3rd GCOS Implementation Plan

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On behalf of GCOS IP writing team
COP-21: Paris Agreement Article 7 (7c)

Strengthening scientific knowledge on climate, including research, systematic observation of the climate system and early warning systems, in a manner that informs climate services and supports decision-making.

Developing the Transparency Framework (the need to promote transparency, accuracy, completeness, consistency, and comparability, and environmental integrity). Preparing for first Global Stock take.

SBSTA Conclusions:

Noted with appreciation the [Status] report by GCOS.

Encouraged GCOS to consider the outcomes of the twenty-first session of the Conference of the Parties when preparing the GCOS IP 2016.

Invited GCOS to collaborate with relevant partners to continue enhancing access to, and understanding and interpretation of, data products and information to support decision-making on adaptation and mitigation at national, regional and global scales.
The writing team

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- Detlef Stammer
- Adrian Simmons
- Mark Bourassa
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2000+ comments over two review cycles
**Time-line**

1) Structure and approach outlined by IP lead GCOS Director and GCOS SC Chair (March 2015)
2) Discussion and input from Science Panels (March / April 2015)
3) Finalization of draft structure and appointment of writing team (July 2015)
4) Outline submitted to SBSTA/COP21 (December 2015)
5) First writing team meeting (February 2016)
6) Scientific community views at GCOS Science Conference (March 2016)
7) GCOS Science Panel development, review and input (March – April 2016)
8) Second writing team meeting (May 2016)
9) V0.1 submitted for Friendly-Fire review to 10th July 2016
10) Public review of V0.2 (following ff review) to 5th September 2016
11) V1.0 prepared in light of comments on V0.2
12) V1.0 submitted to GCOS SC September 2016
13) Final version to be submitted to UNFCCC Secretariat (14th October 2016)
EXECUTIVE SUMMARY

Part 1: MEETING THE NEEDS

1. INTRODUCTION
2. IMPLEMENTATION
3. OBSERVATIONS FOR ADAPTATION, MITIGATION AND CLIMATE INDICATORS
4. THE BROADER RELEVANCE OF CLIMATE OBSERVATIONS
5. CONSISTENT OBSERVATIONS ACROSS THE EARTH SYSTEM CYCLES
6. CAPACITY DEVELOPMENT, REGIONAL AND NATIONAL SUPPORT

Part 2: DETAILED IMPLEMENTATION

1. INTRODUCTION
2. OVER-ARCHING & CROSS-CUTTING ACTIONS
3. ATMOSPHERIC CLIMATE OBSERVING SYSTEM
4. OCEANIC CLIMATE OBSERVING SYSTEM
5. TERRESTRIAL CLIMATE OBSERVING SYSTEM
6. LIST OF ACTIONS

APPENDICES
APPENDIX 1: CONTRIBUTORS
APPENDIX 3: GLOSSARY OF ACRONYMS

Annexes:
ECV PRODUCT REQUIREMENTS
Basic Terminology for Data Records Related to Climate
2. Implementation will

① Ensure that the climate system continues to be monitored

② Improve global, regional and local long-term climate forecasts by: Filling gaps in network coverage; Refining ECV Requirements; Improving techniques; Addressing Global Cycles

③ Support adaptation

④ Improve the provision of useful information to users

⑤ Observe additional parameters

⑥ Improve the communication of the state of the climate

⑦ Improve collaboration
# 2. Implementation provides continuity

<table>
<thead>
<tr>
<th>Measurement domain</th>
<th>Essential Climate Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Atmospheric</strong></td>
<td></td>
</tr>
<tr>
<td>Surface:</td>
<td>Air temperature, wind speed and direction, water vapour, pressure, precipitation, surface radiation budget</td>
</tr>
<tr>
<td>Upper-air:</td>
<td>Temperature, wind speed and direction, water vapour, cloud properties, Earth radiation budget (including solar irradiance)</td>
</tr>
<tr>
<td>Composition:</td>
<td>Carbon dioxide, methane, other long-lived greenhouse gases, ozone and aerosols, supported by their precursors</td>
</tr>
<tr>
<td><strong>Oceanic</strong></td>
<td></td>
</tr>
<tr>
<td>Surface:</td>
<td>Sea-surface temperature, sea-surface salinity, sea level, sea state, sea ice, surface current, ocean colour, carbon dioxide partial pressure, ocean acidity, phytoplankton</td>
</tr>
<tr>
<td>Subsurface:</td>
<td>Temperature, salinity, current, nutrients, carbon dioxide partial pressure, ocean acidity, oxygen, tracers</td>
</tr>
<tr>
<td><strong>Terrestrial</strong></td>
<td>River discharge, water use, groundwater, lakes, snow cover, glaciers and ice caps, ice sheets, permafrost, albedo, land cover (including vegetation type), fraction of absorbed photosynthetically active radiation, leaf area index, above-ground biomass, soil carbon, fire disturbance, soil moisture</td>
</tr>
</tbody>
</table>
## 2. Implementation drives progress

<table>
<thead>
<tr>
<th>Measurement Domain</th>
<th>Essential Climate Variables (ECVs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oceanic</td>
<td>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, Biogeochemistry: Inorganic Carbon, Oxygen, Nutrients, Transient Tracers, Nitrous Oxide (N₂O), Ocean Colour, Biology/ecosystems: Plankton, Marine habitat properties</td>
</tr>
<tr>
<td>Terrestrial</td>
<td>Hydrology: River discharge, Groundwater, Lakes, Soil Moisture, 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, Soil carbon, Fire, Land Surface Temperature, Human use of natural resources: Water use, GHG fluxes</td>
</tr>
</tbody>
</table>

