The evolution of climate services and future challenges

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ECMWF Annual Seminar

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1950-2025 SCIENCE for ACTION

What is WMO?

- The UN Specialized Agency for weather, climate and water
- Has 193 Member States and Territories
- Support resilience and sustainable development of all nations, especially the most vulnerable, in the face of weather, climate and water events
- Defines best practice and sets international standards for weather and climate

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What are climate services

- Climate services are the provision and use of climate information to assist decision-making
- Climate information is becoming increasingly important and relevant for decision-making across society
- Recognised in 2009 at World Climate Conference-3. Heads of States, governments, industry, and scientific experts called for better collaboration and coordination under a *Global Framework for Climate Services*

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Climate Services: Timescales

1. Past and current climate

   observations and monitoring, climatologies, reanalyses

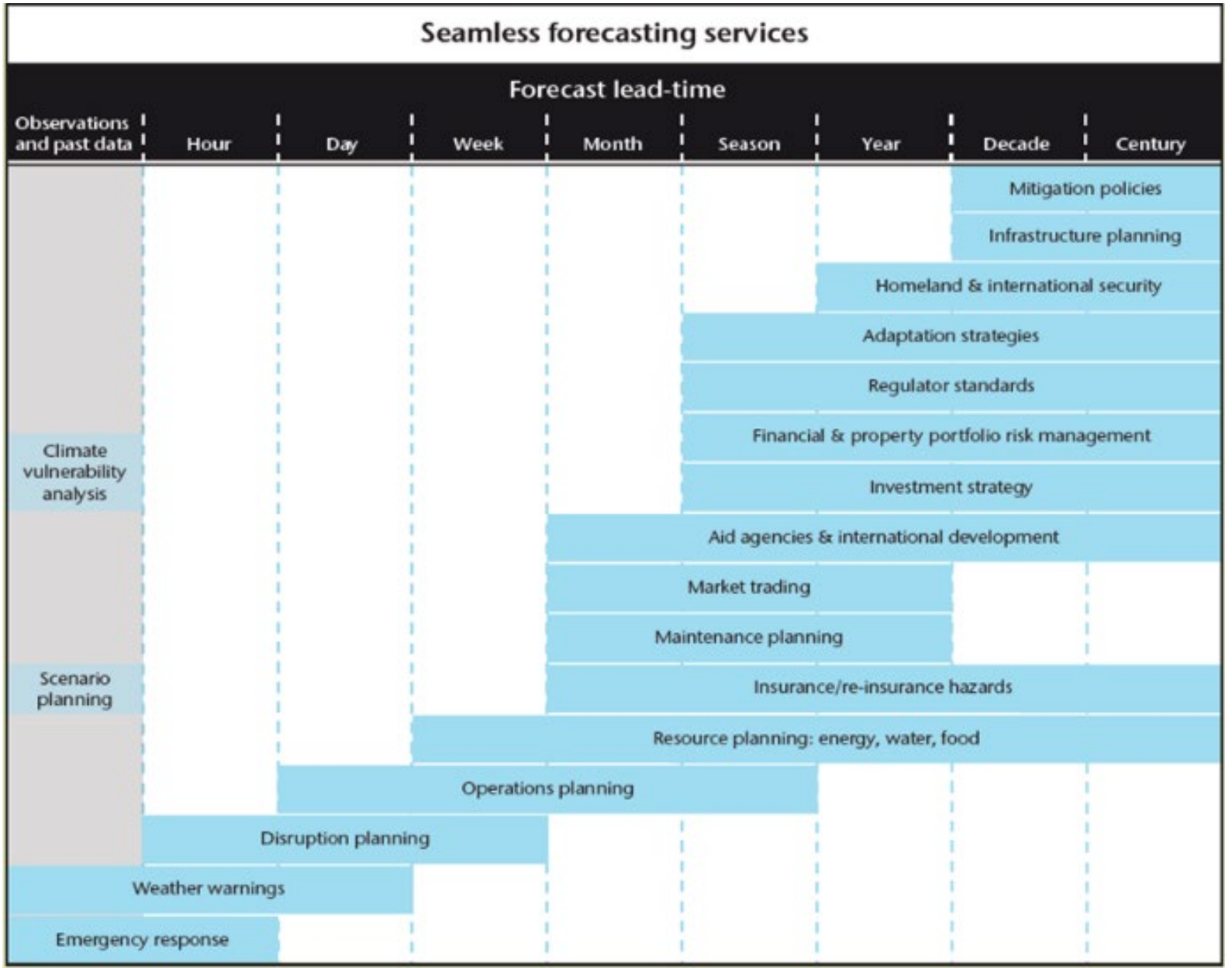
2. Near-term future climate

   month-season-decade predictions

3. Long-term future climate

   multi-decadal projections

Often an overlap with weather services



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Some key events linked to the development of climate services

