

ICM-14

28<sup>th</sup> November 2022

# GCOS Implementation Plan 2022



**GLOBAL CLIMATE  
OBSERVING SYSTEM**

KEEPING WATCH OVER OUR CLIMATE

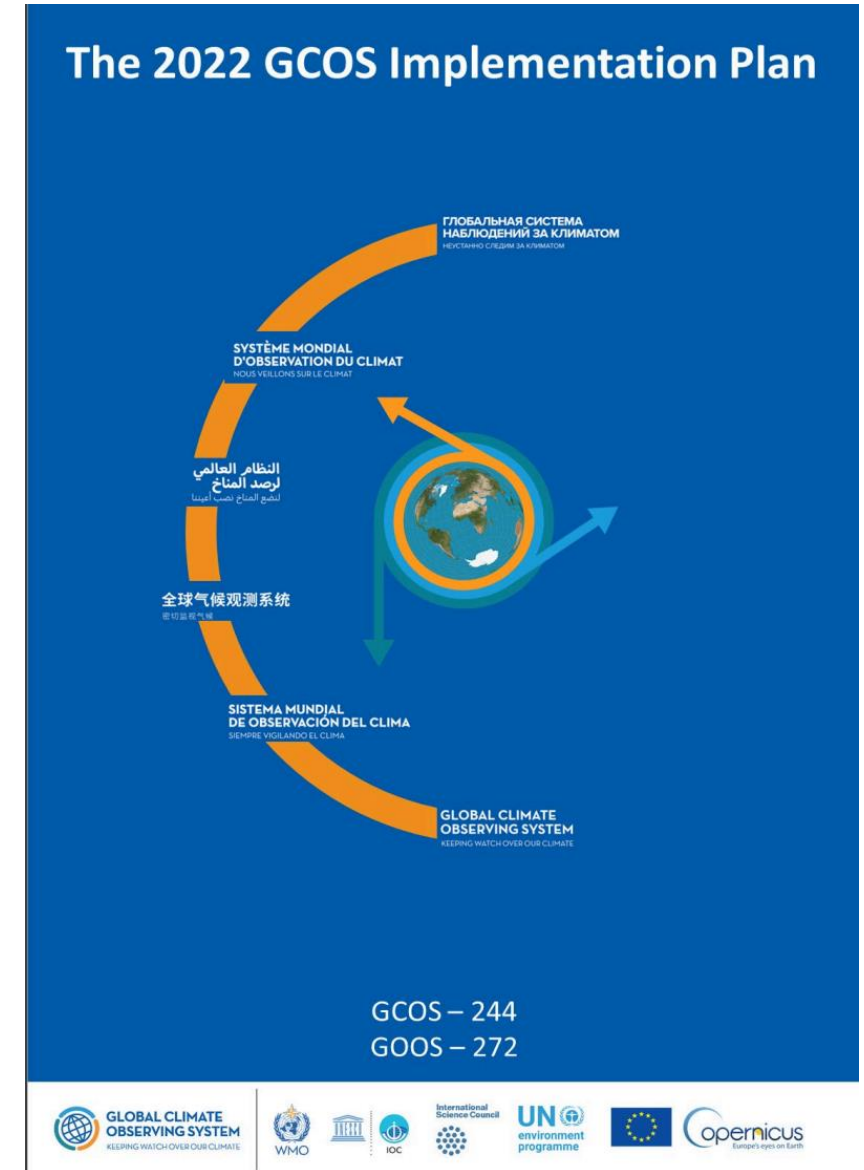


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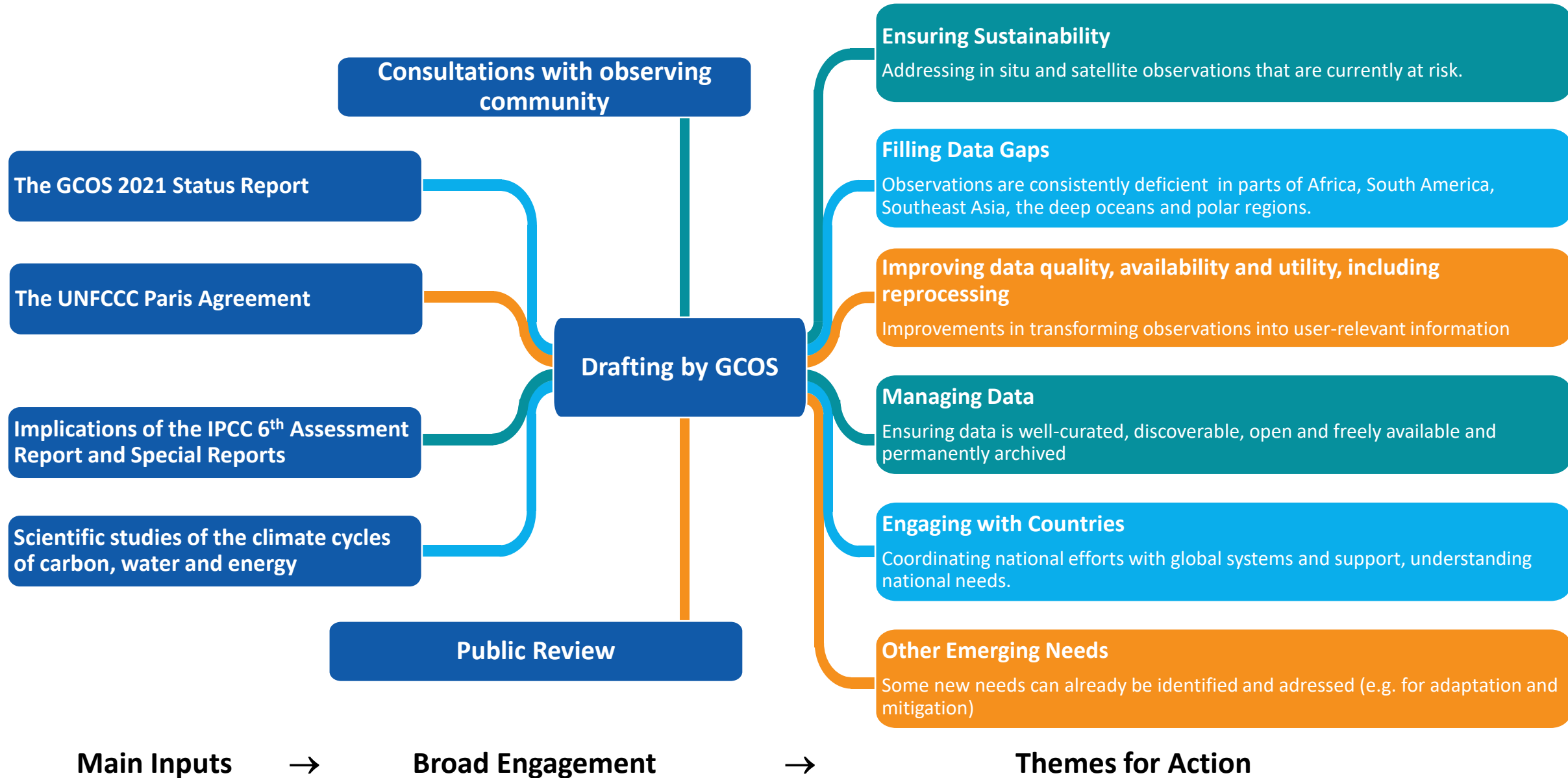


# GCOS Implementation Plan

- Produced every 5-6 years, GCOS Implementation Plans:
  - Are submitted to UNFCCC and the GCOS sponsors.
  - Provide recommendations for a sustained and fit for purpose the global observing system for climate.
  - Cover climate monitoring needs over the entire Earth system from the atmosphere to the oceans, from the cryosphere to the biosphere.
  - Encompass the water, energy and carbon cycles.
  - The GCOS Implementation Plan supports and serves WMO Member States in addressing the challenges of climate change and the implementation of the Paris Agreement.
- This 2022 GCOS Implementation Plan has a different form to earlier plans, it has:
  - Fewer, more focused, and integrated actions.
  - Clearer means of assessment.
  - Clearer identification of the stakeholders who need to respond to the actions.
  - The updated ECVs requirements are presented in a separate document - *The 2022 GCOS ECVs Requirements (GCOS 245)*.



