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Table of Contents

1.	Welcome	5
1.1	Welcome of the host	5
1.2	Welcome of the GCOS Chair.....	5
2.	Sponsor’s remarks: Expecations and Perspective	5
2.1	WMO.....	5
2.2	IOC of UNESCO	6
2.3	UN Environment	6
2.4	ISC.....	8
2.5	Discussion on Sponsors Letter	8
3.	GCOS ACTIVITY REPORT	9
4.	GCOS GOES GREEN	10
5.	Communication	10
6.	Expert panels reports.....	10
6.1	OOPC/GOOS	10
6.2	TOPC	11
6.3	AOPC	11
6.4	Discussion	12
7.	GCOS work plan	13
7.1	Presentation of Work Plan 2019-2022	13
7.2	Climate Observation Conference.....	13
7.3	Status Report 2021 (4 th Status Report, SR4).....	14
7.4	General Discussion on GCOS Workplan.....	14
8.	evolution of observations and networks	14
8.1	Outcome of Ocean Obs 2019.....	14
8.2	Global Baseline Observing Network (GBON)	14
8.3	GCOS Surface Reference Network (GSRN)	15
8.4	Observations for Science – Han Dolman	15
8.5	Observations for and of adaptation	15
8.6	Regional Workshop	16
8.7	GCOS Cooperation Mechanism	16
9.	Partners	16
9.1	GOOS	16
9.2	IPCC	16
9.3	UNFCCC	17
9.4	GEO.....	17
9.5	ISC.....	17
9.6	WCRP.....	17
10.	Budget.....	17
11.	ToR Expert Panel Members	17
12.	Any Other Business.....	17

ANNEX 1: List of participants.....19
ANNEX 2: Agenda22
ANNEX 3: List of decisions25
ANNEX 4: Consolidated list of actions52

1. WELCOME

1.1 Welcome of the host

The host of the 27th meeting of the GCOS Steering Committee (GCOS SC), the Executive Director of the Intergovernmental Oceanographic Commission (IOC) of UNESCO, Dr Vladimir Ryabinin welcomes the members to the meeting at the UNESCO headquarters in Paris, France. He emphasises that as a committed sponsor to the GCOS programme, he is delighted to support the meeting and to provide the committee with the meeting facility.

1.2 Welcome of the GCOS Chair

Stephen Briggs, Chairperson of the GCOS SC, opens the meeting, noting the particular importance of this meeting as it will include discussions to formulate the response of the GCOS SC to the letter received from the sponsors. Stephen Briggs observes that GCOS is in good health with good structures in place to deliver on important documents such as the Status Report and the Implementation Plan; good work has been done in the definitions of the ECVs, including the completion of ECV factsheets; GCOS has a good relation with the United Nations Framework Convention on Climate Change (UNFCCC) resulting in a good interaction with its Subsidiary Body for Scientific and Technological Advice (SBSTA). Stephen Briggs thanks the GCOS Secretariat for its support and the chairs of the expert panels for the excellent job provided by the panels.

The agenda is adopted (Annex 2). The list of participants can be found in Annex 1. The list of the approved decisions and the list of the recommendations and actions can be found respectively in Annex 3 and Annex 4 of this report.

2. SPONSOR'S REMARKS: EXPECTATIONS AND PERSPECTIVE

2.1 WMO

Lars Peter Riishojgaard presents the ongoing reform and restructuring of the WMO secretariat. The main change driver is the holistic earth system approach. The body reform is driven by the new WMO strategic plan, which presents services, infrastructure and science and innovation, as three of its long-term plans, supported by two technical commissions, one for service and one for infrastructure. The infrastructure commission will have 4 standing non inter-governmental committees: earth observing systems and measuring network; methods of observations, measurements and instrumentation; data, products and information exchange and life cycle management; data processing for applied Earth system modelling and prediction. WMO secretariat will have to be restructured to align with the reform. Within WMO, GCOS activities will fall under the new Infrastructure Commission and the management of GCOS Secretariat will change from the now dissolved Climate and Water Department to the new Infrastructure Department, allowing to better exploit synergy between GCOS and related WIGOS activities. WMO would like to strengthen the links between GCOS and the WMO constituent bodies, including a better integration of the normative work of GCOS expert panels with other WMO expert teams, also in view of not duplicating work. He gives the example of the GCOS IP which had been approved by the SC and recognized, welcomed and supported by WMO Executive Council¹ and Technical Commissions, as added by the GCOS Director, but has

¹ WMO picked up on COP decision 19/CP.22 "Implementation of the global observing system for climate" at its next EC (EC-69 Decision 14) in 2017 which stated that WMO decides on supporting the development of actions based on the GCOS IP. Furthermore, WMO welcomed the new IP, recognized that CBS, CHy and JCOMM have decided to support relevant actions and endorses actions pertaining to WMO and observing systems coordinated by WMO. WMO Secretary-General has been requested to provide guidance to Members on these actions.

formally not been adopted by any WMO Constituent Body. One SC member reminded the WMO representative that the GCOS IP had been originally asked for by Parties of the UNFCCC and acknowledged by the Conference of the Parties (COP) after submission to SBSTA. WMO is asking the SC for suggestion on how best to integrate the role of GCOS within the infrastructure department.

2.2 IOC of UNESCO

Albert Fischer presents the GOOS contribution to GCOS. He presents the plans of co-sponsors regarding GCOS, noting that change can capitalize on opportunities and that GCOS partnership requires co-design of change with stakeholders and not only with sponsors. IOC is seeking clarity from WMO regarding how the change will take place and what are the timeline and the different steps in the direction of such change.

2.3 UN Environment

UNEP, represented by Hartwig Kremer, is increasingly engaging more in global monitoring, e.g. also for water variables and non-traditional observing system. UNEP engagement with GCOS is on global monitoring, information exchange, engaging for adaptation and engaging with GCOS on value chains.

He reads out a statement on behalf of UNEP:

The UN Environment Programme role as a custodian for 26 Sustainable Development Goals (SDG) indicators the recent 4th session of the United Nations Environment Assembly in its Ministerial Declaration underlines their ambition to foster sustainable development in an evidence based approach. To meet the related demand for data and information in a coordinated way UNEP Member States aim to improve national, regional and global environmental monitoring systems and technologies including for air, water and soil quality, biodiversity, deforestation. This needs to be seen in the light of global trends and includes climate change and its feedbacks. UNEP is expected to collaborate with partners technically and strategically towards promoting the use and sharing of environmental data and engaging civil society, citizens, indigenous peoples and local communities.

From an implementation perspective UNEP's mandate reflects most strongly in the above declaration asking for a "global data strategy" to be in place by 2025 and also in the resolution on "Environment under Review, Science Policy and GEO". In its center and underpinned by the global long-term data strategy governments ask UNEP to assure the promotion of environmental monitoring, assessment and the primacy of a strong science-policy interface. The implementation process relies on consultation with Governments, United Nations agencies and programmes, the secretariats of the multilateral environmental agreements, and international and regional scientific bodies. Particular attention is to be paid to regular regional and global analysis of the state and trends of environmental parameters.

Internally as well as external the success of this portfolio of tasks relies on partnerships across the UN specialized agencies and programmes, with secretariats of the multilateral environmental agreements and international and regional scientific bodies, and the observation community. It includes the standardization and utility of rigorous protocols for defining essential environmental and climate variables, their measurements, and metadata. UNEP sees this pre-conditional to achieve the core objective to move from data and assessments to action, and in collaboration with partners to provide the necessary services with the environment and affecting global trends central.

Practically, UNEP promotes a scientific focus in its foresight, horizon scanning process as well as by supporting major assessments (e.g. IPCC, IPBES, IRP, GEO, Emissions and Adaptations

Gap). It aims towards improvement of platforms that provide a repository function to allow open access to up-to-date, quality-assured, credible and relevant data, including geospatial, statistics, indicators; and to foster knowledge management, data analysis referring to environment, climate and drivers and to accommodate narratives of successful societal transformation.

As such the UNEP Data Strategy and the World Environment Situation Room stand out. In terms of empowering countries on the pathway to achieve the SDGs this includes to assist Member States, to develop their national environmental data management capacities and their environmental monitoring systems for example for air and water quality, but also encompassing climate and adaptation.

All the above maps onto the GCOS strategic targets to foster sharing appropriate, credible and quality-assured data and information resources to support the environmental dimension of sustainable development assessment processes. And, UNEP looks forward towards a renewed and targeted cooperation with the observing systems in contexts of Essential Climate Variables (ECV) and to emphasize those for water, air, oceans and land which are critical for UNEP's mandate.

Equally important for UNEP is the GCOS effort to review existing ECVs and elaborate on new ones qualifying as indicators "of" as well as indicators "for" climate adaptation. Those will be a critical service to societal transformation and inform transition pathways, their opportunities and risks considering a changing climate and related global trends. We see overlaying information on drivers, global and regional trends_such as demography, climate forcing and development, including investment in adaptation with geospatial information critical and strive for making this available to multiple, including non-traditional targeted audiences.

In the adaptation context and while contributing actively to the respective GCOS Task Team, UNEP in collaboration with partners including the WMO is further developing the World Adaptation Science Programme (WASP). This is a field of expected expanding relevance of the UNEP collaboration with GCOS.

Following its launch in COP 24, the WASP has been further developed and is aiming towards delivery of strategic products in 2019 and subsequent. Recalling its mission is to ensure end-users have the knowledge and capacity to underpin effective adaptation to climate change, the work focuses primarily on provision of climate science and policy products and services supporting science-policy processes led by UNFCCC, IPCC and the GCF. We see here complementarity with GCOS and also addressing the service orientation of the WMO reform since WASP aims at promoting science for climate change adaptation policy and action, practically by:

- Providing scientific data, information and knowledge on climate change vulnerabilities and impacts, in conjunction with the consequences and risks of adaptation response actions versus inaction;
- Facilitating knowledge transfer and sharing, and
- Better linking science to policy, finance, innovative solutions and actions.

WASP shall be catalytic to foster delivery of climate change adaptation products and services by:

- Identifying research priorities on climate change adaptation to bridge the science-policy gap;
- Co-organizing the biennial international Adaptation Futures conference series;
- Supporting the production of the report on the global Adaptation Gap; and
- Facilitating the knowledge-sharing on climate change adaptation.

