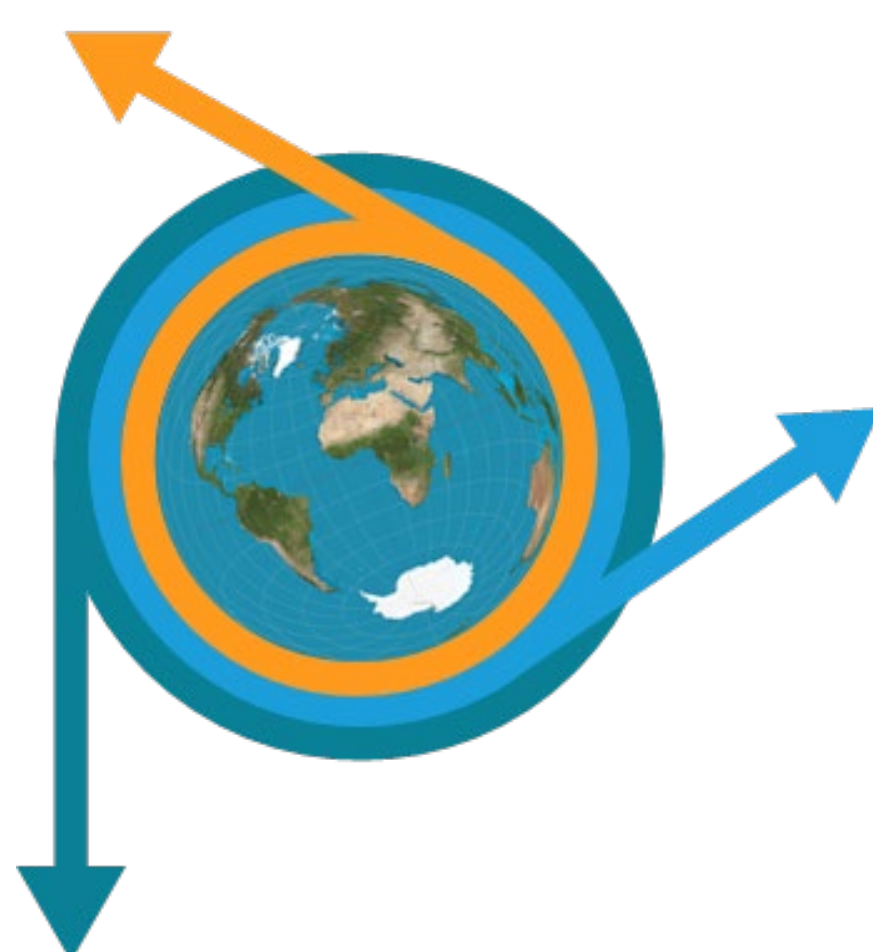


# The 2022 GCOS Implementation Plan

## Climate Observations

Climate observations have been very successful: they have unequivocally shown that anthropogenic climate change is occurring, and they have allowed significant improvements of the models and projections that underpin climate change adaptation and mitigation. Climate services depend on robust, accurate and timely climate observations.



## Why is a new Implementation Plan needed?

Despite their great successes, global climate observations are not yet complete. The 2021 GCOS Status Report on the Global Climate Observing System identified several areas of concern.

For example, in situ observations for almost all the ECVs are consistently deficient over certain regions, most notably parts of Africa, South America, Southeast Asia, as well as the ocean and in particular in the deep ocean and polar regions, a situation that has not improved since the 2015 GCOS Status Report (GCOS-195). Satellite observations have gaps in coverage (e.g. high latitudes) and lack guaranteed continuity.

## Developing Observational Needs and the Paris Agreement

The UNFCCC Paris Agreement has highlighted the importance of both adaptation and mitigation. This puts additional requirements on the global climate observing system to support these climate services.

Recently scientific studies of how well the climate cycles of carbon, water and energy are monitored have identified additional observational needs that will improve scientific understanding, models and projections. Filling these gaps will improve modelling capabilities and provide warning of major changes.

## How was this plan produced?

This report has been compiled by the GCOS expert panels under the guidance of a writing team and under the supervision of the GCOS Steering Committee. The GCOS expert panels

have consulted widely to ensure as many views as possible are taken into consideration. The revised requirements for Essential Climate Variables (ECV) were publicly reviewed in 2021 and the

entire report, (including the ECV requirements) publicly reviewed in May 2022. This process of public review and revision ensures as wide as possible input into the document.

## ENSURING SUSTAINABILITY

While existing observations need to be continued, the plan identifies actions to address the continuity of ground-based and satellite observations that are currently at risk.

## FILLING DATA GAPS

Gaps identified in the 2021 GCOS Status report need to be filled particularly in Africa, South America, Southeast Asia, the deep ocean and polar regions.

