Water , climate and disaster activities of WMO

Prof. Petteri Taalas
WMO Secretary-General

- Early warnings for all
- Km-scale climate modelling
- New reports: climate, water, energy

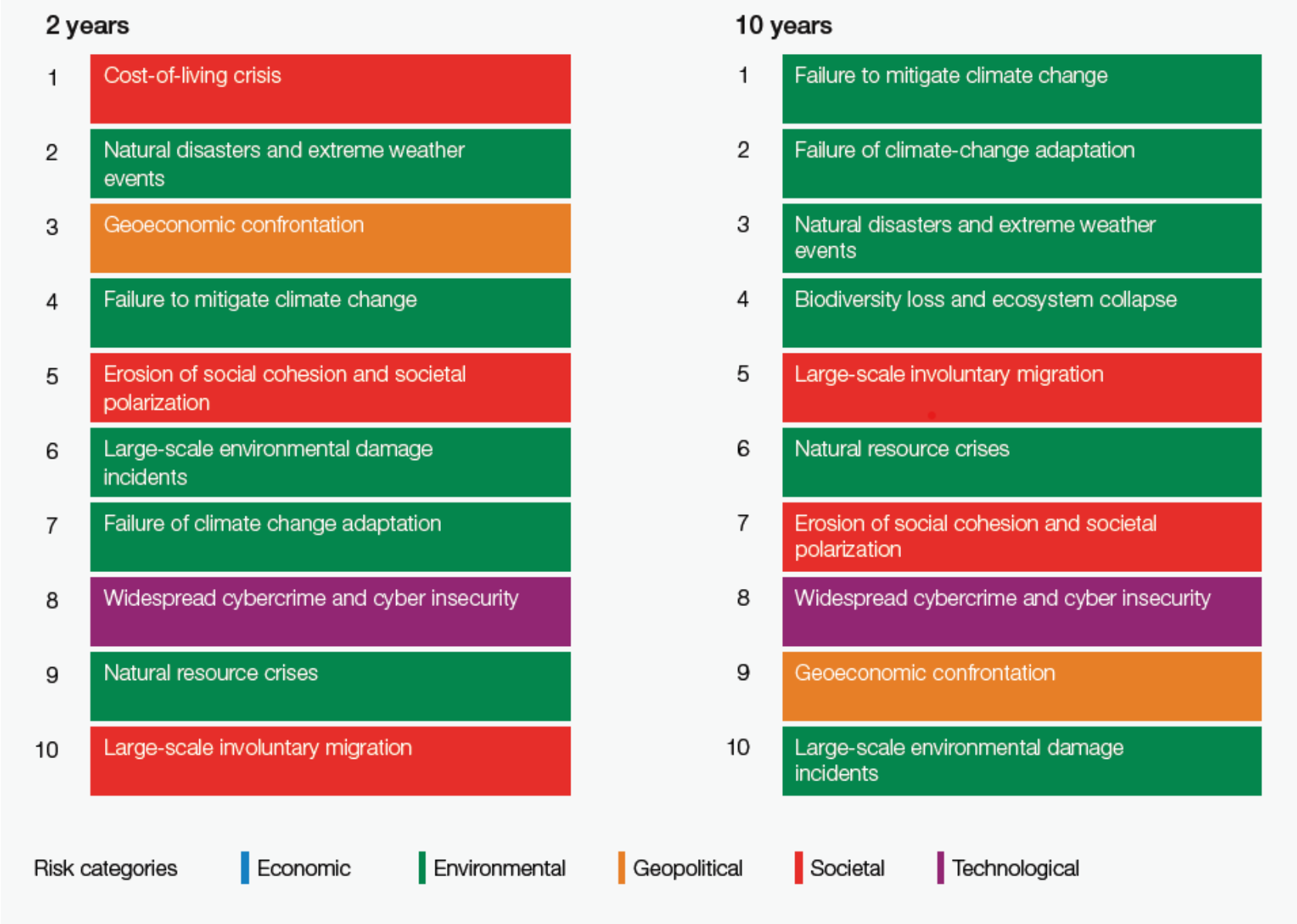
WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

WMO OMM
World Meteorological Organization
Organisation météorologique mondiale

Biggest Global Economic Risks 2023 – 2033 (source: WEF 2023)

WMO strategic priority:

"Enhancing preparedness and reducing loss of life, critical infrastructure and livelihood from hydrometeorological extremes"



WMO OMM

Early Warnings for All

- The UN Global Early Warning Initiative for the Implementation of Climate Adaptation

Today I announce the United Nations will spearhead new action to ensure every person on Earth is protected by early warning systems within five years. I have asked the World Meteorological Organization to lead this effort and to present an action plan at the next UN climate conference, later this year in Egypt.

UN Secretary-General Antonio Guterres on World Meteorological Day 23 March 2022

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Current State of MHEWS Globally

- An enhanced data collection campaign (the ***WMO Performance Monitoring System***) conducted since March 2022 shows that significant MHEWS gaps remain globally

- A **composite Early Warning Index** will be developed with Members and key partners in the months ahead.

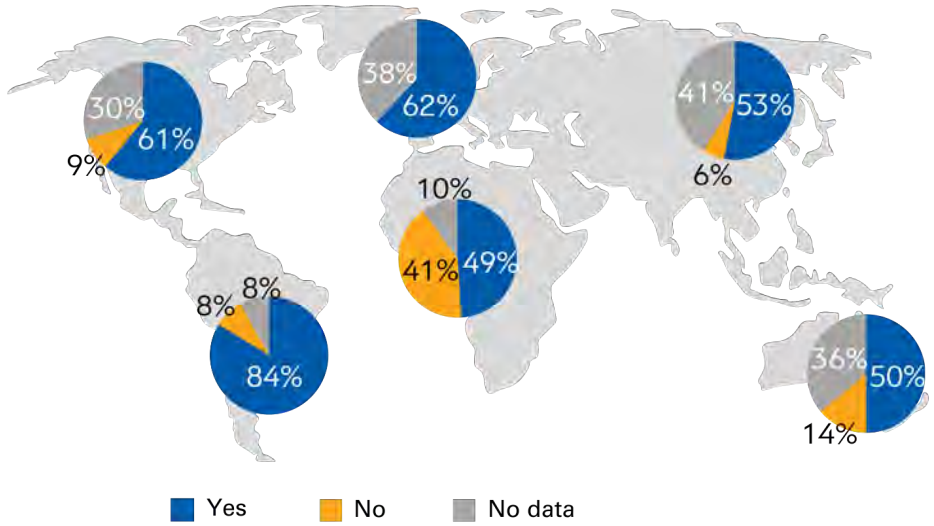
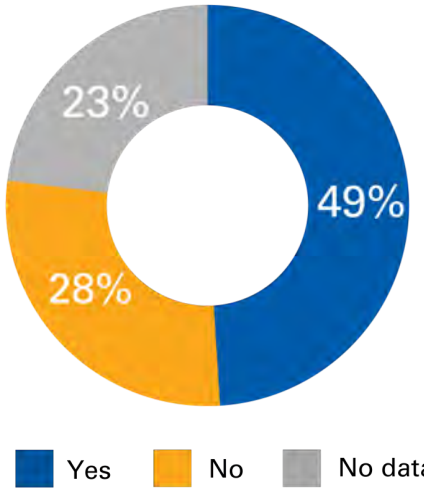
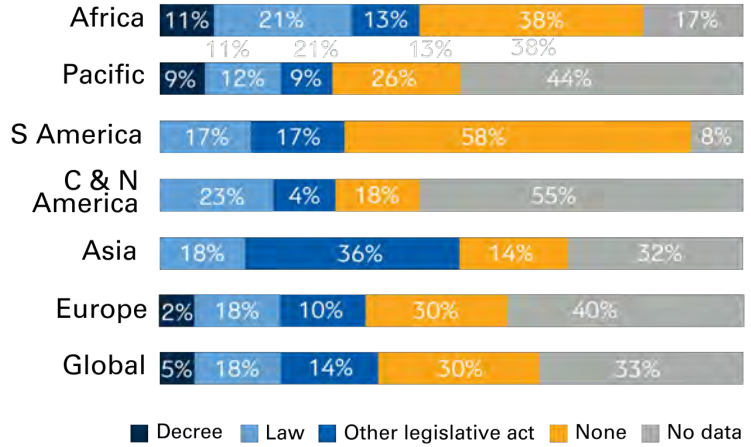


Figure 4: Percentage of countries reporting to have Standard Alerting Procedures (SAPs)



Percentage of WMO Members reporting to have MHEWS



Percentage of Members reporting to have legislation on MHEWS

Ongoing data collection to coordinate with WMO data: The UNDRR **Sendai Framework Monitoring System**, as part of Sendai Framework for Disaster Risk Reduction 2015-2030 **Mid-Term Review**

WMO OMM

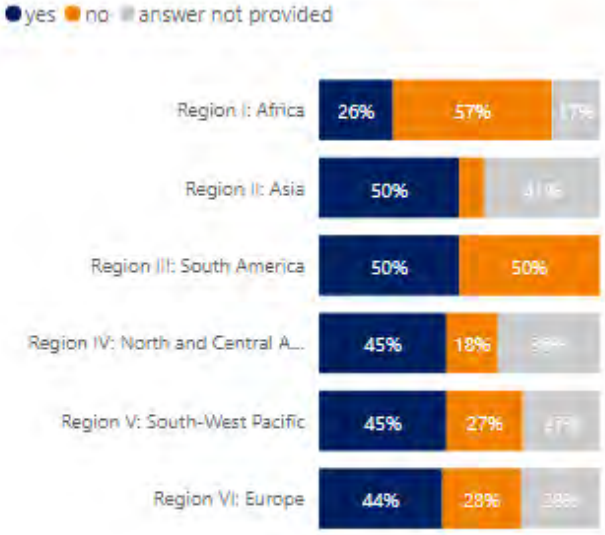
Flood and Drought Forecasting: 193 WMO Members

Flash Flood Forecasting | Around 40% of Members provide this forecasting

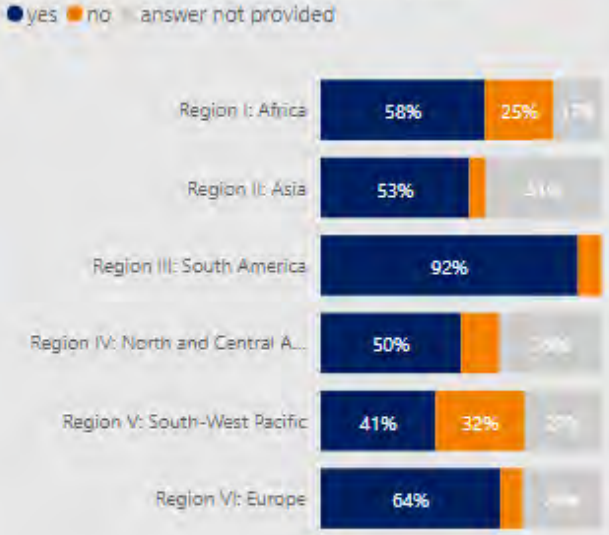
Riverine Flood Forecasting | More than half of Members provide this forecast