In the recent year new members joined, the International Development Research Centre (IDRC) and Climate-KIC which engage in the Policy and Finance Committee. Upcoming and mid-term products/activities comprise:

- Adaptation Futures April 2020, India:

WASP and UNEP with Energy and Resource Institute (TERI) of India, envisage to advance the overall theme of 'accelerating adaptation action and knowledge to support action'. The conference seeks to explore this overarching issue through multiple thematic tracks including:

- Governance of Adaptation;
- Limits to Adaptation;
- Fairness and Equity in Adaptation;
- Knowledge for Action;
- Nature Based Solutions; and
- Financing Adaptation.

WASP will display and introduce the Adaptation Futures Conference at COP25 at the India Pavilion and at the IPCC & WMO joint Pavilion (Dec. 2019).

Immediate will be the final draft of the "report on the current status, gaps and potential priorities on the climate change adaptation research". It reflects on the current status, gaps and potential priorities of climate change adaptation research. Inputs are being compiled and synthesised from the WASP members, NCSE, DG Research & Innovation, IDRC etc. The draft will be ready end 2019.

The WASP also recently started the production of targeted Position Papers. For this purpose, the Science Committee has formed an Ad Hoc Working Group (Jean Palutikof, Mark New and Richard Klein) and initial products shall be available for the AF2020. The topics are:

- (1) adaptation to high-end climate change risks;
- (2) adaptation decision tools and platforms; and
- (3) adaptation to transboundary climate risks.

Finally, WASP SC engages in supporting the Adaptations Gap Report, the scoping for which will start in 15-17 Jan 2020 in Copenhagen, Denmark.

In summary the UN Environment Programme is looking forward to close collaboration with GCOS and its panels and task team and to further develop the whole value chain of data and information towards societal transition. The Member State expectations and work on monitoring and adaptation shall inform and guide the discussions on renewing the collaborative framework.

2.4 ISC

The representative of the International Science Council, Mathieu Denis, will report in agenda item 9.5.

2.5 Discussion on Sponsors Letter

The letter dated 25 October 2019 from the four GCOS sponsors WMO, IOC of UNESCO, UNEP and ISC to the GCOS Steering Committee is discussed. The SC is asked to advise all sponsors on how best the role of GCOS can be integrated in the new WMO structure. The unique role of GCOS in addressing observations in support of the Earth cycles across domains was noted. This integrating function of GCOS is critical and should be maintained in any future implementation among sponsors. Climate change is complex and its monitoring and further

study requires an interdisciplinary structure like GCOS, with connections to many different communities not necessarily covered by WMO. Climate observations come from a wide number of partners and while WMO can offer an opportunity to cover some of the aspects needed for climate observations, it is clear that it will not be able to cover marine ecosystem nor land surface. One member recalls that the Permanent Representative of a Country to WMO is supposed to represent more than just its meteorological service. The challenge therefore is on how to use the support that WMO can offer in building new partnerships and looking at opportunities coming from new structures without leaving the other important communities out. The importance to have an observing system which goes beyond organizational structures is for example clearly reflected in the key role of GCOS for UNFCCC and for space agencies. It is finally noted that the discussion on the future of GCOS needs to include not only the sponsors but a wider community which includes other stakeholders, which are both the beneficiaries of GCOS and the communities providing input to GCOS's work.

The Executive Director of IOC recommends to call in a consultative meeting with broader stakeholder community including UNFCCC, IPCC, WCRP and the observing systems GOOS, WIGOS and whatever can be considered as element of a "GTOS". The chairman supports this idea and noted that one needs to differ between sponsors and stakeholders, and that among the latter there are contributors and beneficiaries, e.g., Copernicus, ESA Climate Change Initiative, ICOS, etc. The WMO representative supported such a meeting in addition to the WMO internal consultation and change management process as it would clearly add clarity to the role of GCOS and its panels.

Number	Action	Responsibility	Notes
SC-27/1 Recommendation	Organize a consultative meeting with broader stakeholder community to support pro-actively the WMO change management process.	GCOS Secretariat	

The participants continued to discuss the role for the Steering Committee which is seen as an agile body able to set the agenda for GCOS as it is not to inhibited by institutional constraints. The SC members drafted a bullet list of key statements which became part of the response of the SC² to the sponsors letter.

The members also recommended the valuable network of experts established through the GCOS panels, and the working processes set up by the programme which are efficient and effective.

3. GCOS ACTIVITY REPORT

Carolin Richter, Director of the GCOS secretariat, presents the GCOS activity report. She notes that the strategy has not been approved by WMO yet. GCOS SC chair requests sponsors to respond to request to approve submitted documents by either approving them or explaining why they are not approved in a reasonable time. The GCOS Green strategy was approved by WMO but the SC is asked to come back with a more ambitious strategy. The SC notes with interest that many of the extra-budgetary contribution depend on an operating and independent GCOS secretariat. In that regard, the committee commended the role of the Director of the secretariat for her good work and that she is able to sustain all these processes by fundraising a significant amount of extra-budgetary resources.

² The response letter from the GCOS SC to the sponsors letter has been sent on 7 November 2019.

4. GCOS GOES GREEN

It is discussed how to implement guidelines from the GCOS Goes Green strategy. Yearly panel meetings are seen as necessary to move the work of the panels ahead. One of the possibility is for the SC to meet every two years, with task teams on specific topic to work online in between meetings. The SC asks the secretariat to propose a possible plan about how biannual meetings could be organized.

Number	Action	Responsibility	Notes
SC-27/2 Action	Propose a plan on how biannual SC meeting with intermediate online meetings of task teams, could be organized.	GCOS Secretariat	4. GCOS Goes Green

5. COMMUNICATION

Valentin Aich presents the new GCOS logo. He also introduces the new website climatedata.wmo.int, which is planned to go online on the 1st of November 2019³. To give GCOS a better visibility, the SC asks the Secretariat to change the text in the landing page of the website to include a mention to GCOS.

With regard to the ECV Factsheets, the SC members recognize that the panels have made different decisions with regard to the ECV stewardship. The SC recommends to explicitly list the data providers.

Number	Action	Responsibility	Notes
SC-27/3 Action	Change title of section in the climatedata.wmo.int from "Essential Climate variables" to "GCOS Essential Climate Variables".	GCOS Secretariat	5. Communication

6. EXPERT PANELS REPORTS

6.1 OOPC/GOOS

Bernadette Sloyan, chairperson of OOPC, presents the work and progress of the OOPC. The Joint Panel Meeting was very successful in fostering and increasing interaction between the members of the different panels. Actions for the next years include the harmonization of requirements for EOVS and ECV observations, which will result in new, coherent requirements table developed for EOVS Specification Sheets, compatible with both GCOS reporting needs and WMO RRR; activity on ocean heat and freshwater storage; activity on air-sea heat fluxes; project on boundary systems. Bernadette Sloyan notes that the main challenges OOPC faces are securing funding for end-to-end ocean observing system; the complexity of setting requirements for various users and the complexity of the coordination role of OOPC, within GOOS, to meet GCOS planning and reporting processes. She reports progress in how data are collected, processed and made inter-comparable. While physics and geochemistry data are at a same maturity, the biological data are at a different stage: data is collected, but there is still the need to bring together the networks internationally. Coastal zones are important but

³ The launch of the website has been further delayed due to an incomplete internal approval process.

difficult to observe, and it is important to work together with the modelling community as the time resolution needed to observe the boundary of the ocean cannot be achieved by observations only.

One SC member asks about the connection between GOOS and IPCC and how to increase the interaction between IPCC and its working groups and OOPC, in order to better address seasonal outlooks and regional scales. Another SC members would like to discuss cross-cutting observations for extreme events and wonders if ECVs would need to be extended with regard to an Earth System approach.

The OOPC does not see the need to add any new ECVs. Overseeing GOOS physics, as well as delivery into Climate (through GCOS), operational services (through WMO), research applications (through WCRP) requires appropriate secretariat support. Bernadette Sloyan notes that the current allocation of one OOPC secretariat is not adequate and asks the SC for additional secretariat support. Finally, she announces that she will be stepping down as the chairperson of OOPC after July 2020.

6.2 TOPC

Wolfgang Wagner, chairperson of TOPC, acknowledges that the Joint Panels Meeting in March 2019, in Marrakesh, was very successful for fostering cross-cutting discussion and that yearly meeting of the panel are needed to ensure the coherence of the group. The composition of TOPC has changed to include more women and younger members, all of them keeping good connections with different communities. However, within the panels it is not possible to cover all the topics and therefore TOPC relies on the ECV stewards in order to reach out to the broader community and to acknowledge the experts who are not members of TOPC for their work. The working arrangement for TOPC is the online forum, which facilitates discussion amongst panel members and the wider ECV community and is now open for all experts with invitation. At the moment the TOPC online forum counts 48 members and it is hosted by the TU Wien Department of Geodesy and Geoinformation, which has offered to continue hosting the forum. TOPC is revising the terrestrial ECV product requirements and a first consolidate version will be ready for the open review starting in January 2020, according to GCOS time plan. In terms of requirements, adaptation and extremes are seen as having an impact in terms of spatial resolution and frequency. Finally, he announces that he is stepping down as the chairperson of TOPC and that the role will be taken up by Thelma Krug, who brings a strong link to IPCC.

