

## **Global Climate Observing System (GCOS) Report**

### **1. Highlights for JSC**

- The Global Observing System for Climate: Implementation Needs, (GCOS-200), 2016

GCOS ensures the long-term climate records on which climate science are based. It provides:

- Requirements – specifications of what should be measured (see GCOS-200 annex A)
- Monitoring Guidelines – as approved by the UNFCCC and WMO
- Reviews of adequacy of existing systems – the Status Report (GCOS-195)
- Plans and guidance for maintenance and improvement – reports and actions from the science panels

GCOS covers not just the monitoring systems and networks, but also data storage and archives and data rescue. For climate data to be useful they should be available with free and open access – without access to the data by users they are useless.

The GCOS implementation plan has led to the formulation of the detailed observational requirements for all ECVs within WMO`s review process of requirements.

The requirements, that were produced by the three GCOS/WCRP panels supported by a range of experts and subject to a public review as part of the development of the Implementation Plan in 2016, are listed in Annex A of the Implementation Plan and are going to be used as a first entry for the requirements database (RRR and OSCAR).

These requirements are inter-alia expected also to cover the requirements of the WCRP for long-term sustained observations. Hence, the application area “Climate monitoring” includes also the needs of WCRP. This was supported by the 2017 session of the WCRP WDAC, which recommended to fold the WCRP requirements into the climate monitoring ones envisaged by GCOS by default.

The latest GCOS panel meetings discussed how to improve the review process for GCOS requirements in the upcoming assessment cycle, and the experts suggested to consider not only one but three values following the WMO`s Rolling Review of Requirements process (RRR). The three values are the

- **"threshold"** which is the minimum requirement to be met to ensure that data are useful
- **"goal"** which is an ideal requirement above which further improvements are not necessary, and
- **"breakthrough"**, which is an intermediate level between "threshold" and "goal" which, if achieved, would result in a significant improvement for the targeted application. The breakthrough level may be considered as an optimum, from a cost-benefit point of view, when planning or designing observations systems.

As the RRR and OSCAR are not seen as adequate to capture WCRP requirements for process studies, WCRP might need to discuss alternative options.

In addition to comments on the existing list of ECV and their requirements, GCOS is also asking for comments on the overall targets for the monitoring on the climate cycles water, carbon and energy.

- GCOS Strategy, draft version is available, 2018

A new strategy for GCOS will address key issues in the context of recent global agreements. GCOS advocates and coordinates observing systems that support evidence-based policy making by enabling assessment and long-term climate prediction to support risk management across a range of multilateral environmental agreements.

In 2016 GCOS, published its latest implementation plan which addresses some of these issues. As recommended in the GCOS Review in 2014, *"GCOS should develop a short statement of strategy, based on the vision to guide priority setting and to communicate to stakeholders the aims and intended benefits of GCOS"*.

The draft version suggest that in the future GCOS will have **six strategic goals**:

- 1) Ensure that **climate observations are enhanced and continued** into the future to provide the empirical evidence needed to understand and predict the evolution of the climate, to guide mitigation and adaptation measures, to assess risks and enable attribution of climatic events to underlying causes, and to underpin climate services.
- 2) **Support integrated observations** of the physical, chemical and biological properties and processes across the atmospheric, oceanic and terrestrial domains, including the **Earth's water and carbon cycles and energy balance**
- 3) Plan an observing system that is built, as far as possible, **on the climate-related components of the established observing systems**;
- 4) Focus on obtaining the observations required **to meet identified user needs**.
- 5) Identify observations that more fully meet the needs of **adaptation and mitigation to climate change, support sustainable development, the requirements of the UNFCCC and other multilateral environmental agreements (MEA)**
- 6) Advocate for **free and open access to relevant data**

- GCOS Task Team on Paris Agreement

GCOS has created a task force that will identify where existing and future observations for climate can support the ambitions of the Paris Agreement and subsequent UNFCCC COP decisions in relation to the global stocktake. It will also consider where GCOS can provide advice for observations supporting adaptation, mitigation, assessments of losses and damages, as well as means of implementation. Effective support for these actions will be delivered through climate services which, themselves, require access to extensive, reliable and accurate observational data on the past and current evolution of essential climate variables.

## 2. Issues and challenges:

- GCOS and Climate Science

WCRP programmes and the IPCC are two significant users of climate data (see Figure 1). In its latest plans GCOS emphasises the importance of observations of the carbon and water cycles, energy balance and changes in ecosystems for improving scientific understanding. In addition to the ECV requirements, GCOS has set long-term targets for the monitoring of these cycles as a whole and thus improve the understanding of the science of the climate system.

