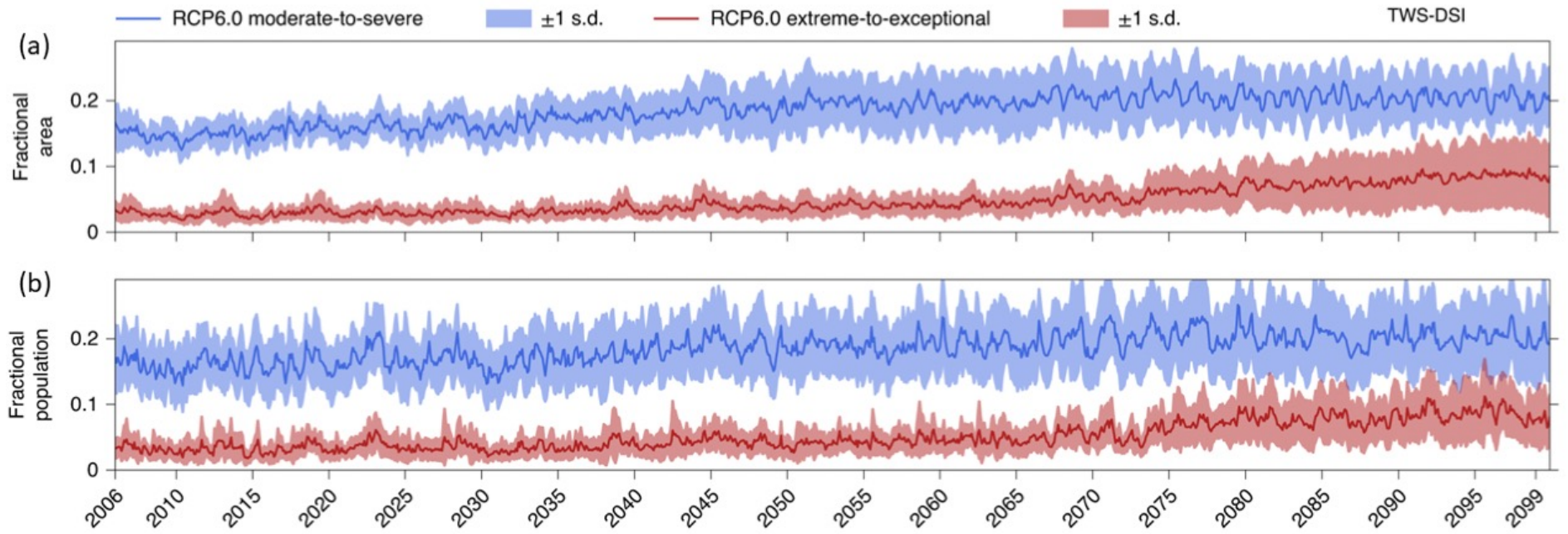


Streamflow changes at 1.5℃, 2℃ and 4℃ GWL

Ten Key Findings: Finding 5

Drought and flood risks and societal damages are projected to increase with every degree of global warming (medium confidence)

- Drought risks are projected to increase over the 21st century in many regions
- The global population exposed to extreme-to-exceptional total water storage drought is projected to increase from 3% to 8% over the 21st century (RCP2.6-SSP2).



Multi-model intercomparison

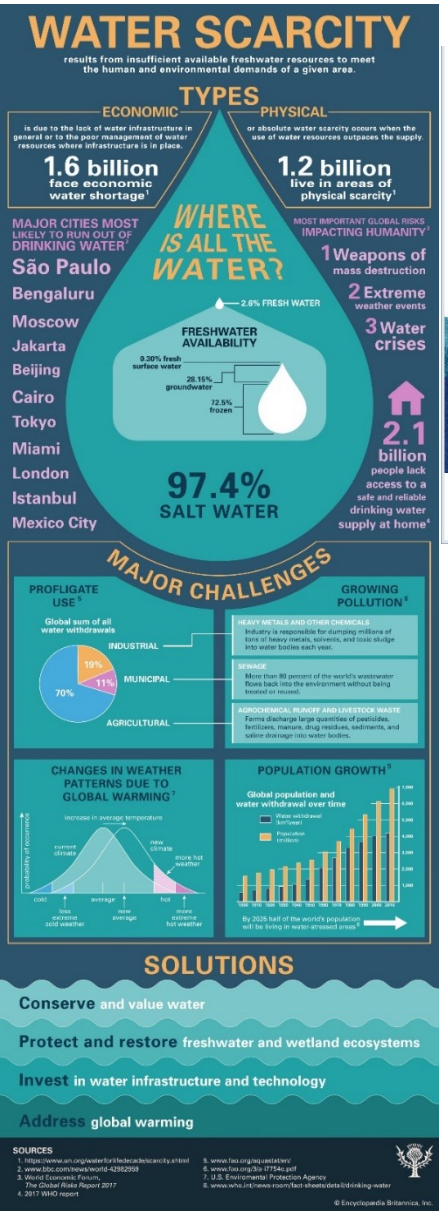
Area exposed to extreme-to-exceptional total water storage drought