6.3 AOPC

Kenneth Holmlund, chairperson of AOPC, acknowledges the success of the Joint Panels Meeting especially regarding the cross-cutting work with the other panels. He notes that at the moment AOPC has fewer members than expected. However, new panel members will be considered when implications of WMO restructuring is known. A key focus for AOPC during the past year has been the updates of the ECV product definition and requirements. Atmospheric composition requirements are being updated in collaboration with GAW. Progress has been made also in implementing the GCOS IP actions. GUAN and GSN Network monitoring shows further deterioration in data availability and a possible way forward will be discussed in item 8.2 of the agenda. GRUAN is still expanding to include more stations, and its Lead Center is supported by the DWD, who has recently added a staff position. In response to the request of the AOPC chair, the SC agrees to close the two task teams "Use of radar for climate study" and "GUAN", as they have completed their work. The ongoing value of the GUAN was supported by the Global Basic Observation Network (GBON) meeting (July 2018) and GCOS will work on an updated GUAN in collaboration with the GBON proposal. Details are summarized in section 8.2 of this report. The SC agrees to keep the task team TTLOCA on lightning observations for

climate open until next AOPC meeting where a new ToR will be presented to be evaluated by AOPC. It agrees as well to keep the TT on GSRN open for additional 2 years to help with the first phase of the implementation. Details on the GSRN are discussed in 8.3. The SC congratulates AOPC for closing two task teams. Kenneth Holmlund asks the SC for guidance on how to update the atmospheric ECV products requirements in OSCAR. At the moment, the OSCAR database is populated with the requirements from the GCOS IP Annex A. However, progress has been made in the last years by the AOPC panel and some of the requirements have been updated and in cases significantly improved. The question raised is whether the update should be reflected in OSCAR/requirements database. The GCOS IP Annex A values should be kept until next update of the IP, which will be ready in 2022. Finally, AOPC chair is asked by the SC to check with the joint CEOS-CGMS WGClimate, responsible for the ECV inventory, to ensure that they are acknowledging data records in the ECV inventory are only satellite based.

6.4 Discussion

The GCOS expert panels chairs bring to the SC attention their concern about the WMO Catalogue for Climate Data. The assessment of products for inclusion in the catalogue is based upon the application of a so-called stewardship maturity matrix which considers aspects of data access, usability and usage, quality management and data management and is described in the Manual on High-Quality Global Data Management Framework for Climate, which was approved in WMO CG-18 Resolution 22.

GCOS was involved in the process via the Secretariat, and several GCOS expert panel members raised concerns during the process.

The GCOS panel members have expressed significant reservations about the role of the catalogue. In particular, the decision on entry to the catalogue is based solely upon data stewardship maturity assessment, which does not at all guarantee that the proposed dataset has sufficient scientific quality, nor that it is supported and used by the science community. This can lead to the following problems:

- Implied assumptions that certain datasets are better than others based purely upon data stewardship maturity, which may not at all be correlated with the scientific quality of the data;
- Potential negative impacts for any newer datasets (these will always by definition be “less mature” than older dataset) with knock-on impacts regarding the potential for future funding of new and novel dataset creation efforts;
- Potential grandfathering of data products whereby products that have mature processing aspects get promoted over new versions of products from the same group.

As stated in the document, the authority to propose datasets is now assigned to an “authoritative source” which is not clearly defined. The website hosting the assessed datasets affirms that “An initial 18 global climate datasets have been so far submitted by international domain Subject Matter Experts (SMEs) and assessed”, without further explanation on who these SMEs are or the process for their selection.

The data provider can assess their own datasets and submit their assessment for the data to be added on the catalogue, which leads to a lack of transparency in the process. The approach is not consistent with other approaches such as the one of the ISC World Data System.

Both the GCOS Secretariat and several GCOS Expert Panel members provided comments to the Manual on High-Quality Global Data Management Framework for Climate. However, the final version of the document that was submitted to Congress was finalized without GCOS approval and without taking these comments into account. The climate data catalogue website was implemented responding to the request of the CG-18 resolution 22.

Regarding the implementation of the climate data catalogue website, the three GCOS experts panels are concerned with the following:

- That the WMO Climate data Catalogue does not point to any datasets, but rather to the KNMI climate explorer;
- That the assessments are not openly made available on the web and will be only made available by request;
- The fact that WMO has chosen to point to third party providers of the products rather than to the original sources raises concerns about version divergence and proper acknowledgement /citation.

This effort is a duplication of other efforts like EUMETSAT's ECV Inventory, Copernicus Climate Data Store, CEOS/CGMS WGClimate activities (to date 1300+ recorded datasets) and potentially several others.

At this point, the GCOS Panels have not been involved in the selection of the datasets published, nor do they have any insight into what "other authoritative sources" have made these recommendations or which "established scientific foundation and quality criteria" they used as a basis for them.

Based on this information the SC decides to withdraw the name of GCOS from the website until these issues can be resolved and asks the GCOS expert panel chairs to inform the president of the infrastructure commission to inform him of these concerns.

Number	Action	Responsibility	Notes
SC-27/4 Action	Inform the president of the infrastructure commission of the panel's concerns on the WMO Climate Data Catalogue.	GCOS Panel Chairs	6. Discussion on the WMO Climate Data Catalogue
SC-27/5 Action	Withdraw the name of GCOS from the website on the WMO Climate Data Catalogue.	GCOS Secretariat	6. Discussion on the WMO Climate Data Catalogue

A discussion on whether is necessary for GCOS to start looking into additional application areas leads to the following recommendation:

The SC will form a Task Team that will investigate whether GCOS should add process studies to its application areas.

Number	Action	Responsibility	Notes
SC-27/6 Action	Investigate whether GCOS should add process studies to its application areas.	GCOS Steering Committee	6. Discussion on GCOS Application Areas

7. GCOS WORK PLAN

7.1 Presentation of Work Plan 2019-2022

Carolyn Richter presents GCOS work plan for 2019-2022, noting that it has been approved by the 30th IOC Assembly in July 2019.

7.2 Climate Observation Conference

The SC adopts Decision 7.2 on holding a 2nd Climate Observation Conference in October 2021.

An ad-hoc task force outlines a draft conference concept, see annex of Decision 7.2.

7.3 Status Report 2021 (4th Status Report, SR4)

The skeleton of next Status Report to be published in 2021 is adopted by the SC (Decision 7.3). The panel chairs express their concern on the workload for the panel members. However, it is noted that this is not significantly different of the work done for last Status Report and that the panels are already working on many of the significant input for the SR4. The SC asks the Secretariat to include in the SR4 consideration of the 6th assessment report and special reports.

Decision 7.3 is adopted.

7.4 General Discussion on GCOS Workplan

The decision 7.4 on GCOS work plan and timeline is adopted with the addition of the consideration of the adequacy of observations for the Global Stocktake.

8. EVOLUTION OF OBSERVATIONS AND NETWORKS

8.1 Outcome of Ocean Obs 2019

Toste Tanhua reports on the outcome of OceanObs' 19, that took place in September 2019. The conference included a wide range of themes and aspects, such as interoperability, innovation and integration. The challenge to make the connections from the data provider to the end users was acknowledged, as well as the fact that the community needs guidance on priorities and overall performance and integration of the observing system. GOOS will produce an implementation plan using output from OceanObs' 19. Carolin Richter congratulates Toste Tanhua on the success of OceanObs' 19. Hartwig Kremer, on behalf of UNEP, indicates that UNEP is interested to work together with GOOS, especially regarding marine litter and plastics.

8.2 Global Baseline Observing Network (GBON)

Lars Peter Riishojgaard presents an update on the GBON. GBON supports the three WMO Application areas Global Numerical weather prediction, climate monitoring and climate applications. GBON is a Congress-approved WMO policy that will help achieving adequate supply of observations to global NWP systems providing basis for weather and climate services to all WMO Members. The need for global exchange of weather and climate observations is well understood, and yet there is a lack of observations. This is due to the fact that both the WMO Convention and the Paris Agreement implicitly assume national responsibility for observations and some countries are unable to provide observations. The recognized problems are data policy, technical capabilities and financial resources. The SC is interested in knowing how the GBON concept will play a role for climate observations. It is well understood that there are more requirements for climate. However, by preventing GUAN station's closure, GBON will ensure that GUAN station will continue to provide observations adequate for climate monitoring. GBON is a global design that is based on the OSSE studies and it is not easy to translate the concept to other application areas. A workshop in December 2019 will try to address this issue⁴. It is important for GCOS to work with WIGOS to determine how the networks GSN, GUAN and BSRN can contribute to the GBON's support to climate monitoring as well as the relationship of the GCOS reference networks to GBON. Therefore, decision 8.2 on the collaboration of GCOS with WIGOS on GBON is adopted.

The SC is asked for comments to WIGOS on the concept note produced in July. The secretariat will provide the concept note to the SC.

⁴ This workshop is postponed to 2020.

Number	Action	Responsibility	Notes
SC-27/7 Action	Provide comments to WIGOS on the concept note produced in July (to be provided to the SC members by the GCOS Secretariat).	GCOS Steering Committee	8.2 GBON

8.3 GCOS Surface Reference Network (GSRN)

Ken Holmlund presents the progress of the AOPC Task Team on the GSRN. The team has produced a report, approved by GCOS and published in 2019, that provides a proposal for the establishment of a GSRN. Recommendations from the task team to proceed to implementation are the approval of the proposed GSRN by relevant WMO programmes, the GCOS programme and other sponsors; the establishment of a Lead Center which requires an offer to host and staff appropriately the proposed Lead Centre and offers of suitable sites for an initial GSRN. The SC agrees on the importance of implementing the GSRN report and asks the GCOS Secretariat to work towards the recommendations and to present a draft decision to the upcoming 72nd session WMO Executive Council, in June 2020. Decision 8.3 is approved.

8.4 Observations for Science – Han Dolman

At the Joint Panels Meeting (JPM) in March 2019 it was decided to prepare scientific papers on observations strategy for each of the Earth System cycles. Based on discussions held during the JPM, four papers are in preparation:

- Energy Cycle: Heat stored in the Earth system: Where does the energy go?’ to be published on Earth System Science Data by December 2019, in time for the IPCC deadline;
- Water Cycle: Consistent monitoring of water cycle variability with Earth observations: What are we missing? with possible submission to BAMS;
- Carbon Cycle: A story Arc for the Carbon Cycle Paper;
- Biosphere: Observations sufficient to explain climate-induced changes in the global biosphere to be submitted to Global Change Biology.

Authors for all these papers include experts from the GCOS and the WCRP community as well as experts from the broader scientific community. While significant progress has been made for all 4 papers, it is likely that the papers are not going to be ready for the IPCC deadline of December 2019, and it is agreed to extend the deadline and have the papers published before the Climate Observation Conference where they will be then introduced.

8.5 Observations for and of adaptation

The work of the TOPC Task Team on adaptation is presented. The SC made a strategic decision that a global observations system can contribute both to supporting adaptation and also can monitor the progress and implementation of adaptation. The work of the TOPC TT on adaptation has showed that this is possible and has provided an example. However, it is perceived that there is not enough expertise in the panels to be able to answer the questions on identifying the observations needed to support to existing National Adaptation Plans (NAPs) and evaluate whether these observations are covered by the existent ECVs. In order to decide how to move forward in the topic of adaptation, the SC requests that a TOPC Task Team finalizes the report, further refines the analyses of the adequacy of at least 5 ECVs in their current form to inform categories of adaptation identified in the existing NAPs on the UNFCCC website, and identifies next steps to be taken. This is reflected in decision 8.5.