# Wide range of views and inputs condensed into 6 themes



## Who has to act?

- **WMO**
- **NMHS**
- **Space agencies**
- **GOOS**
- Reanalysis Centres
- Global Data Centres
- **Research organizations**
- **National Agencies**
- Parties to UNFCCC
- Academia
- Funding Agencies
- GCOS

## GCOS

### Has:

- Produced 5 supplements: WMO/NMHS, Space Agencies, GOOS, Research Organization, National Agencies.

### Will:

- Address actions allocated to it in Implementation Plan.
- Identify additional needs arising from Paris Agreement (i.e. adaptation & mitigation).
- Continue to monitor performance of global climate observing system through its panels.
- Facilitate reviews of observations of the climate cycles.
- Review adequacy of ECV requirements.
- Promote national engagement in GCOS.

Theme	Actions	Implementing Bodies											
		WMO	NMHS	Space agencies	GOOS	Reanalysis Centers	Global Data Centers	Research organ.	National Agencies	Parties to UNFCCC	Academia	Funding Agencies	GCOS
A: ENSURING SUSTAINABILITY	<b>A1: Ensure necessary levels of long-term funding support for in situ networks, from observations to data delivery</b>	x	x					x			x	x	x
	A2: Address gaps in satellite observations likely to occur in the near future			x									
	A3: Prepare follow-on plans for critical satellite missions			x									
B: FILLING DATA GAPS	<b>B1: Development of reference networks (in situ and satellite Fiducial Reference Measurement (FRM) programs)</b>	x	x	x				x				x	x
	B2: Development and Implementation of the Global Basic Observing Network (GBON)	x	x		x								x
	B3: New Earth observing satellite missions to fill gaps in the observing systems			x									
	B4: Expand surface and in situ monitoring of trace gas composition and aerosol properties		x					x	x			x	
	B5: Implementing global hydrological networks	x	x	x			x					x	
	B6: Expand and build a fully integrated global ocean observing system		x		x			x	x		x		
	B7: Augmenting ship-based hydrography and fixed-point observations with biological and biogeochemical parameters			x	x			x					
	B8: Coordinate observations and data product development for ocean CO <sub>2</sub> and N <sub>2</sub> O	x			x			x	x				
	B9: Improve estimates of latent and sensible heat fluxes and wind stress		x	x	x			x			x		
	B10: Identify gaps in the climate observing system to monitor the global energy, water and carbon cycles							x				x	x
C: IMPROVING DATA QUALITY, AVAILABILITY AND UTILITY, INCLUDING REPROCESSING	C1: Develop monitoring standards, guidance and best practices for each ECV	x		x	x								x
	C2: General improvements to satellite data processing methods			x				x			x		
	<b>C3: General improvements to in situ data products for all ECVs</b>		x					x			x		
	C4: New and improved reanalysis products			x		x					x		
	C5: ECV-specific satellite data processing method improvements			x		x							
D: MANAGING DATA	D1: Define governance and requirements for Global Climate Data Centres	x					x						x
	D2: Ensure Global Data Centres exist for all in situ observations of ECVs	x	x		x				x			x	x
	D3: Improving discovery and access to data and metadata in Global Data Centres						x					x	x
	<b>D4: Create a facility to access co-located in situ cal/val observations and satellite data for quality assurance of satellite products</b>	x	x	x				x					
	D5: Undertake additional in situ data rescue activities	x	x							x		x	x
E: ENGAGING WITH COUNTRIES	E1: Foster regional engagement in GCOS	x			x					x			x
	E2: Promote national engagement in GCOS	x	x							x	x	x	x
	E3: Enhance support to national climate observations									x		x	x
F: OTHER EMERGING NEEDS	F1: Responding to user needs for higher resolution, real time data	x	x	x				x			x		x
	F2: Improved ECV satellite observations in polar regions			x				x			x		
	F3: Improve monitoring of coastal and Exclusive Economic Zones		x	x	x			x			x		
	F4: Improve climate monitoring of urban areas	x	x					x	x		x		x