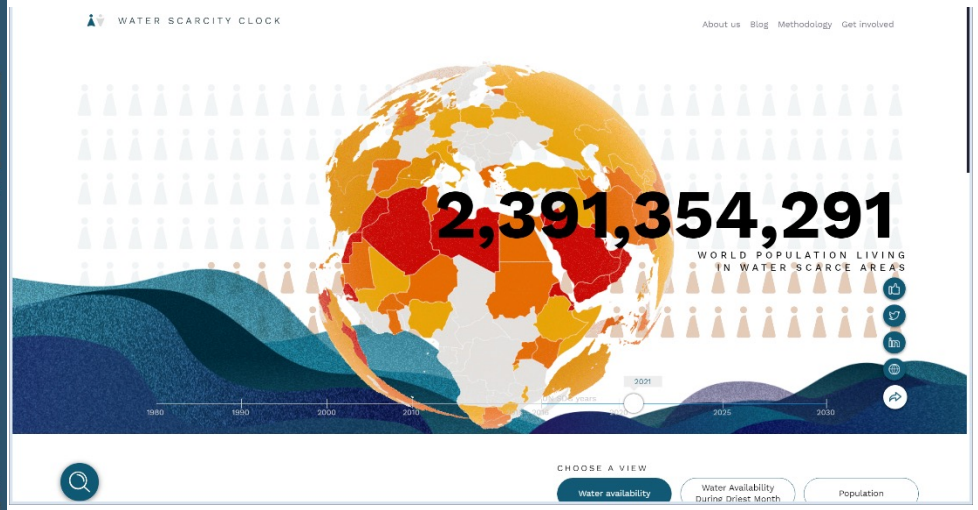
Population exposed to extreme-to-exceptional total water storage drought