the past 80 years…in 1 slide

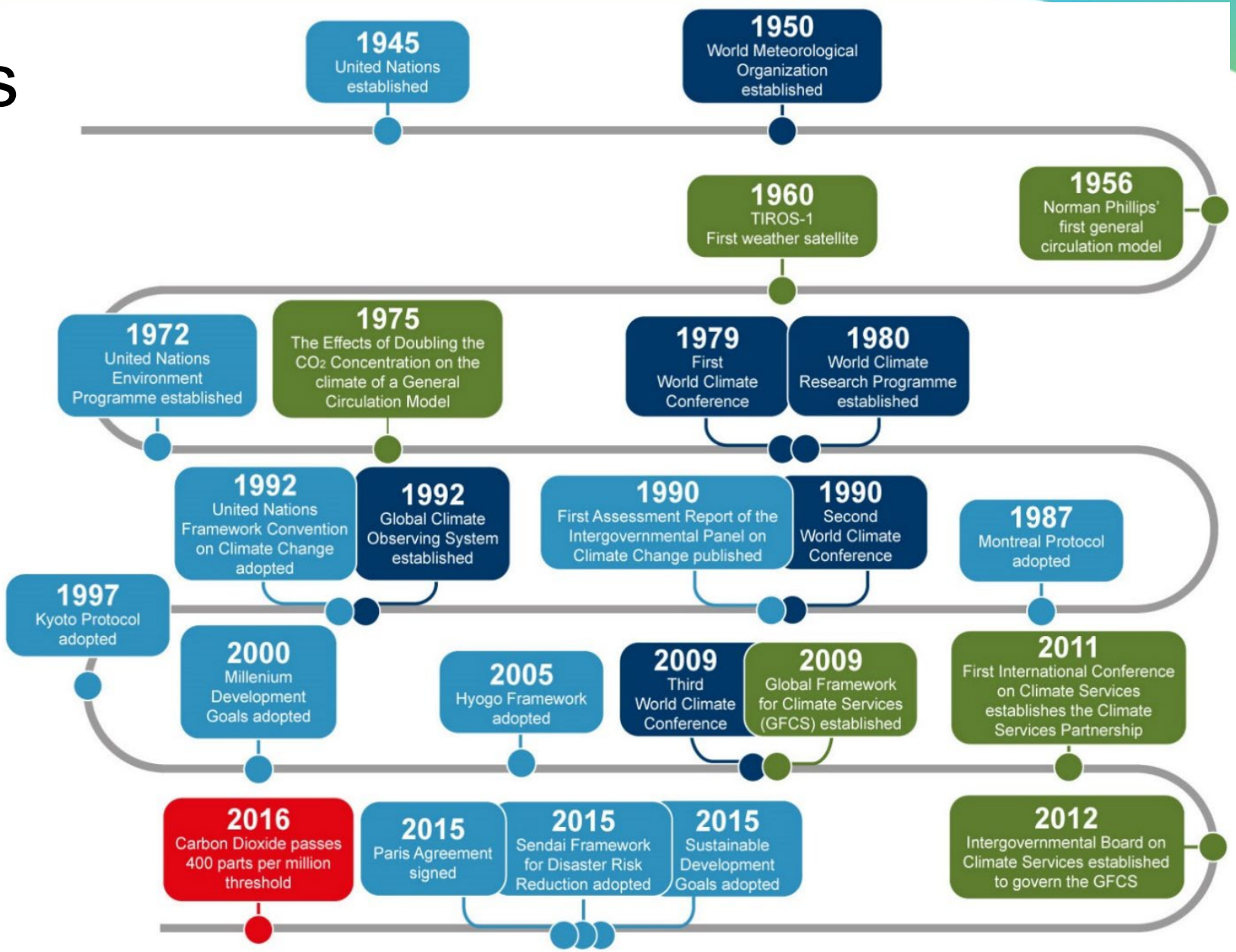

Figure from Hewitt et al, 2020, BAMS, https://doi.org/10.1175/BAMS-D-18-0211.1

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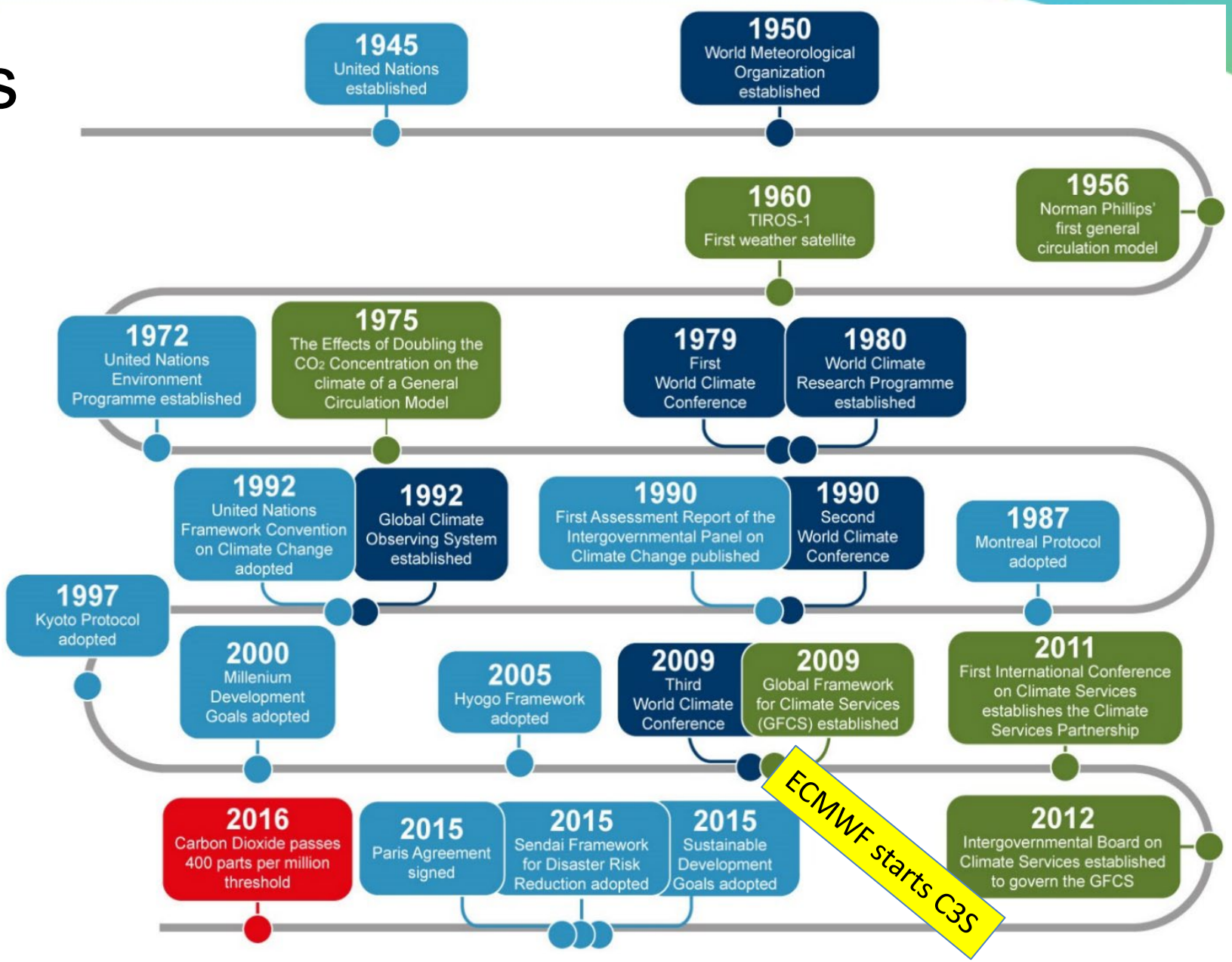


