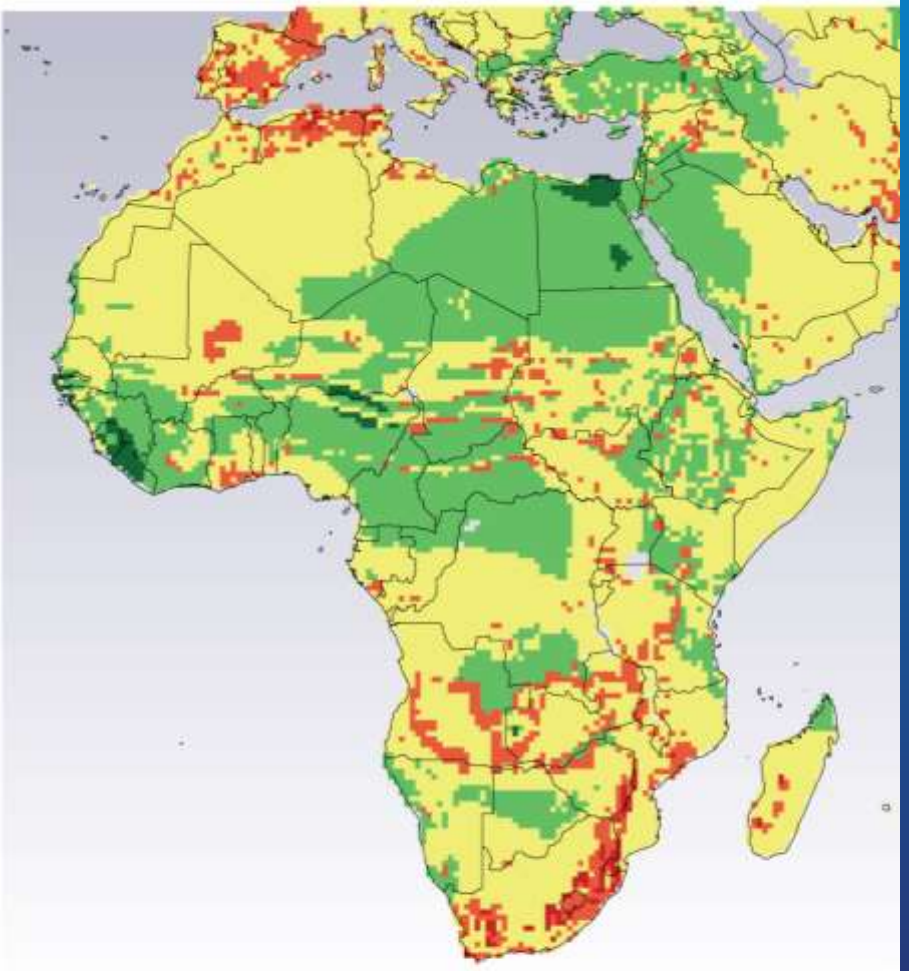
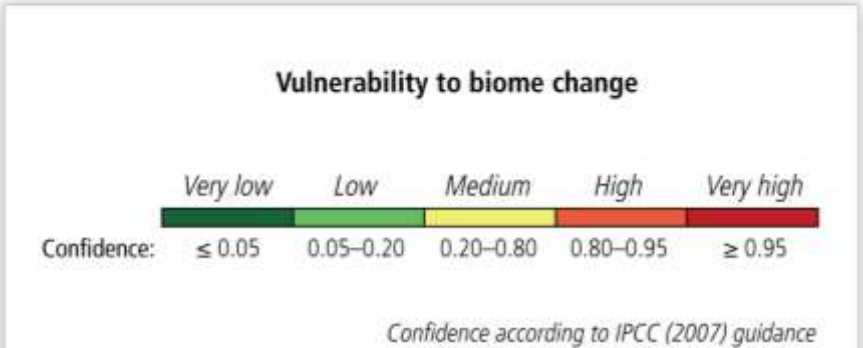
(b) Vulnerability of ecosystems to biome shifts based on historical climate (1901–2002) and projected vegetation (2071–2100)





Aims & Objectives

Improving the value chain from observations to climate services to support climate policy, adaptation and mitigation in Africa