Pokhrel Y., … **Liu J.**, et al., *Nature Climate Change* 11: 226–233

ISIMIP Writing Workshop 2015

Which Does Water Scarcity Occur?
Multiple Model Intercomparison



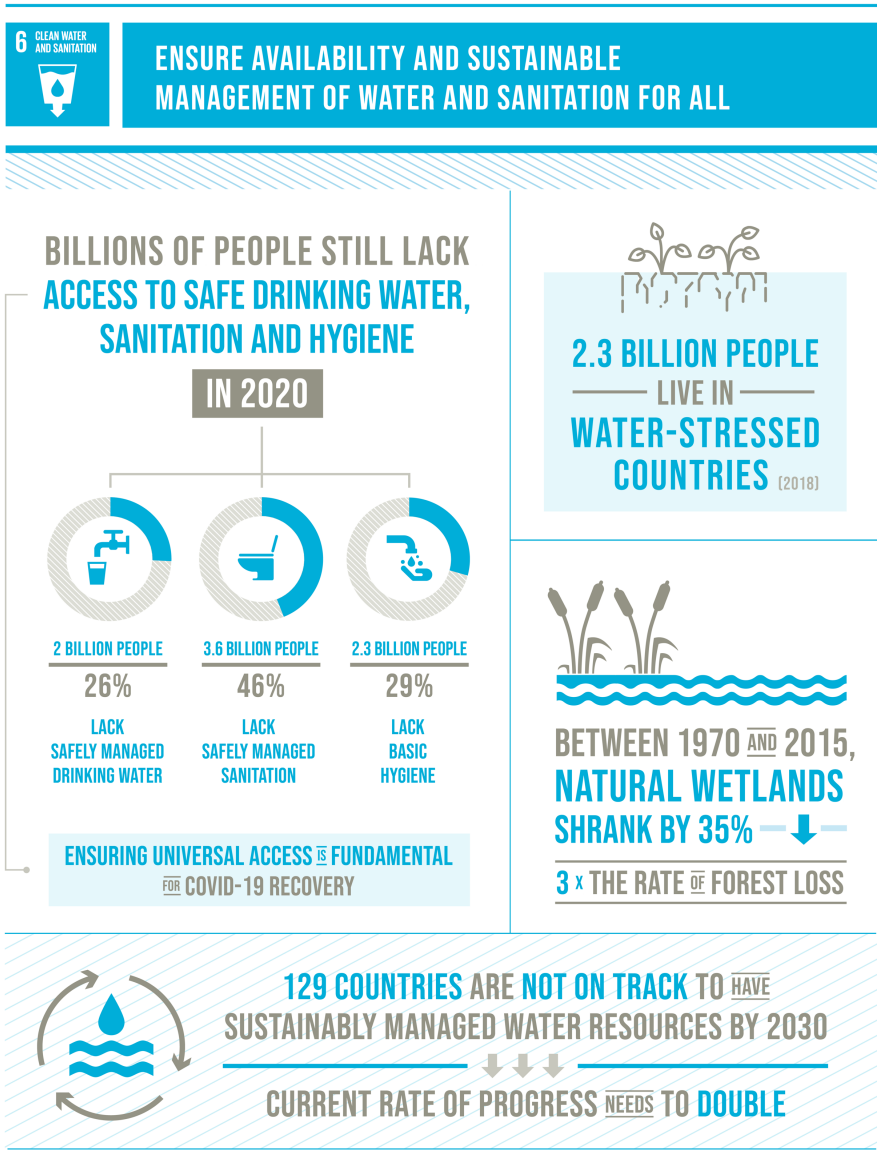


WATER SCARCITY CLOCK https://worldwater.io/

Previous global-scale assessments have explored the spatial distribution and number of people affected by water scarcity, for historical and future time periods.

However, it remains unclear when water scarcity may **first occur**, in particular in the future under different population growth and climate change scenarios.

Water Scarcity is a Big Concern of SDGs

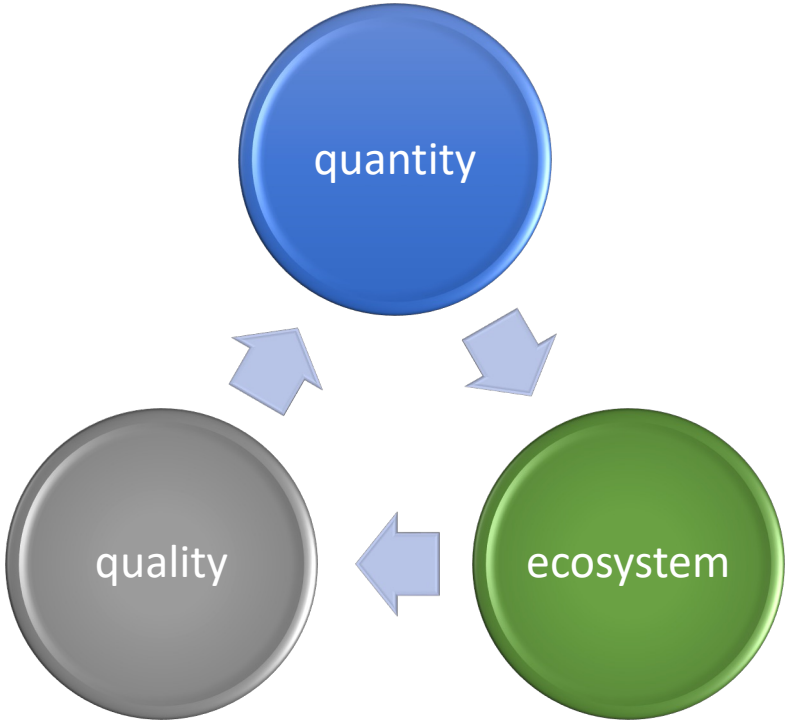


https://sdgs.un.org/goals/goal6

Target 6.4: By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address **water scarcity** and substantially reduce the number of people suffering from **water scarcity**

3-Dimensional Water Scarcity

Water scarcity is the lack of fresh water resources to meet the standard water demand of required quantity or quality. This demand is either from socio-economic sectors (human), or from ecosystems (nature)