Drought Forecasting | More than one third of members provide drought forecasting

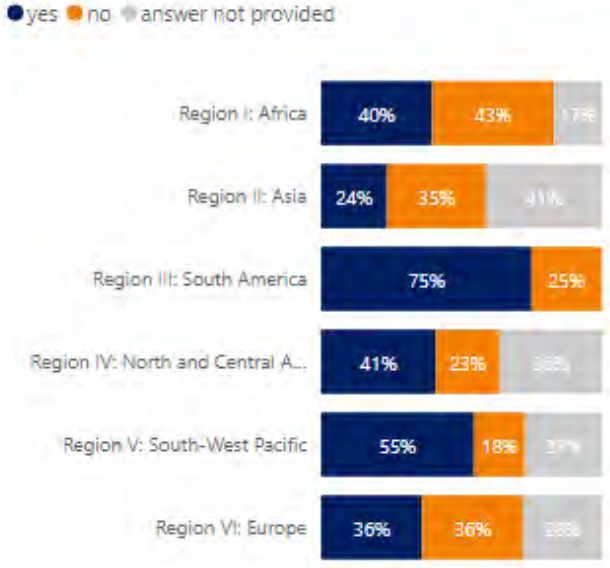
Flash Flood Forecasting | In Region I (Africa) the provision is lowest, applying only to a quarter of Members



Riverine Flood Forecasting | Only in Region V (South-West Pacific) less than half of Members have it in place



Drought Forecasting | In Region II (Asia) only a quarter of members provide this



Associated Programme on Flood Management (APFM)

Last 20 years, WMO promotes the concept of Integrated Flood Management(IFM)

IFM integrates **land use** and **water resources** in a river basin, in accordance with Integrated Water Resources Management, with the objective of **maximizing net benefits** derived from the use of floodplains and **minimizing loss of life** due to flooding. IFM keeps in consideration environmental preservation, balancing development needs with **flood risk** towards **sustainable development**

http://www.floodmanagement.info

WORLD METEOROLOGICAL ORGANIZATION

Milestones of the Associated Programme on Flood Management (APFM)

2001 Launch of the Associated Programme on Flood Management

2003 Development of a Concept Paper on Integrated Flood Management (IFM)

2005 First national strategy on flood management co-developed by APFM in Kenya

2006 Testing community approaches to flood management

Launch of the IFM Tools series

2007 Zambia introduces their IFM Strategy

Recognition of the IFM Concept by the World Meteorological Congress

2009 Establishment of the IFM HelpDesk

2013 The Integrated Drought Management Programme (IDMP) is founded

Start of the pilot project "Community-Based Approaches to Flood Management in Thailand and Lao PDR"

2014 Support to the development of the Mexican national strategy on flood management

Supporting the development and implementation of IPA FLOODS

2016 Global Competition for Youth-Led Projects on Flood and Drought Management

2017 Writing a Guidance Document on IFM Strategies

Implementation of a new government structure: The Support Base Partners

APFM supports the Climate Risk Early Warning System (CREWS)

2019 The Volta Flood and Drought Management Project

2020 WMO reform and inclusion of APFM in the workplan of the Standing Committee on Hydrological Services

2023 Setting up and operating a community of practice on end-to-end early warning systems for flood forecasting

2024 Expanding the scope of the IFM HelpDesk to provide guidance on additional topics related to Integrated Water Resources Management

20 YEARS APFM ASSOCIATED PROGRAMME ON FLOOD MANAGEMENT

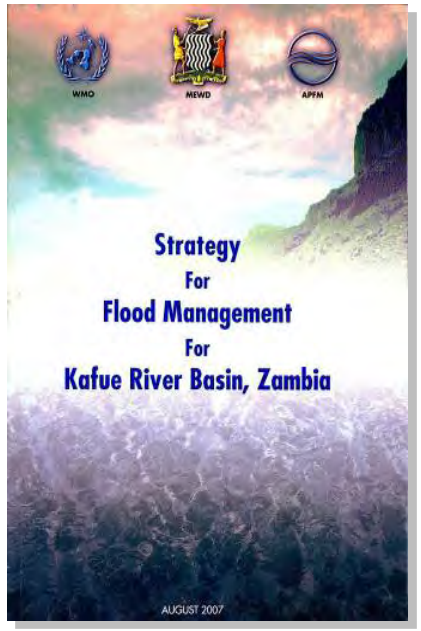
Global Water Partnership

WORLD METEOROLOGICAL ORGANIZATION

IFM Capacity Building and Training

- **Training of Specific topics and contact with experts :**
  - **Integrated flood management,**
  - **urban flood management,**
  - **community-based approaches**
- **Development of National Strategies that apply the IFM concept**

Training & Capacity Building



IFM for flood hazard mapping, Japan

National strategy on IFM, Lao PDR

https://www.floodmanagement.info/get-help/capacity-building/

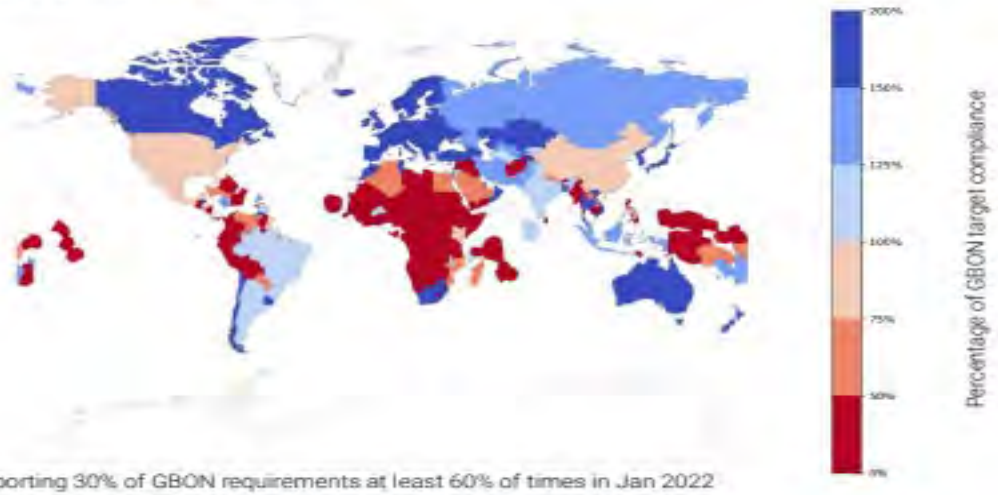
PPE - 30+ Support Base Partners including Japan

Specialized institutes in various disciplines relevant for IFM

The state ground-based and sounding stations

Surface reporting density

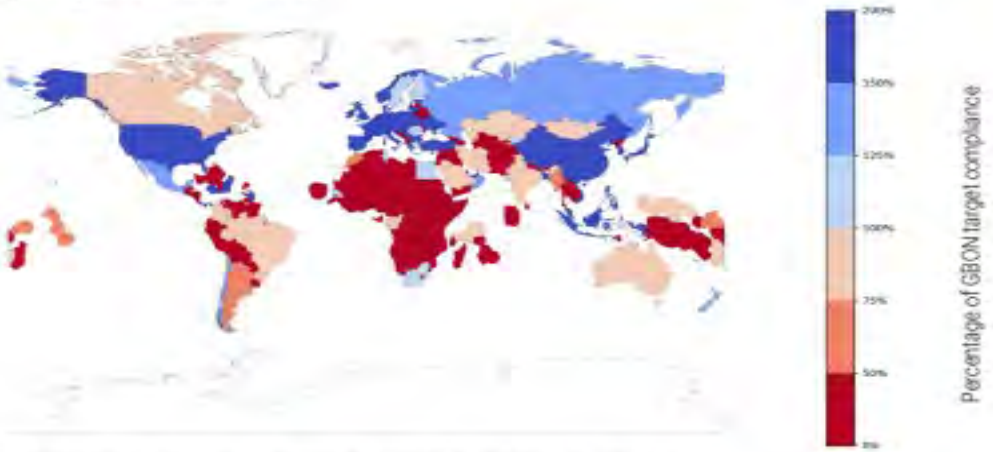
Surface Reporting Horizontal Resolution



Stations reporting 30% of GBON requirements at least 60% of times in Jan 2022

Upper-Air reporting density

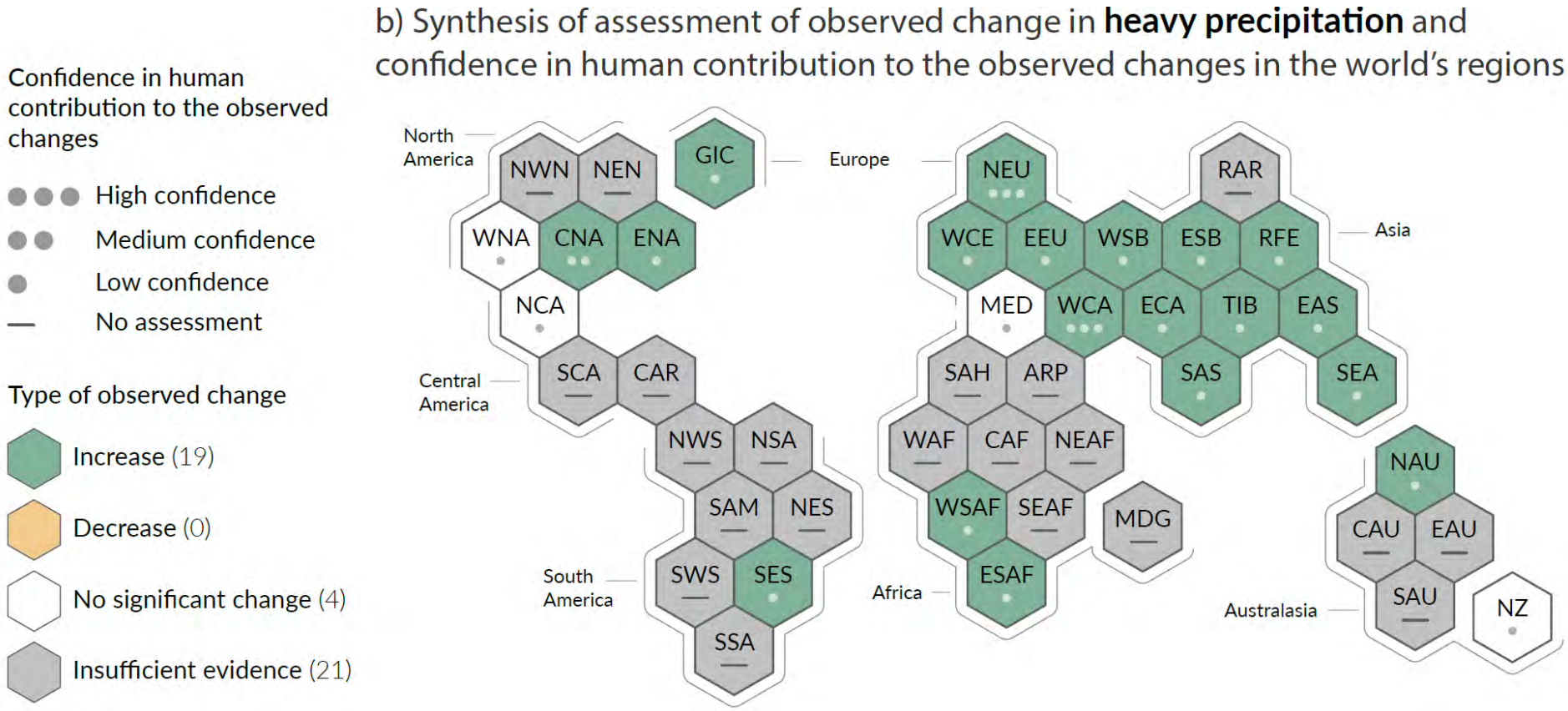
Upper-Air Reporting Horizontal Resolution



