



Four-Year Implementation Plan for the period November 2015 to November 2019

1 INTRODUCTION

The purpose of this document is to outline the main **Joint CEOS/CGMS Working Group on Climate** objectives, associated implementation modalities and schedule for the period November 2015 to November 2019, embracing the WG Chair periods of ESA (Pascal Lecomte) and EUMETSAT (Jörg Schulz). This plan will be updated with further details as they become available, particularly in view of the uncertainties associated with the evolution of the requirements.

For practical reason, this work plan covers four years, from November 2015 to November 2019 in order to encompass two revision cycles of the ECV Inventory. It is detailed for the next two-year cycle (cycle 2), and less detailed for the following cycle (cycle 3) which will include lesson learned during cycle 2.

In order to understand the specificity of the **Joint CEOS/CGMS Working Group on Climate** with two main stakeholders (CEOS and CGMS), it is useful to go through some background information.

2 BACKGROUND INFORMATION ON WGClimate

The proposal for a climate working group resulted from the efforts of a CEOS ad hoc Climate Advisory Group that was established in April, 2010 at the 25th Meeting of the CEOS Strategic Implementation Team in Tokyo, Japan. Stephen Briggs (ESA) reported at Plenary on the process undertaken in 2010, which resulted in a proposal for CEOS to establish a standing Working Group on Climate (WGClimate). This proposal was subsequently endorsed at the 24th Plenary in 2010 in Rio de Janeiro, Brazil, where CEOS agreed to create a new Working Group on Climate to coordinate and encourage collaborative activities between the world's major space agencies in the area of climate monitoring.

Following a WMO/GCOS workshop in January 2011, a "badgeless" Ad Hoc Writing Group was formed to develop a "Strategy Towards an Architecture for Climate Monitoring from Space". Considering the success of the approach adopted for development of the architecture, which enabled all major space agencies to contribute via a coordinated CEOS and CGMS approach.

EUMETSAT initiated a discussion at the 40th meeting of CGMS with a proposal to use a coordinated approach among space agencies to develop a coordination mechanism that allows long term planning of space agencies implementing the architecture. As a result, after the 41st meeting of CGMS and the 27th CEOS Plenary the WGClimate subsequently became a joint group to include CGMS and CEOS agencies. The joint working group enables the implementation of the architecture and becomes the implementation reference for the response of space agencies to the GCOS and GFCS requirements.

For the initial period of this new Working Group, EC/JRC (Mark Dowell) agreed to be the Chair, and NOAA as CGMS Agency (John Bates) agreed to be the Vice-Chair. Subsequently, from 2013 to late 2015, CGMS/NOAA has been Chair of WGClimate, with

CEOS/ESA (Pascal Lecomte) elected as Vice Chair. In November 2015, CEOS/ESA became Chair of WGClimate, with CGMS/EUMETSAT (Jörg Schulz) elected as Vice Chair. According to the WGClimate's ToR, the next Vice Chair shall be elected within the CEOS Agencies.

The WGClimate mandate has been to facilitate the implementation and exploitation of Essential Climate Variable (ECV) time-series through coordination of the existing and substantial activities undertaken by CEOS and CGMS member agencies. In addressing this goal, the WGClimate reviews and assesses, on behalf of CEOS and CGMS, the generation of Fundamental Climate Data Records (FCDRs) and derived Essential Climate Variable (ECV) climate products supported by CEOS and CGMS Agencies. WGClimate has also contributed to the review of compliance of satellite missions and products with the Global Climate Observing System (GCOS) Climate Monitoring Principles and with the "Guideline for the Generation of Datasets and Products meeting GCOS Requirements". It also identifies multi-agency implementation teams for each product, reviews their actions, and ensures that a coherent implementation plan exists for each and every climate data product. An example for multi-agency implementation teams are those working under the umbrella of the WMO SCOPE-CM initiative coordinating and performing data processing of multi-agency satellite data.

WGClimate also provides guidance to CEOS regarding climate-related Tasks in the Group on Earth Observations (GEO) Work Plan. In part, this is accomplished by reviewing relevant reports on behalf of the CEOS Plenary. These reports include the update of documents such as the CEOS Response to GCOS requirements and the update of reports to the United Nations Framework Convention on Climate Change Subsidiary Body for Scientific and Technological Advice (UNFCCC/SBSTA) on CEOS climate actions. The WGClimate also supports the work of GCOS in defining and delivering the ECVs required by the UNFCCC and supports the overall relation of CEOS to the UNFCCC, its subsidiary bodies, and to the Intergovernmental Panel on Climate Change (IPCC).

