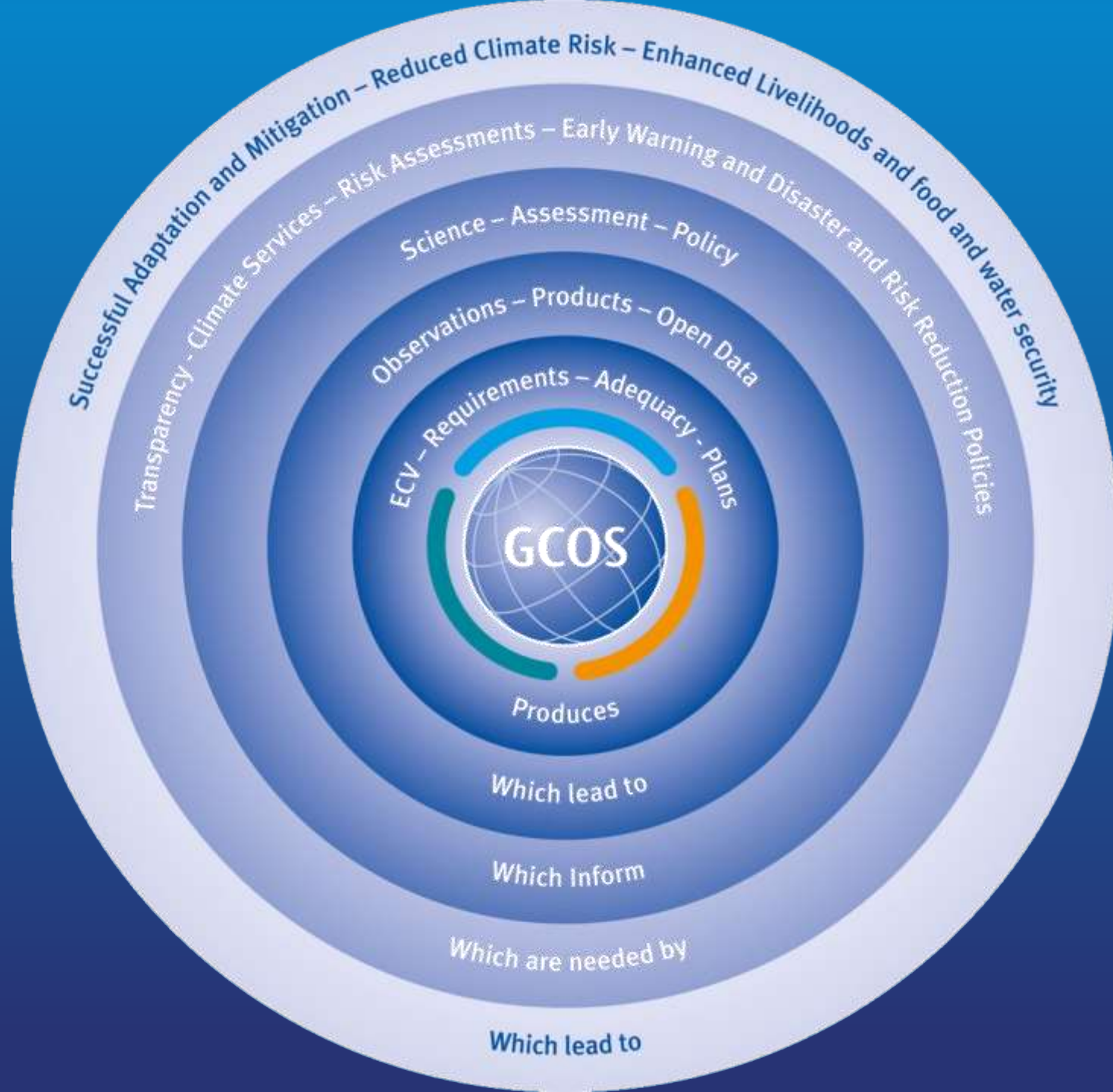


GCOS: The new implementation plan and the cryosphere

supporting the Paris Agreement goals

,Simon Eggleston
GCOS Secretariat, WMO

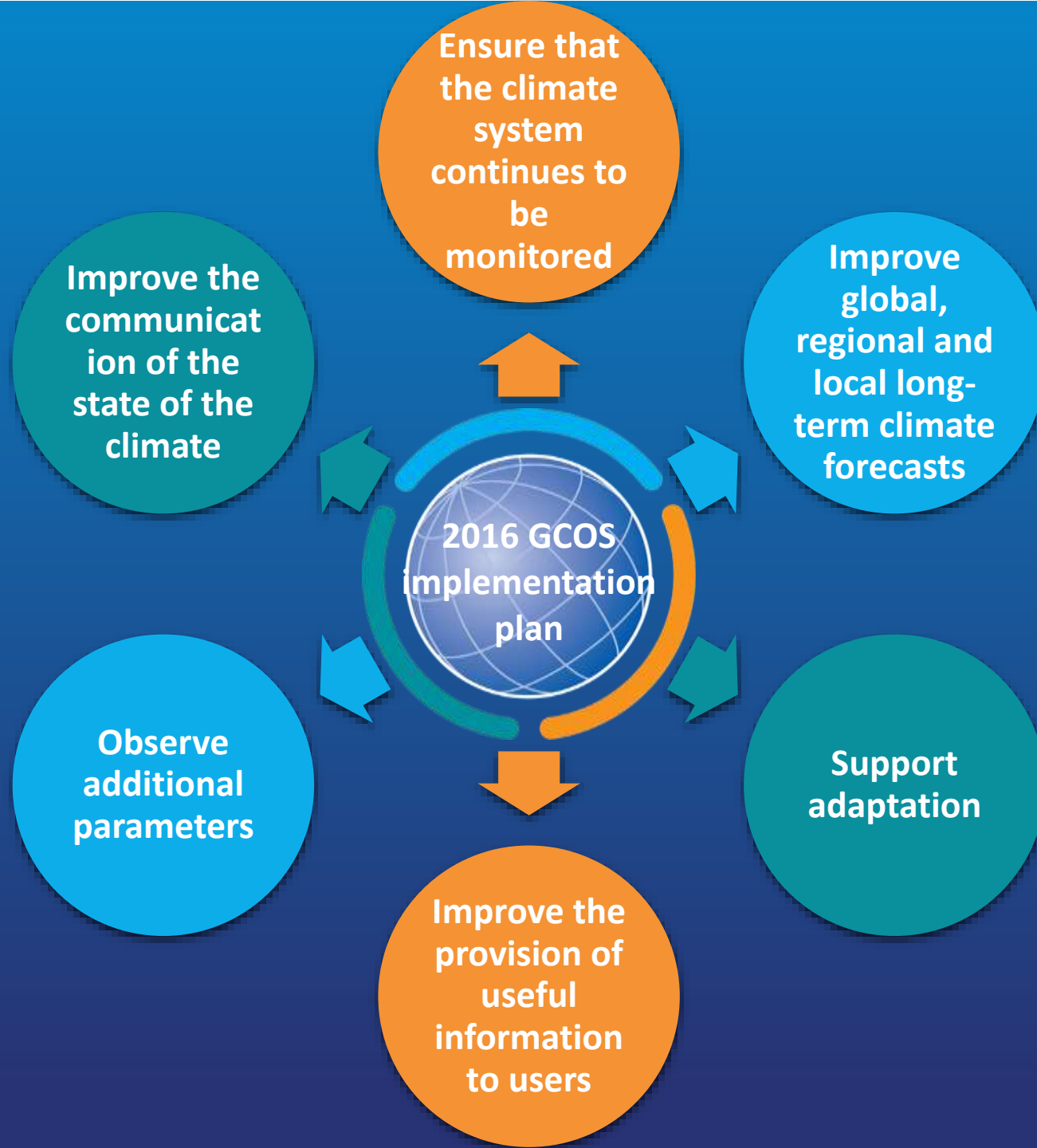


Vision:

**improving livelihoods
and security by policies
informed by sound
scientific information**

Purpose:

**ensuring the availability
of global observations
for the entire climate
system for all users**

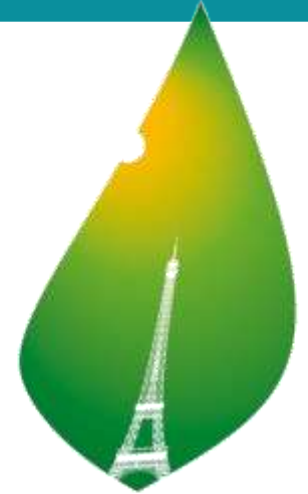


**the 2016
implementation
plan supports these
six areas**

**supporting
adaptation to
climate change is a
key driver and cuts
across these areas**

Supporting adaptation covers:

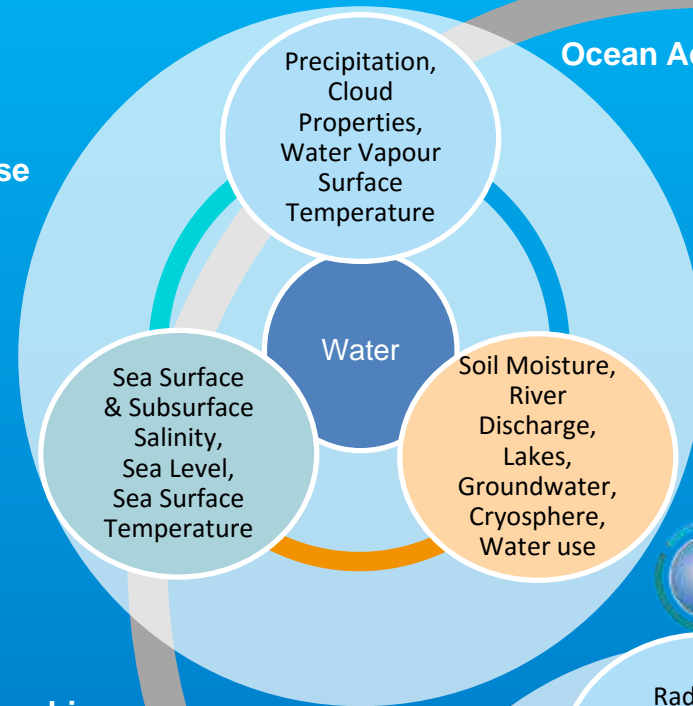
- Requirements and guidance
 - Define user needs
 - Provide guidance (Action G1)
- Acquiring data
 - Produce high-resolution data (Action G2)
 - Data rescue
 - Invest in observations
- Improve data stewardship
- Climate Services
 - Climate services presenting data in useful ways – Indicators (Action G3 & G4)
 - GFCS
- Coordination
 - Coordination amongst UN programmes and observational communities
 - Long-term research and observations



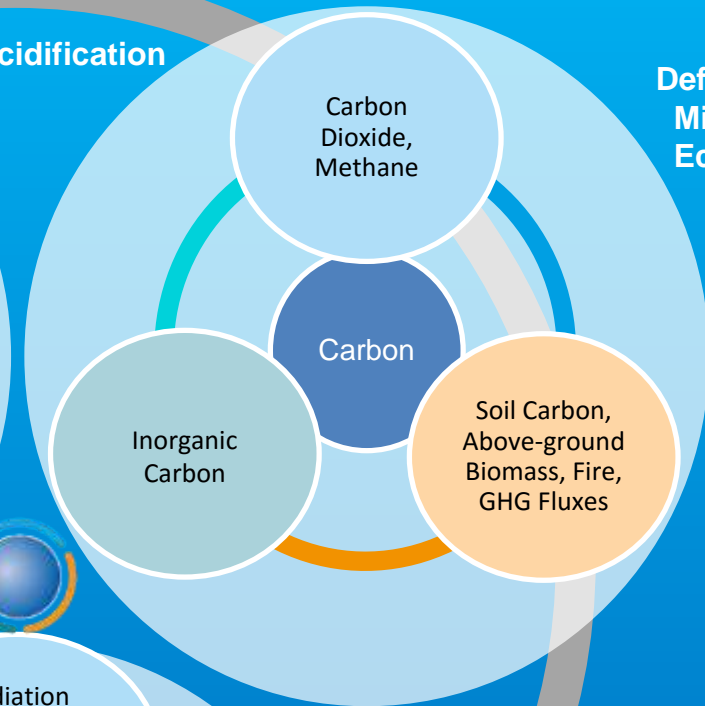
COP21 • CMP11
PARIS 2015
UN CLIMATE CHANGE CONFERENCE