8.6 Regional Workshop

In July 2019 GCOS together with WIGOS organized a workshop in Belize. From all three GCOS regional workshops held so far (South Pacific, Eastern Africa and Caribbean) the same message has been clearly articulated: Short-term project funding from international donors does not lead to sustainable, systematic observation of the climate. Piecemeal funding has caused a range of issues for effective operation and has not established sustainable long-term operation. There are no plans for the next regional workshop but some indications that it will be held in central Asia and focussing on non-strictly NWP variables such as for example glaciers.

Noting that GCOS had been requested by UNFCCC to hold regional workshop and the success of the previous 3 regional workshops, the SC agrees on the further planning of additional regional workshops, and in particular asks that GCOS should jointly with WIGOS continue to hold regional workshop to explore regional implementation issues and identify important observations, subject to available funding. This is reflected in decision 8.6 which is adopted.

8.7 GCOS Cooperation Mechanism

The GCOS Cooperation Mechanism (GCM) was established following a decision by the UNFCCC SBSTA in 2004 and it is the system improvement and resource mobilization activity of the GCOS programme. Even though at the moment it is mostly concerned with upper-air observations, it can be used for any observation and Tim Oakley welcomes other panels to propose other possible networks. The GCM Mechanism addresses one problem at the time for one station and it is an example of how targeted work can work. However, funds are limited and the mechanism for promoting new funding do not always have the desired impact. The open question is now how does the GCOS Cooperation Mechanism fit into the future WMO structure, a question the SC needs to address while considering the request of an alignment of GCOS to WMO.

9. PARTNERS

9.1 GOOS

Toste Tanhua presents the GOOS strategy, that has been adopted by IOC and WMO congress. Ocean information will be essential to supporting evidence-based decisions on the pathway to sustainable development, many of the SDGs are not sustained by observations and therefore a better observing system is needed. The mechanism to transfer information from observations to users has also to be improved. GOOS envisions a fully integrated 2030 ocean observing system as providing the critical ocean information needed to address climate change, generate forecasts, protect ocean health and support sustainable growth, and with participation involving all nations.

9.2 IPCC

Youba Sokona presents the IPCC Sixth Assessment (AR6), that will inform the Global Stocktake in 2023. He outlines the different working groups, and points out to the relevance of GCOS for each of them. He also presents the knowledge and data gaps from the IPCC Special Report on Climate Change and Land (SRCCL), and from the IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC). The SRCCL includes studies on desertification, land degradation, food security and a chapter that provides the interlinkage between those. In the SROCC it is acknowledged that availability of observations and improved models together with improved methodologies is leading to improvement in uncertainty. However, the detection of trends has been limited, due to shortened of the record data gaps, data treatment algorithms, as well as not harmonized classes. Gaps remain in deep ocean temperature and salinity measurements for sea-level and closure of the energy budget. Gaps in oxygen and

carbon measurements dense enough to measure de-oxygenation of the world ocean and track the mechanisms driving the ocean carbon cycle.

9.3 UNFCCC

Florin Vladu summarizes GCOS activities related to UNFCCC, in particular the role that the GCOS IP 2016 has in relation to UNFCCC. He also notes that it is important to identify, understand and make use of all entry points for the GCOS contribution to supporting Parties to implement the Paris Agreement.

It is also important to consider specific Global Stocktake needs and assess if any changes are needed on the ECVs, ECV products or product requirements to address those needs.

9.4 GEO

Sara Venturini suggests areas of possible collaboration between GEO and GCOS, such as activities focussing on terrestrial observations, support of GEO to GCOS to monitor adaptation, and possible joint activities, such as for the climate observation conference. She also informs that GEO is establishing a Climate Working Group which ToRs are being discussed by the GEO Executive Committee and are expected to be approved in March 2020. The GEO Climate Working Group will greatly benefit of GCOS' and other partners' involvement.

9.5 ISC

Mathieu Denis provides an overview on the ISC status and work plan. He announced that early 2020, ISC will invite to a first leadership meeting of chairs of ISC co-sponsored initiatives to which, inter-alia, GCOS, GOOS and WCRP will be called upon.

9.6 WCRP

Pascale Braconnot provides a summary of WCRP structure and activity. The two main areas of interaction between GCOS and WCRP are the requirements for the earth's cycle and the work done by the WDAC panel. The chairman recommended to hold a working meeting between WCRP and GCOS to discuss the specific observational needs and uncertainties.

10. BUDGET

Carolin Richter presents the budget to the SC, noting that due to lack of funds, there is a possibility that the GCOS expert panels meeting will be held remotely this year. The budget is endorsed .

11. TOR EXPERT PANEL MEMBERS

Carolin Richter presents the updated version of the ToR for expert panel members, that now includes the suggestions from the SC-26. Decision 11 is approved.

12. ANY OTHER BUSINESS

The response from the SC to the letter from the sponsor's is further discussed. The general text for the letter is agreed. The letter will be sent to the sponsors shortly.

The SC suggests to change the format of the presentations from the partners and sponsors for the next SC meeting, by asking them to focus on the role of GCOS and on their expectations from GCOS rather than delivering a generic presentation on their activities.

The SC requests the GCOS Secretariat to provide all documents for the SC committee, including panel reports, an update on progress on the IP actions and any requests from the panels to the SC, two weeks in advance of the SC meeting.

Number	Action	Responsibility	Notes
SC-27/8 Action	Provide all documents for the SC committee, including panel reports and an update on progress on the IP actions and any requests from the panels to the SC, two weeks in advance of the SC meeting.	GCOS Secretariat	12. AOB

The meeting closes at 12:00. A tentative date for the SC meeting in 2020 is set for the week October 26 – 30, 2020. The location is still to be decided, though the default is at WMO headquarters , Geneva.

ANNEX 1: LIST OF PARTICIPANTS

Members of the GCOS Steering Committee	
<p>Prof. Stephen BRIGGS (Chairman) GCOS Secretariat c/o WMO 7 bis, avenue de la Paix P.O. Box 2300 CH-1211 GENEVA 2 Switzerland</p>	
<p>Dr Sue BARRELL Honorary Affiliate, Bureau of Meteorology GPO Box 1289 MELBOURNE, VIC 3001 Australia</p>	<p>Dr Qingchen CHAO Deputy Director General China Meteorological Administration National Climate Center No. 46 Zhongguancun Nandajie Haidian District, BEIJING 100081 China</p>
<p>Prof. Albertus Johannes DOLMAN Department of Earth Sciences VU University Amsterdam De Boelelaan 1085 1081 HV AMSTERDAM The Netherlands</p>	<p>Dr Johnny JOHANNESSEN Nansen Environmental and Remote Sensing Center Thormøhlensgt. 47 N-5006 BERGEN Norway</p>
<p>Dr Amos KABO-BAH Department of Energy and Environmental Engineering, UENR Box 214, Sunyani, Ghana Earth Observation Research and Innovation Centre (EORIC) Box 214 SUNYANI Ghana</p>	<p>Dr Hartwig KREMER UN Environment (UNEP) Head of GEMS Water Unit; and Climate Technology Centre and Network (CTCN) P.O. Box 30552 NAIROBI 00100 Kenya</p>
<p>Dr Rodney MARTINEZ GÜINGLA (Not available) WMO Representative for North America, Central America and the Caribbean Development and Regional Activities Department World Meteorological Organization San José - Costa Rica</p>	<p>Dr Sybil SEITZINGER Director, Pacific Institute for Climate Solutions University of Victoria P.O. Box 1700 STN CSC VICTORIA V8W 2Y2 Canada</p>
<p>Dr Youba SOKONA Special Advisor on Sustainable Development South Centre 17-19 Chemin du Champ d'Anier 1211 PETIT-SACONNEX Geneva</p>	<p>Mr Kazuto SUDA Director, Atmospheric Environment Division Global Environment and Marine Department Japan Meteorological Agency 1-3-4, Otemachi, Chiyoda-ku TOKYO 100-8122 Japan</p>

<p>Dr Toshio SUGA Department of Geophysics Graduate School of Science Tohoku University Aoba-ku SENDAI 980-8578 Japan</p>	<p>Dr Michael ZEMP World Glacier Monitoring Service (WGMS)/ Department of Geography University of Zurich Winterthurerstrasse 190 8057 ZURICH Switzerland</p>
Ex-officio Members	
<p>Dr Kenneth HOLMLUND (Chair, AOPC) Head, Remote Sensing and Products Division EUMETSAT Eumetsat-Allee 1 64295 DARMSTADT Germany</p>	<p>Dr (Ms) Thelma KRUG (Future Chair, TOPC) National Institute for Space Research (INPE) Av of Astronauts, 1758 -. Garden of Granja São José dos Campos / SP - CEP 12227-010 Brazil</p>
<p>Dr Bernadette SLOYAN (Co-Chair, OOPC) Research Scientist CSIRO Oceans and Atmosphere Flagship GPO Box 1538 HOBART TAS 7001 Australia</p>	<p>Prof. Wolfgang WAGNER (Chair, TOPC) Vienna University of Technology Centre for Water Resource Systems Karlsplatz 13/222 A-1040 VIENNA Austria</p>
Invited Experts	
<p>GOOS co-chair Dr Toste TANHUA GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel Düsternbrooker Weg 20 D-24105 KIEL Germany</p>	<p>WMO Commission for Basics Systems (CBS) Mr Michel JEAN (Not available) Meteorological Service of Canada (MSC) Director General, Environment Canada 2121 Transcanada Highway DORVAL Canada</p>
<p>UNFCCC Mr Florin VLADU Adaptation Programme Climate Change Secretariat, UNFCCC Platz der Vereinten Nationen 1 53113 BONN Germany</p>	<p>GEO Dr Sara VENTURINI GEO Secretariat 7 bis, Avenue de la Paix P.O. Box 2300 1211 GENEVA 2 Switzerland</p>
<p>WCRP Ms Pascale BRACONNOT Laboratory for Climate and Environmental Sciences (LSCE) Institut Pierre-Simon Laplace (IPSL) 91190 GIF SUR YVETTE France</p>	