Figure from Hewitt et al, 2020, BAMS, https://doi.org/10.1175/BAMS-D-18-0211.1

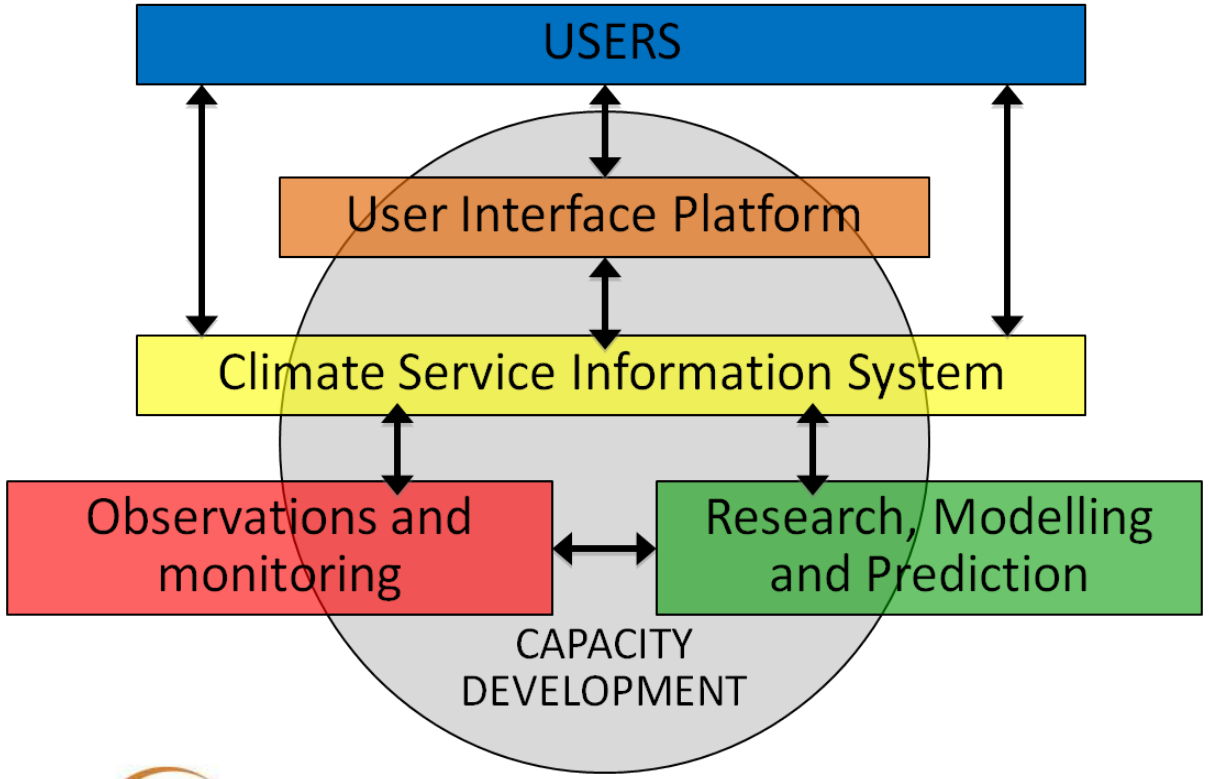
Global Framework for Climate Services (GFCS)

Vision: enable society to manage better the risks and opportunities arising from climate variability and change. Using science-based climate information

Launched in 2012

Priority areas:

- Agriculture and food security
- Water resource management
- Health
- Disaster risk reduction
- Energy



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GFCS GLOBAL FRAMEWORK FOR CLIMATE SERVICES

Hewitt *et al*, 2012: Nature Climate Change, **2**, 831-832, https://www.nature.com/articles/nclimate1745

Some achievements during the GFCS

- **Elevated the awareness of climate services** and the role they play in policy and development, including in the UNFCCC Conference of Parties (COP) to the Paris Agreement
- **Helped National Met. and Hydro. Services (NMHS) be central to climate services** within their countries through NFCSs, recognized under the Paris Agreement as a framework for supporting adaptation action
- **Identified and better aligned investments** to implement the climate services value chain, including through major programmes and related initiatives
- **The increase in climate-related activities and financing** continues to require coordination to align efforts, avoid piecemeal and isolated activities
- **GFCS is now embedded** within many regional and national programmes and activities
- **Climate services are even more important and relevant** than at WCC-3 in 2009

Refocussed GFCS – 2023 onwards

Vision: ***enable society to better manage the risks and opportunities arising from climate variability and change***

1 Strengthen climate service capacity and capability, particularly in NMHSs

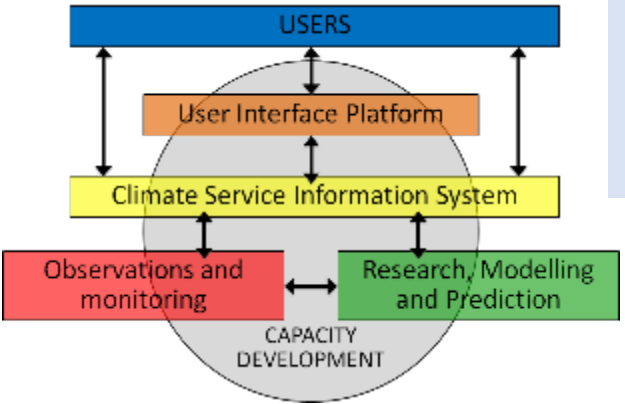
- Improve availability of, access to, and use of, climate information, providing scientific and technical support
- Establish National Frameworks for Climate Services, and National Climate Fora, and link to regional structures