WGClimate activities and their associated actions are:

- Coordinate implementation and further development of the Climate Monitoring Architecture establishing and maintaining the ECV Inventory to enable the provision of a coordinated medium to long term action plan for implementation
- CEOS Reporting
- CGMS Reporting
- External Reporting to UNFCCC/SBSTA and GCOS

The following chapters will cover these activities.

3 DEVELOPMENT OF ECV INVENTORY - CLIMATE MONITORING ARCHITECTURE.

The objectives associated with ECV Inventory development are intrinsic to the fulfilment of the core objectives assigned to WGClimate in its Terms of Reference, and form a pivotal asset in the implementation of the Climate Monitoring Architecture. The activity is predicated on the concept of the “Inventory Development Cycle”.

Each WGClimate Chair has the objective of completing one inventory development cycle within their respective terms, with each development cycle corresponding to a series of CMRS actions, leading to a baseline version of the ECV Inventory.

The activity during NOAA chairmanship of WGClimate formed Inventory Development Cycle #1, resulting in Version 1 of the ECV Inventory. ESA is responsible for completing Inventory Development Cycle #2 by November 2017, and EUMETSAT for completing Inventory Development Cycle #3 by November 2019.

To successfully complete an Inventory Development Cycle, it is necessary to: Collect updated information from data providers on CDR holdings; Incorporate updated information in the ECV inventory; Quality control, in the form to verify completeness and consistency of the ECV inventory contents, as well as a critical analyse the relevance of the various data records - the removal of some irrelevant records may be necessary; Perform a gap analysis on the ECV inventory to identify missing or endangered elements in the future; Generate a coordinated action plan to address gaps/opportunities; Publish the results on completion of the cycle.

3.1 Cycle Stage #1: Collection of New & Updated Information from Data Providers

In view of the ambitious four-year work plan defined herein, Cycle #2 will predominantly make use of the existing set of questionnaires (current and future components) for the collection of updated information from data providers. The announcement of the process to request updates to the inventory records was made at the CEOS Plenary in Autumn 2015 by the incoming chair.

Regarding Cycle #3, there will be the opportunity to further adjustment of the questionnaire, and perhaps evolution of the inventory structure further described in section 3.6.2.

In contrast to the process followed for Cycle #1 for the collection of information from data providers, it is foreseen that prior to the release of any questionnaire during cycles 2 and 3, key Climate Data Record programme managers will be contacted to solicit support and "buy in" for the activity. Furthermore a strictly limited time window will be available for the update by record providers (rather than the open-ended approach followed for Cycle #1).

3.2 Cycle Stage #2: Data Incorporation and Quality Control

The Incorporation of new and updated information into the existing ECV inventory, to reach a new baseline, requires quality control, in the form of verifying completeness and consistency of the ECV inventory contents, as well as a critical analysis of the relevance of the various data records to fulfil GCOS needs - the removal of some irrelevant records may be necessary;

3.3 Cycle Stage #3: Gap Analysis

For the gap analysis activity during Cycle #2 a manual gap analysis process will be implemented initially because: a) the number of records in the inventory is expected to decrease after the verification process as irrelevant records are culled, b) it is not clear at this stage if an automated tool would greatly facilitate the process, and c) there is some uncertainty about the appropriate specification of such a tool, e.g., on the comparison of GCOS quantitative requirements to information provided for the data records which may not be directly comparable (more experience with the gap analysis process is needed and will be gained during Cycle #2).

Additionally, once more experience with the gap analysis process has been obtained, gap analysis tool(s) could be developed/procured, if felt necessary. Moreover, several teams will perform the cycle #2 gap analysis in parallel, with the work organised by thematic area. To ensure consistency of approach across the full inventory, the gap analysis work of the individual teams will be supported by a gap analysis guide document and overseen/coordinated by the WGClimate chairs supported by USGS. The outcome of the gap analysis will be a gap analysis result document that already contains recommendations for actions to remedy the identified gaps and to realise available and maybe missed opportunities.

3.4 Cycle Stage #4: Action Plan

The recommendations for actions from the gap analysis will be used to define an action plan for space agencies that is defining actions, such as internationally coordinated implementation of Climate Data Record generation, the long-term planning of needed additional space segments, etc.