GCOS new Implementation Plan aims to improve monitoring of Global Climate Cycles

Sea Level Rise
Fisheries

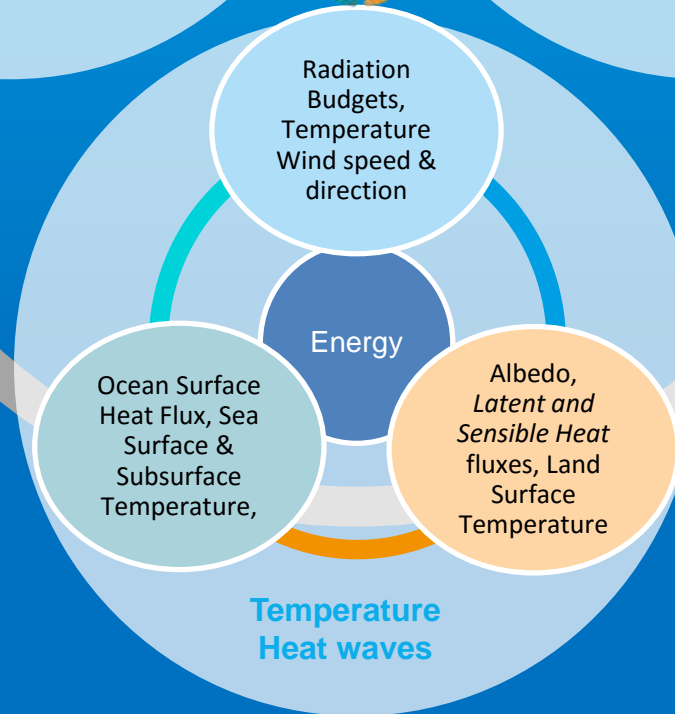


Ocean Acidification



Deforestation
Mitigation
Ecosystem Loss

Coral Bleaching
Agriculture
Human Health
Floods
Droughts
Water Resources
Storms



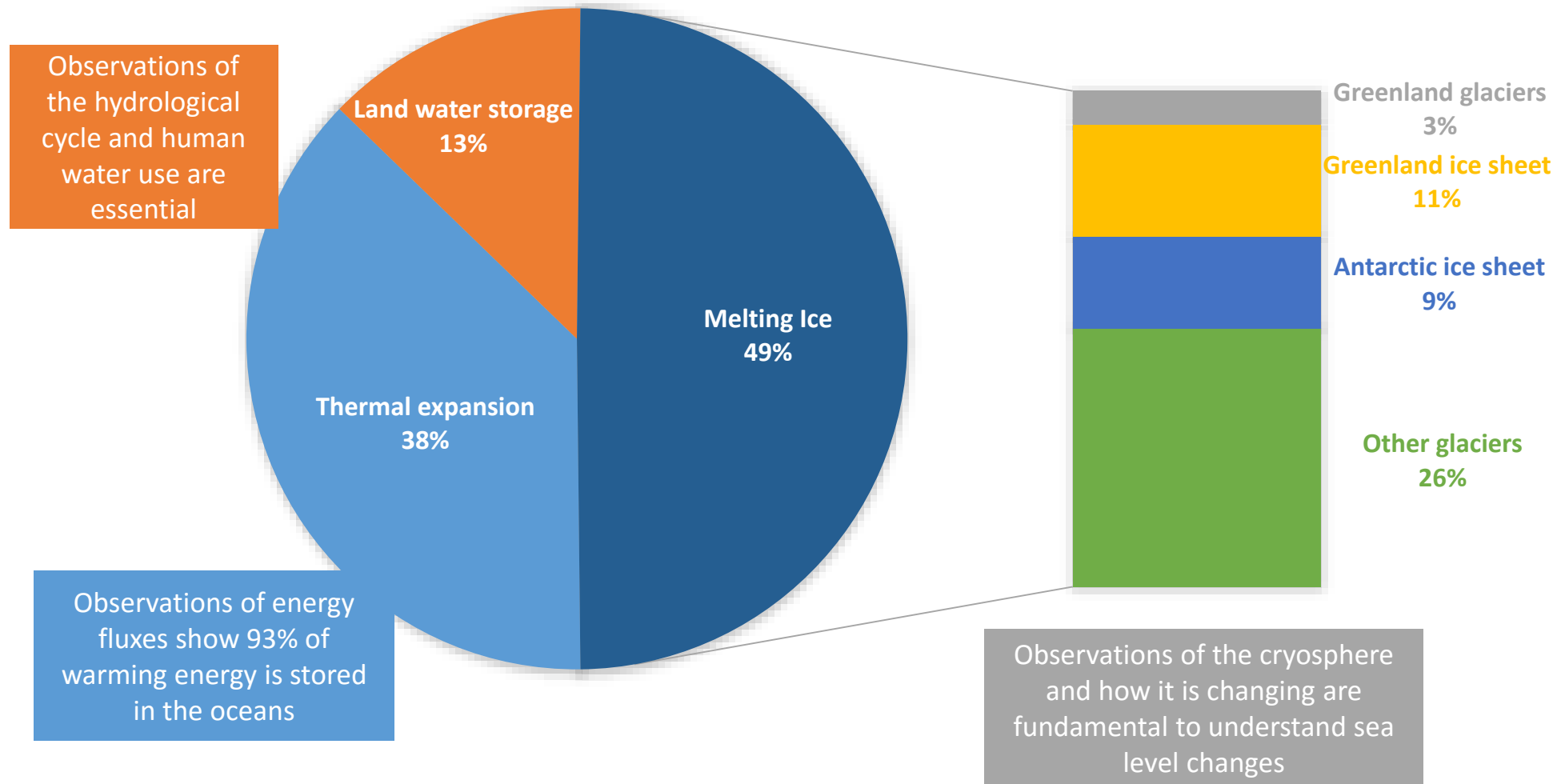
Systemic Risks
Security
Slow Economic
Development