Joint GCOS – Copernicus – WIGOS – GFCS Workshop in collaboration with UNFCCC

Uganda – 29th October to 2nd November 2018

Global System, Local Observations

GCOS Secretariat, WMO

WMO UNESCO IOC International Science Council UN environment

Since 1992 GCOS has supported global observations climate

- 1990: 2nd World Climate Conference
  - "*Present observational systems for monitoring the climate system are inadequate … are deteriorating in both industrialised and developing regions… There is an urgent need to create a Global Climate Observing System (GCOS) … including both space-based and surface-based components…….*".
- **GCOS Established in 1992 so that**
  - all users have access to the climate observations, data records and information which they require to address pressing climate related issues
- In 1992 UNFCCC agreed
  - Article 4.1 (g) Commitments
  - Article 5 Research and Systematic Observations

United Nations
Framework Convention on
Climate Change

global climate monitoring is a system of systems

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

Essential Climate Variables (ECVs)

Atmospheric

Surface

Air temperature, Wind speed and direction, Water vapour, Pressure, Precipitation, Surface radiation budget.

Upper-air

Temperature, Wind speed and direction, Water vapour, Cloud properties, Earth radiation budget, Lightning

Composition

Carbon Dioxide (CO_2), Methane (CH_4), Other long-lived greenhouse gases (GHGs), Ozone, Aerosol, Precursors for aerosol and ozone.

Oceanic

Physics

Subsurface temperature, subsurface salinity, Subsurface currents, Ocean surface stress, ocean-surface heat flux, sea-surface temperature, surface currents, sea-surface salinity, sea level, sea state, sea ice

Biogeochemistry

Inorganic carbon, oxygen, nutrients, transient tracers, nitrous oxide (N_2O), ocean colour

Biology/ecosystems

Plankton, marine habitat properties

Terrestrial

Hydrology

River discharge, groundwater, soil moisture, lakes

Cryosphere

Snow, glaciers, ice sheets and ice shelves, Permafrost

Biosphere:

Albedo, land cover, fraction of absorbed photosynthetically active radiation, leaf area index, above-ground biomass, fire, land-surface temperature, soil carbon

Human use of natural resources:

Water use, Anthropogenic Greenhouse Gas fluxes

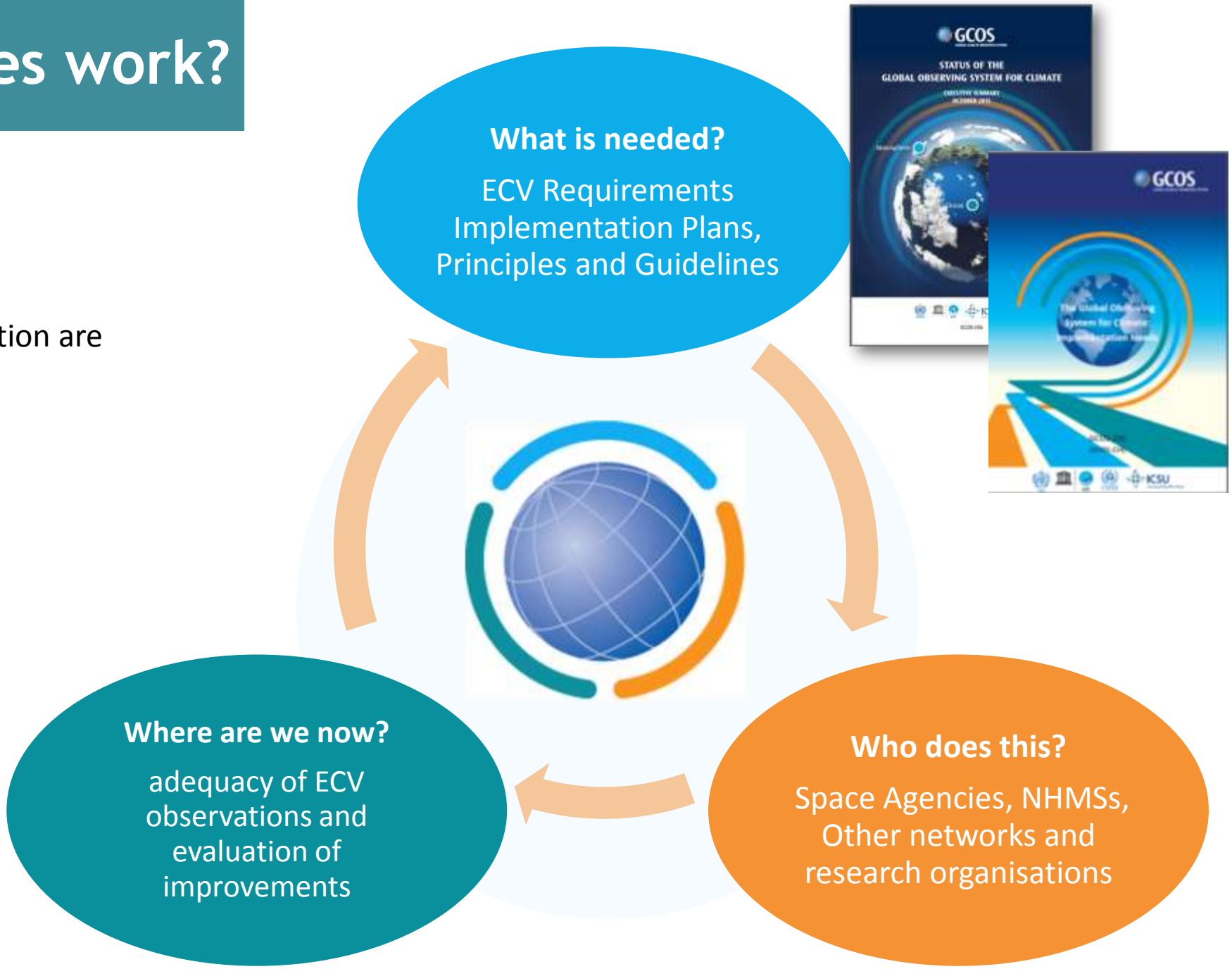
AOPC Atmospheric Observation Panel for Climate
GCOS · GOOS · WCRP