Sponsors	
<p>WMO Dr Lars-Peter RIISHOJGAARD World Meteorological Organization (WMO) WIGOS Project Manager P.O. Box 2300 1211 GENEVA 2 Switzerland</p>	<p>International Science Council (ISC) Mr Mathieu DENIS International Science Council (ISC) 5, rue Auguste Vacquerie 75016 PARIS France</p>
<p>IOC/UNESCO Dr Albert FISCHER Director GOOS Project Office, Ocean Observations and Services Section Intergovernmental Oceanographic Commission of UNESCO 1, Rue Miollis 75732 PARIS Cedex 15 France</p>	<p>UN Environment Programme (UNEP) Represented by Dr Hartwig KREMER</p>
GCOS Secretariat Staff	
<p>Dr Carolin RICHTER Director GCOS Secretariat</p>	<p>Dr Caterina TASSONE Scientific Officer, AOPC GCOS Secretariat</p>
<p>Dr Valentin AICH Junior Professional Officer GCOS Secretariat</p>	<p>Mr Tim OAKLEY GCOS Network Manager GCOS Secretariat</p>

ANNEX 2: AGENDA

Monday 28 October 2019						
Time	N°	Item	Presenter	Details/ Targeted Outcome	Documents	
14:00	1.	Welcome				
	1.1	Welcome of the host	Albert Fischer		<ul style="list-style-type: none"> List of participants Doc. 1.0 Agenda 	
	1.2	Welcome of the GCOS Chair	Stephen Briggs	Adoption of the Agenda	<ul style="list-style-type: none"> SC26 Report, FMI, Helsinki, Finland, 2018 	
14:30	2.	Sponsor's Remarks: Expectations and Perspective				<ul style="list-style-type: none"> Sponsors Letter
	2.1	WMO	Lars Peter Riishojgaard	<ul style="list-style-type: none"> WMO Reform and Restructuring of Secretariat 	<ul style="list-style-type: none"> MoU 1998 GCOS Programme Review: Synthesis report, GCOS-181 New WMO structure (presented at Townhall meeting 4 October 2019) 	
	2.2	UNESCO-IOC	Albert Fischer			
	2.3	UN Environment	Hartwig Kremer			
	2.4	ISC	Mathieu Denis			
	2.5	Discussion on Sponsors Letter				
15:30	Coffee Break					
	2.5 Cont	Discussion on Sponsors Letter (Continued)				
	3.	GCOS Activity Report	Carolyn Richter	Information on: <ul style="list-style-type: none"> Activity report Joint Panel Meeting 2019 Time plan GCOS until 2022 	<ul style="list-style-type: none"> Document 3.0, Activity report JPM report, GCOS-228 GCOS Time plan until 2022 List of key meetings 	
	4.	GCOS Goes Green	Valentin Aich	<ul style="list-style-type: none"> Presenting the Green Strategy Report and Statistics 	<ul style="list-style-type: none"> GCOS Goes Green 2019 GCOS Green Preliminary Report 	
	5.	Communication	Valentin Aich	<ul style="list-style-type: none"> GCOS Website Climate data Website ECV Factsheets 	<ul style="list-style-type: none"> ECV Factsheets 	
17:30	Adjourn					
Tuesday 29 October 2019						
Time	N°	Item	Presenter	Details/ Targeted Outcome	Documents	
09:00	6.	Expert Panels Reports		<ul style="list-style-type: none"> Focus on critical issues and request for guidance from Steering Committee Joint Panel Meeting Outcome 	JPM Report, GCOS-228	
	6.1	OOPC/ GOOS Panels	Bernadette Sloyan			
	6.2	TOPC	Wolfgang Wagner			
10:30	Coffee Break					
10:50	6.3	AOPC	Ken Holmlund			
	6.4	Discussions		<ul style="list-style-type: none"> WMO Climate Data Quality Assessment New application areas for ECV requirements? 	<ul style="list-style-type: none"> Draft manual High Quality Global Data Management Framework for Climate 	
12:30	Lunch Break					

14:00	7.	GCOS Work Plan			
	7.1	Presentation of Work Plan 2019 - 2022	Carolin Richter		<ul style="list-style-type: none"> GCOS Workplan and Guidelines for updating the GCOS 2015 Status Report and the 2016 Implementation Plan - v7, 11 July 2019
14:30 – 15:30		Guided Tour Through Arts in UNESCO	Julie Durand (UNESCO staff)		
15:30	Coffee Break				
	7.2	Climate Observation Conference	Carolin Richter	<ul style="list-style-type: none"> Decision 	<ul style="list-style-type: none"> Decision 7.2
	7.3	Status Report 2021	Carolin Richter	<ul style="list-style-type: none"> Decision 	<ul style="list-style-type: none"> Decision 7.3
	7.4	General Discussion on GCOS Workplan	Carolin Richter	<ul style="list-style-type: none"> Decision 	<ul style="list-style-type: none"> Decision 7.4
17:00	Adjourn				
19:00	Dinner (self-paid, more information will be provided)				
Wednesday 30 October 2019					
Time	N°	Item	Presenter	Details/ Targeted Outcome	Documents
09:00	8.	Evolution of Observations and Networks			
	8.1	Outcome of Ocean Obs 2019	Toste Tanhua		
	8.2	Global Baseline Observing Network (GBON)	Sue Barrell/ Lars Peter Riishojgaard	<ul style="list-style-type: none"> Decision 	<ul style="list-style-type: none"> Cg-18 Document GBON Decision 8.2 Concept Note of workshop
	8.3	GCOS Surface Reference Network (GSRN)	Ken Holmlund/ Caterina Tassone	<ul style="list-style-type: none"> Decision 	<ul style="list-style-type: none"> GSRN Report Decision 8.3
	8.4	Observations for Science	Han Dolman	<ul style="list-style-type: none"> Outcome of Joint Panels Meeting, Marrakesh Climate Cycles papers 	<ul style="list-style-type: none"> JPM Report, GCOS-228
10:30	Coffee Break				
	8.5	Observations for and of Adaptation	Hartwig Kremer, Valentin Aich	<ul style="list-style-type: none"> Decision 	<ul style="list-style-type: none"> Presentation JPM SC TT Adaptation Presentation JPM TOPC TT Adaptation Draft strategy for GCOS to support observations for adaptation Observations for Adaptation Task Team report (TOPC TT) Observations for Adaptation Task Team Report

					<ul style="list-style-type: none"> • Decision 8.5
	8.6	Regional Workshops	Tim Oakley	<ul style="list-style-type: none"> • Decision 	<ul style="list-style-type: none"> • Decision 8.6
	8.7	GCOS Cooperation Mechanism (GCM)	Tim Oakley	<ul style="list-style-type: none"> • 2018 GSN/GUAN performance and GCOS Cooperation Mechanism Update 	<ul style="list-style-type: none"> • Document 8.7
12:30	Lunch Break				
14:00	9.	Partners			
	9.1	GOOS	Toste Tanhua	<ul style="list-style-type: none"> • Partnership between GCOS and GOOS 	<ul style="list-style-type: none"> • GOOS 2030 Strategy • GOOS Implementation road map
	9.2	IPCC	Youba Sokona Thelma Krug	<ul style="list-style-type: none"> • AR6 • Special reports 	
	9.3	UNFCCC	Florin Vladu	<ul style="list-style-type: none"> • Global Stocktake • Paris Agreement 	<ul style="list-style-type: none"> • WGMS letter of concern to COP 25 • GCOS Statement to SBSTA 49 • WMO Statement on GCOS to SBSTA 50
15:30	Coffee Break				
	9.4	GEO	Sara Venturini	<ul style="list-style-type: none"> • Updates on GEO and ideas for GEO-GCOS collaboration 	
	9.5	ISC	Mathieu Denis	<ul style="list-style-type: none"> • Strategic updates on the ISC, with a focus on ISC's new Action Plan 	
	9.6	WCRP	Pascale Braconnot		
17:00	Adjourn				
Thursday 31 October 2019					
Time	N°	Item	Presenter	Details/ Targeted Outcome	Documents
09:00	10.	Budget	Carolin Richter	<ul style="list-style-type: none"> • Endorse budget 	<ul style="list-style-type: none"> • Budget
	11.	ToR Expert Panel Members	Carolin Richter	<ul style="list-style-type: none"> • Decision 	<ul style="list-style-type: none"> • Decision 11
	12.	Any other business			
10:15	Coffee Break				
	13.	Decisions and Actions	Carolin Richter	<ul style="list-style-type: none"> • Actions from GCOS SC-26 	<ul style="list-style-type: none"> • Document 13.0
12:00	14.	In Camera Session (if needed)	Carolin Richter	<ul style="list-style-type: none"> • Memberships 	
13:00	End of Meeting				

ANNEX 3: LIST OF DECISIONS

Summary of the decisions:

Number	Title	Decision
7.2	Climate Observation Conference	<p>The Steering Committee decides to hold a Second Global Climate Observations Conference in October 2021.</p> <p>The Steering Committee decides to adopt the concept note for the Second Global Climate Observations Conference as in Annex 1.</p> <p>The steering committee asks the secretariat to Identify organizations willing to support such a conference;</p> <p>Identify a venue;</p> <p>Prepare a plan to be presented to the steering committee for the financial, logistical, organizational and scientific aspects of this conference by 1 December 2019.</p>
7.3	Status Report 2021	<p>The GCOS Steering Committee requests the secretariat to prepare a fourth Status Report (SR4) in 2021. A proposed skeleton is attached in Annex 1.</p> <p>1. The GCOS Steering Committee requests the secretariat to start the preparation for the IP 2022.</p>
7.4	GCOS Work Plan 2019–2022	<p>1. The Steering Committee reinforces its endorsement of the timeline and its details and requests the GCOS Secretariat to coordinate with the panel chairpersons the timing of related activities.</p> <p>2. The Steering Committee requests the director to ensure that the timeline will find approval by WMO's 72nd Executive Council in 2020 and at the appropriate governance level of ISC and UN Environment.</p> <p>3. The Steering Committee requests the Secretariat to provide the budget and resources necessary to act on these milestones.</p>
8.2	GCOS and GBON	<p>The Steering Committee decides, that:</p> <p>1. GCOS should work with WIGOS to determine:</p> <ol style="list-style-type: none"> how the networks GSN, GUAN and BSRN can contribute to the GBON's support to climate monitoring. whether the current performance monitoring of the GCOS networks can be incorporated within the WIGOS WDQMS. The relationship of the GCOS reference networks to the GBON <p>2. GCOS is continuing jointly with WIGOS to explore regional implementation issues and to identify important observations, for example in holding regional workshop</p> <p>3. the GCOS secretariat will report progress to the related panels.</p>
8.3	Global Surface Reference Network	<p>1. The GCOS Steering Committee emphasizes the importance of implementing the GSRN report.</p> <p>2. The GCOS Steering Committee asks the GCOS</p>