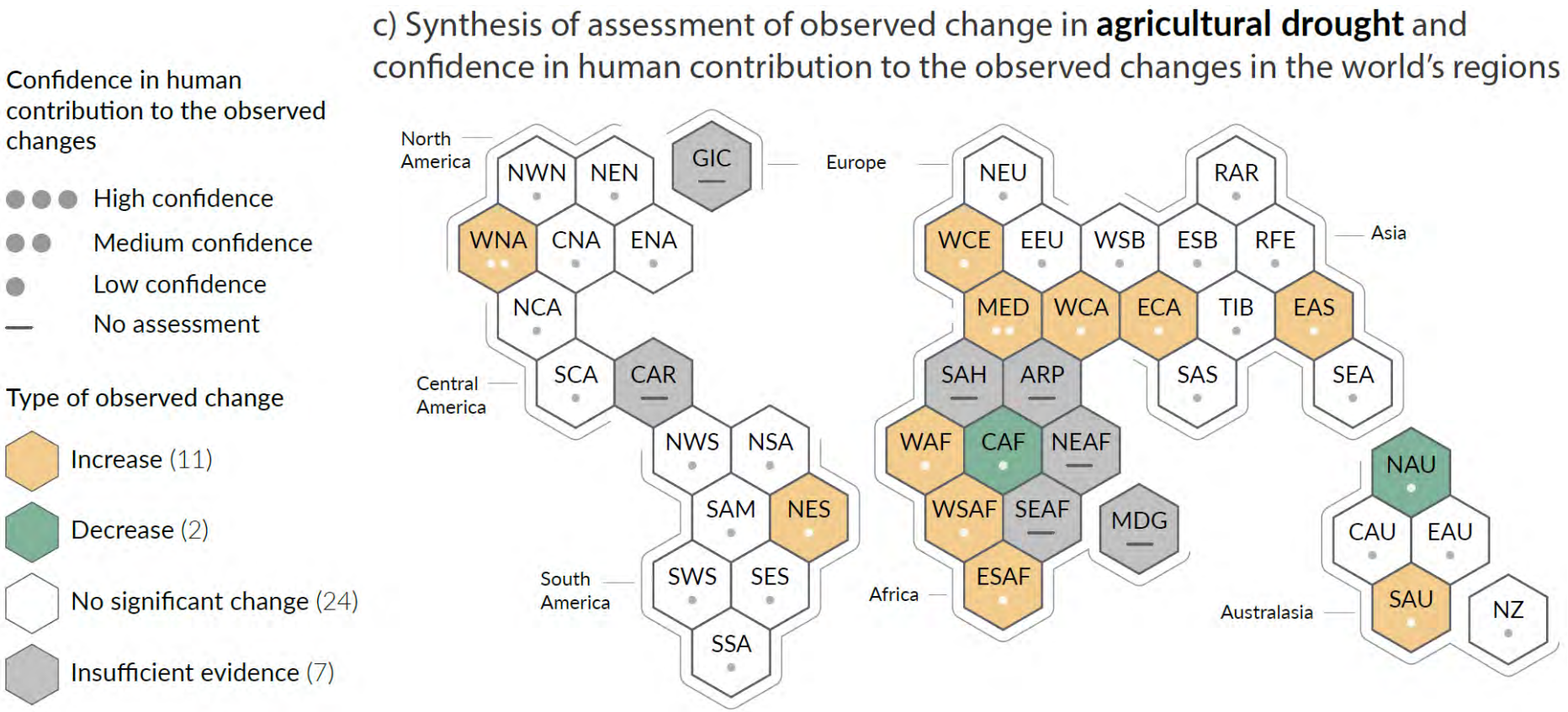
Radiosondes Stations making 1-daily report at least 60% of times in Jan 2022

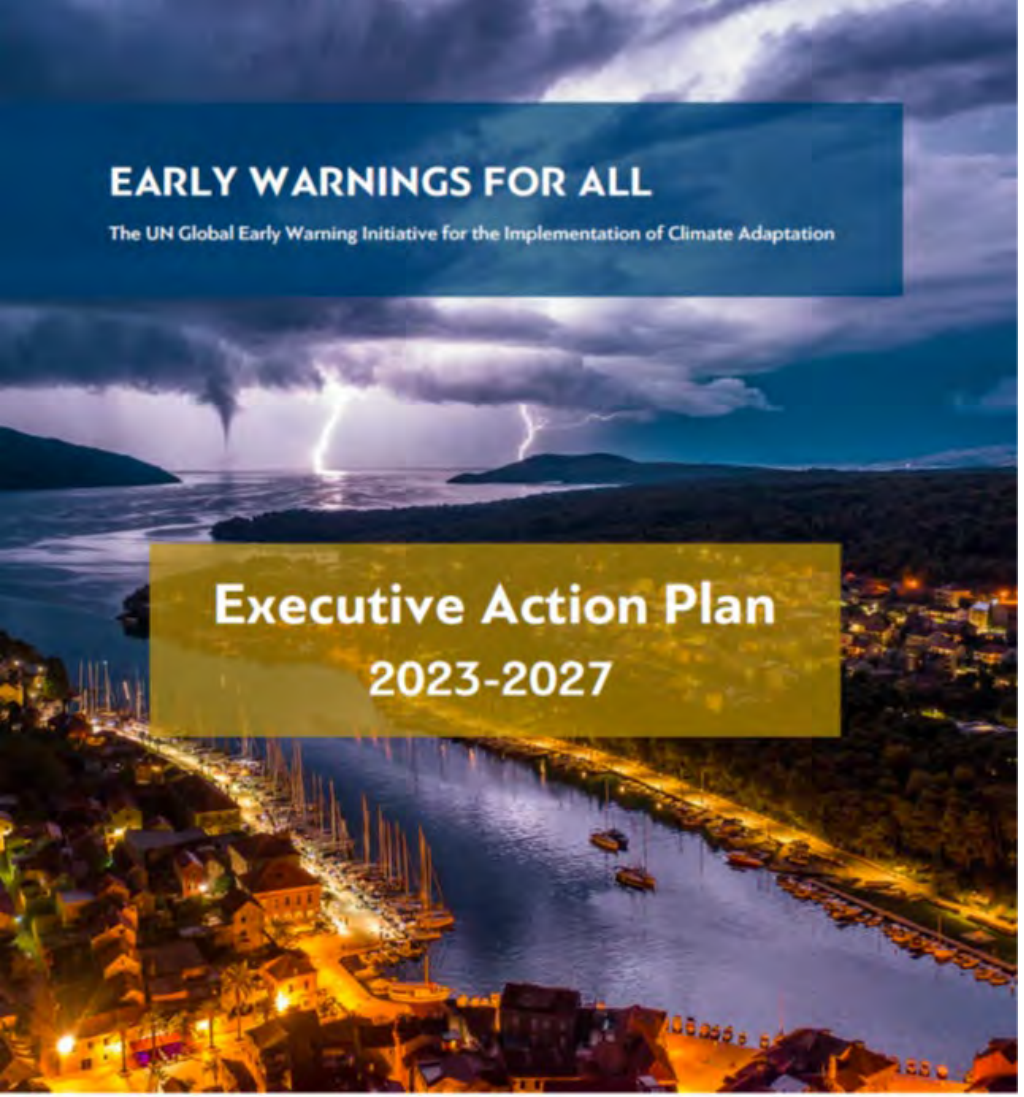
More than half of the planet has been facing increase of heavy precipitation

b) Synthesis of assessment of observed change in **heavy precipitation** and confidence in human contribution to the observed changes in the world's regions