GCOS · GOOS · WCRP
OOPC Ocean Observations Panel for Climate

GCOS · WCRP
TOPC Terrestrial Observation Panel for Climate

How GCOS does work?

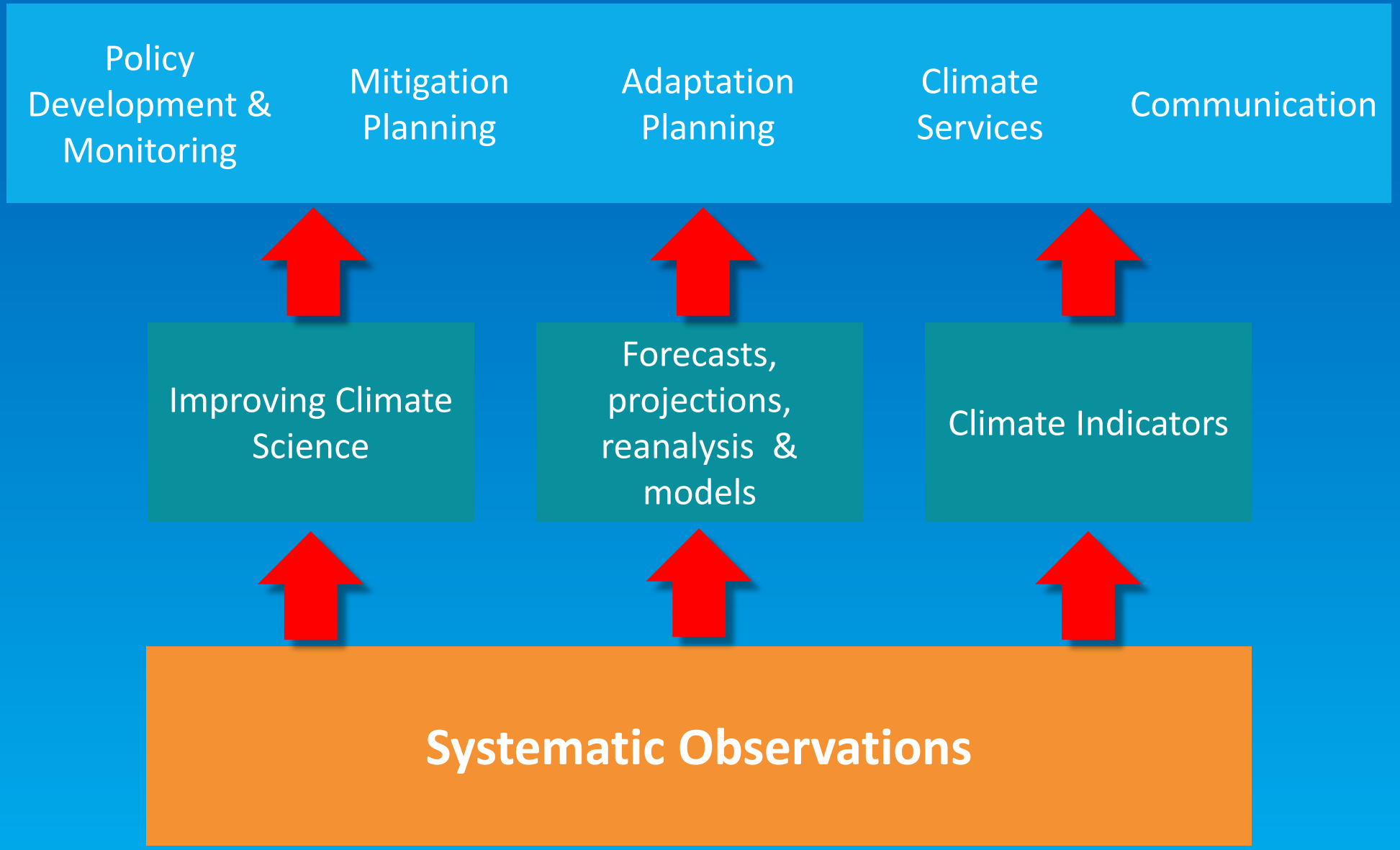
Coordination and communication are ongoing tasks