The defined actions need to be agreed with the participating space agencies which will be achieved by endorsement by the CEOS and CGMS Plenaries 2017.

3.5 Complimentary Activities

Complimentary activities will be undertaken, in support of, and in parallel with, the Inventory content analysis and action planning Cycle.

3.5.1 Complimentary Activity #1: Hosting of ECV Inventory

The ECV Inventory will be hosted by EUMETSAT during the period of the four-year work plan, and connected to a WGClimate outreach website to be hosted by ESA.

3.5.2 Complimentary Activity #2: Development of Further ECV Inventory Capabilities

As described in section 3.1 there will be the opportunity to further adjustment of the questionnaire, and the evolution of the inventory structure, to accommodate for example: The new GCOS IP (expected to be available by the end of 2016), new requirements originating from C3S, and experiences from applicable projects.

To enable this evolution to take place during Cycle #3, the necessary preparatory work will take place during 2017 and will be led by EUMETSAT.

3.5.3 Complimentary Activity #3: Development/Promotion of Case Studies

This work, supervised by the EC JRC and WMO, has produced WMO 1192. The possibility exists for further involvement by an expanded team to analyse more case studies providing confidence into the functionality of the architecture for climate monitoring from space. The output of previous and potential future work will be prominently featured on the dedicated WGClimate website.

3.5.4 Complimentary Activity #4: Development and Maintenance of the WGClimate Website.

The overarching goal of the Joint CEOS/CGMS Working Group on Climate is to improve the systematic availability of Climate Data Records (CDRs) through coordinated implementation, and further development of the architecture for climate monitoring from space, to both the CGMS and CEOS communities. The objective of the WGClimate website is to provide the single authoritative location, housing the assets for which WGClimate is responsible, including the Climate Monitoring Architecture definition and the ECV Inventory, and used as the working area for WGClimate members both from CGMS and CEOS. Development of the WGClimate web site will include additional resources for CDR users (e.g. finding CDRs by using ECV Inventory, etc...).

Climate Monitoring, Research, and Services Objectives/Deliverables: 2016-2020			
Objective/Deliverable	Projected Completion Date	Background Information	Responsible CEOS Entity
Cycle #2 - Cycle Stage #1	Sep-2016	Collection of New & Updated Information from Data Providers.	WGClimate
Cycle #2 - Cycle Stage #2	Nov-2016	Data Incorporation and Quality Control	WGClimate
Cycle #2 - Cycle Stage #3	Feb-2017	Gap Analysis	WGClimate
Cycle #2 - Cycle Stage #4	Jun-2017	Action Plan	WGClimate
Cycle #3 - Cycle Stage #1	Sep-2018	Collection of New & Updated Information from Data Providers.	WGClimate
Cycle #3 - Cycle Stage #2	Nov-2018	Data Incorporation and Quality Control	WGClimate
Cycle #3 - Cycle Stage #3	Feb-2019	Gap Analysis	WGClimate
Cycle #3 - Cycle Stage #4	Jun-2019	Action Plan	WGClimate
Complimentary Activity #1	Dec-2016	Hosting of ECV Inventory	WGClimate
Complimentary Activity #2	Feb-2019	Development of Further ECV Inventory Capabilities	WGClimate
Complimentary Activity #3	Sep-2017	Development / Promotion of Case Studies	WGClimate
Complimentary Activity #4	Sep-2017	Development & Maintenance of a WGClimate Site	WGClimate

4 CEOS Reporting.

As presented by WGClimate at the 28th CEOS Plenary, all CMRS actions relating to Version 1 have been closed. Additionally, the following are the CMRS actions presented at the CEOS 2015 Plenary which were not closed, as they were either version 2 or have an

end date which surpassed the end of the Version 1 end date - these are superseded by the actions defined herein.

1. An update of the ECV inventory, with an accompanying gap analysis and action plan for Cycle #2 from Q2 2015 to Q4 2016 (CMRS-9). This is superseded by the actions defined in Part I.
2. Construction of an analysis report on implications of new climate change treaty. Q1 2017 to Q4 2018 (CMRS-11). This is superseded by the actions defined in Part IV.

5 CGMS Reporting.

The 44th plenary session of CGMS will be held from 5-10 June 2016 (Biot), hosted by EUMETSAT. The 43rd plenary session of CGMS was hosted by NOAA on 18-22 May 2015. The final status of CGMS-42 actions and recommendations resulting from CGMS-43 discussions point to one open action on WGClimate.