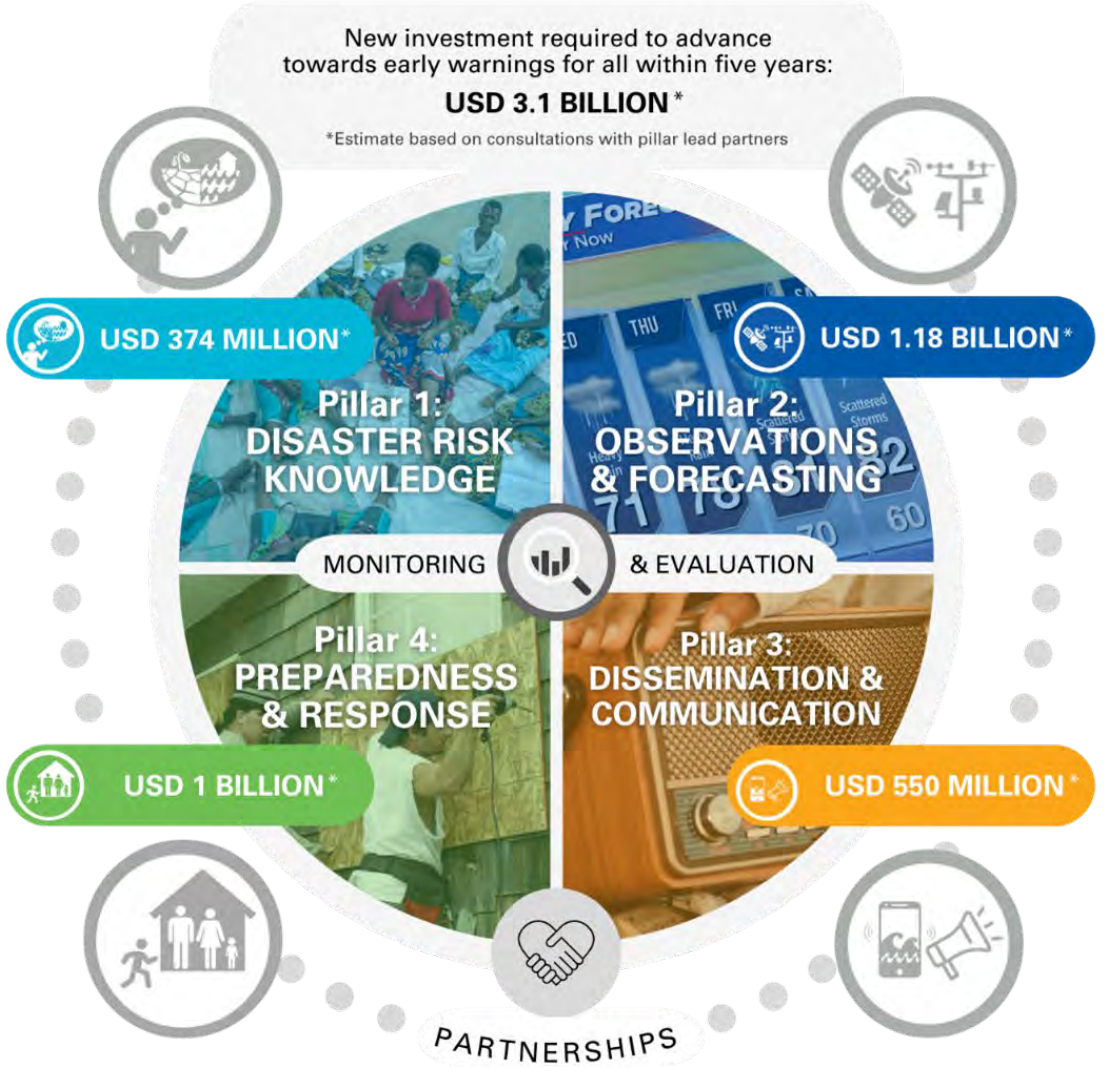


Increase of agricultural drought has been observed in all continents



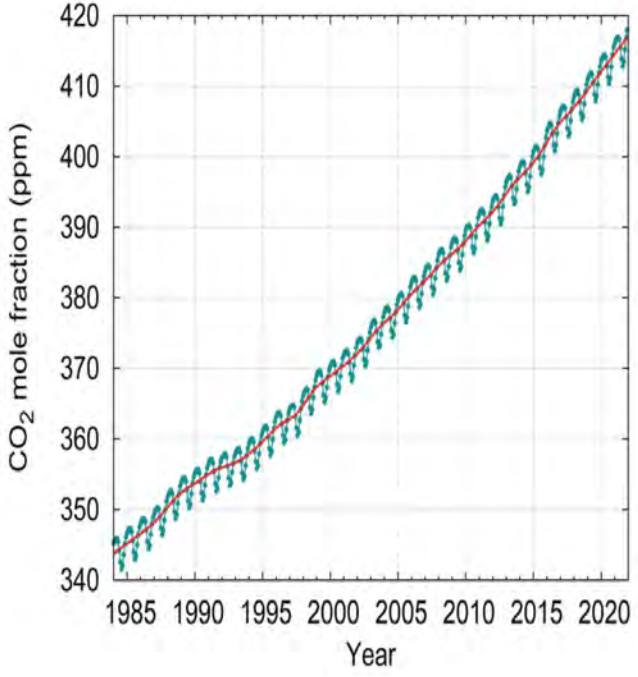


Join us to make it happen!

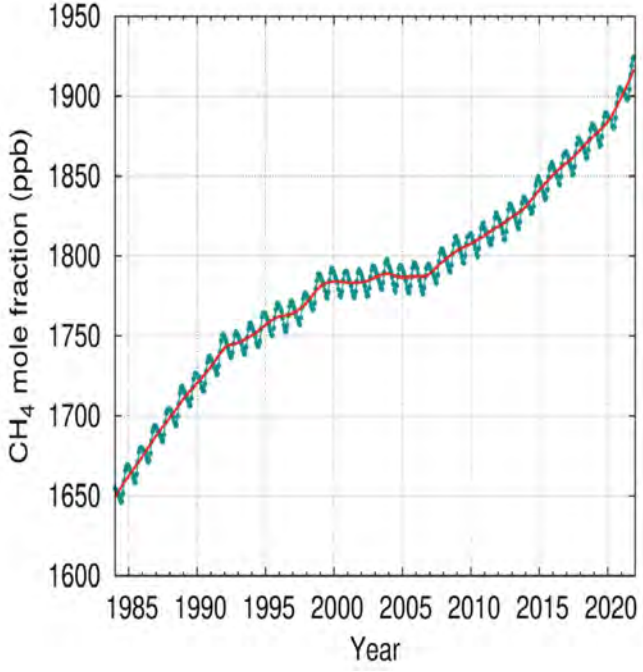


Available at WMO online library

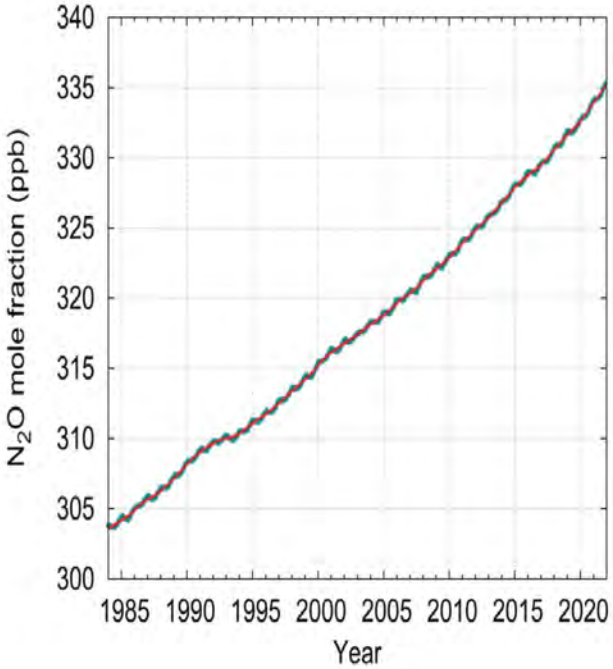
Greenhouse gas concentrations (CO_2, CH_4 and N_2O) continue to rise to new record highs



Carbon dioxide levels **+149%**



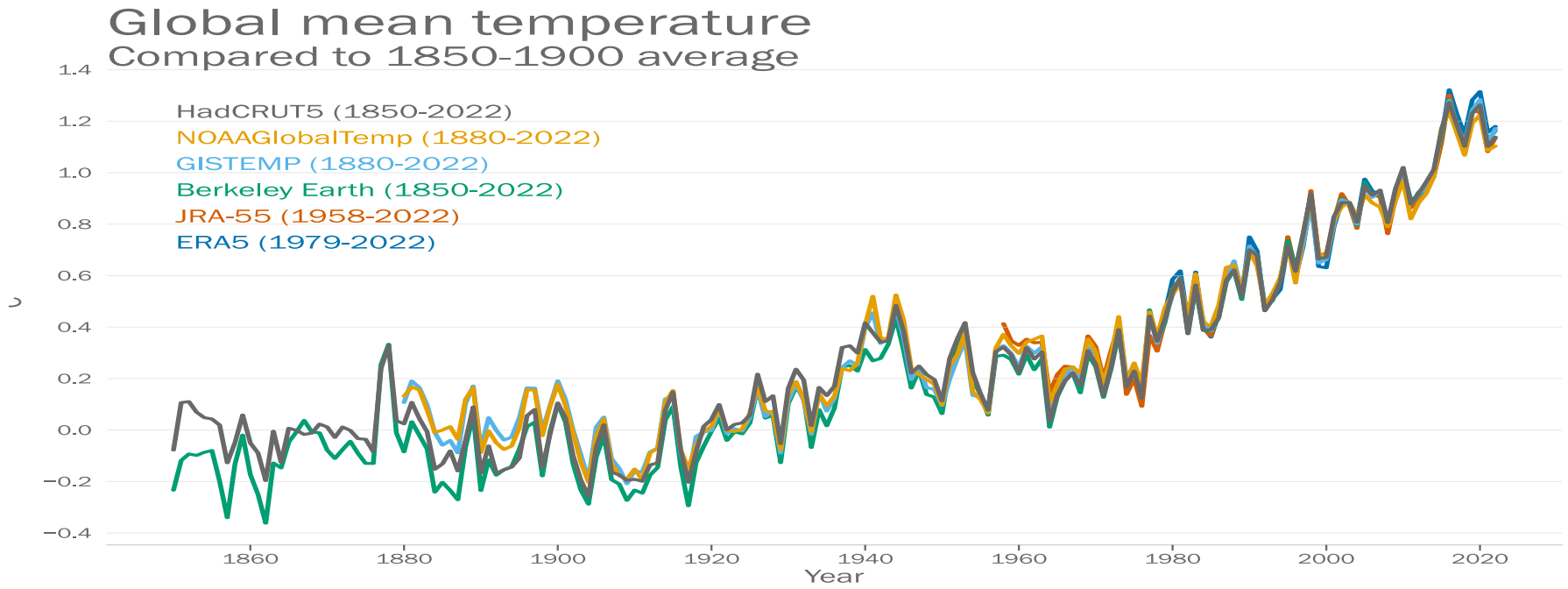
Methane levels **+262%**

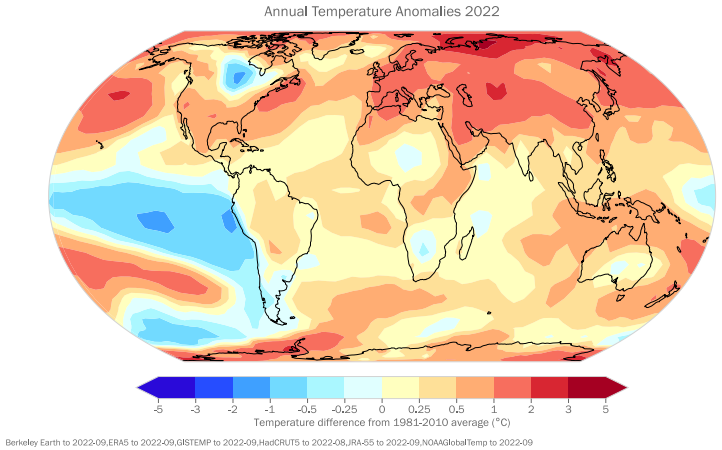


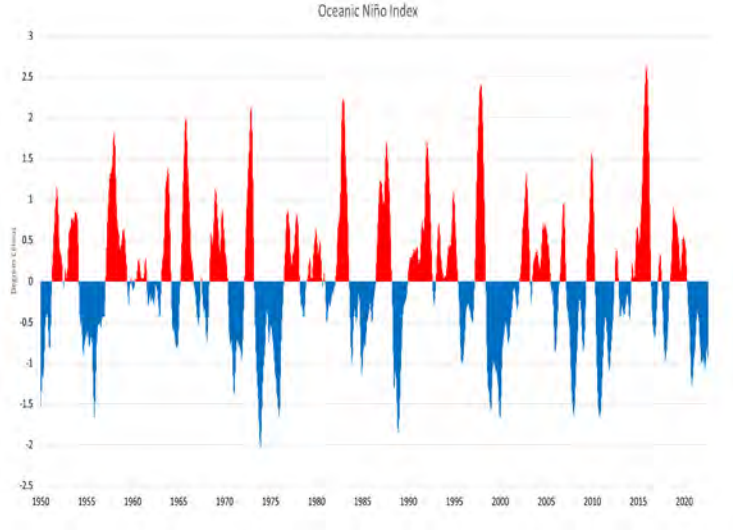
Nitrous oxide levels **+124%**

of pre-industrial levels (before 1750)

