

GCOS Climate Observation Conference Statement

The Earth's climate is changing as a result of human activities. Observations of our climate show widespread, rapid, and intense changes that are unprecedented over many thousands of years. These changes affect all components of the climate system and every region on Earth. They have led to more frequent and more extreme events, such as heat waves, storms, floods, and droughts, that strongly impact our society, our infrastructures and all living things. Climate observations have been fundamental in the development of scientific assessments and policies, including IPCC reports and the 2015 Paris Agreement. They are the foundation of our understanding of the climate and how to mitigate climate change, adapt to future conditions, and reduce and address future loss and damage.

"Observations underpin all weather, climate, water, and ecosystems services and products. Without the collection and sharing of these observations, the ability to understand, predict, mitigate, and adapt to changes in the climate system is limited," Sabrina Speich, chair of the GCOS Climate Observation Conference, said.

The newly released 2022 Implementation Plan of the Global Climate Observing System (GCOS) specifies the climate observations required to inform science, services and society. The report was requested by the United Nations Framework Convention on Climate Change (UNFCCC). The GCOS Implementation Plan identifies existing gaps in Earth observations and areas in need of improvement. These needs must be urgently addressed to progress towards a comprehensive and sustainable global climate observing system.

Building on the GCOS Implementation Plan, the Climate Observation Conference (17-19 October 2022, in Darmstadt, Germany) fostered international dialogue amongst climate scientists, observations experts, operational services, United Nations agencies, intergovernmental organisations, and policy makers.

In particular, the conference participants unanimously call for UN Member States, and relevant agencies for:

- **Sustained, long-term funding**, which is essential to ensure the continuity and expansion of observations to monitor the Essential Climate Variables. The provision of many observations is still supported through limited-term funding, and the climate observing system remains fragile.
- **Addressing the key gaps in observations**, that have been identified in different components of the observing system in, the atmosphere, the ocean, the cryosphere, the biosphere, the mountains, and lakes and rivers. Priority areas for improvement are parts of, Africa, South America, South-East Asia, the deep ocean, and the polar regions.
- **The improvement of data quality, availability, accessibility and utility**. Many climate observations are underexploited because of the lack of consistency, and clarity, in their processing, interoperability and usability. The conference has provided concrete pathways to improvements, identifying that increased effort is required to ensure that

the data can be readily used in reanalysis and are fit for purpose. It also recognized the importance of reference quality observations, with full traceability, and defined and quantified uncertainties.

- **The creation and maintenance of climate data repositories.** To address and understand climate change, the longest possible time series need to be preserved and made available. Climate data must be made available through global data repositories, and their access must be free and unrestricted. The conference also identified the need for increased funding to ensure data can be rescued from hard-copy, or archaic digital formats, to extend existing data time series.
- **Addressing the emerging needs.** Climate information needs are changing. As an example, the increased frequency of observations for adaptation and mitigation measures are needed urgently. The global climate observing system must evolve in response to such needs.
- **The engagement with nations.** Many climate observations are made by national agencies. These agencies need to be supported by their governing bodies and they need to be coordinated transnationally, at regional and global level. The benefits of climate observations need to be widely understood and the contributions of national observations to global datasets require enhancement.
- **The improvement of regional and national climate change information.** Improved understanding of the local decision-making context and associated observational requirements, will help address the gap between the "top-down", global, production of observations and climate information, and the "bottom-up" local-scale decision making.
- **Integrated and collocated observations** of the physical, chemical, and biological components of the climate system, which will enhance our understanding on climate variability, trends and impacts, particularly on fragile ecosystems.

The conference participants call for the establishment of a global goal on observations under the UNFCCC. This should guide the needed "action-oriented framework for observation" to assist recognition, understanding and coordination of activities by international, regional and national stakeholders to deliver climate information on the impacts of climate change and for mitigation and adaptation action and reporting. Observations remain fundamental to the value chain of scientific knowledge and activities that support our understanding of our current and future environment and decisions on sustainable development.