+Lightning, Ocean surface stress, Ocean surface heat flux, Marine habitat properties, Land surface temperature, GHG Fluxes
NB: Changes also at the level of ECV Products (e.g. Lakes)

| Action G38: Establish sustained production and improvement for the new Lake ECV Products |
|---|---|
| Action | Establish satellite based ECV data records for Lake Surface Temperature, Lake Ice Coverage, and Lake Water Leaving Reflectance (Lake Colour). Implement and sustain routine production of these new satellite based products; Sustain efforts on improving algorithms, processing chains and uncertainty assessments for these new ECV Products; Develop additional products derived from Lake Water leaving Reflectance for turbidity, chlorophyll, and coloured dissolved organic matter. |
| Benefit | Add additional Lake ECV products for extended data records. Providing a more comprehensive assessment of climate variability and change in Lake systems |
| Timeframe | Continuous |
| Who | Space Agencies and CEOS. Copernicus Global Land Service, GloboLakes and ESA CCI+ |
| Performance Indicator | Completeness of database |
| Annual Cost | 1-10M US$ (40% in non-Annex-1 Parties) |
3. Observations for adaptation, mitigation and climate indicators

Table 22 The greenhouse gases of interest. The focus of support for observing the carbon cycle will be on CO₂ and CH₄.

<table>
<thead>
<tr>
<th>Gas</th>
<th>UNFCCC reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂</td>
<td>Mandatory</td>
</tr>
<tr>
<td>CH₄ and N₂O</td>
<td></td>
</tr>
<tr>
<td>HFCs, PFCs, SF₆ and NF₃</td>
<td>Mandatory (annex 1)</td>
</tr>
<tr>
<td>additional GHGs, such as HFEs and PFPEs, and other gases for which 100-year global warming potential values are available from the IPCC</td>
<td>Strongly Encouraged</td>
</tr>
<tr>
<td>indirect greenhouse gases such as SO₂, NOx, CO and NMVOC</td>
<td>Optional</td>
</tr>
<tr>
<td>Gases controlled by the Montreal Protocol</td>
<td>No</td>
</tr>
<tr>
<td>Aerosols</td>
<td></td>
</tr>
</tbody>
</table>
## 3. Observations for adaptation, mitigation and climate indicators

### Action G3: Development of indicators of climate change

<table>
<thead>
<tr>
<th>Action</th>
<th>Devise a list of climate indicators that describe the ongoing impacts of climate change in a holistic way. Consider the work of the WMO, IPCC and others. Indicators may include: heating of the ocean, rising sea level, increasing ocean acidity, melting glaciers and decreasing snow, changes in arctic sea ice, changes in vegetation characteristics and distributions and land cover changes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefit</td>
<td>Communicate better the full range of ongoing climate change in the Earth system</td>
</tr>
<tr>
<td>Timeframe</td>
<td>2017</td>
</tr>
<tr>
<td>Who</td>
<td>GCOS in association with other relevant parties including WMO and IPCC.</td>
</tr>
<tr>
<td>Performance Indicator</td>
<td>Agreed list of indicators (for example, 6 in number)</td>
</tr>
<tr>
<td>Annual Cost</td>
<td>10-100k</td>
</tr>
</tbody>
</table>

### Action G4: Indicators for Adaptation and Risk

<table>
<thead>
<tr>
<th>Action</th>
<th>Promote definition of and research supporting the development of indicators linking physical and social drivers relating to exposure, vulnerability and improved resilience, in line with national requirements.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefit</td>
<td>Tracking of progress of climate change and adaptation, improved capacity to respond and avoid loss.</td>
</tr>
<tr>
<td>Timeframe</td>
<td>2017</td>
</tr>
<tr>
<td>Who</td>
<td>GCOS with relevant agencies and national bodies</td>
</tr>
<tr>
<td>Performance Indicator</td>
<td>Definition and development of relevant risk assessments</td>
</tr>
<tr>
<td>Annual Cost</td>
<td>10-100k US$</td>
</tr>
</tbody>
</table>
4. The broader relevance of climate observations

Ramsar Convention: framework for national action and international cooperation for the conservation and wise use of wetlands and their resources
5. Consistent observations across the Earth System Cycles
PART II: Detailed Implementation

Introduction

Overarching and cross-cutting actions

Requirements for Climate Observations
Planning, Review and Oversight
Data management, stewardship and access
Production of Integrated ECV Products
Ancillary and additional observations

183 pages
ECV Product Requirements and the Satellite Supplement

① Maximise GCOS - CEOS / CGMS synergy

② Reduce time-lag between IP and Satellite Supplement release

③ Align requested reporting of both GCOS and the Space Agencies to SBSTA

④ Provide Satellite Supplement as an Appendix to this Implementation Plan

⑤ Extend ECV product requirements provided in satellite supplement to all observations (incl. those based primarily on in-situ observations)

⑥ Action to define review process in 2017 and provide periodic updates
Impacts

- Continuity, evolution and progress
- Addresses information needs for adaptation and mitigation
- Addresses information needs of Transparency Framework and other elements of the Paris Agreement
- Greater efficiency
- Improved capacity building and outreach
- Improved information exchange between conventions
- Focused demand on core ‘providers’
- Focused products for core ‘users’