Climate Observations

- Climate observations need to
  - be able to detect trends when inter-annual variability is large and annual change is small.
    - Accurate, traceable and stable long-term observations are required
  - be **sustained** over the **long-term** to detect changes and monitor the impacts of any policies
  - be able to **combine data** from different sources: records should be **accurate, traceable** and **well documented**
- Climate data should be
  - Open to all (data that is not available may as well not be measured)
  - Accessible and discoverable
    - Have standardised metadata
    - DOI
  - Archived for long-term storage
- Many climate ECV need to be monitored for numerical weather prediction and are input into reanalysis

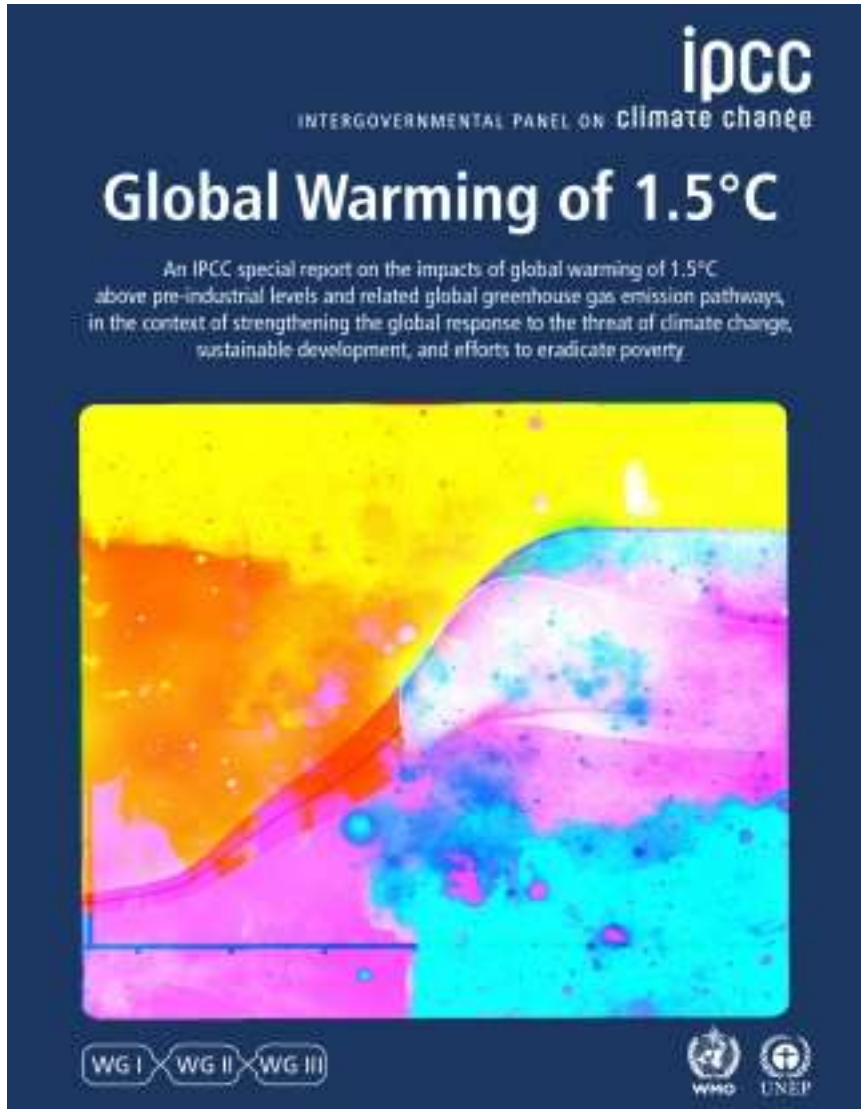
systematic observations enable the science that supports adaption and mitigation planning, monitors their implementation and informs everyone of progress