# Action B1: Development of reference networks (in situ and satellite Fiducial Reference Measurement (FRM) programs)

## **Activities:**

1. Continue development of GRUAN.
2. Implement the GSRN.
3. Better align the satellite FRM program to the reference tier of tiered networks and enhance / expand FRM to fill gaps in satellite cal/val.
4. Develop further the concept of a reference network tier across all earth observation domains.
5. Establish a long-term space-based reference calibration system to enhance the quality and traceability of earth observations. The following measurables are to be considered: high-resolution spectral radiances in the reflected solar (RS) and infrared (IR) wave bands, as well as GNSS radio occultations.

## **Implementers:**

1. **Lead Centre (DWD)**, GCOS, WMO, NMHS.
2. GCOS, Lead Centre (CMA), WMO, NMHS.
3. Space agencies, WMO, GCOS, Funding agencies.
4. GCOS, WMO, NMHS, Research organizations.
5. Space agencies.

## **Means of assessing progress:**

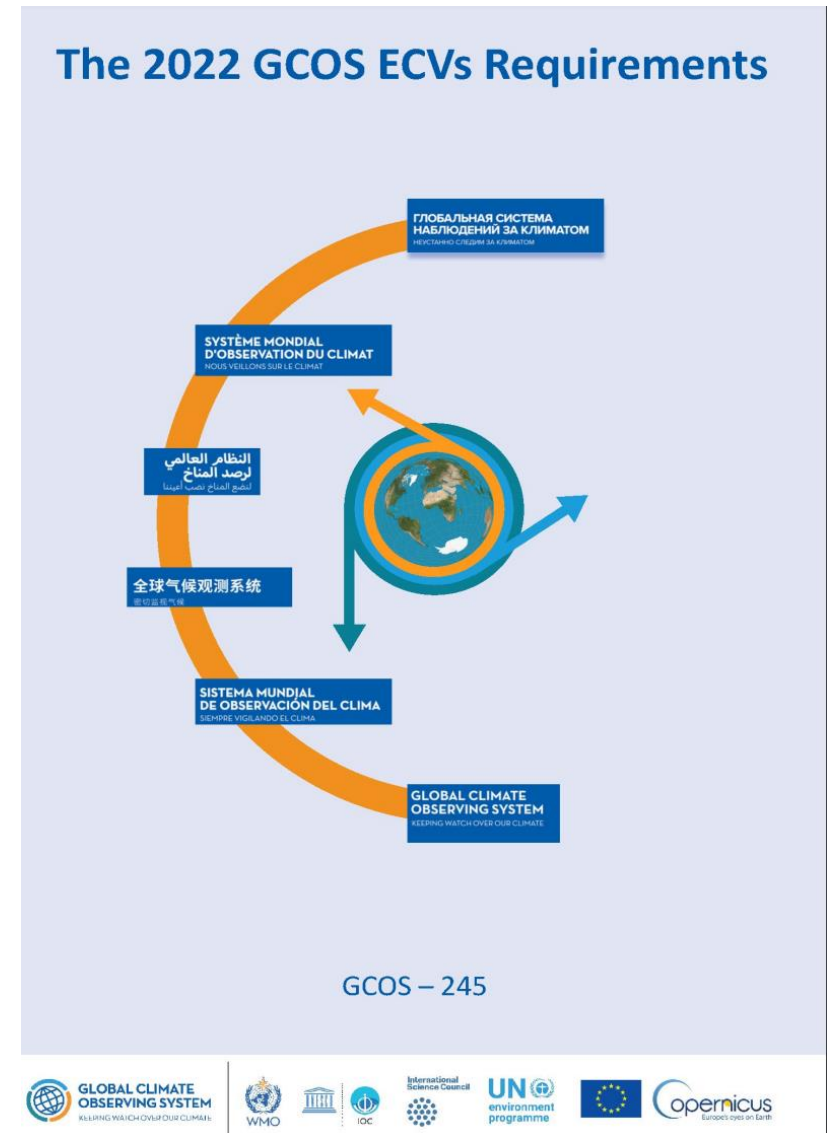
1. **Number of certified GRUAN stations and geographical distribution of stations; number of data products; data usage measured through citations.**
2. Operational GSRN (for an initial set of stations focussing on temperature and precipitation).
3.
  - a) Alignment of FRM programs into the tiered network of networks concept;
  - b) Additional FRM measurements to fill gaps to support satellite cal/val of ECVs such as Above Ground Biomass, albedo, FAPAR, LAI and burned area.
4. Inventory of (potential for) global reference networks across atmosphere, ocean and terrestrial.
5. Implementation of CLARREO pathfinder, TRUTHS and Prefire. Plans for long-term follow-on missions to the short-term (~1 year) pathfinder missions (CLARREO and Prefire) and long-term continuous measurements.

