

The Global Observing System for Climate

GCOS

What is GCOS and why should we care about climate monitoring?

Stephen Briggs

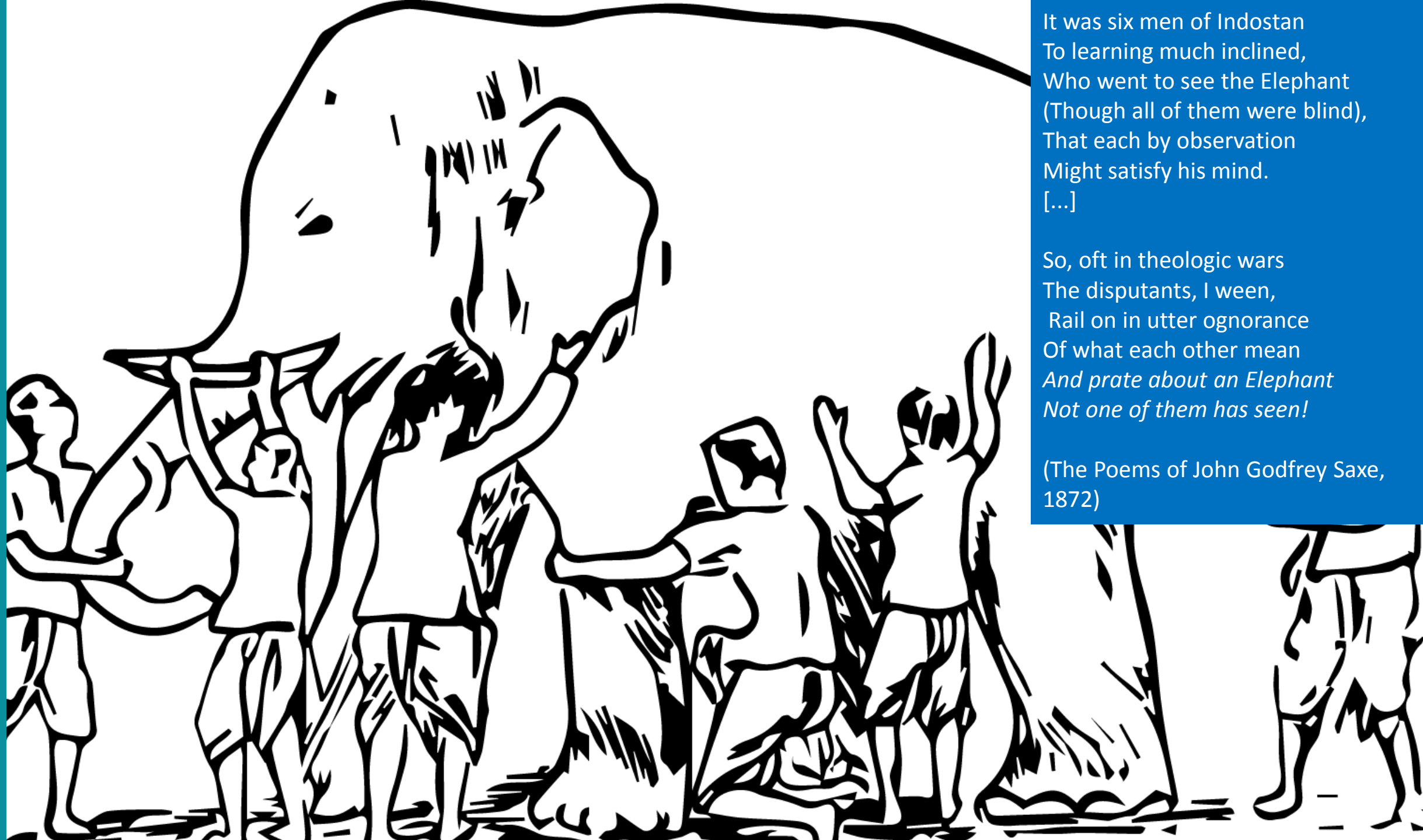
Chairman, GCOS Steering Committee



ICSU

International Council for Science