Temperature
Heat waves

- Carbon Budget
 - Quantify fluxes of carbon-related greenhouse gases to +/- 10% on annual timescales
 - Quantify changes in carbon stocks to +/- 10% on decadal timescales in the ocean and on land, and to +/- 2.5 % in the atmosphere on annual timescales
- Global Water Cycle
 - Close water cycle globally within 5% on annual timescales
- Global Energy Balance
 - Balance energy budget to within 0.1 Wm^{-2} on annual timescales
- Explain changing conditions of the biosphere
 - Measured ECVs that are accurate enough to explain changes of the biosphere (for example, species composition, biodiversity, etc.)

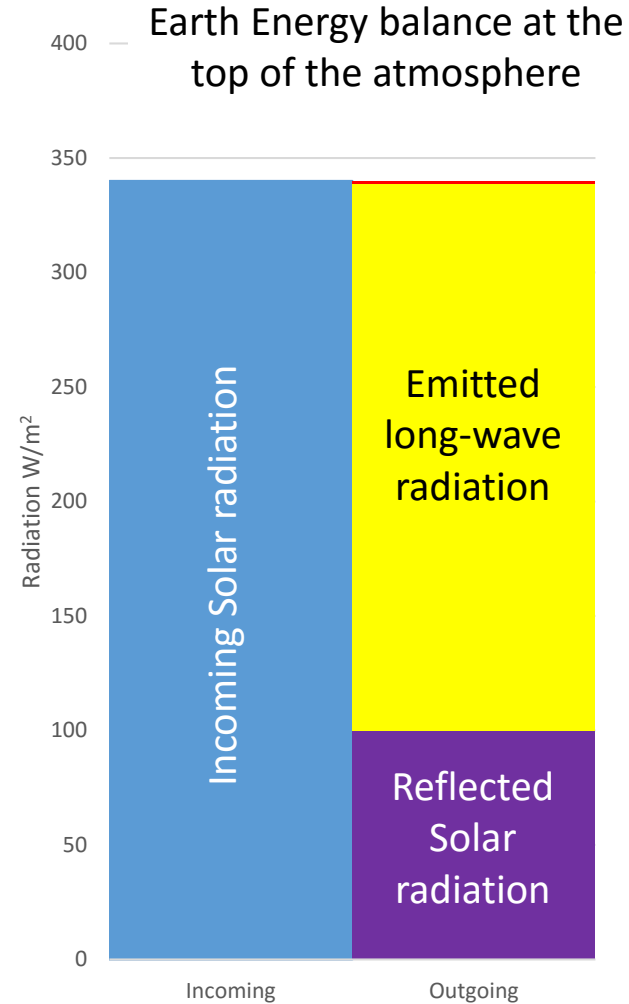
Water Cycle: Sea Level Rise

Contributions to sea level rise (3.2 mm/year in 1993-2010)