Number	Title	Decision
		Secretariat to: <ol style="list-style-type: none"> a. Present the proposed GSRN for approval to relevant WMO programmes and to the Bureau International des Poids et mesures (BIPM) b. Work with the relevant WMO programme and with the PR of countries to identify one or more offers to host and staff appropriately the proposed Lead Centre c. Work with the relevant WMO programme and with the PR of countries to identify a list of suitable sites for an initial GSRN d. Present a draft decision to the upcoming 72nd session WMO Executive Council, in June 2020.
8.5	Observations for and of Adaptation	1. The GCOS SC requests that a TOPC Task Team (composition TBD) a) finalize its report and b) further refine the analyses of the adequacy of at least 5 ECVs in their current form to inform categories of adaptation identified in the existing NAPs on the UNFCCC website, and c) to identify next steps to be taken.
8.6	Regional Workshops	1. Noting key messages and plans from the 1 st and 2 nd regional workshops, support the key messages from the 3 rd workshop (Annex 1). 2. Agree on the further planning of additional regional workshops. GCOS should jointly with WIGOS continue to hold regional workshop to explore regional implementation issues and identify important observations, subject to available funding.
11	GCOS Panel Members Terms of Reference	The GCOS Steering Committee decides to adopt the GCOS Panel Members Terms of Reference as in Annex 1.

Climate Observation Conference

(Submitted by the GCOS Secretariat)

Decision 7.2 (SC-27)

1. The Steering Committee decides to hold a Second Global Climate Observations Conference in October 2021.
2. The Steering Committee decides to adopt the concept note for the Second Global Climate Observations Conference as in Annex 1.
3. The steering committee asks the secretariat to
 - a. Identify organizations willing to support such a conference;
 - b. Identify a venue;
 - c. Prepare a plan to be presented to the steering committee for the financial, logistical, organizational and scientific aspects of this conference by 1 December 2019.

Background

1. In accordance with its Memorandum of Understanding⁵, GCOS prepares regular reports on the status of the global climate observing system followed by implementation plans that address issues and gaps, and new developments and user needs. These reports are submitted to the WMO and UNFCCC Subsidiary Body on Science and Technology (SBSTA)⁶. In the 2016 GCOS Implementation Plan⁷, endorsed by the WMO⁸ and UNFCCC⁹, the review and updating of ECV requirements is addressed by actions G10-13. Chapter 2 outlines the general process.
2. One important contribution to the drafting of the 2016 GCOS Implementation Plan was the conference *Global Climate Observations: the road to the future* held in Amsterdam in 2-4 March 2016¹⁰. This allowed a wide observation and user community to present and discuss their views of the future of climate observations and, thus, supported the drafting of the Implementation Plan.
3. To engage data providers and user communities to provide their input to the next IP, GCOS should hold a second climate observations conference. According to the GCOS work plan, the Implementation Plan will be published in 2022. Therefore, the GCOS Climate Observations conference should be planned for end 2021. Participants will be able to present their views on how the global climate observing system needs to evolve to address the challenges of climate change and to adequately observe the carbon, water, energy cycles as well as the biosphere. The closing of these Earth cycles was identified in the 2016 GCOS IP as being key to allow improved forecasts of climate change. The outcome of the conference will contribute to draft an implementation plan that will be aimed to ensure that these ECV are globally observed, and these observations sustained and openly available.

⁵ Memorandum of Understanding between the World Meteorological Organization, the Intergovernmental Oceanographic Commission of the United Nations, Educational, Scientific and Cultural Organization, the United Nations Environment Programme and the International Council for Science. 1998

⁶ E.g. see FCCC/SBSTA/2015/L.18 Research and Systematic Observation and Decision 19/CP.22 Implementation of the global observing system for climate

⁷ The Global Observing System for Climate: Implementation Needs, 2016, GCOS-200

⁸ Decision 14 (EC-69) WMO 2017

⁹ FCCC/SBSTA/2015/L.18 Research and Systematic Observation and Decision 19/CP.22 Implementation of the global observing system for climate.

¹⁰ See <http://www.qcos-science.org/>

Annex to Decision 7.2 (SC-27)

DRAFT CONCEPT NOTE – Second Conference on Observations for Climate

11-15 October 2021 (tentatively)

Darmstadt, Germany (tentatively)

WHAT IS THE PURPOSE OF THE SECOND CONFERENCE?

The second conference on Observations for Climate will be based on the status of the global climate observing system (20%), but focus (80%) on looking forward to the process of implementation.

Emphasis will be on the Earth system approach. Special focus will be on global Earth cycles and the following themes in close collaboration with WCRP: closing the global energy balance and global water cycle, closing the carbon budget and explaining changing conditions of the biosphere.

The conference will foster the dialogue with funders, sponsors, implementation “agents” and stakeholders who are encouraged particularly to attend.

PARTNERS

Ensure support from partners, notably, WMO, IOC-UNESCO, ISC, UN Environment, EUMETSAT, ESA, NASA, GEO, EC Copernicus and its Climate Change Service, the joint space-agencies Working Group on Climate and the Data Advisory Council of the World Climate Research Programme and IPCC.

WHO WILL ATTEND

The second conference on Observations for Climate will invite the broad Earth observation and climate science community, representatives of regions in urgent need to adapt to a changing climate and to find mitigating measures.

We will also invite national, active GCOS representatives, leaders of past GCOS science days, data managers and data providers.

It is expected to have inscribed about 200 participants: climate observation experts from Europe, Asia, Africa and the Americas, and in particular from the Global South; and potential users who need climate information based on ECVs.

FORMAT

The meeting will take place over three days.

The conference will offer sessions linked to the chapters of the IP, but also workshop/breakout and panel sessions.

Sessions will invite to show some success stories, focused on ECVs and supporting networks. Panels with the implementers will discuss only a couple key actions on what and why issues are not happening. Discussion should point to gaps and challenges.

White papers / published papers on the cycles (Marrakesh meeting) will be provided before the conference as scientific base for discussions.

The conference will consist of presentations, some of them invited, posters and time for discussions.

Virtual poster presentations will be considered.
Virtual participation will be facilitated.

A draft conference statement looking forward to Global Stock take in 2023 and wider sector engagement will be circulated before the conference to help focus the discussions.

EXPECTED OUTCOMES

The conference aims to summarize the contribution of systematic observations towards the implementation of the Sustainable Development Goals (SDGs) as well as the Paris Agreement and the assessment of its implementation through the first Global Stocktake in 2023.

GCOS is currently planning to re-assess the status of the implementation of global climate observations in 2020/2021, and to update its current Implementation Plan. The outcome of this conference and actions will be included in the updated Implementation Plan to be published at the end of 2022.

Agree on a final Conference statement – 2 pages.
A Conference summary (20 pages) will be provided as input to the 4thIP document.

ORGANIZATION

Science Committee:
Writing team of the IP16/may include also the expert panels/teams.

Program Committee:
Steering Committee members (include other experts to promote the wider sector engagement we look forward for)

Organizational/Sponsor Committee:
Conference Team of the sponsor(s)

Status Report 2021

(Submitted by the GCOS Secretariat)

Decision 7.3 (SC-27)

1. The GCOS Steering Committee requests the secretariat to prepare a fourth Status Report (SR4) in 2021. A proposed skeleton is attached in Annex 1.
2. The GCOS Steering Committee requests the secretariat to start the reparation for the IP 2022.

Background

1. In accordance with its Memorandum of Understanding¹¹, GCOS prepares regular reports on the status of the global climate observing system that address issues and gaps. This report is submitted to GCOS` sponsoring organisations and UNFCCC Subsidiary Body on Science and Technology (SBSTA)¹². Based on these Status Reports, GCOS prepares Implementations Plans that address issues and gaps described in the Status Report in form of recommended actions.
2. GCOS will prepare a fourth Status Report (SR4) in 2021. This will allow that a fourth Implementation Report can be prepared in 2022. The reports will be presented to the United Nations Framework Convention on Climate Change (UNFCCC) in time for the UNFCCC's Global Stocktake in 2023 and will also align with the Intergovernmental Panel on Climate Change (IPCC) assessment cycle.
3. The GCOS Secretariat has prepared a document, Work plan and Guidelines for updating the GCOS 2015 Status Report and 2016 Implementation Plan in July 2019. This was approved by the steering committee chair and distributed to the GCOS panels for their guidance.
4. At the GCOS Joint Panels Meeting in 2019¹³, it was decided (Action G2) to "Consider Traceability, Sustainability and Open Data and ensure these are addressed in upcoming updates to the Status Report and Implementation Plan, considering WMO, IOC and UNFCCC regulations and decisions." In addition it was decided (Action G10) for the "next status report [to] cover extremes [and] include reports about the capability of current observing systems for extreme events explicitly in next status report." For observations for and of adaptation, the GCOS Steering Committee Subgroup on observations in support of adaptation recommended to "start with existing GCOS ECVs, and evaluate which existing ECVs in their current specifications could inform adaptation".
5. The SR4 will mainly address (1) the current capability of the global climate observing system to monitor individual ECVs; (2) the status of the main global climate networks for the atmosphere, ocean, land and satellites, and (3) the progress of implementing Actions of the 2016 Implementation Plan. In a fourth part, the information of these three sections will be integrated into conclusions on the overall ability of the global climate observing system to adequately monitor the three main climate cycles and the biosphere.
6. The SR4 shall address traceability, sustainability and open data as well as the current capability of the global observing system for climate to capture extremes and provide observations for and of adaptation as requested by the GCOS Joint Panels Meeting 2019 and by the GCOS Steering Committee Subgroup on observations in support of adaptation.