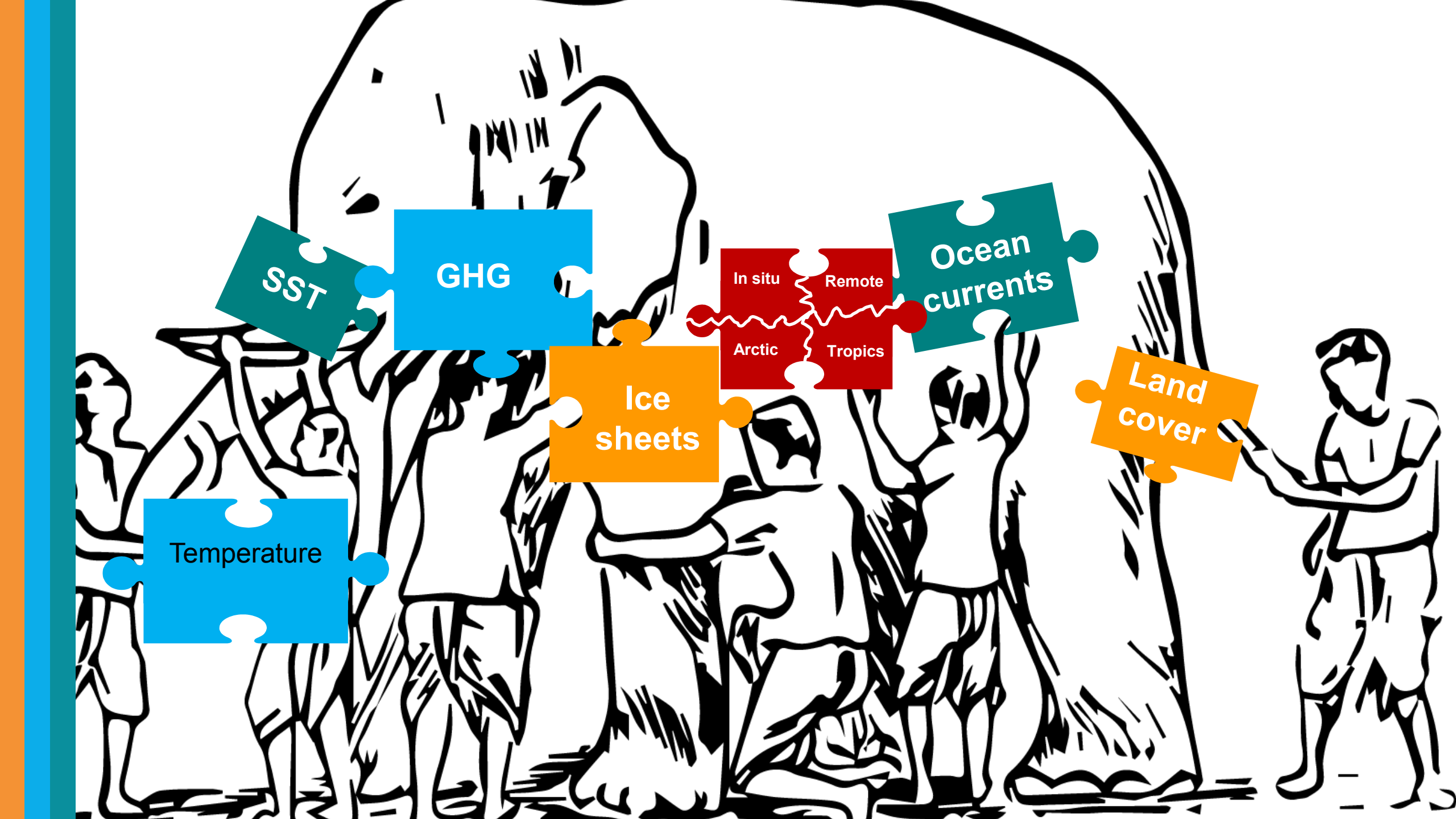




It was six men of Indostan
To learning much inclined,
Who went to see the Elephant
(Though all of them were blind),
That each by observation
Might satisfy his mind.
[...]