IPCC Special Report on Global Warming of 1.5°C

- Temperature, Global Observations to date
  - Increasing mean temperature
  - Increasing temperatures of hottest and coldest days
  - Increasing numbers of hot days
  - Decreasing numbers of cold days
- Regionally, between 1.5 and 2°C will lead to
  - Increasing mean temperature
  - More summer days
  - Increasing warm spells

- Precipitation, Global Observations to date
  - There is low confidence in any trends on precipitation **due to data quality, data completeness** or disagreement amongst available estimates
  - there is medium confidence that anthropogenic forcing has contributed to a global-scale intensification of heavy precipitation over the second half of the 20th century
  - robust increases in observed precipitation extremes can be identified for annual maximum 1-day precipitation and consecutive 5-day precipitation associated with a global warming of 0.5°C
- Regionally, between 1.5 and 2 °C will lead to
  - Number of days with precipitation >20mm

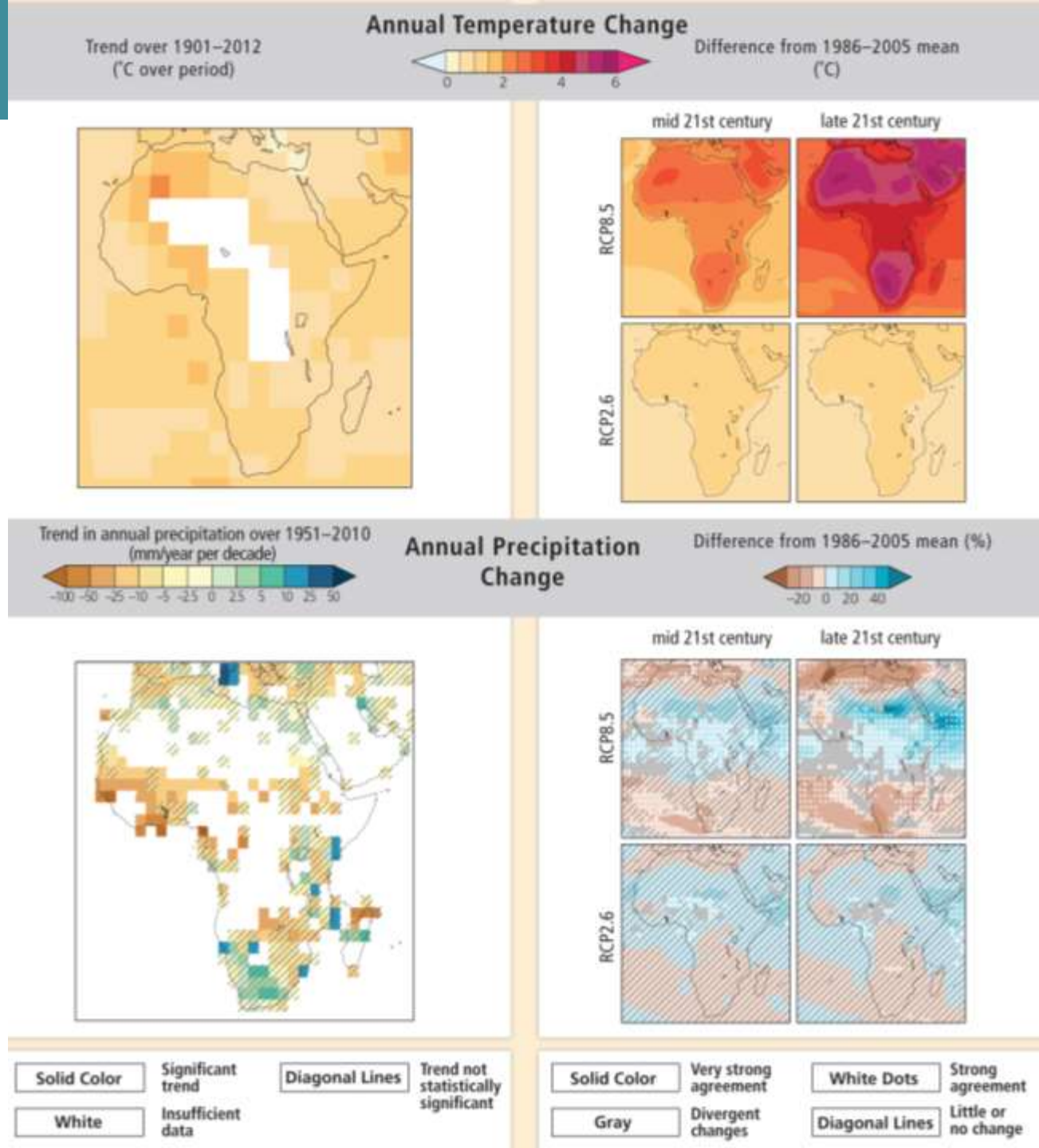


SR 1.5 and this region

- Issues regarding **undersampling … over Africa**, may lead to biases in estimated changes in Global Mean Surface Temperature (GMST) and also affect **the confidence of assessments** regarding regional observed and projected changes in both mean and extreme temperature

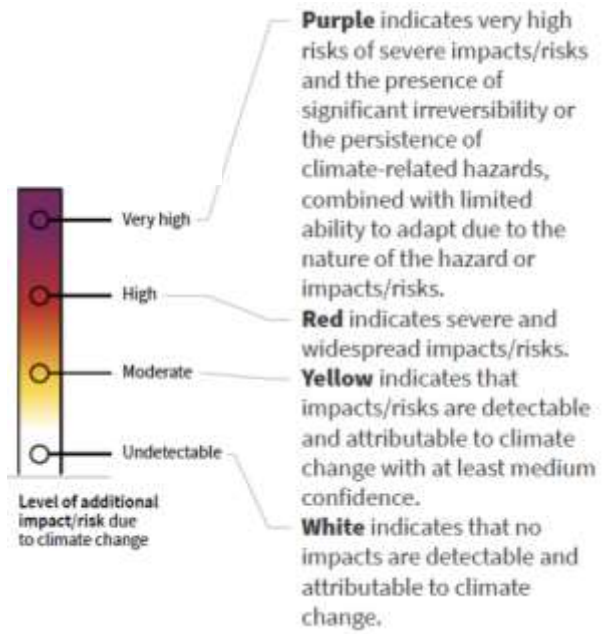
- Low to medium confidence in some African regions lacking observations, but locations with observations display increases in warm days and warm nights, and decreases in cold days and cold nights

- Issues on which there is little or no information include Fluvial flood, Wildfire, Changes in ecosystem Production, Shift and composition change of biomes (major ecosystem types), Heat-related morbidity and mortality, Ozone related mortality, Undernutrition, Wildfires