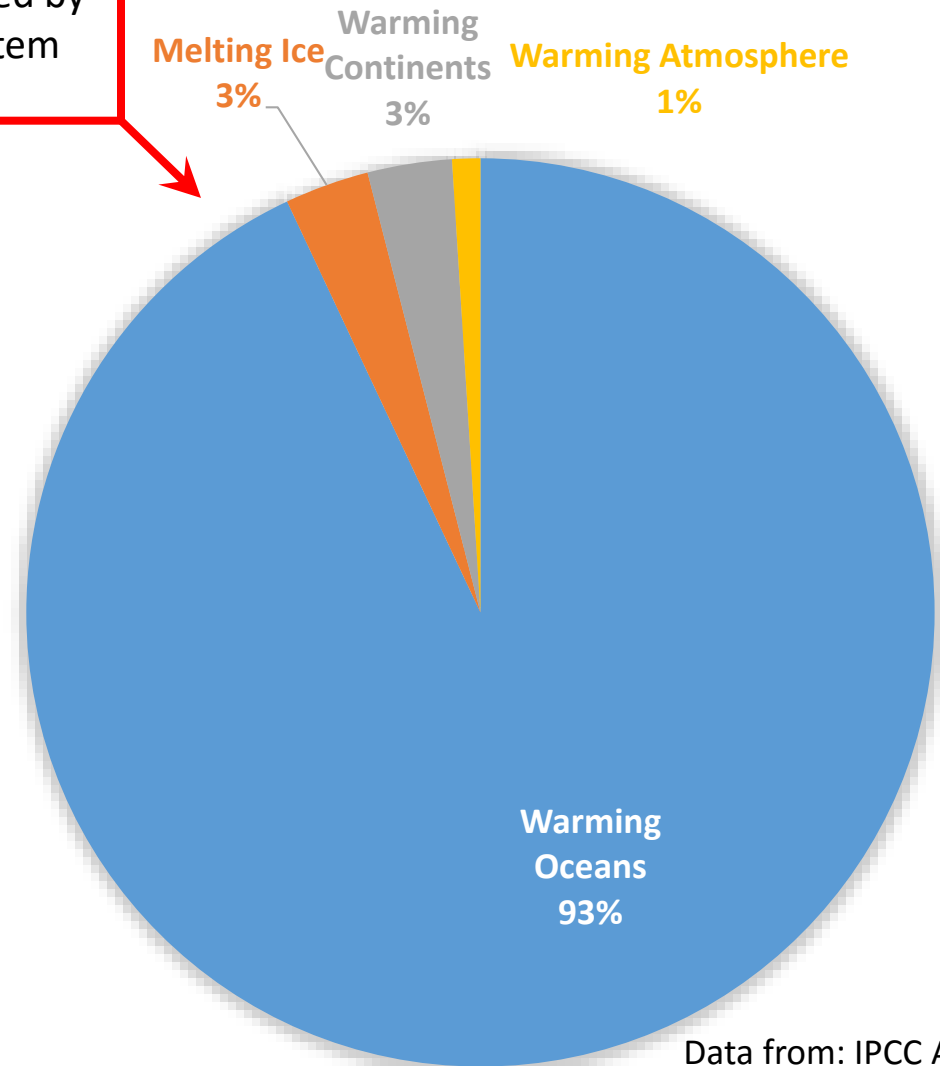


Energy Cycle and the cryosphere

Earth's energy flows and climate change



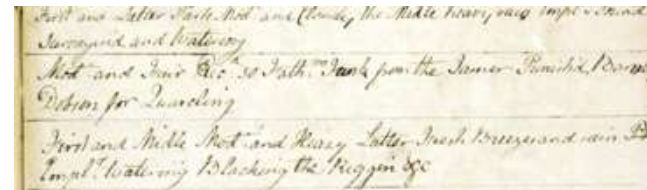
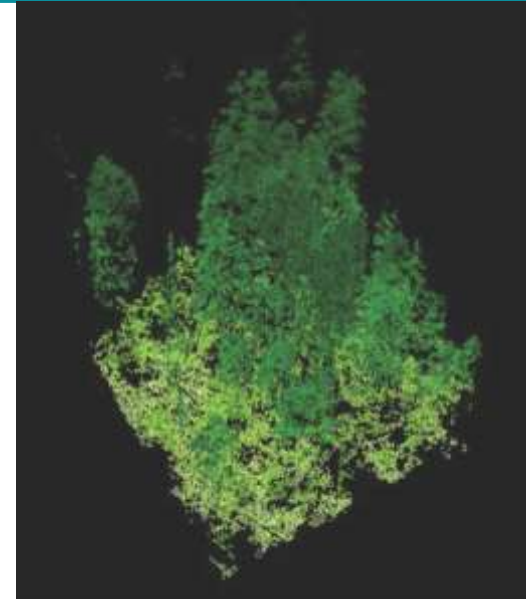
Energy absorbed by the earth system
 0.6 W/m^2