So, oft in theologic wars
The disputants, I ween,
Rail on in utter ignorance
Of what each other mean
*And prate about an Elephant
Not one of them has seen!*

(The Poems of John Godfrey Saxe,
1872)



SST

GHG

Ocean currents

Land cover

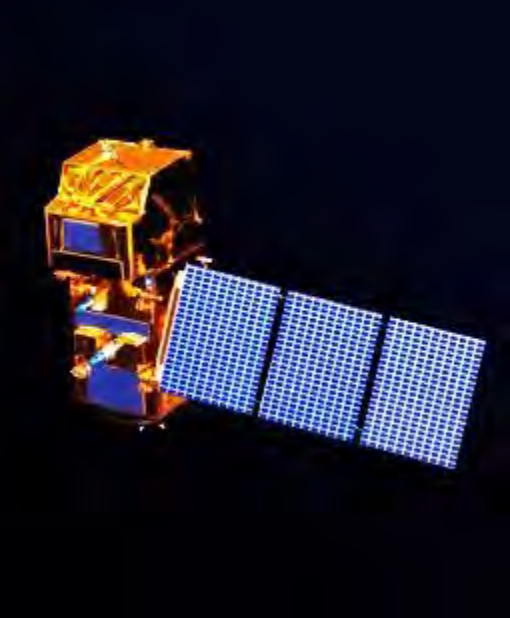
Ice sheets

Temperature

In situ
Remote
Arctic
Tropics

GCOS is a system of systems

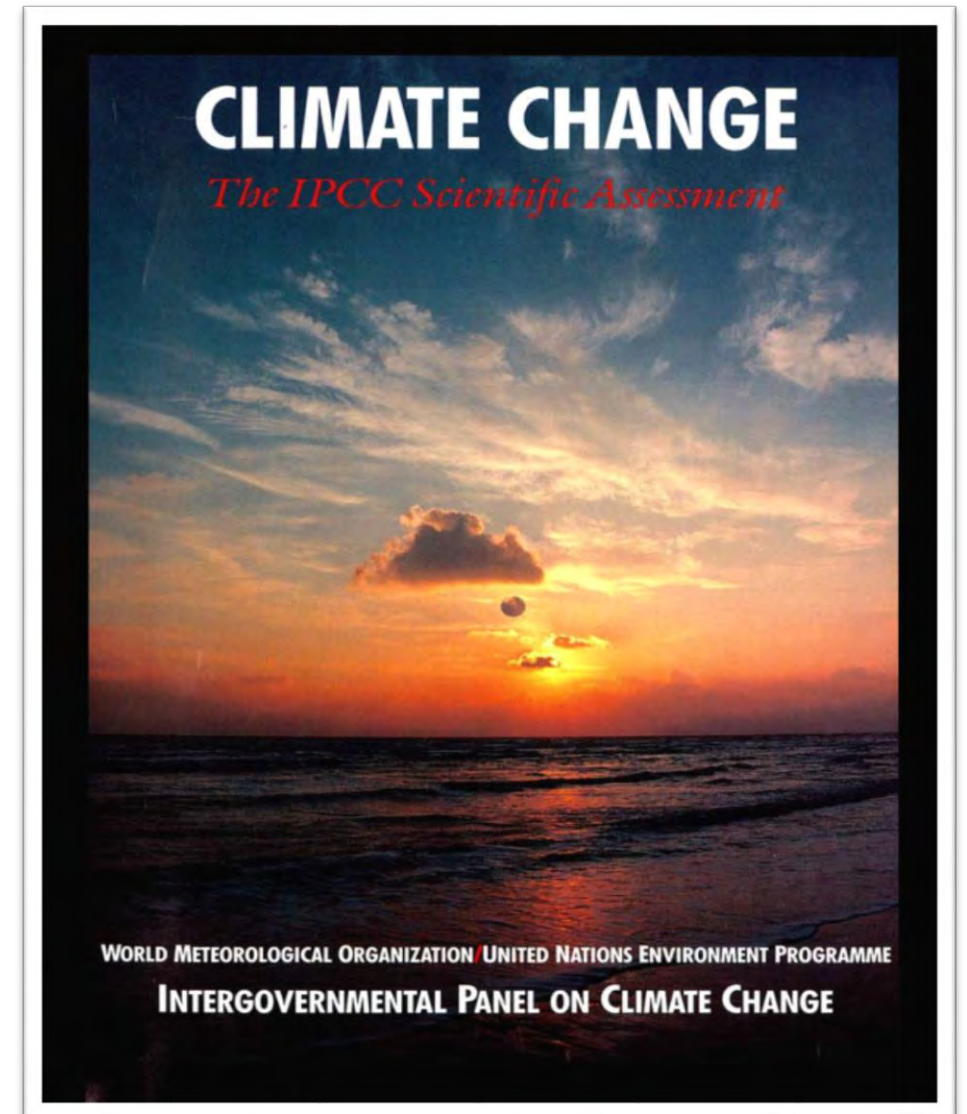
It comprises any data and information on the climate system taken by in situ, airborne or space-based techniques and platforms, while the ownership of the observing systems and networks will remain fully with their operating entities.