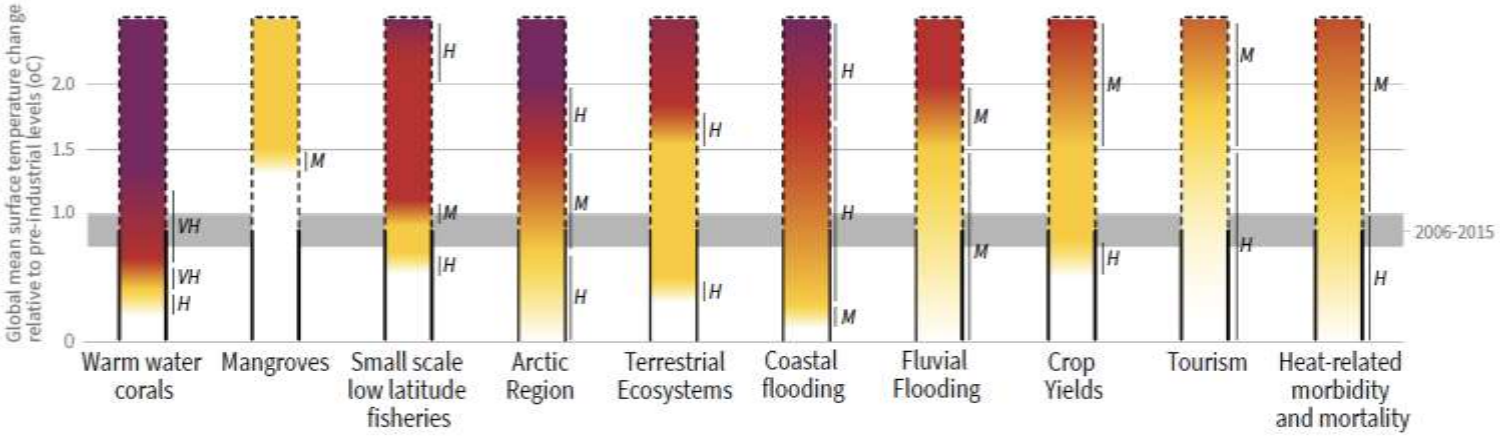


Impacts: SR 1.5°C

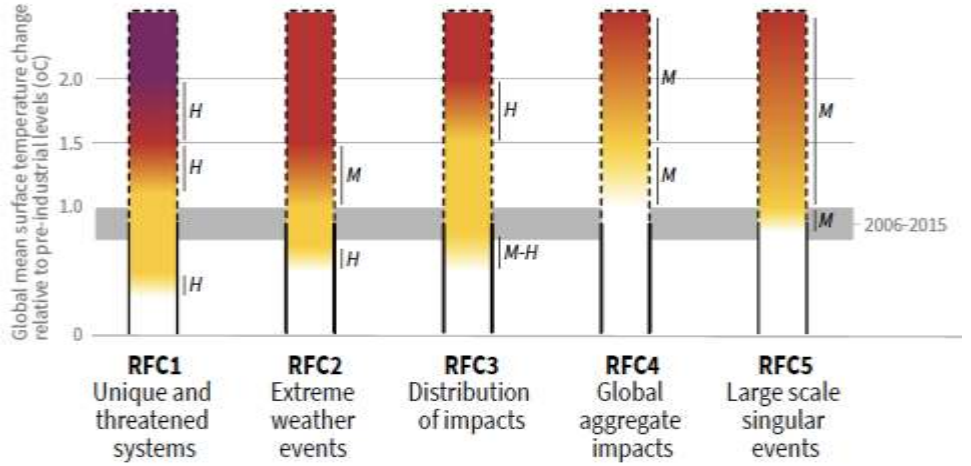
- Regionally, the impact of a 2°C global warming includes
  - average precipitation does not show a significant response due to two compensating phenomena
    - the number of rain days decreases whereas the precipitation intensity increases,
    - the rainy season occurs later during the year with less precipitation in early summer and more precipitation in late summer.
  - an increase in runoff is projected
  - projected increases of extreme low flows are exacerbated
  - Significantly increased high flows are expected to occur at 1.5°C which intensify under 2°C
  - Increased temperature will likely induce changes in river discharge and basin water amount, leading human and livestock populations to experience water stress



Impacts and risks for selected natural, managed and human systems



Impacts and risks associated with the Reasons for Concern (RFCs)



This Meeting will

- Demonstrate the link from local observations to global reanalysis and on to local climate applications and services. These services will support responses to the regional changes such as the findings of the IPCC special report on the impacts of global warming of 1.5 °C.
  - Provide training in access to and use of Copernicus data products.
- Identify observational gaps in the regional needed to support global reanalysis and numerical weather prediction and develop plans to address these needs
  - Link to HIGHWAY as example of a project aiming to reduce loss of life, in this case by providing better prediction of high impact weather on Lake Victoria.

The Global Observing System for Climate

Thank you

WMO UNESCO IOC International Science Council UN environment