## **Additional details:**

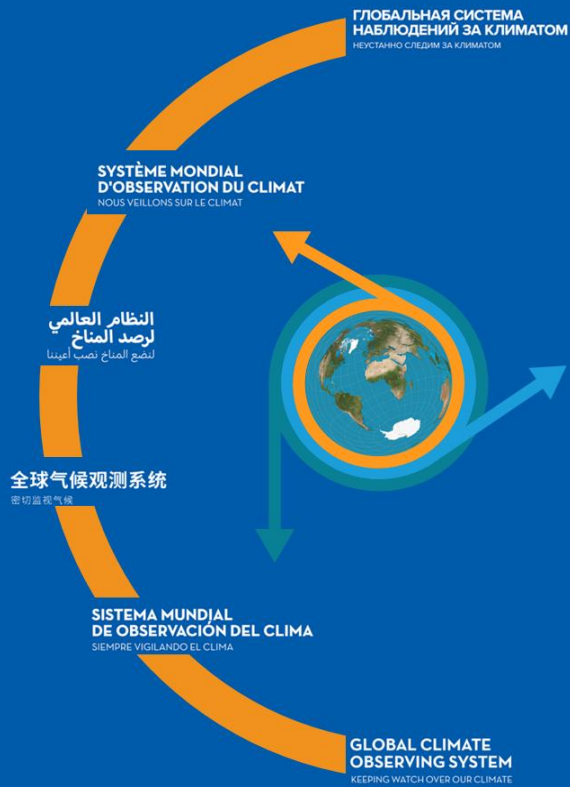
1. **GRUAN** is envisaged as a global network of eventually 30-40 measurement sites. As of August 2021, GRUAN comprises 30 sites, 12 of which have been officially certified. However, few GRUAN stations exist in several geographical regions (e.g. Africa, South America). There is also substantial work required to expand the number of GRUAN Data Products including from a range of ground-based remote sensing and in situ balloon-borne techniques. The WG-GRUAN is supported by, and reports to, AOPC who should continue to oversee progress. Regular Implementation and Coordination Meetings should continue. Efforts should be made to better integrate GRUAN into WIGOS operations.

# ECV Requirements

- GCOS specifies 54 ECV variables, for most of the ECVs there are one or more ECV products.
  - ECV product: measurable parameter needed to characterize the ECV.
- GCOS routinely maintain, review and revise the list of ECV product requirements.
- The 2022 GCOS ECV Requirements presents ECV product requirements covering all ECV products.
  - For each ECV product:  
Names, definition, units, spatial and temporal resolution, timeliness, uncertainty (2-sigma) and stability.  
Requirements are specified for goal, breakthrough and threshold.  
References are added for traceability.
- GCOS provides requirements for the RRR Application area: Climate monitoring
- Requirements were defined by GCOS expert panels members, informed by the wider community, and reviewed by the wider community







Thank you



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