## IMPROVING DATA UTILITY

Many climate observations are currently underexploited because of the lack of consistency in their processing and usability. This theme looks at how the original observational data is transformed into user-relevant information.

## MANAGING DATA

For each ECV the longest possible time series need to be preserved and made available in perpetuity. Recognised global data repositories that are adequately supported, well-curated and that provide free and open access to data are needed.

## ENGAGING WITH COUNTRIES

Many climate observations are made by national bodies. GCOS can help by linking these national efforts into the global system, providing information on observing needs, promoting needs for support and access to global information.

## EMERGING NEEDS

Needs for climate data are evolving. The GCOS Expert Panels have already identified several areas where emerging needs arising from response measures such as adaptation and mitigation need to be addressed in the short term.

This Plan is arranged around six themes

## Essential Climate Variables

GCOS specifies what needs to be observed in terms of Essential Climate Variable (ECV) to monitor and project the Earth's climate. These cover the atmosphere, oceans, hydrology, cryosphere and biosphere.

## This Plan identifies who should undertake specific actions

Theme	Actions	Implementing Bodies									
		WMO, NMHS	Space Agencies	GOOS	Reanalysis Agencies	Global Data Centres	Research Agencies	National Agencies	Parties to UNFCCC	Academia	Funding Agencies
<b>A: ENSURING SUSTAINABILITY</b>	Ensure necessary levels of long-term funding support for in-situ networks, from observations to data delivery	x					x		x	x	
	Ensure continuity of satellite missions critical to climate science		x								
<b>B: FILLING DATA GAPS</b>	Development of reference networks (in-situ and satellite Fiducial Reference Measurement (FRM) programs)	x	x				x		x	x	x
	Development and Implementation of the Global Basic Observing Network (GBON)	x		x							x
	New Earth observing satellite missions to fill gaps in the observing systems			x							
	Expand surface and in-situ monitoring of trace gas composition and aerosol properties	x					x	x			x
	Implementing global hydrological networks	x	x					x		x	
	Expand and build a fully integrated global ocean observing system	x	x				x	x			
	Augmenting ship-based hydrography and fixed-point observations with biological and biogeochemical parameters		x	x			x				
	Coordinate observations and data product development for ocean CO <sub>2</sub> and N <sub>2</sub> O	x	x				x	x			
	Improve estimates of latent and sensible heat fluxes and wind stress	x	x	x			x		x		
	Identify gaps in the climate observing system to monitor the global energy, water and carbon cycles	x	x	x			x			x	x
<b>C: IMPROVING DATA UTILITY</b>	Develop monitoring standards, guidance and best practices for each ECV	x	x	x							x
	General Improvements to satellite Data Processing Methods		x				x		x		
	General Improvements to in-situ Data Products for all ECVs	x					x		x		
	New and improved reanalysis products				x				x		
<b>D: MANAGING DATA</b>	ECV-specific Satellite Data Processing Method Improvements	x	x		x						
	Define governance and requirements for Global Climate Data Centres	x				x					x
	Ensure Global Data Centres exist for all ECVs	x		x				x		x	x
	Improving discovery and access to data and metadata in Global Data Centres					x				x	x
	Create a database of co-located in-situ cal/val observations and satellite data for quality assurance of satellite products	x	x	x			x				
<b>E: ENGAGING WITH COUNTRIES</b>	Undertake Additional Data Rescue Activities	x						x		x	x
	Foster regional engagement in GCOS	x	x						x		x
	Promote national engagement in GCOS							x	x	x	x
<b>F: EMERGING NEEDS</b>	Support to national climate observations							x		x	x
	Responding to user needs for higher resolution, real time data	x	x				x		x		x
	Improve technology for ECV satellite observations in polar regions		x				x		x		
	Improve monitoring of coastal and Exclusive Economic Zones	x	x	x			x		x		
	Improve climate monitoring of urban areas	x					x	x	x		x
Develop an Integrated Operational Global GHG Monitoring System	x	x				x	x	x			

## Next Steps

- GCOS is finalising the report based on the public review and will publish it soon
- GCOS will produce short documents for specific constituencies listing actions they can undertake
- GCOS will monitor the performance of the observation system and the implementation of this plan
- GCOS will continue to identify emerging observational needs driven by the Paris Agreement
- GCOS will develop its regional programme

## GCOS

Climate Observations are the result of the investment of billions of dollars made by many countries. The GCOS Secretariat aims to ensure that these activities most effectively provide the information the world needs to respond to the challenge of a changing climate. The GCOS Secretariat depends on the donors to provide the support for the secretariat, experts and meetings.

Supported by the European Union