2 Support climate policy and finance with authoritative scientific information

- Produce regular reports and advice to support adaptation and mitigation (such as Global and Regional State of Climate reports; State of Climate Services; ENSO Bulletins; Climate Updates. Build on IPCC knowledge)
- Provide tools and expertise to help incorporate climate science into actions and investments

3 Develop Standards, Quality Management and Training

- Assess and develop Climate Service capacities (basic ⇨ essential ⇨ full ⇨ advanced) and needs
- Produce guidance on standards and competencies (through WMO's SERCOM and INFCOM)



4 Develop the climate services value chain/cycle

- Scientific capability (including Obs., data, WCRP) ⇔ climate services information ⇔user engagement
- Generate value and enable actions

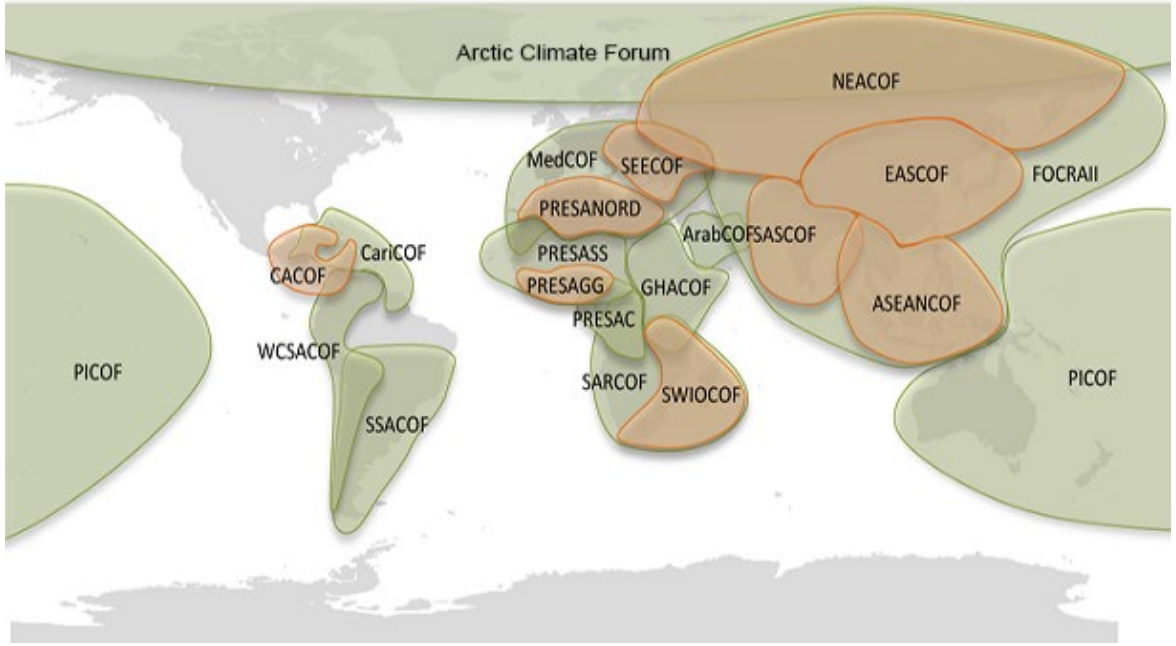
5 Improve visibility and effectiveness of GFCS, promote coordination

- Climate services are essential for society. Needs global-regional-national coordination
- Provide a forum for stakeholder communication, knowledge sharing, collaboration

Regional Climate (Outlook) Forums

RCOFs — Regional Climate Outlook Forums

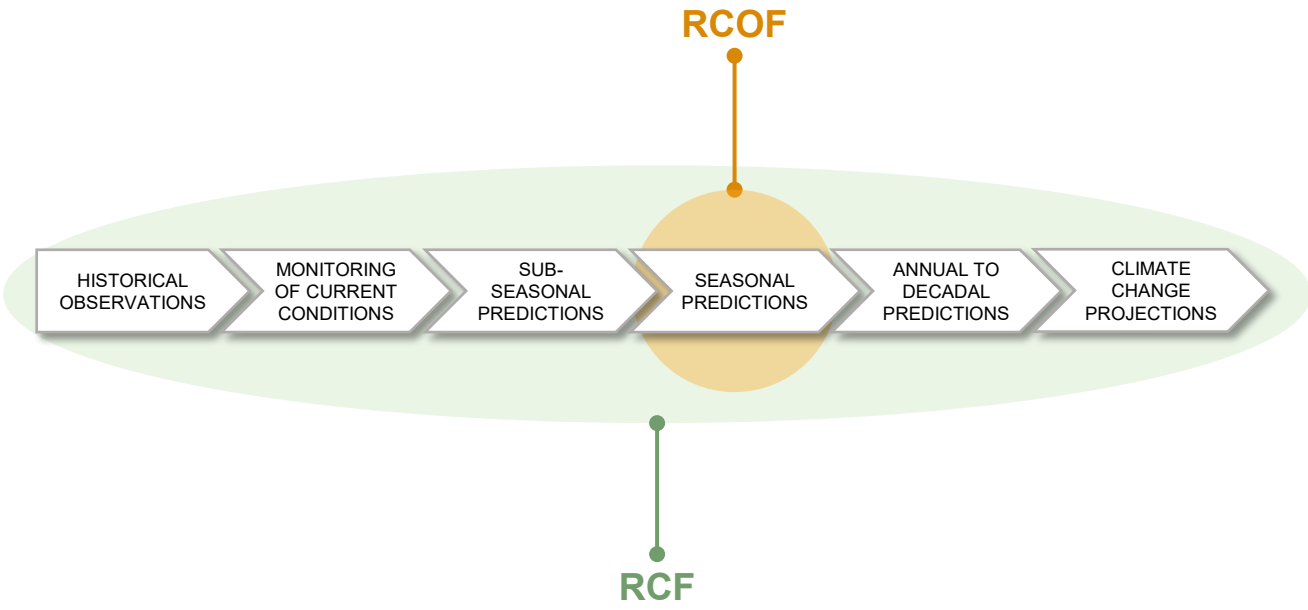
- RCOFs are regularly conducted in many parts of the world.
- RCOFs produce consensus-based seasonal climate forecasts.