As raised at the CGMS-43 Plenary, an action on the Pilot FCDR Inventory (AGN Item Plen H.3.2) is to be undertaken by WGClimate to (1) Conduct an initial analysis of available FCDRs past and current available for or planned for use in the current set of SCOPE-CM projects using CEOS, CGMS, and WMO satellite data bases; (2) Identify SCOPE-CM ECV projects that are or may be able to use the above FCDRs; (3) Assess availability of the above FCDRs for the future; (4) Following the first ECV gap analysis, consider FCDRs that may be useful in assessing ECV opportunities in the future ECV gap analysis.

Finally, WGClimate will address CGMS WG-IV Action 39.51 on interoperability standards for providing and sharing of climate data records. This topic will be addressed at the next WGClimate meeting and the result of the discussion presented at the CGMS Plenary.

The WGClimate Chair will participate at future CGMS Plenaries.

Climate Monitoring, Research, and Services Objectives/Deliverables: 2016-2020

Objective/Deliverable	Projected Completion Date	Background Information	Responsible CGMS Entity
Participation at CGMS Plenaries	Jun-2016	WGClimate Terms of Reference	WGClimate
AGN Item Plen H.3.2	Jun-2016	Minutes of CGMS-43	WGClimate
CGMS WG-IV Action 39.51	November 2016	Minutes of CGMS-43	WGClimate

6 External Reporting to UNFCCC/SBSTA and GCOS

In response to an invitation by UNFCCC at SBSTA-33, GCOS submitted to COP-21 / SBSTA-43 A Status of the Global Observing System for Climate (GCOS-195), so fulfilling the responsibility of the GCOS programme to review and assess the development and implementation of the component parts of the climate observing systems. GCOS-195 reports on progress in context to the 2010 Implementation Plan and supplementary requirements related to satellite observations in 2011, and more general assessment of the capability of global observing system for climate.

GCOS-195 was supported by an updated WGClimate report to CEOS, representing the CEOS response to the requirements implementation of IP-10 and its satellite supplement, and so fulfilling CEOS Work Plan action CMRS-7.

6.1 Responding to SBSTA-43.

The draft SBSTA-43 conclusions proposed by the Chair which directly address GCOS, reveal an overlap with relevant areas of WGClimate expertise and responsibility (as defined in the WGClimate Terms of Reference), and which are listed below as WGClimate prospective activities. WGClimate [may / will] support GCOS consideration of COP-21 outcomes in their preparation of the GCOS IP 10, given item 6 of the draft SBSTA-43 conclusions proposed by the Chair and items 7 and 8 of the draft SBSTA-43 conclusions.

As defined by the WGClimate Terms of Reference, WGClimate ensures the planning and development of a response to climate information needs including the update of reports directly to SBSTA on CEOS/CGMS climate actions. The most recent response to the UNFCCC at the writing of this plan (SBSTA-43) follows an invitation at COP-20 / SBSTA-41 for the working group to provide an updated report on progress made by their member agencies.

Responding to SBSTA-44. WGClimate will participate as observer to SBSTA-44, as part of the ESA delegation.

6.2 Supporting Definition of New GCOS IP (CEOS action).

The forthcoming new GCOS Implementation Plan, requested at SBSTA-37, is expected in December 2016. As expressed at the CEOS Plenary, there is consideration as to whether the Satellite Supplement can be published in parallel with the new IP and whether WGClimate can support this schedule. Consequently, it was actioned at the CEOS SIT Plenary for the WGClimate Chair to collaborate with the GCOS Secretariat on this matter (CEOS Action 29-1). Similarly, an action was taken also for this liaison on ECVs, supporting the new GCOS IP (CEOS Action 29-2).

6.3 Reacting to Release of New GCOS IP (CEOS Action).

The new GCOS IP is expected to be available at the end of 2016, but it is not clear at the moment if this delivery will include an updated satellite supplement. Assuming the GCOS IP delivery will include the satellite supplement, this will mean that a response to the new GCOS IP will be required by the end of ESA's term at the end of 2017.

Climate Monitoring, Research, and Services Objectives/Deliverables: 2016-2020			
Objective/Deliverable	Projected Completion Date	Background Information	Responsible CEOS Entity
Responding to SBSTA	Oct-2016	As appropriate	WGClimate
CEOS Response to GCOS IP	Nov-2017	See comment above	WGClimate