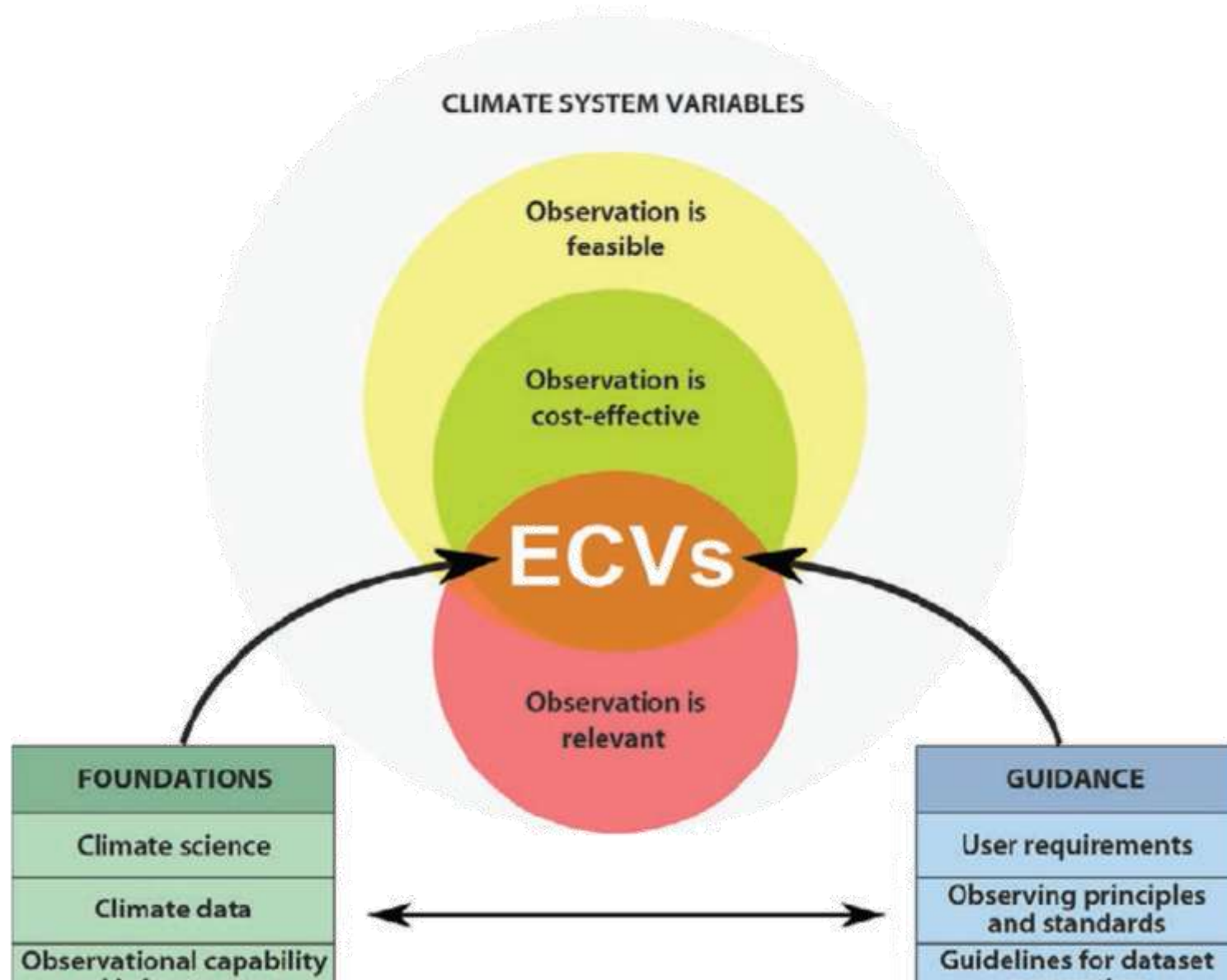
Data from: IPCC AR5 (2013)

Data Stewardship - vital for GCOS to be successful

- General GCOS approach:
 - Open data policies
 - Standardised metadata
 - Support national/regional data centres
 - Ensure long-term accessibility of data
 - Provide data access and discoverability
 - Use of digital object identifiers (DOI) for data records
 - Collaboration with WMO CCI on climate data management



Essential Climate Variables (ECVs)