IPCC First Assessment Report 1990

IPCC First Assessment Report (1990)

IPCC concluded „that improved predictability of (human induced) climate change would require improved systematic observation of climate related variables on a global basis“



Second World Climate Conference (WCC-2) Ministerial Session in 1990



The Secretary-General of WMO, G.O.P. Obasi, addressing the opening of the ministerial sessions of the Second World Climate Conference in the Palais des Nations, Geneva, on 6 November 1990. Behind him (left to right) are the Hon. E. Fenech-Adami, Prime Minister of Malta; the Rt Hon. M. Thatcher, Prime Minister of the United Kingdom; HM King Hussein I of Jordan; Federal Councillor A. Köller, President of the Swiss Confederation; M. Rocard, Prime Minister of France; and the Rt Hon. B. Paeniu, Prime Minister of Tuvalu.

**CLIMATE CHANGE:
SCIENCE, IMPACTS
AND POLICY**

“Present observational systems for monitoring the climate system are inadequate for operational and research purposes. They are deteriorating in both industrialised and developing regions...”

“There is an urgent need to create a **Global Climate Observing System (GCOS)** built upon the World Weather Watch Global Observing System and the Integrated Global Ocean Service System and including both space-based and surface-based components.....”.

PROCEEDINGS OF THE SECOND WORLD CLIMATE CONFERENCE

EDITED BY J. JÄGER AND H.L. FERGUSON



GCOS established April 1992

The vision of GCOS is that all users have access to the climate observations, data records and information which they require to address pressing climate-related concerns. GCOS users include individuals, national and international organizations, institutions and agencies.

The role of GCOS is to work with partners to ensure the sustained provision of reliable physical, chemical and biological observations and data records for the total climate system – across the atmospheric, oceanic and terrestrial domains, including hydrological and carbon cycles and the cryosphere.

gcos.wmo.int

Flip 1: © Jürgen Graeser/Alfred Wegener Institute. Radiosonde launch at Ny-Ålesund, Norway.
Flip 2: © ESA–Pierre Carril. Artist's view of Meteosat Third Generation. The MTG system is being established through cooperation between EUMETSAT and the European Space Agency (ESA).