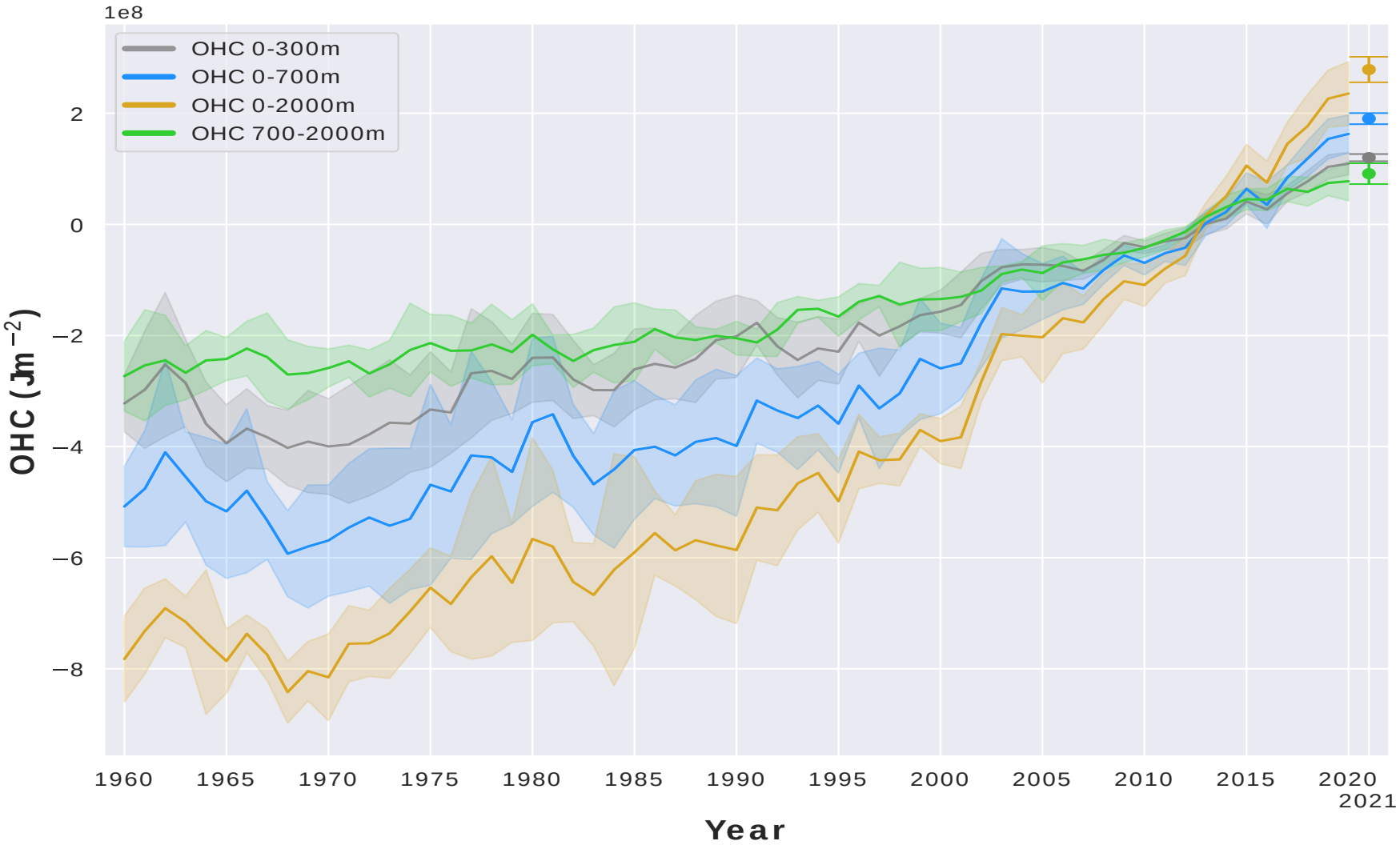
Global temperature & ENSO



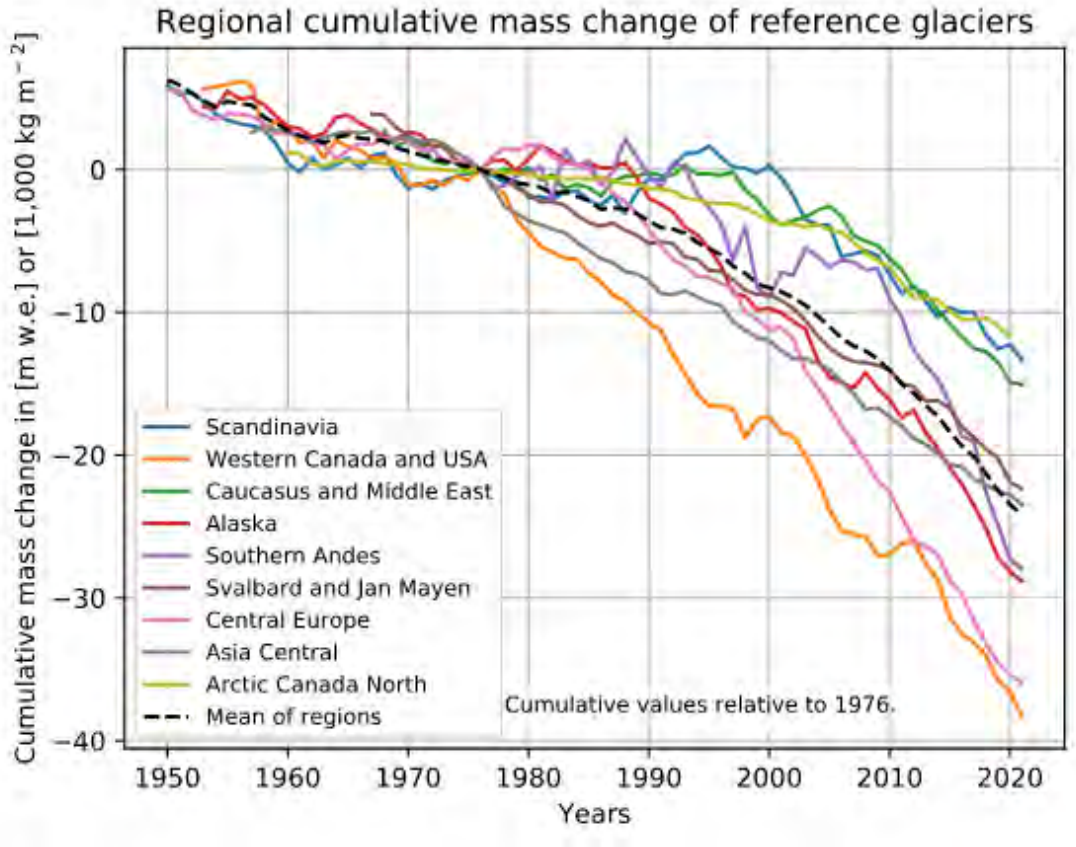




Ocean heat content at record high levels

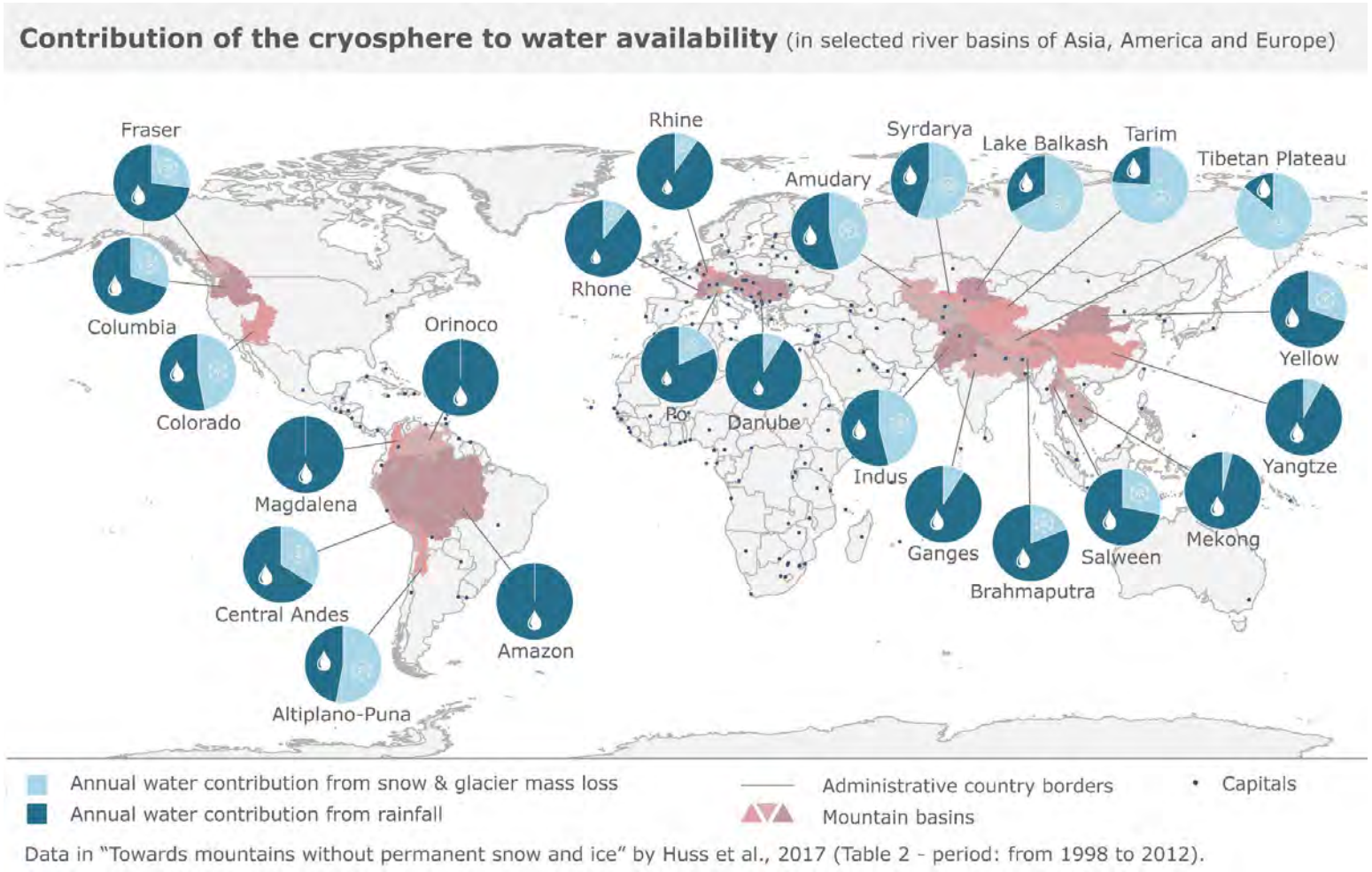


Cryosphere Water Resources

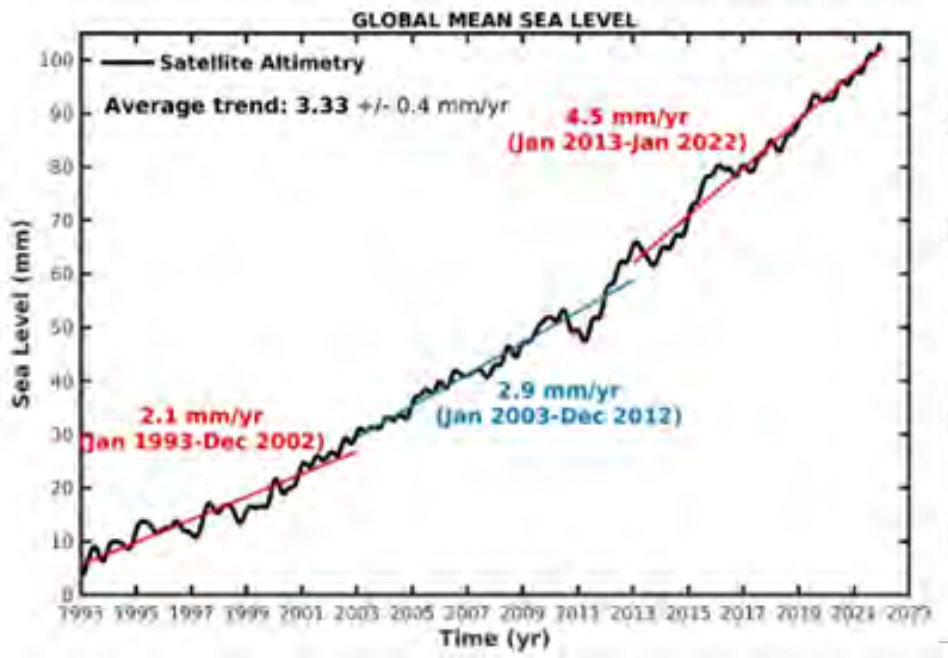


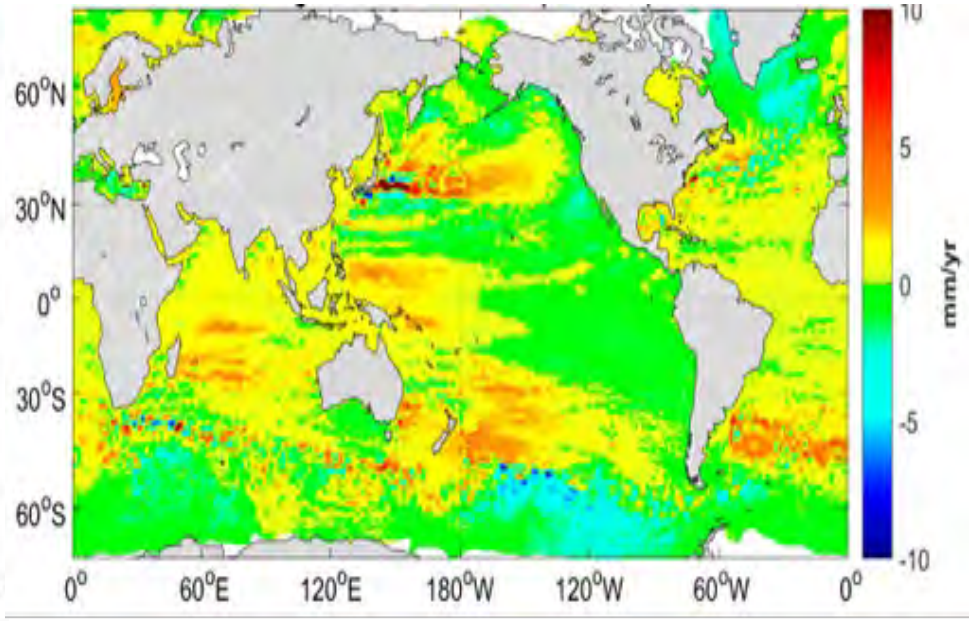