WMO Regional Climate Outlook Forums

Transition to Regional Climate Forums (RCFs)

Now evolving the RCOF concept to RCFs to offer climate information across multiple timescales beyond seasonal time scale to better address requirements.



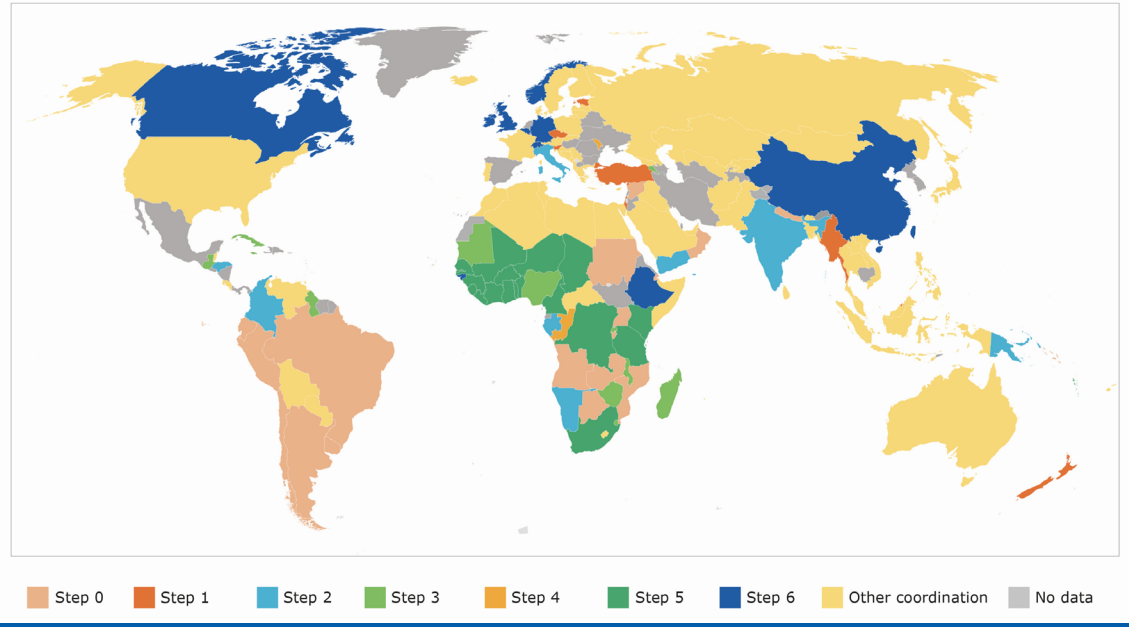
National level: National Frameworks for Climate Services
National Climate Forums

National Frameworks:

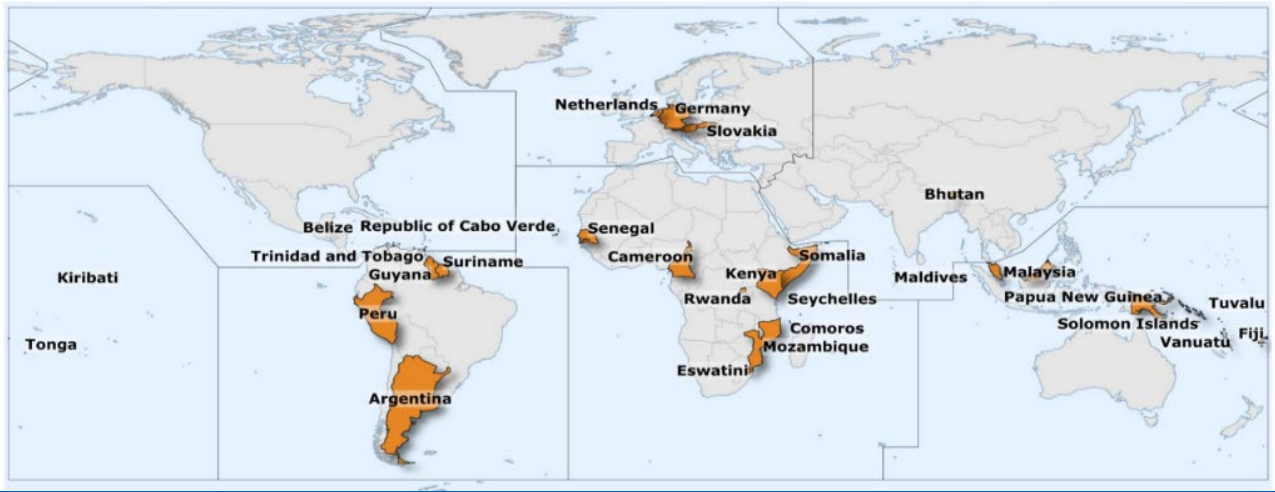
coordination, governance, collaboration to improve the **development, delivery and use of climate services at country level** to support decision-making

National Forums:

National platforms for dialogue for the design of **tailored climate information** to the national context and **translation of key messages** for users



Snapshot of countries organizing National Climate (Outlook) Forums



WMO Climate Reports

Annual, and mid-year Update for COP

Decadal

Global reports

State of the Climate

Five Regional reports

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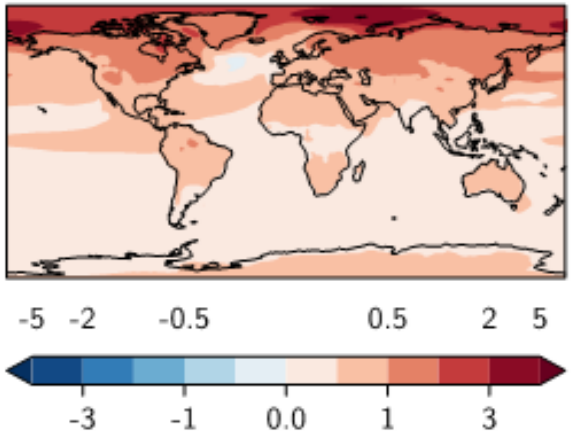
State of Climate Services