25 years of Global Climate Observing System



GCOS
established
April 1992



Rio Conventions - 1992



United Nations
Framework Convention on
Climate Change

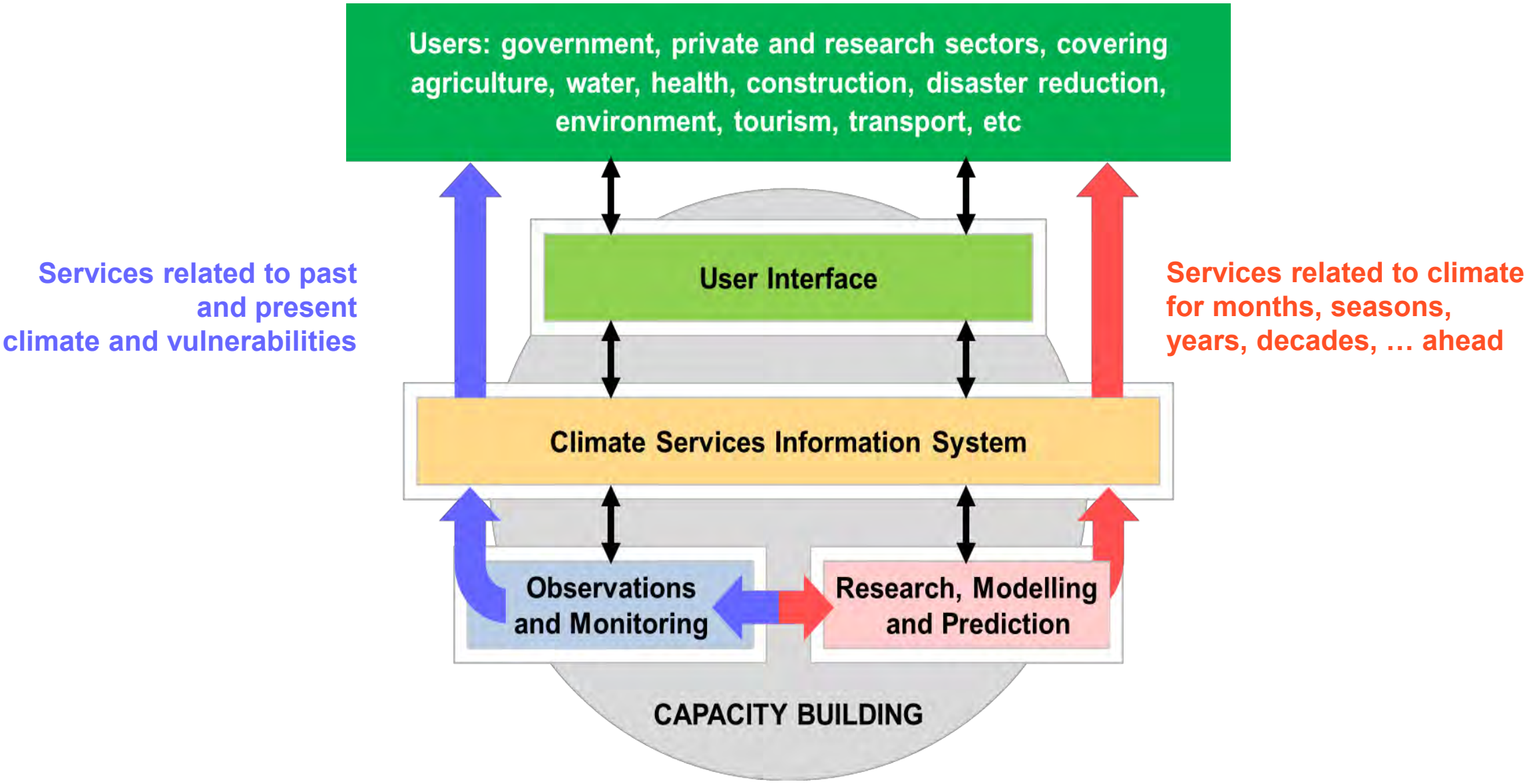


Convention on
Biological Diversity

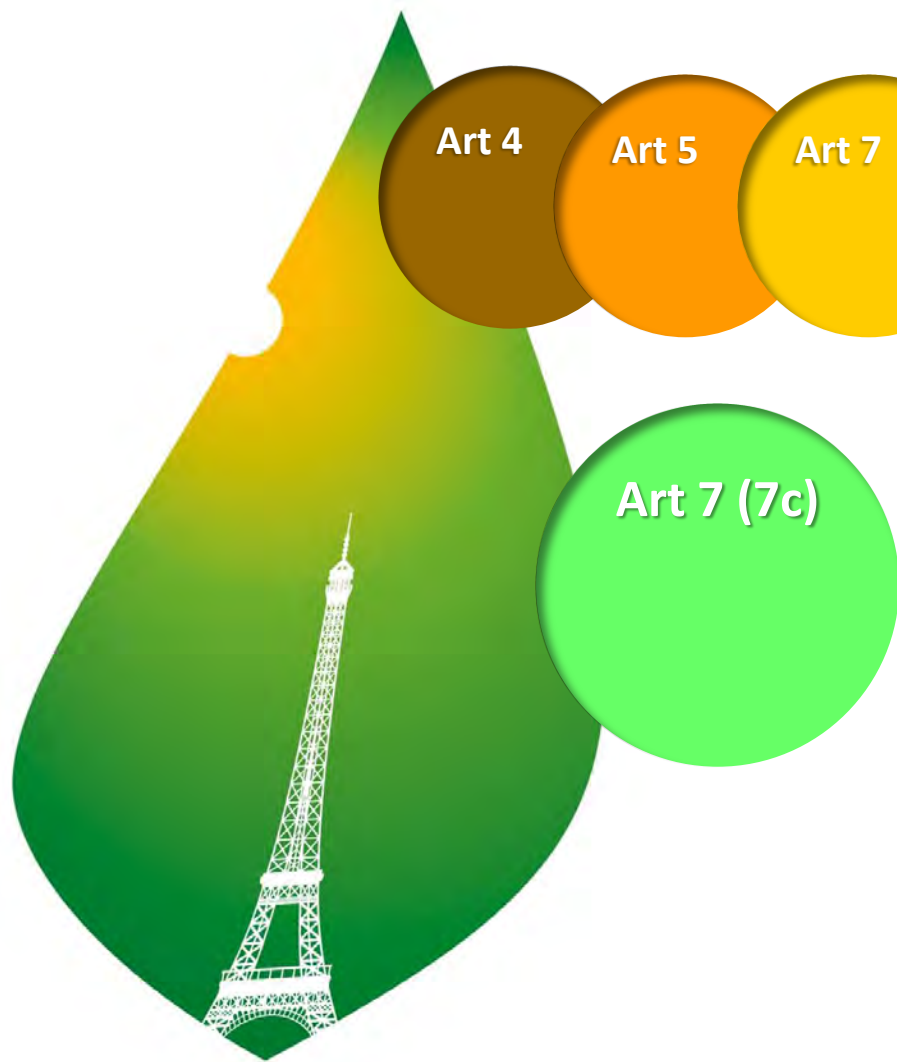
Article 4.1 (g) Commitments

Article 5 Research and Systematic Observations

Observations for climate services



(Prof. A. Simmons, GFCS II side event, Cg-XVI, 19 May 2011)



Art 4

Art 5

Art 7

Art 8

Art 9

Art 10

Art 11

Art 12

Art 13

Art 14

Art 7 (7c)

Paris Agreement Article 7 (7c):
Strengthening scientific knowledge on climate, including research, systemic observation of the climate system and early warning systems.

Article 8:

Loss & Damage: Cooperation and facilitation of EWS, emergency preparedness, slow onset events, ...

COP21 • CMP11

PARIS 2015

UN CLIMATE CHANGE CONFERENCE

Climate observations also support



**SUSTAINABLE
DEVELOPMENT**

GOALS

Energy & Temperature

Other Physical Properties

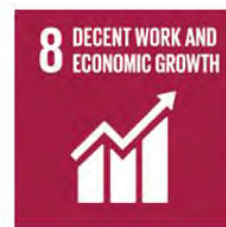
Carbon Cycle and other GHGs

Hydrosphere

Snow & Ice

Biosphere

Human Resource Use



- **the observations**

- what is measured, how it is measured,