GCOS also recognises that other major uses of climate data are mitigation and adaptation and as future input into the UNFCCC Paris Agreement for monitoring changes in the climate system. These users need not just climate data records directly, but also outputs from reanalysis, models and downscaling. GCOS aims to ensure the long-term, sustained monitoring of vital parameters indicating the state of the climate system (the Essential Climate Variables, ECV) that underpin these activities.

- GCOS and WCRP

One role of GCOS is to ensure that the long-term observations WCRP programmes need are made. WCRP, therefore, should not initiate long-term global monitoring systems itself, but should work with GCOS to do this, where possible working with existing monitoring systems and networks. Where WCRP programmes do undertake specific measurements, (e.g. short-term observations of specific phenomena not covered by existing ECV) this should be communicated with the GCOS science panel to reduce chances of duplication.

It is vital that WCRP provides inputs into GCOS about its needs and its views on the adequacy of existing observing systems so that GCOS can ensure the data needed by WCRP.

Joint meetings are one way of allowing this exchange of information (e.g. WDAC), but it is important that a broader approach to ensuring this communication is needed. GCOS provides mechanisms to receive feedback from users and WCRP should use all of these as appropriate:

- **Science Panels.** The science panels will collect feedback from users on their needs and the adequacy of climate monitoring, they will monitor the performance of global climate monitoring and develop plans for improving future improvements including the ECV requirements.
- **Formal Reviews.** Periodically, GCOS reviews the state of the entire global climate monitoring system, published in *adequacy* or *status* reports (the latest was produced in 2015, GCOS-195)
- **Feedback from relevant programmes and organisations** (e.g. Joint CEOS-CGMS WGClimate, ESA’s CCI+, Copernicus, Space agencies, UNFCCC). GCOS works with these organisations to understand their needs, help refine the monitoring requirements and ensure long-term sustained monitoring and data access
- **Scientific Meetings.** These provide fora where the latest results and new developments are exchanged.
- **GCOS “Science” Conference.** Held periodically, this provides a venue where the latest observational developments and needs can be discussed, and the science panels can present for discussion their plans.

GCOS aims to ensure the availability of Climate Data Records, long-term observations that need to be maintained, and meet the needs of multiple users with levels of accuracy to detect small changes. GCOS needs to ensure sustainability, good data stewardship and free and open access to data.

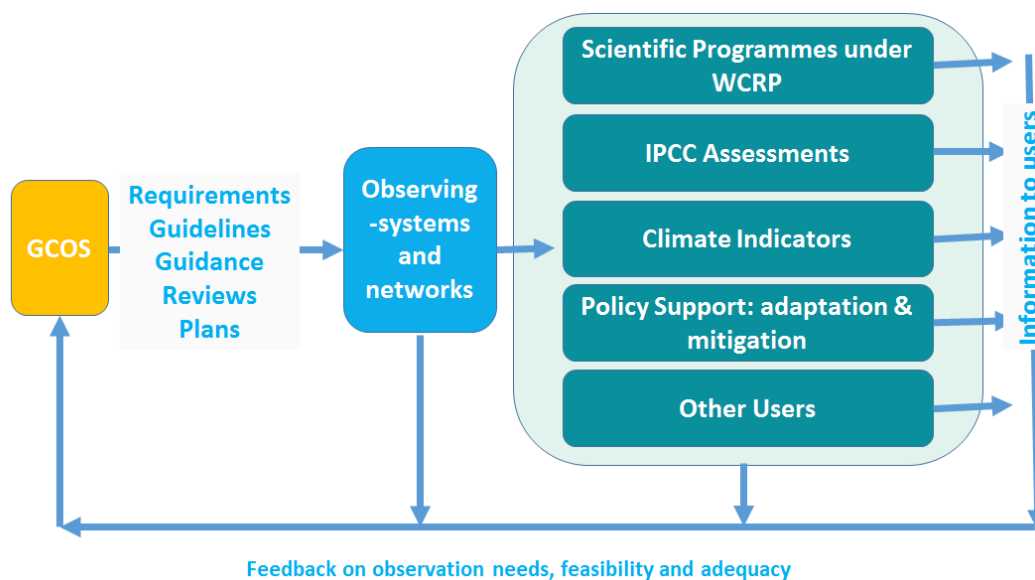


Figure 1 - Generalised flow of observational data and feedback from users