ENSO & Multiannual forecast



State of the Global Climate reports

- **WMO started the annual *State of the Global Climate* in 1993,** at the request of WMO Executive Council
- **Information on climate variability and change, extreme events.**
  The initial audience was primarily WMO Members/National Met. Services
- **WMO has formally submitted** *State of the Global Climate* report to UNFCCC Conference of Parties since 2016
- **Complements IPCC's longer-term (5-9 year) Assessment Cycle:**
  - update the long-term climate trends annually,
  - summarise observed climate variability and drivers
  - highlight high-impact events and impact on socio-economic sectors
- ***Regional State of the Climate* reports:**
  - Africa since 2019; Asia, Latin America & Caribbean, and Southwest Pacific since 2020
  - Europe since 2021, merged with Copernicus Climate Change Service European State of the Climate report since 2023

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FINAL COUNTDOWN FOR THE FLAGSHIP JOINT C3S - WMO ANNUAL REPORT

Save the date! The European State of the Climate 2024, is out on 15 April

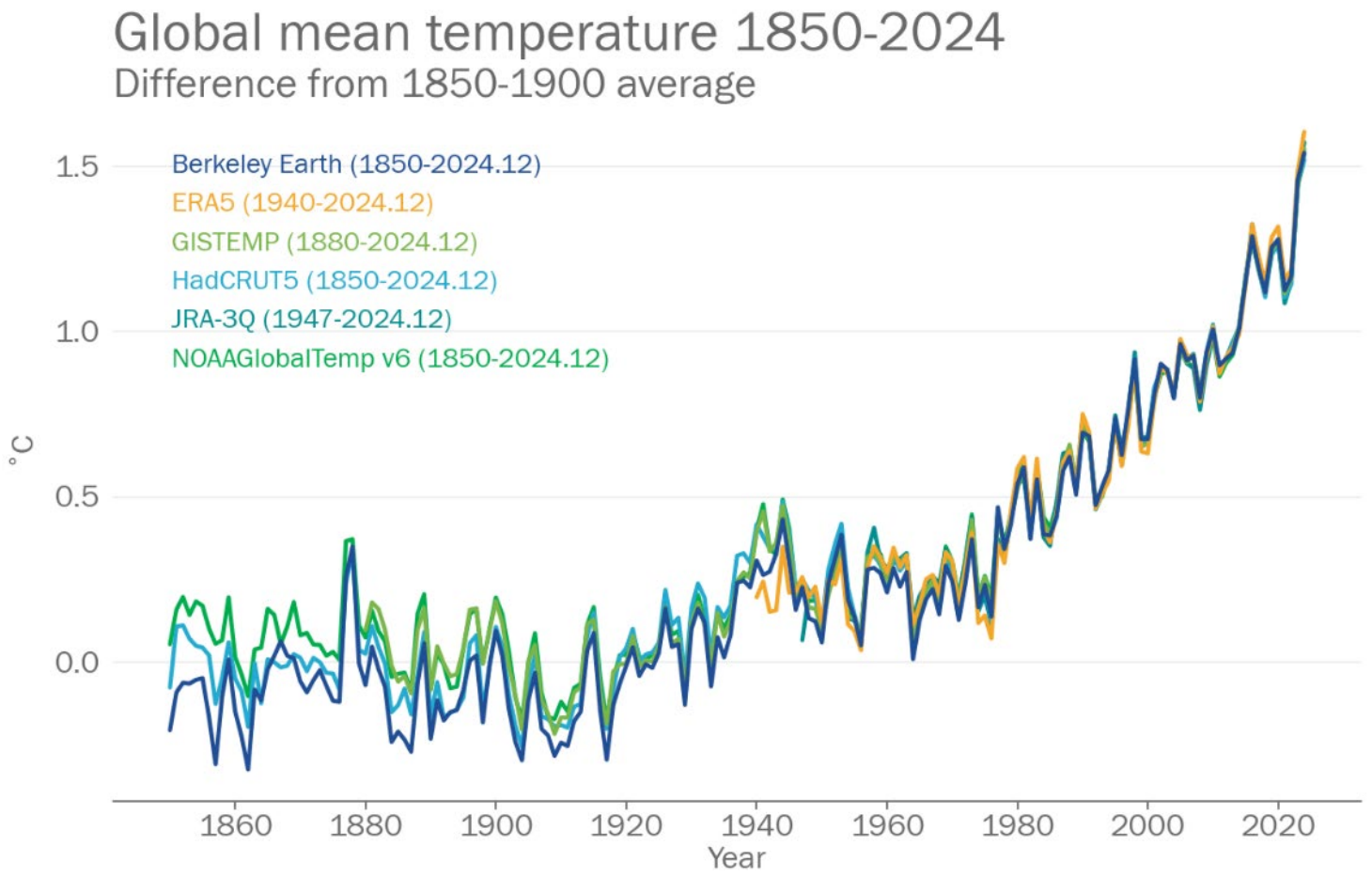
State of the Global Climate 2024

Released on 19 March 2025

2024 was the warmest year on record

1.55±0.13°C

above the 1850-1900 average.



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Climate Pulse BETA version

PROGRAMME OF THE EUROPEAN UNION

Copernicus Europe's eyes on Earth

IMPLEMENTED BY ECMWF

Climate Change Service

Near-real time updates of key global climate variables from the Copernicus Climate Change Service (C3S)