Source: World Glacier Monitoring Services, Global Glacier State, accessed 26 Sept 2022

Cryosphere Water Resources



Global sea level rising at an increasing rate



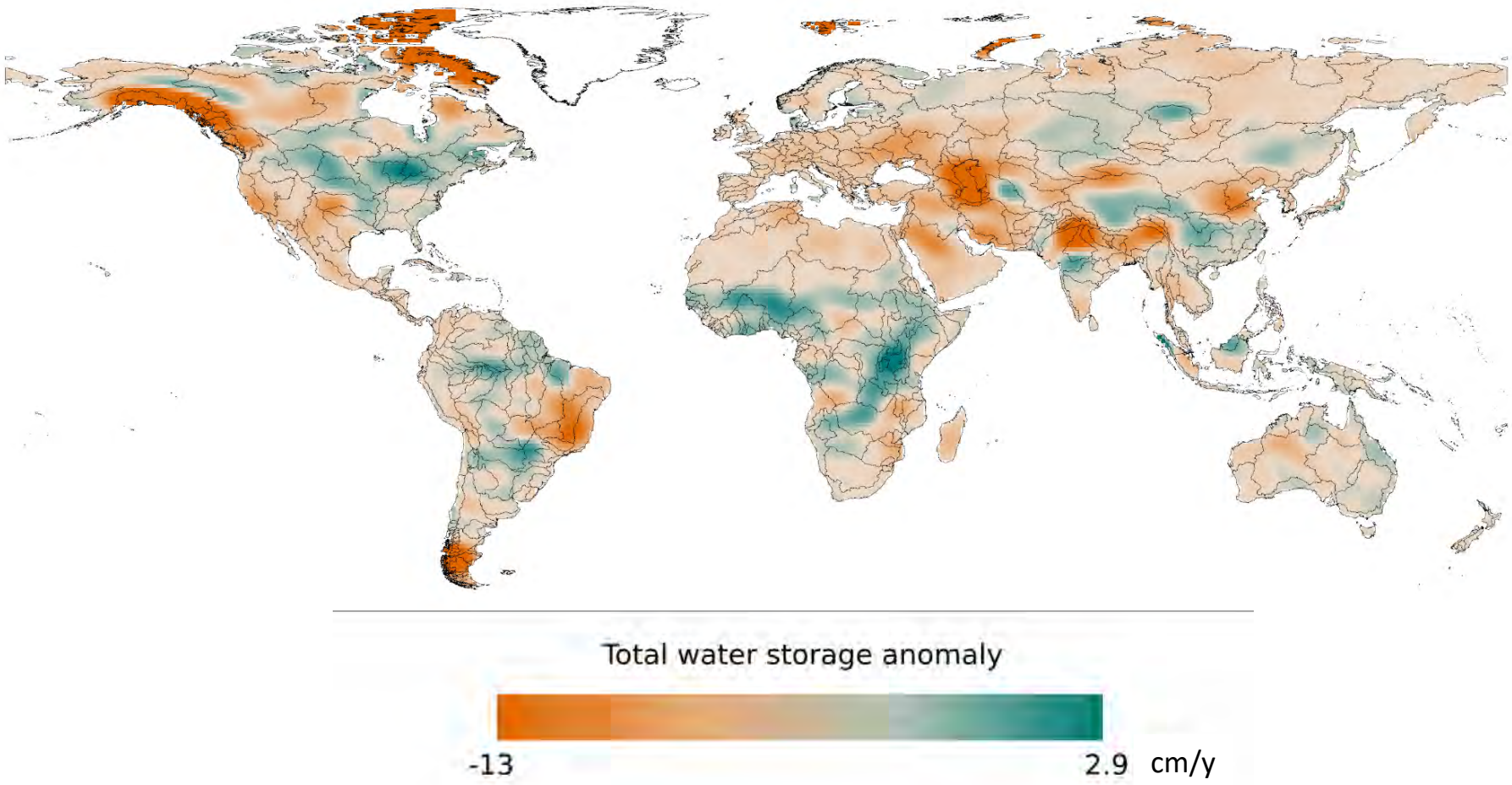


Regional deviations from post-1993 trend

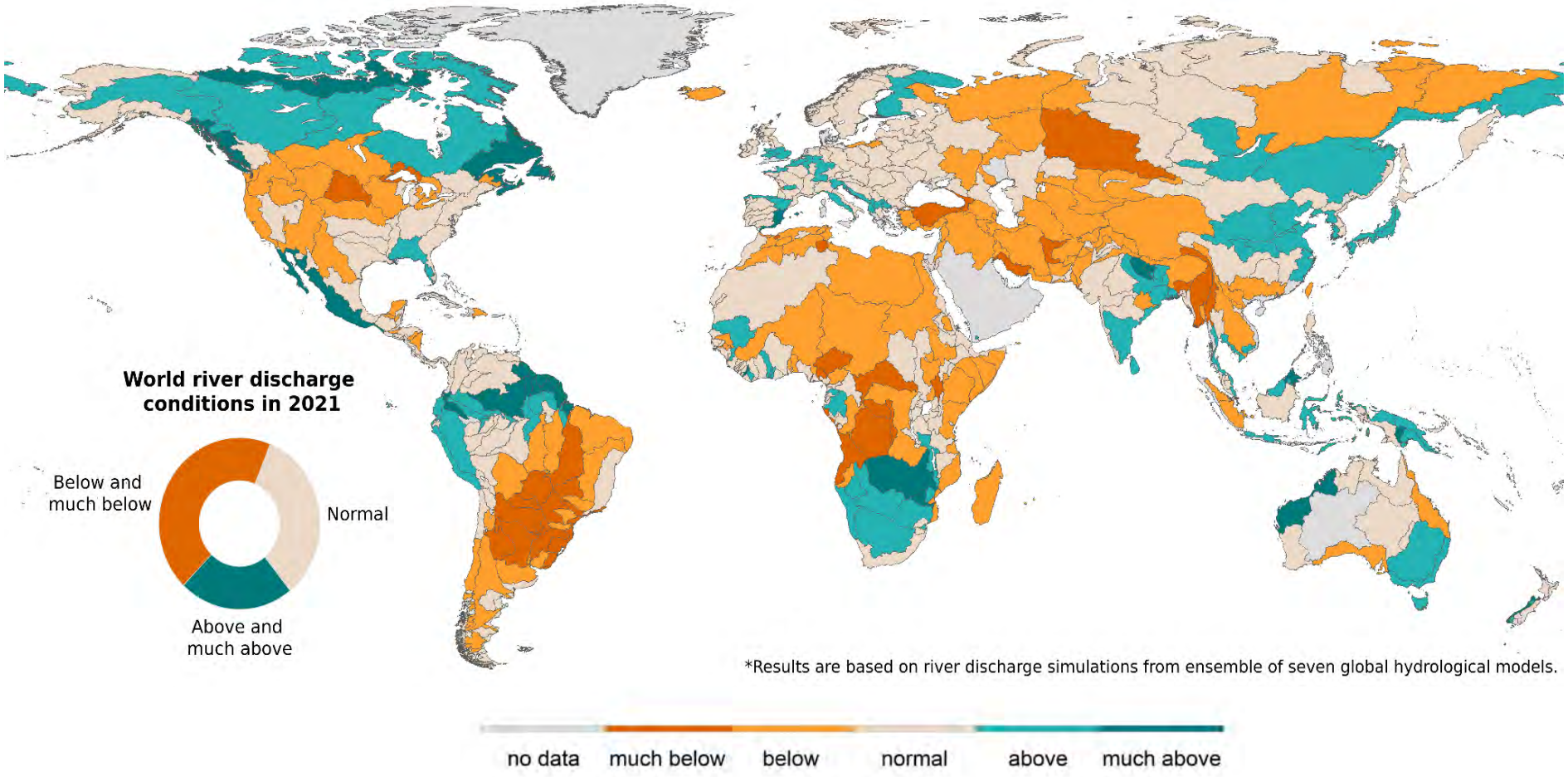
Sea level rise from ice sheet loss:

Greenland: 0.8 mm/yr
Antarctica: 0.4 mm/yr

Total Water Storage Trends 2002-2021

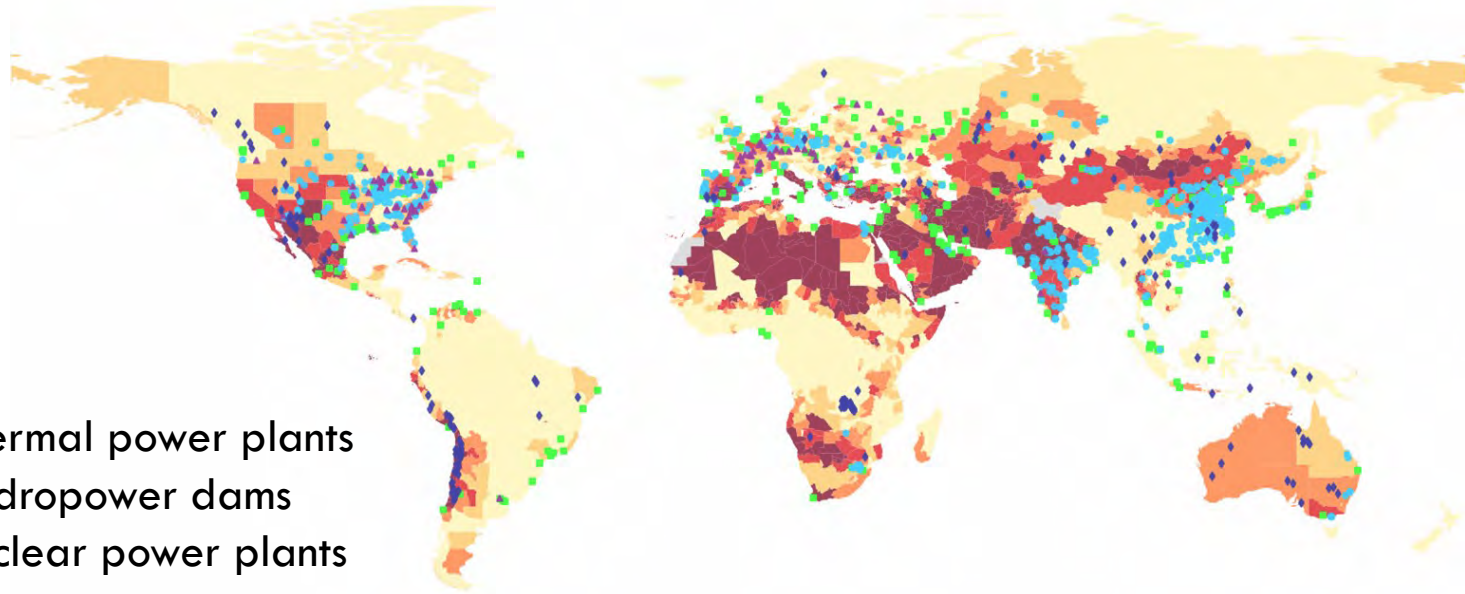


Streamflow 2021



Streamflow in 2021 w.r.t. the hydrological normal for 515 basins
(calculated based on 30 years historic data)

Climate change is a challenge for energy

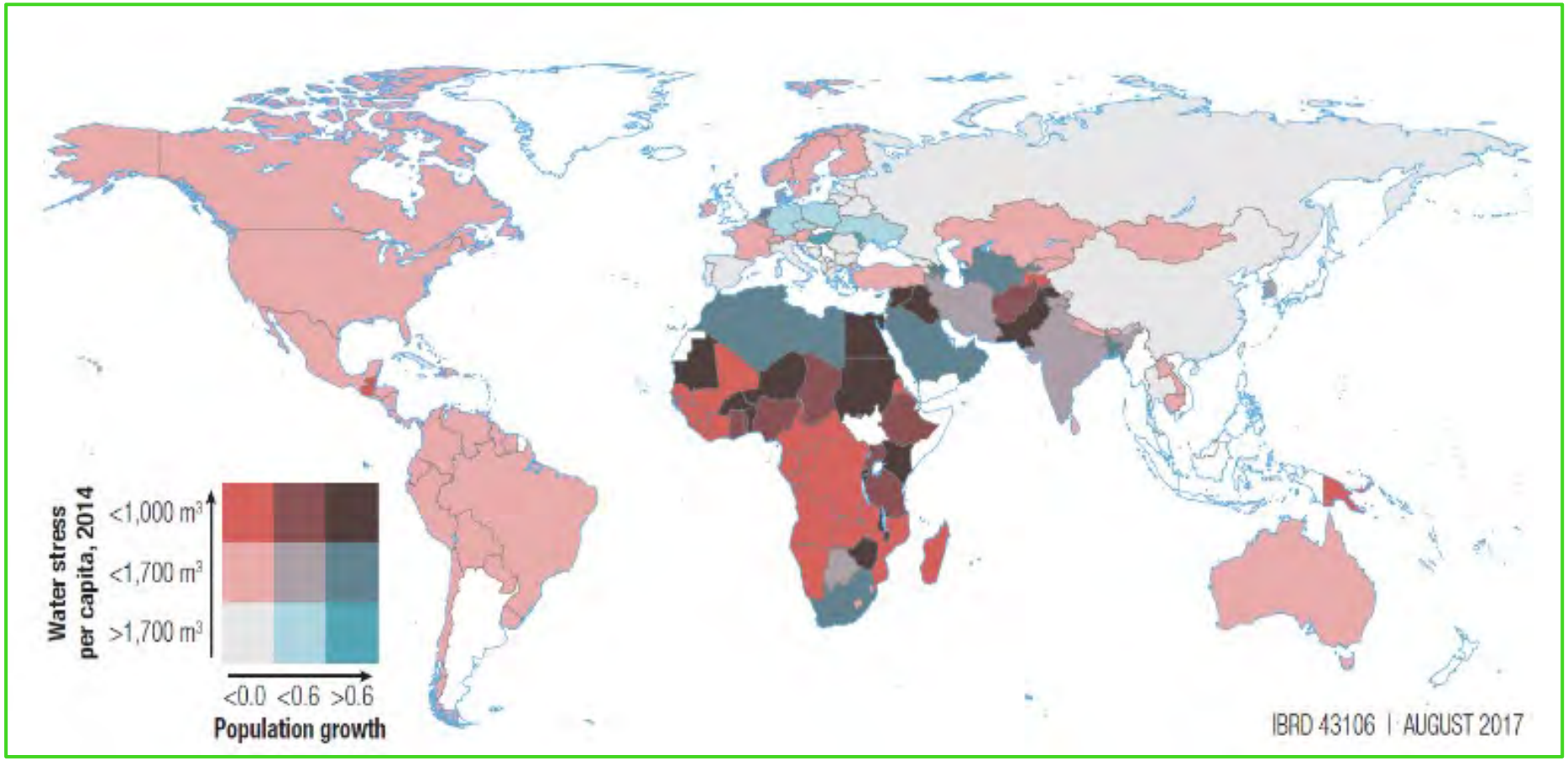


33% of thermal power plants
26% of hydropower dams
15% of nuclear power plants

located in **high water stress areas**

(IEA, IAEA)

Water availability & population growth 2050

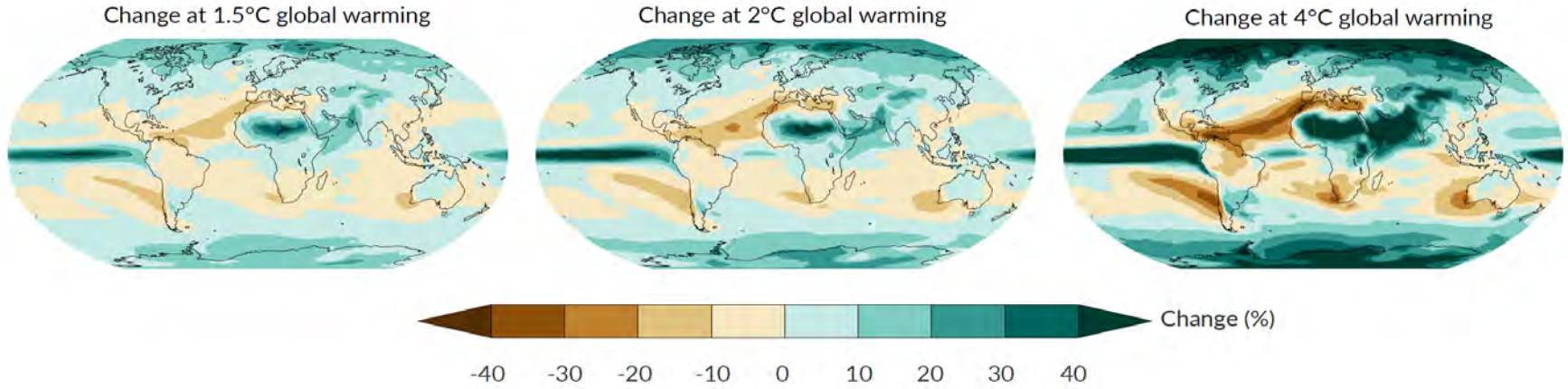


About **4 billion people**, representing nearly two-thirds of the world population, **experience severe water scarcity** during at least **one month of the year**