¹¹ Memorandum of Understanding between the World Meteorological Organization, the Intergovernmental Oceanographic Commission of the United Nations, Educational, Scientific and Cultural Organization, the United Nations Environment Programme and the International Council for Science. 1998

¹²E.g. see FCCC/SBSTA/2015/L.18 and Decision 19/CP.22 Implementation of the global observing system for climate

¹³GCOS Joint Panels Meeting Report, GCOS-228, 2019, https://library.wmo.int/index.php?lvl=notice_display&id=21481.

Annex to Decision 7.3 (SC-27)

PROPOSED STRUCTURE FOR THE STATUS OF THE GLOBAL CLIMATE OBSERVING SYSTEM REPORT 2021

1. FOREWORD

2. EXECUTIVE SUMMARY

3. INTRODUCTION

4. STATUS OF THE GCOS ESSENTIAL CLIMATE VARIABLES

4.1. Atmosphere Essential Climate Variables

4.1.1. Surface Air Temperature

Role in the Climate System:

Text from the factsheets, why this variable and its products are relevant for the climate.

Status of the Observation

Status of ECV monitoring covering the observations itself, if necessary individually per ECV product. This includes in-situ and satellite.

At the end, a maturity rating for each ECV Product will be provided, red, yellow green. These qualitative judgement should be defined as exact as possible so the individual ECV Stewards can do this rating homogeneously across all ECVs.

Status of Data Availability and Quality

Text about the data availability and quality aspect for the ECV, if necessary individually per ECV product. For both of these aspects, a rating similar to the maturity rating is given for each ECV product (red, yellow, green).

Adaptation

If ECV is relevant for adaptation, text from adaptation report (as decided in Marrakesh).

Extreme

Text about the capability to monitor extremes of this ECV, if relevant (as decided in Marrakesh).

4.2. Land Essential Climate Variables

Similar to Atmospheric

4.3. Ocean Essential Climate Variables

Similar to Atmospheric

5. STATUS OF THE OBSERVING NETWORKS

5.1. Atmosphere

5.2. Land

5.3. Ocean

5.4. Satellite

6. STATUS OF THE IMPLEMENTATION OF ACTIONS FROM THE IMPLEMENTATION PLAN 2016

Table of all actions with text from IP Rapporteurs. A rating system (red, yellow, green) will indicate progress. These need to be defined in order to assure homogeneity across domains and actions.

7. CONCLUSIONS

7.1. Principal Findings

7.2. The Earth System Cycles (integrating results of sections 4-6)

7.2.1. The Energy Cycle

7.2.2. The Water Cycle

7.2.3. The Carbon Cycle

7.2.4. The Biosphere

7.3. Observations of and for Adaptation

7.4. Monitoring Extremes

GCOS Work Plan 2019–2022

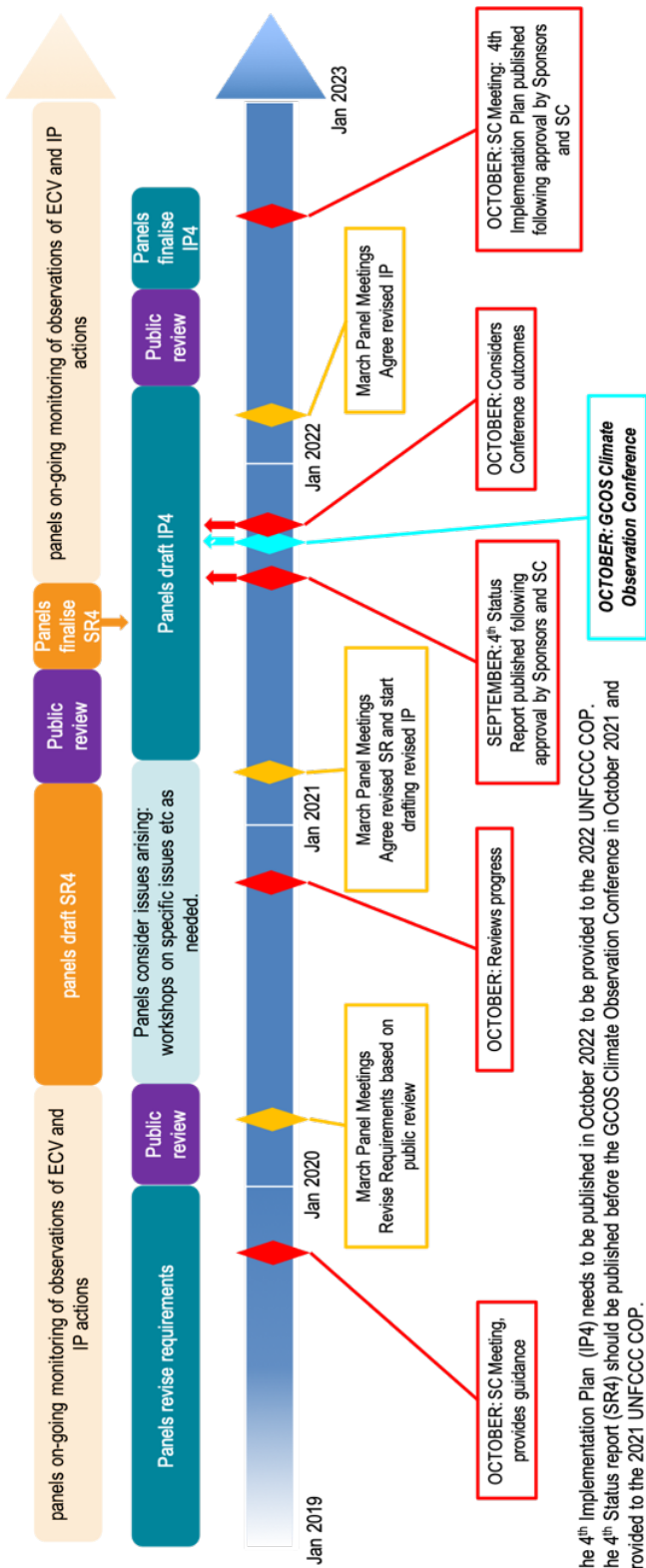
(Submitted by the GCOS Secretariat)

Decision 7.4 (SC-27)

1. The Steering Committee reinforces its endorsement of the timeline and its details and requests the GCOS Secretariat to coordinate with the panel chairpersons the timing of related activities.
2. The Steering Committee requests the director to ensure that the timeline will find approval by WMO's 72nd Executive Council in 2020 and at the appropriate governance level of ISC and UN Environment.
3. The Steering Committee requests the Secretariat to provide the budget and resources necessary to act on these milestones.

Background

1. This work plan has been developed to address the activities from 2019 to 2022 required for GCOS' 4th assessment cycle, which will address updating the 2015 status report and the 2016 implementation plan.
 2. The work plan is aligned to the publication of IPCC's sixth assessment report (AR6) and to the 2022 UNFCCC COP which will provide the input to the UNFCCC Global Stocktake in 2023. It will ensure the adequacy of the specification of the observing system for the assessment of the GST.
 3. In developing this work plan, a number of considerations were addressed:
 - The need for transparency and community involvement in the process;
 - Allowing enough time for any issues to be resolved on individual ECVs;
 - Ensuring that the status report and implementation plan are updated consecutively not simultaneously;
 - Deadlines of October 2021 for the 4th Status Report (SR4) and October 2022 for the 4th Implementation Plan (IP4).
 4. An important concept of the GCOS programme are the Essential Climate Variables (ECV). Each ECV may comprise of one or more parameter, called ECV Products, and for each of these GCOS provides requirements in terms of definitions, resolution and uncertainty. In 2018, the GCOS panels have already been tasked with considering the ECV requirements, assessing if they are still fit-for-purpose and proposing refinements in consultation with their respective communities. An on-going task of the GCOS panels is to review how well ECVs are monitored and to review the status of actions in the most recent implementation plan. To do this, the panels have appointed ECV Stewards and IP action rapporteurs.
 5. This timeline has been already introduced to the Steering Committee at its 26th session in Helsinki in 2018, and to all panels at their joint session in March 2019. It was approved at the 30th IOC Assembly in July 2019. As GCOS was not reporting to WMO Congress and following Executive Council in 2019, the next opportunity will be the 72nd session of WMO Executive Council in 2020. A detailed timeline is shown in Figure 1 with more detail on some activities in Table 1.
-



The 4th Implementation Plan (IP4) needs to be published in October 2022 to be provided to the 2022 UNFCCC COP.
 The 4th Status report (SR4) should be published before the GCOS Climate Observation Conference in October 2021 and provided to the 2021 UNFCCC COP.
 These deadlines imply that the review of updated requirements needs to be in Jan-Feb 2020. This also allows time for any issues arising to be addressed before IP4 is drafted.
 The Steering Committee (SC) in 2021 will be immediately after the co-located GCOS Climate Observation Conference

Figure 1. GCOS work plan, 2019-2022 addressing the update of the Status Report (SR) and Implementation Plan (IP)

		4 th Status Report (SR4)	4 th Implementation Plan (IP4)	
2019	Now-Dec	Continue monitoring IP actions and ECV observations – the on-going tasks of the panels. The information collected here should allow easy compilation into the Status Report.	Review and revise ECV requirements. Include at least threshold and goal values led by ECV Stewards who should include views of the respective communities. The Secretariat will monitor progress.	
	Jan - Feb		Public Review of initial proposed ECV requirements. While this should be open to all, all the relevant communities specifically invited.	
2020	Mar	Draft revised Status Report. This will be based on contributions from the ECV Stewards and IP Action Rapporteurs, compiled and coordinated by the GCOS Secretariat.	Panel Meetings. Consider responses to ECV requirements, identify areas for further work	
	Apr-Dec		Activities focused on ECVs where additional consideration is needed. Some of these areas can be anticipated (GHG for example) but others will be identified through the public review. There may workshops or Task Teams on specific areas	
2021	Jan - Feb		Public Review of SR4 draft. While this should be open to all, all the relevant communities specifically invited.	Draft revised IP4, this will be led by the GCOS Panels and incorporated the revised ECV requirements that have been developed since 2019. Contributions and inputs will come from the SR4, Climate Observation Conference, and interested scientific communities.
	Mar-Apr		The GCOS Panels and Secretariat will finalise SR4 by addressing all the comments and the final document should be approved by the GCOS Sponsors	
	May-Aug	Publish SR4 in time for the UNFCCC COP 8-19 November 2021		
	Sep			
	Oct-Dec			
2022	Jan -Mar		Public Review of IP4 draft. While this should be open to all, all the relevant communities specifically invited.	
	Mar-Apr		The GCOS Panels and Secretariat will finalise IP4 by addressing all the comments and the final document should be approved by the GCOS Sponsors	
	May-Sep		Publish revised IP4 in time for the UNFCCC COP 7-18 November 2022	
	Oct			

KEY:	Document drafting	Public Reviews
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Table 1. Proposed GCOS Timeline for revising the SR and IP

GCOS and GBON

(Submitted by the GCOS Secretariat)

Decision 8.2 (SC-27)

The Steering Committee decides, that:

1. GCOS should work with WIGOS to determine:
 - a. how the networks GSN, GUAN and BSRN can contribute to the GBON's support to climate monitoring.
 - b. whether the current performance monitoring of the GCOS networks can be incorporated within the WIGOS WDQMS.
 - c. The relationship of the GCOS reference networks to the GBON.
2. GCOS is continuing jointly with WIGOS to explore regional implementation issues and to identify important observations, for example in holding regional workshop
3. The GCOS secretariat will report progress to the related panels.