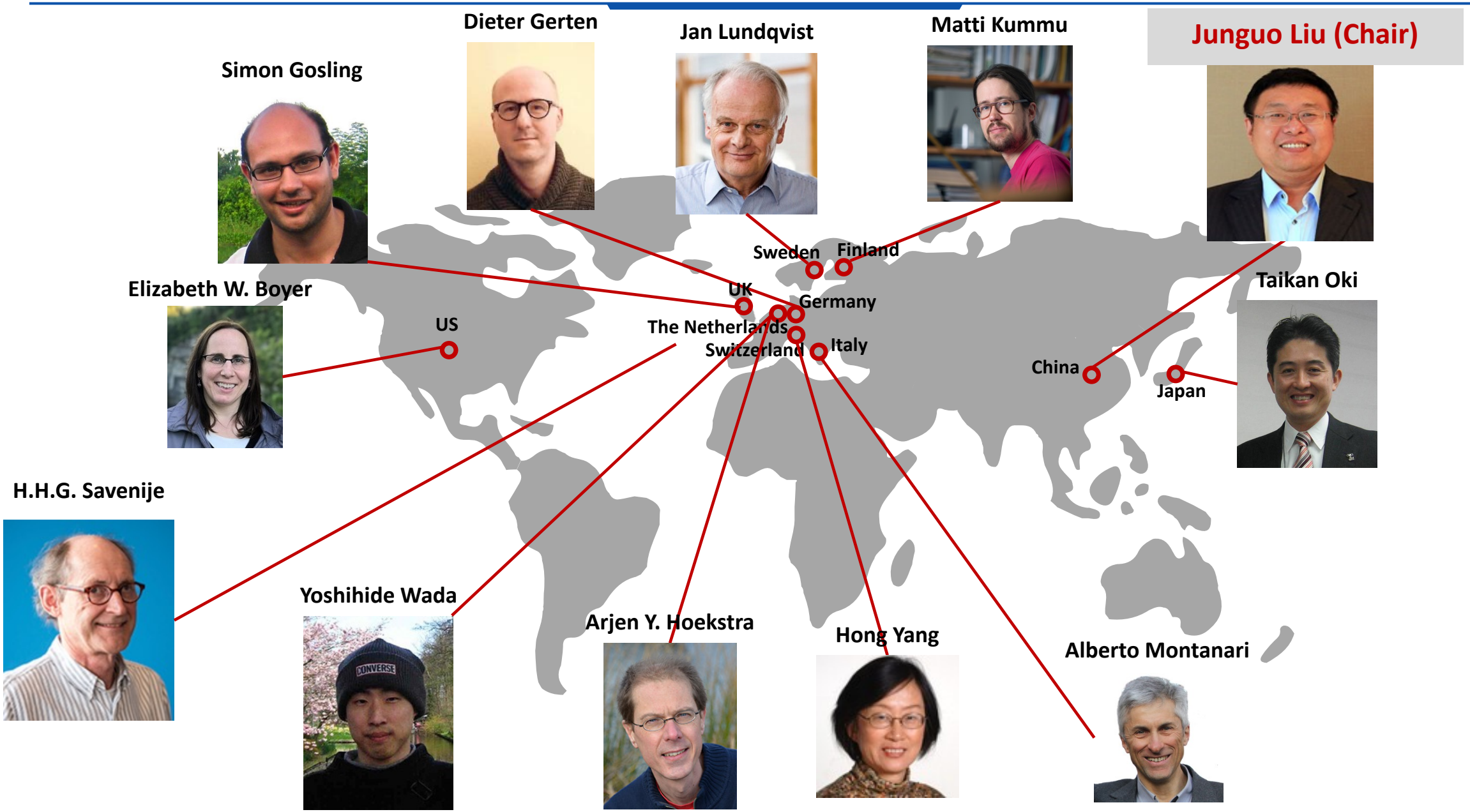


- **Quantity-induced water scarcity**: the quantity of water is not sufficient to meet *human* demand
- **Quality-induced water scarcity**: the quality of water is not sufficient to meet *human* demand
- **Ecological water scarcity**: the quantity or quality of water is not sufficient to meet demand of *ecosystems*

Liu, J. et al. (2017), *Earth's Future*, 5, 545–559

Liu J.*, Zhao D., 2020. *Chinese Science Bulletin* 65 (36): 4251-4261

Working Group of IAHS: Water Scarcity Assessment



3-Dimensional Water Scarcity for SDGs

MejiasMoreno, Patricia, FAO

Biancalani, Riccardo, FAO

Liu, Junguo, SUSTech

May 9, 2022

- We are discussing with FAO to consider 3D water scarcity for SDGs
- You are welcome to collaborate in this direction

Thank you!

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