- where it is measured, how measurement is sustained,
- how change is managed

- **data transmission**

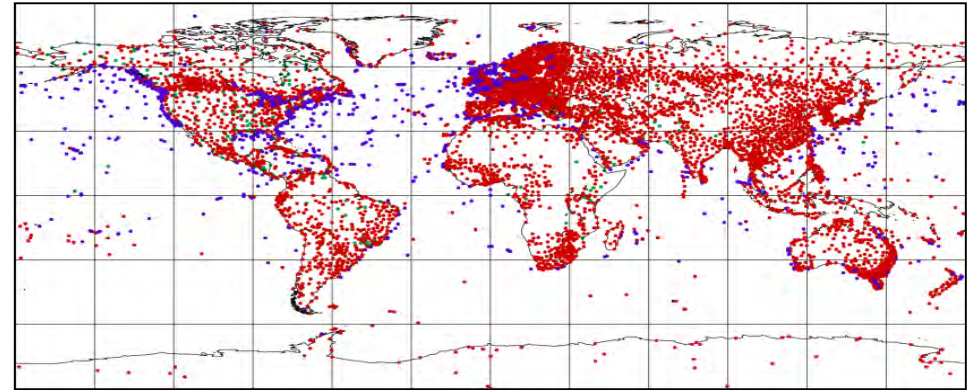
- what is transmitted, with what time delay, in what code

- **data management, including data rescue**

- archiving and access to raw data, metadata, processed data records and products
- recovery and rehabilitation of past data

- **data records and products**

- fundamental records, including recalibration and homogenisation
- satellite retrievals, gridded fields from *in situ* and remotely-sensed measurements, comprehensive reanalyses of multiple observational datasets based on weather-prediction systems



Locations of 36064 surface weather observations
received by ECMWF
09-15UTC 12 June 2012



THE CONCEPT OF ESSENTIAL CLIMATE VARIABLES IN SUPPORT OF CLIMATE RESEARCH, APPLICATIONS, AND POLICY

BY STEPHAN BOJINSKI, MICHEL VERSTRAETE, THOMAS C. PETERSON, CAROLIN RICHTER, ADRIAN SIMMONS, AND MICHAEL ZEMP

Described is the concept of Essential Climate Variables developed under the Global Climate Observing System for a range of applications, as well as to provide an empirical basis for understanding past, current, and possible future climate variability and change.