SOURCE: Bojinski, S. et al., 2014

GCOS Climate Monitoring Principles

- agreed by the UNFCCC at Bali, December 2007, (decision 11/CP.13)
- Cover:
 - Changes of equipment
 - Metadata
 - Data quality
 - Continuity and need for long time series
 - Operational
 - Data management
 - Satellite calibration and sampling
- Climate data needs to have long time series and to be of high enough accuracy and stability to detect relatively small changes over decades

Measurement domain	Essential Climate Variables (ECVs) (2016)
Atmospheric	<p>Surface: air temperature, wind speed and direction, water vapour, pressure, precipitation, surface radiation budget</p> <p>Upper-air: temperature, wind speed and direction, water vapour, cloud properties, Earth radiation budget, lightning</p> <p>Composition: carbon dioxide (CO₂), methane (CH₄), other long-lived greenhouse gases, ozone, aerosol, precursors for aerosol and ozone</p>
Oceanic	<p>Physics: temperature: sea surface and subsurface; salinity: sea surface and subsurface; currents, surface currents, sea level, sea state, sea ice, ocean surface stress, ocean surface heat flux</p> <p>Biogeochemistry: inorganic carbon, oxygen, nutrients, transient tracers, nitrous oxide (N₂O), ocean colour</p> <p>Biology/ecosystems: plankton, marine habitat properties</p>
Terrestrial	<p>Hydrology: river discharge, groundwater, lakes, soil moisture</p> <p>Cryosphere: snow, glaciers, Ice sheets and Ice shelves, permafrost</p> <p>Biosphere: albedo, land cover, fraction of absorbed photosynthetically active radiation, leaf area index, above-ground biomass, soil carbon, fire, land surface temperature</p> <p>Human use of natural resources: water use, greenhouse gas fluxes</p>

Cryosphere ECV product requirements				
ECV	Products	Frequency	Resolution	
Snow	Area covered by snow	Daily	1 km (100 m in complex terrain)	
	Snow depth	Daily	1 km (100 m in complex terrain)	
	Snow-water equivalent	Daily	1 km	
Glaciers	Glacier area	Annual (at end of ablation season)	Horizontal 15–30 m	
	Glacier elevation change	Decadal	Horizontal 30 m–100 m x vertical 1 m	
	Glacier mass change	Seasonal to annual (the latter at end of ablation period)	Vertical: 0.01 m or 10 kg/m ² (at point location)	
Ice sheets and ice shelves	Surface elevation Change	30 days	Horizontal 100 m	
	Ice velocity	30 days	Horizontal 100 m	
	Ice mass change	30 days	Horizontal 50 km	
	Grounding line location and thickness	Yearly	Horizontal 100 m Vertical 10 m	
Permafrost	Thermal state of permafrost	Daily to weekly	Sufficient sites to characterize each bio-climate zone	
	Active layer thickness			
Sea ice	Sea-Ice concentration	Weekly	1–15 km	
	Sea-ice extent/edge	Weekly	1–5 km	
	Sea-ice thickness	Monthly	25 km	
	Sea-ice drift	Weekly	5 km	

Specific Cryosphere actions in Actions in implementation plan

- Maintain and improve ground, ocean and satellite observing systems
- Improved products: e.g. albedo
- Funding for data centres e.g. international glacier data centres
- Ensure research projects make their data available
- Improved reporting of some parameters e.g. glacier velocity, snow-cover, soil freeze/thaw
- Improved ice-sheet modelling to assess future sea-level rise
- Standards and best-practices

Role of Science Panels

- Main Objectives:
 1. **Assessing the current state of the global observing system** for climate, and identifying its gaps and inadequacies and designs to ensure long-term monitoring;
 2. **Advocating and promoting** the establishment and enhancement of **the systems** required to provide long-term and consistent data; securing the implementation of designated GCOS networks;
 3. **Promoting** the transfer and accessibility of **data to the user community**.
 4. **Identifying measurable key variables** that control the physical, biological and chemical processes affecting climate, and are indicators of climate change;
 5. **Coordinating activities** with other global observing systems, panels and task groups to ensure the consistency of requirements with overall programmes.
- Work with communities making these observations



Current Planning

Gender	Percentage
Male	85%
Female	14%
Other	1%



SOURCE: Imas/Clive
McMahon/EPA

GCOS will continue to assess new needs, monitoring
methods and ECVs & update existing requirements

The Global Observing System for Climate

Thank you

gcos.wmo.int