Latest data: 31 March 2025

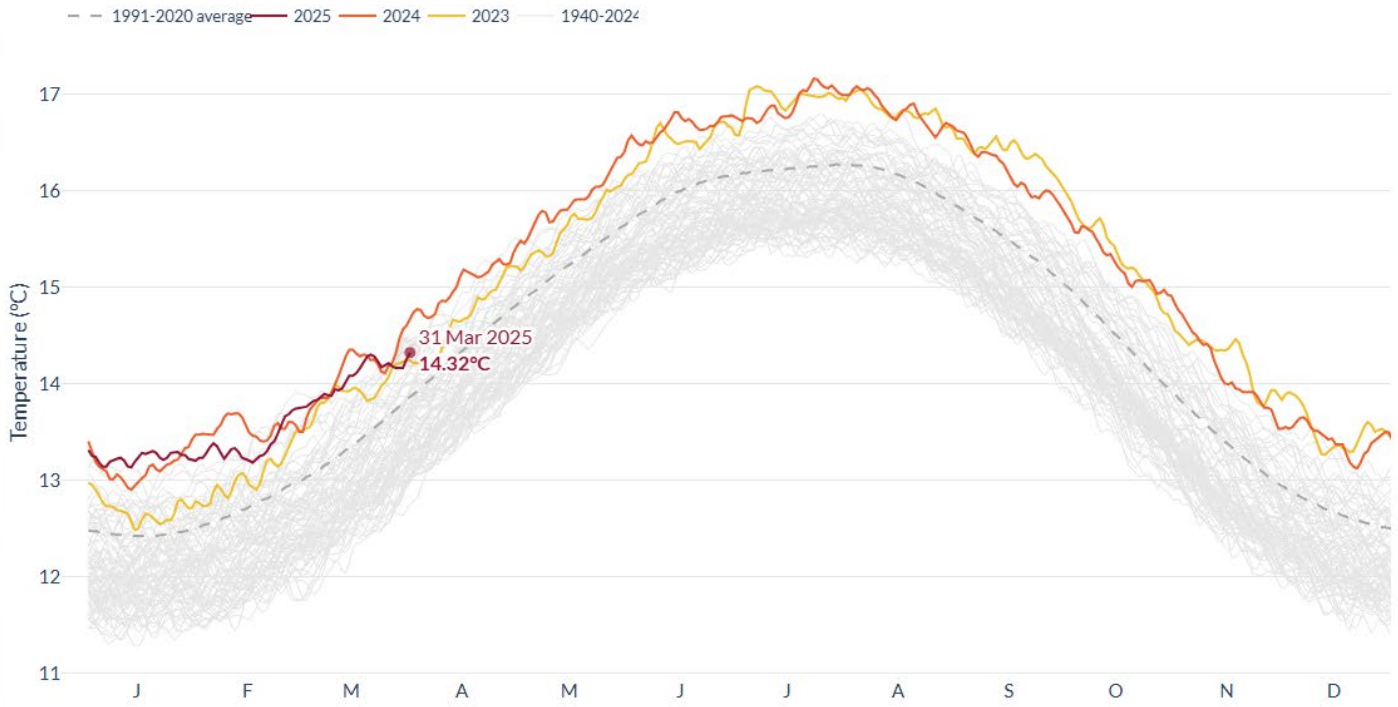
Air temperature | Sea temperature

Absolute values | Anomalies

Global surface air temperature

Daily average • Data ERA5

Credit: C3S/ECMWF



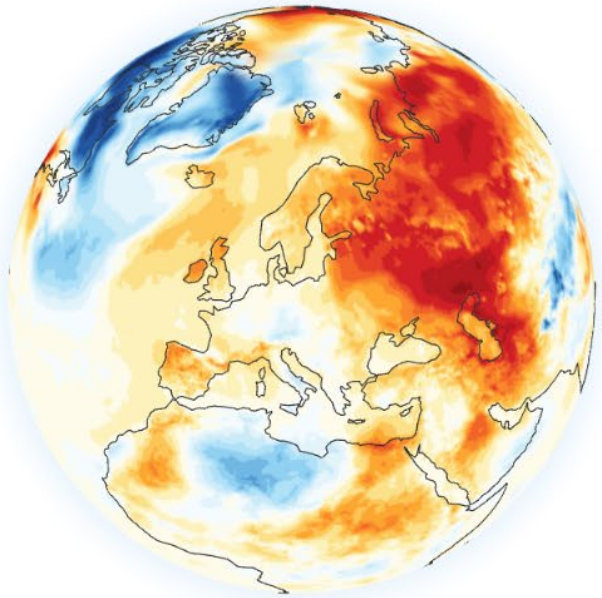
+ Add years to compare with 2025

Absolute values | **Anomalies**

Surface air temperature anomaly • 31 Mar 2025

Daily average • Baseline: 1991-2020

Data: ERA5 • Credit: C3S/ECMWF



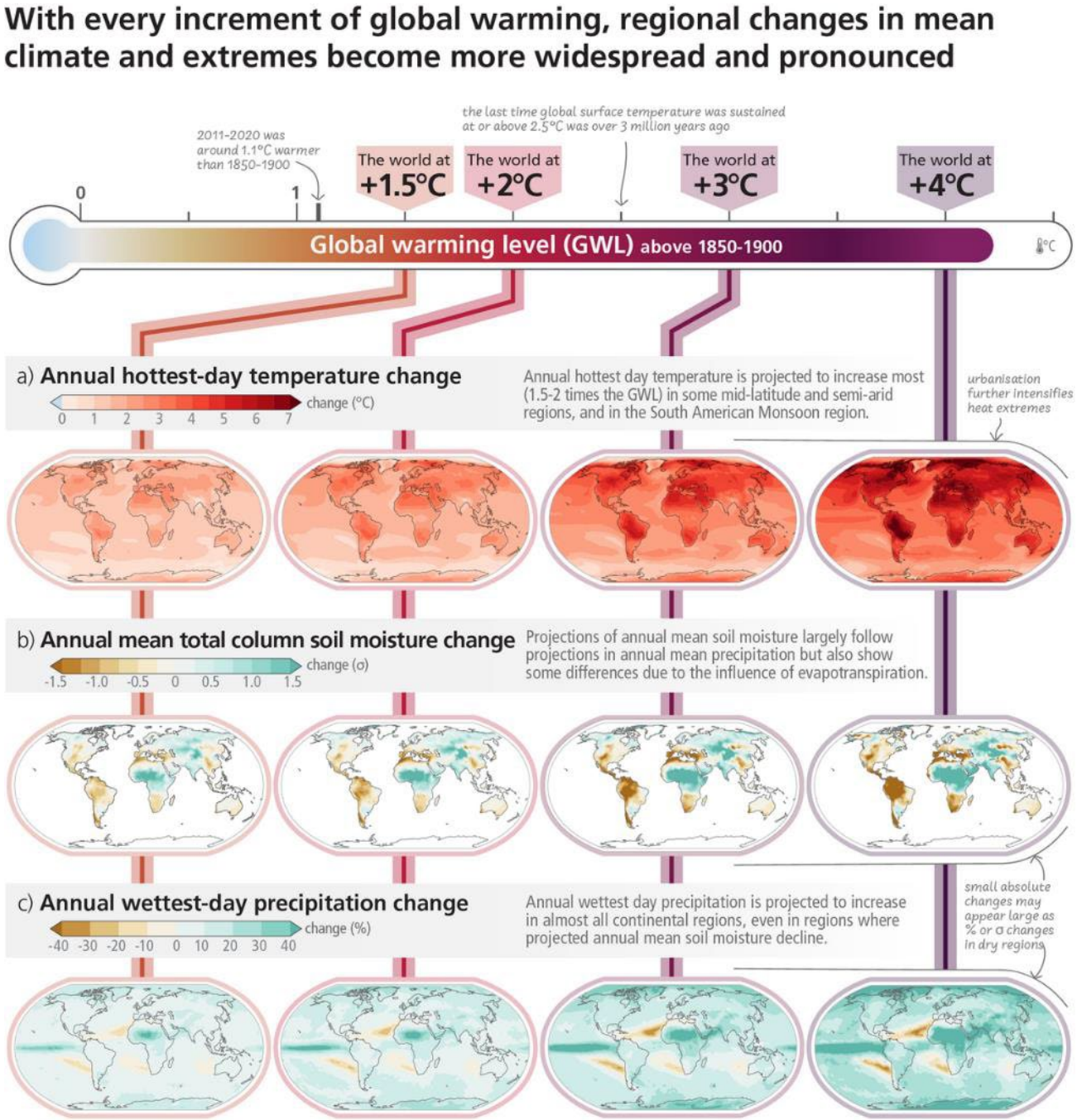
Temperature anomaly (°C)