Observations are fundamental to advancing scientific understanding of climate (Doherty et al. 2009; Shapiro et al. 2010) and delivering the vetted, timely, and purposeful climate information needed to support decision making in many sectors. Observations and monitoring are key elements of the emerging Global Framework for Climate Services (WMO 2011a) and more generally support climate research, the assessment of climate change, and the development of policy responses (Fig. 1). For these purposes, observational datasets in general need to be traceable to quality standards, be readily interpretable and freely available, and cover sufficiently long periods: for example, the 30 years traditionally used for calculating climate normals (WMO 2011b). Transparency in the generation of climate datasets is

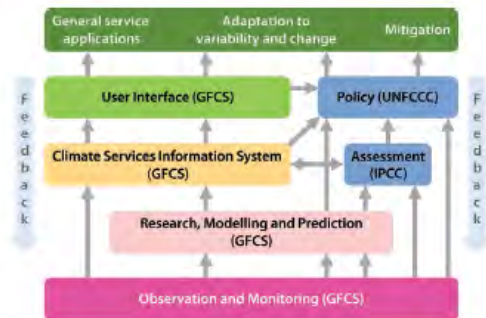


FIG. 1. The role of observation within the Global Framework for Climate Services (GFCS) and in support of research; the assessment of climate change, in particular as undertaken by the IPCC; and the development and implementation of policy responses, in particular under the UNFCCC. Gray arrows denote the main directions of flow of climate data and derived information. Feedback for system improvement flows mainly in the opposite direction. The GFCS includes a substantial capacity-development component that underlies all illustrated components. Adapted from WMO (2009, 2011a).

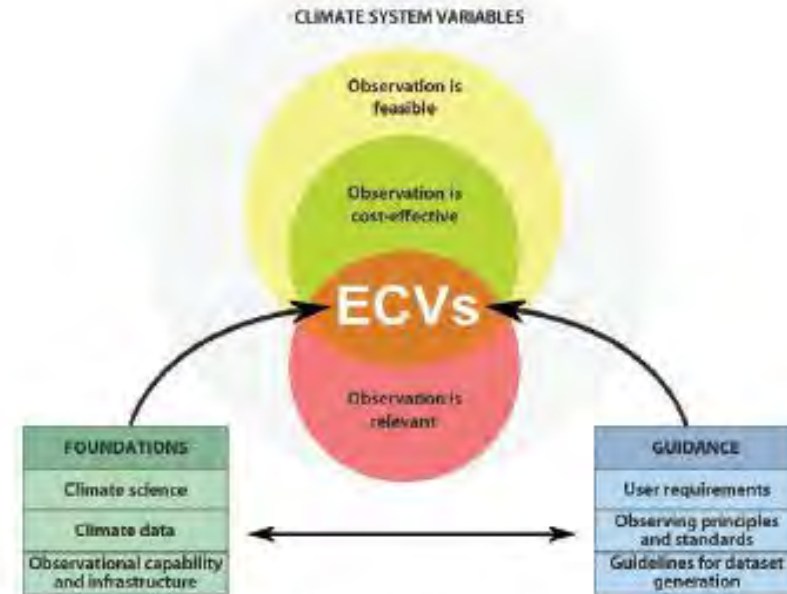


FIG. 2. Schematic of the ECV concept: knowing existing climate-relevant observing capabilities, climate datasets, and the level of scientific understanding of the climate system are the foundations (lower-left box) necessary for selecting the ECVs from a pool of climate system variables. In addition, guidance is needed to make practical use of the ECVs (lower-right box): user requirements capture the data quality needs of science, services, and policy; climate-specific principles guide the operation of observing systems and infrastructure; and guidelines facilitate the transparent generation of ECV data records. The latter address the availability of metadata, provisions for data curation and distribution, and the need for quality assessment and peer review.