Rainfall & soil moisture versus future warming

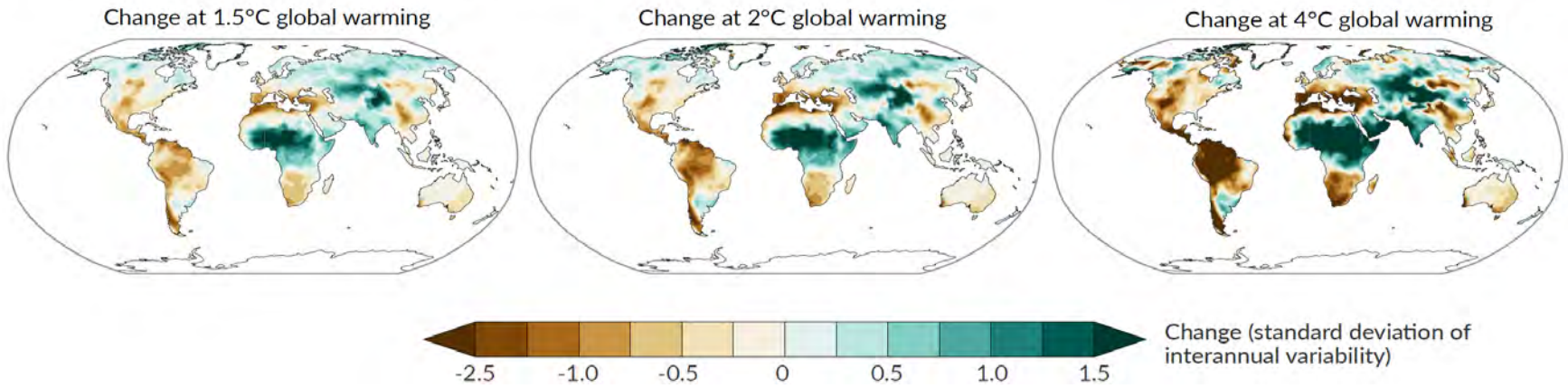
c) Annual mean precipitation change (%)
relative to 1850-1900 at three global warming levels

Precipitation increases over high latitudes, tropical oceans and parts of the monsoon regions but decreases over parts of the subtropics.

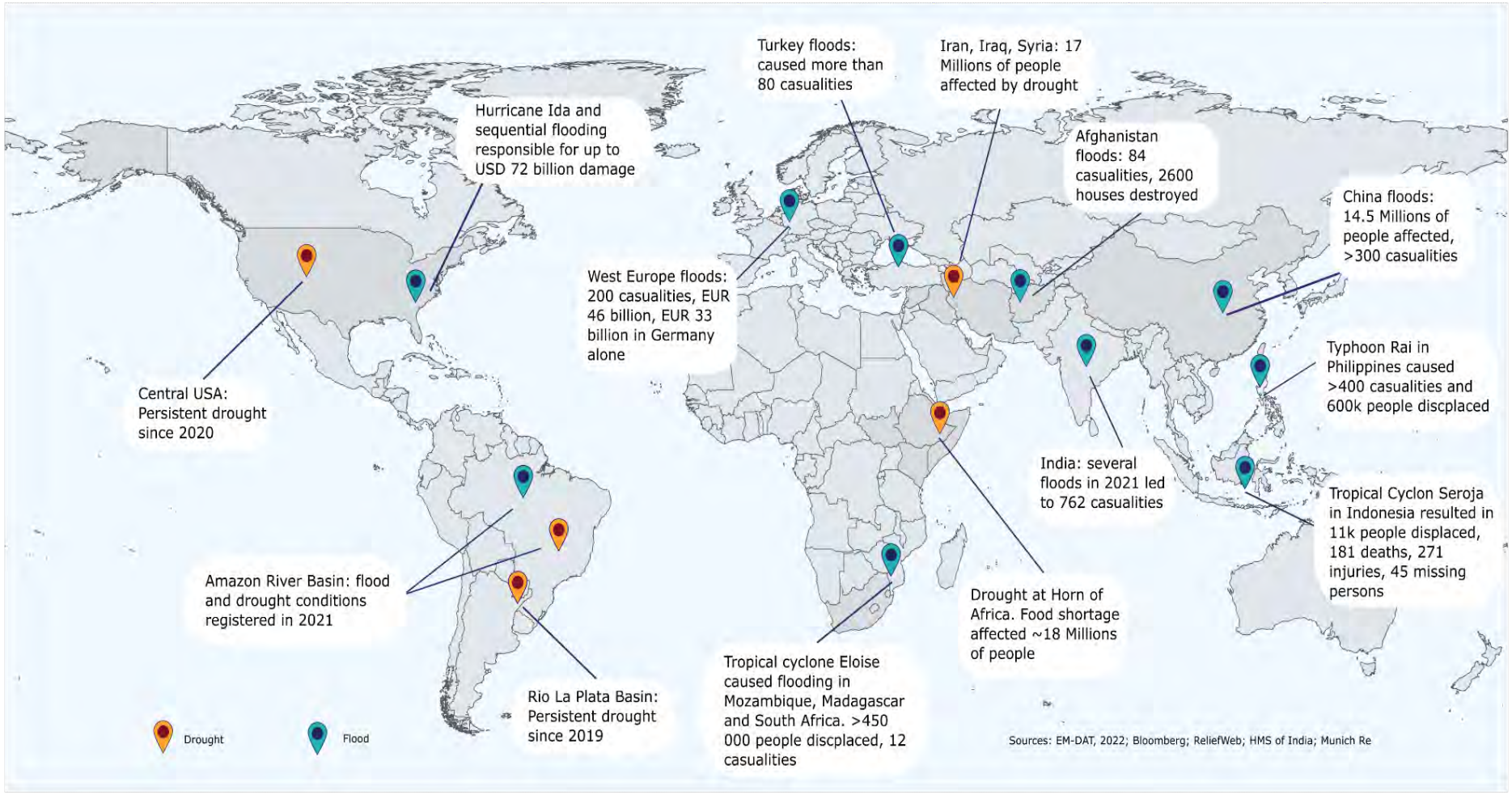


d) Annual mean soil moisture change (sd)
(standard deviation of interannual variability) relative to 1850-1900 at three global warming levels

Across warming levels changes in soil moisture largely follow changes in precipitation but also show some differences due to the influence of evapotranspiration.



High Impact Water Events 2021



Information on the events was collected from EM-DAT

Think big and model small

Ambitious partnership needed for reliable climate prediction

Current global climate models struggle to represent precipitation and related extreme events, with serious implications for the physical evidence base to support climate actions. A leap to kilometre-scale models could overcome this shortcoming but requires collaboration on an unprecedented scale.

Julia Slingo, Paul Bates, Peter Bauer, Stephen Belcher, Tim Palmer, Graeme Stephens, Bjorn Stevens, Thomas Stocker and Georg Teutsch

Water is Earth's life blood and fundamental to our future. Hydro-meteorological extremes (storms, floods and droughts) are among the costliest impacts of climate change, and changes in the seasonality and natural variability of precipitation can have profound effects on many living systems, in turn threatening our food security, water security, health and infrastructure investments. Yet the current generation of global climate models struggles to represent precipitation and related extreme events, especially on local and regional scales[1,2]. The model precipitation biases are substantial in both space and time, and in the tropics they overwhelm the projected signal of climate change[3]. Despite decades of enormous efforts by the community, these biases have remained stubbornly intractable[1,2] (Box 1). Consequently, future scenarios of precipitation remain very uncertain in the IPCC assessments so far[4]. As water is an essential resource for humans

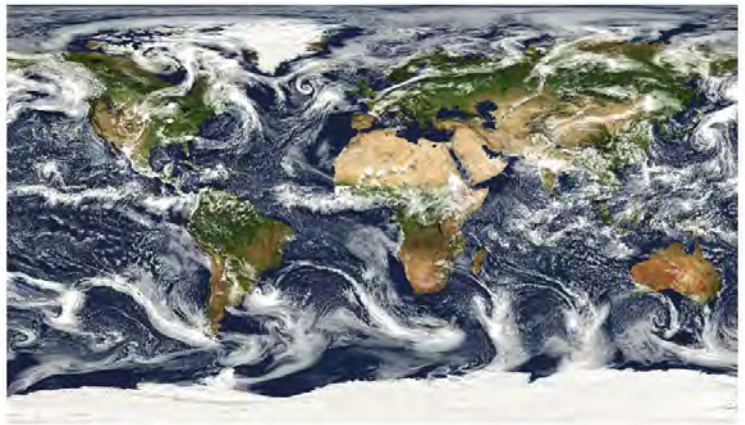
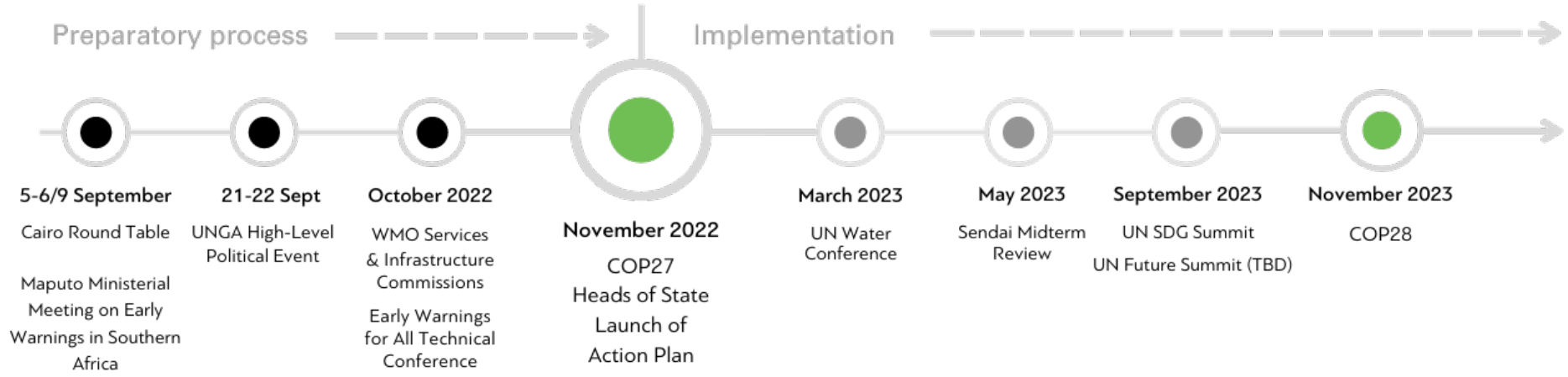


Fig. 1 | The realism of k-scale global climate modelling. Snapshot of clouds from a simulation with a global k-scale climate model, showing the detailed structures of tropical clouds, mid-latitude storms and evidence of MCSs across West Africa and the US Great Plains[13]. Base map provided by NASA's Earth Observatory.

Milestones to COP27 and beyond



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COP27
SHARM EL-SHEIKH
EGYPT 2022

Summary & conclusions

- Implementation of the Early warning services for all is a major opportunity to improve impact-based MHEWS & integration of hydrometeorological services of ~100 Members 2023-27

- There is a need to invest in hydrological observing infrastructures and promote free exchange of data

- There is a need for km-scale climate modelling to improve cloud physics, hydrological cycle and weather extremes scenarios

شكرا لكم
Thank you
Gracias
Merci
Спасибо
谢谢

WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

WMO OMM
World Meteorological Organization
Organisation météorologique mondiale