-12 -8 -6 -4 -2 0 2 4 6 8 12

« 5 days | ‹ 1 day | › 1 day | » 5 days

Select date | Daily

Every fraction of a degree of warming matters



IPCC, 2023: Summary for Policymakers, Figure SPM.2

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Wildfires in Canada
Floods in Valencia, Spain
Heatwaves Europe, SE Asia, Middle East
Cold and Snow in Pakistan, Afghanistan, Iran
Hurricane Helene and Hurricane Milton
Heavy rain and floods, Sahel and East Africa
Typhoon Yagi
Drought in Central and South America
Drought in southern Africa
Flooding in Brazil
Cyclone Chido
Wildfires in Chile
Low Antarctic Sea-ice Extent

- Extreme Heat causes the greatest mortality of all extreme weather
- An estimated 489,000 yearly heat-related deaths globally from 2000-2019, with 45% of these in Asia and 36% in Europe
- Heatwave mortality could be 30x times higher than recorded
- Heat warnings are provided in only half of world's countries, and only 26 countries have climate-informed heat-health early warning systems
- **Early warnings and climate services are vital to protect communities and economies.**

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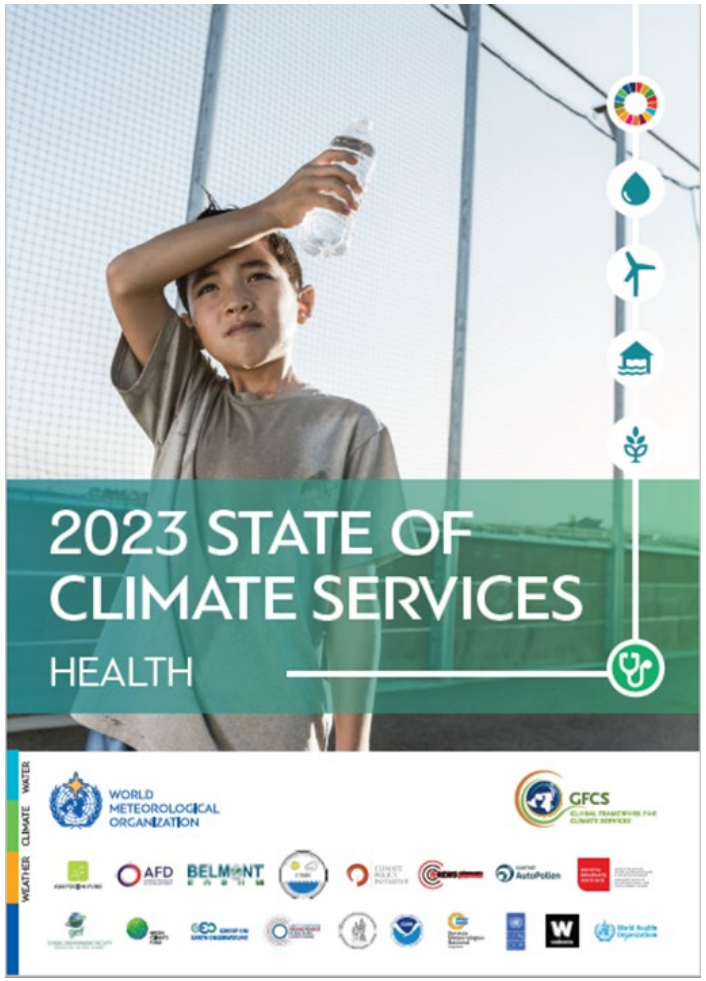

Early Warnings for All

GFCS GLOBAL FRAMEWORK FOR CLIMATE SERVICES

Some current challenges for climate services:

- Only worth delivering if it is to be used to influence an outcome
- Coordination and engagement – Time-consuming, but beneficial
- Requirements versus capability – Often a big gap
- Capabilities and capacities – Providers and users

Some future challenges

- How do providers deal with the growing user interest and demands? (for more information, reduced uncertainty, more detail, etc.)
- How do users navigate the growing number and variety of climate service providers? (nationally, regionally, globally, public versus private sector providers, …)
- Do we need standards for climate services? If so, how, what, who?
- Rapid attribution of extreme weather and climate events

Thank you for listening

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