Improved observations lead to significant benefits

ECV
Requirements,
Adequacy
Reports, Plans

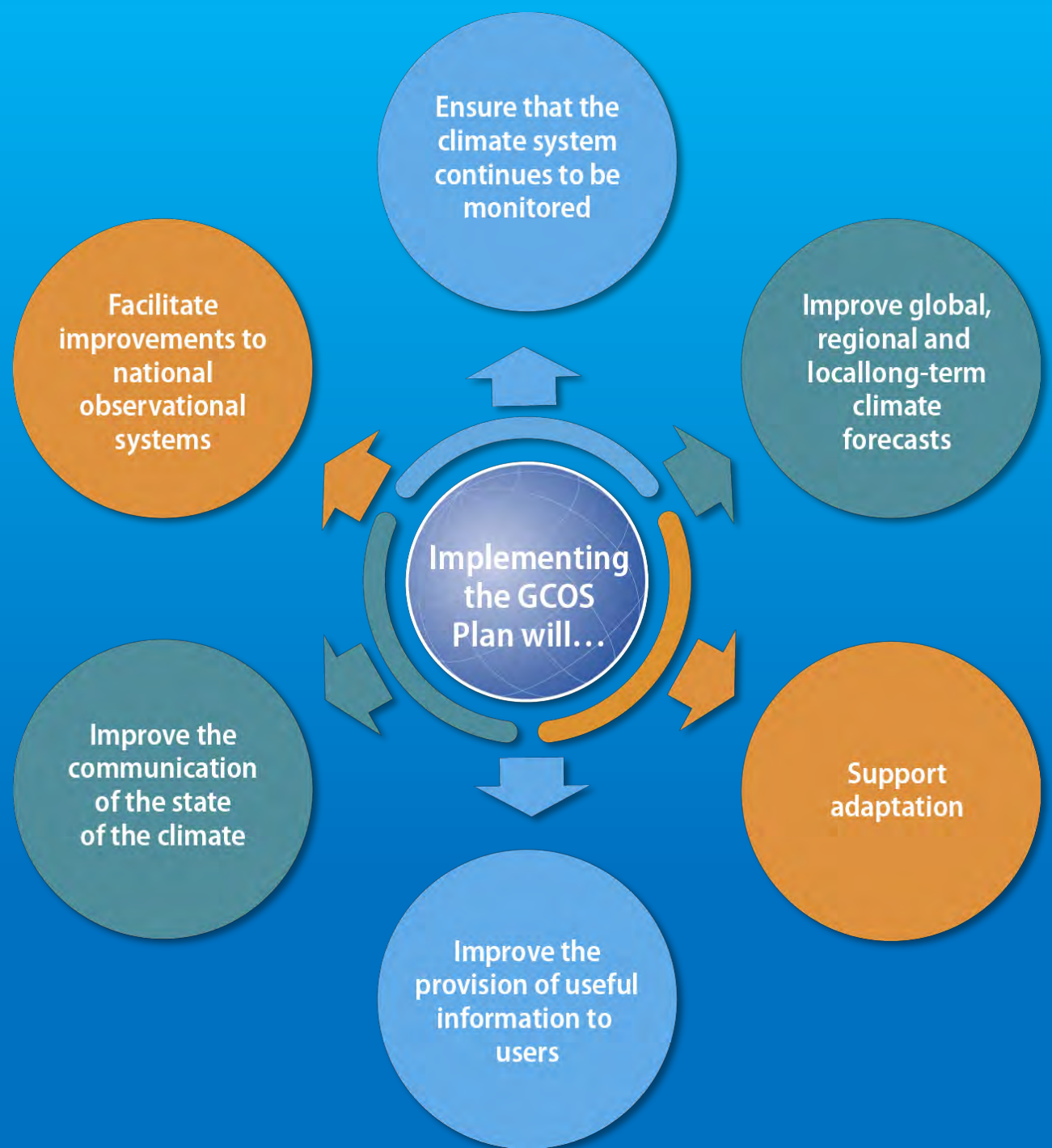
Observations,
Products,
Open Data

Science,
Assessments,
Policy

Climate
Services, Risk
Assessments,
Early Warning &
Disaster Risk
Reduction
Policies

Successful
adaptation and
mitigation,
reduced climate
risks, enhanced
livelihoods, and
food & water
security.

Implementation Aims





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GCOS Implementation Plan