Background

1. The 2016 GCOS Implementation Plan¹⁴, endorsed by the WMO¹⁵ and UNFCCC¹⁶, in action G8, asked GCOS to hold regional workshops. The first joint GCOS/WIGOS Regional Workshop, held in Fiji (October 2017), planned how to establish and maintain a regional network of upper air stations that will lead to regional and global improvements in weather forecast and climate modelling in a regional with limited resources. Based on this meeting, WMO has established the Global Baseline Observing Network (GBON)¹⁷ to extend this globally. Subsequent joint GCOS/WIGOS workshops in Uganda (2018) and Belize (2019) have explored associated issues that including sustainability, international data exchange, support by WMO and international funding.
 2. There are several GCOS networks that would contribute to GBON including the Global Surface network (GSN), the Global Upper Air Network (GUAN) and the Baseline Surface Radiation Network (BSRN).
 3. WIGOS and GCOS have adopted a tiered approach to networks with reference stations providing the highest quality, traceable observations, baseline networks that provide the global coverage at the required accuracy and comprehensive networks that provide more spatial detail but less precision. The reference stations allow the baseline network to be linked to standards and quantified uncertainties¹⁸.
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¹⁴ The Global Observing System for Climate: Implementation Needs, 2016, GCOS-200

¹⁵ Decision 14 (EC-69) WMO 2017

¹⁶ FCCC/SBSTA/2015/L.18 Research and Systematic Observation and Decision 19/CP.22 Implementation of the global observing system for climate.

¹⁷ WMO Draft Resolution 6.1(1)/1 (Cg-18)

¹⁸ Manual on WIGOS (WMO-No. 1160, Appendix 2.1)

Global Surface Reference Network

(Submitted by the GCOS Secretariat)

Decision 8.3 (SC-27)

1. The GCOS Steering Committee emphasizes the importance of implementing the GSRN report.
2. The GCOS Steering Committee asks the GCOS Secretariat to:
 - a. Present the proposed GSRN for approval to relevant WMO programmes and to the Bureau International des Poids et mesures (BIPM).
 - b. Work with the relevant WMO programme and with the PR of countries to identify one or more offers to host and staff appropriately the proposed Lead Centre.
 - c. Work with the relevant WMO programme and with the PR of countries to identify a list of suitable sites for an initial GSRN.
 - d. Present a draft decision to the upcoming 72nd session WMO Executive Council, in June 2020.

Background

1. GCOS and the WMO Integrated Global Observing System (WIGOS) both recommend that networks should be part of a tiered system: reference, baseline and comprehensive networks. This tiered network concept is included in the Manual on WIGOS¹⁹.
 2. In 2017, AOPC agreed²⁰ on the creation of a task-team to scope a potential Global Surface Reference Network (GSRN), which was then endorsed during the GCOS Steering Committee at its twenty-fifth Session. The GSRN is the surface equivalent of the GCOS Upper Air Reference Network (GRUAN)²¹, which at the 17th Session of the WMO Congress (Cg-17) was recognized as a WIGOS implementation project.
 3. The Commission of Climatology expressed an interest in the GSRN and the 17th Session of the Commission for Instruments and Methods of Observation stated its support to the GSRN²².
 4. The report²³ produced by the GSRN Task Team was approved by GCOS and published in 2019. It provides a proposal for the establishment of a GSRN, with the support of the GCOS programme, relevant programmes at WMO and the Bureau International des Poids et Mesures (BIPM).
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¹⁹ WMO-No. 1160, Appendix 2.1, Principle 7.

²⁰ 22nd Session of the GCOS/WCRP Atmospheric Observation Panel for Climate (AOPC-22), Exeter, United Kingdom, 27–31 March 2017, GCOS-207, WCRP-7/2017, pub. WMO, 2017.

²¹ <https://www.gruan.org/>

²² CIMO, 17 Decision 27 WMO, 2018 (WMO-No. 1227)

²³ GCOS-226: GCOS Surface Reference Network (GSRN): Justification, requirements, siting and instrumentation options. World Meteorological Organization (WMO); United Nations Educational, Scientific and Cultural Organization (UNESCO); Intergovernmental Oceanographic Commission (IOC); et al. - WMO, 2019

Observations for and of Adaptation

(Submitted by the GCOS Secretariat)

Decision 8.5 (SC-27)

1. The GCOS SC requests that a TOPC Task Team (composition TBD) a) finalize its report and b) further refine the analyses of the adequacy of at least 5 ECVs in their current form to inform categories of adaptation identified in the existing NAPs on the UNFCCC website, and c) to identify next steps to be taken.

Background

1. In accordance with its Memorandum of Understanding, GCOS should meet the needs for, inter alia, ... *monitoring the impacts of and response to climate change ... data for application to national economic development* The 2016 GCOS Implementation Plan²⁴, endorsed by the WMO²⁵ and UNFCCC²⁶, considers this in Chapter 3 (observations for adaptation, mitigation and climate indicators) while actions G1, G2, G8, G9 and G10 relate to adaptation.
 2. At its 25th session the Steering Committee in 2017 established a Task Team to look at how GCOS should respond to the needs of adaptation in its work.
 3. At the 26th session of the Steering Committee in 2018 appointed a revised Task Team on adaptation to provide guidance on how the GCOS programme should approach this topic. A draft short strategic paper is provided in the annex.
 4. The 19th session of TOPC established a Task Team to review the possibilities for observations to monitor adaptation and also observations to support adaptation.
 5. Both of these task teams reported to this session of the Steering committee which discussed a way forward.
 6. It is clear that some observation already contributes to adaptation (e.g. by support global and regional modelling, forecasts and projections). Additionally, existing ECVs can also be used, singly in in conjunction, to monitor aspects of adaptation (e.g. urban greening), noting the difficulties is attributing observed changes solely to adaptation.
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²⁴ The Global Observing System for Climate: Implementation Needs, 2016, GCOS-200

²⁵ Decision 14 (EC-69) WMO 2017

²⁶ FCCC/SBSTA/2015/L.18 Research and Systematic Observation and Decision 19/CP.22 Implementation of the global observing system for climate.

Annex to Decision 8.5 (SC-27)

Draft strategy for GCOS to support observations for adaptation

21 January 2019

Background:

- GCOS SC 25 appointed a task team to develop a position paper on how GCOS could contribute to the UNFCCC Stocktake for adaptation and mitigation. The report was presented during GCOS SC 26 in Finland.
- As a next step GCOS SC 26 called for the development of an adaptation strategy document. A slightly revised task team membership was identified to develop that.

GCOS SC Task team: Han Dolman, Hartwig Kremer, Rodney Martinez, Michel Verstraete, Florin Vladu, Sybil Seitzinger, Nigel Tapper

Below is a Draft Strategy (multi-year project) for a GCOS adaptation strategy with short, medium and longer term actions (4.b,c,d).

Note: All steps would require substantial/extensive engagement with adaptation and observation academics and other experts and users (e.g. practitioners, CEOs, GFCS, etc.) outside of current GCOS SC. GCOS however would lead the process.

1. Identify opportunities and user needs through consultations/workshops:
 - a. Review existing 12 NAPS for major sectors and concerns
 - b. Utilize information from GCOS adaptation scoping and user needs workshops, including the TOPC February 2018 meeting.
2. Develop broader partnerships with adaptation experts (academic and practitioner), CEOs, GCMS, reanalysis centers, finance sector, etc. to define adaptation specifications for the ECVs
3. Define initial set of major sectors (e.g., agriculture, health, urban and communities, water resources, renewable energy, industry, forests, oceans and coasts, environment) based on 1.
4. Associate into sectors, ECVs that would support user identified needs (an ECV will likely show up in multiple sectors)
 - a. consider observation needs (incl. minimum and ideal temporal and spatial scales) in sectors identified in 2. for:
 - i. assessing vulnerability (developing NAPs),
 - ii. tracking effectiveness of NAPs,
 - iii. modifying/updating NAPs
 - b. initial objective: start with existing GCOS ECVs, and evaluate which existing ECVs in their current specifications could inform adaptation 4.a. i. – iii).
 - c. medium-term objective: evaluate where there are current observation capabilities (e.g., temporal and spatial scales) for an ECV parameter that go beyond what is specified in existing ECV suite, that could move the parameter from “not useful in specification” to minimum or ideal level for adaptation
 - d. long-term objective: consider new ECVs (parameters not in current GCOS suite), and need for promoting additional observation capabilities for adaptation that likely will be needed and that future global observations could support
5. Document the results from the above steps in published reports after review.

Regional Workshops

(Submitted by the GCOS Secretariat)

Decision 8.6 (SC-27)

1. Noting key messages and plans from the 1st and 2nd regional workshops, support the key messages from the 3rd workshop (Annex 1).
2. Agree on the further planning of additional regional workshops.
3. GCOS should jointly with WIGOS continue to hold regional workshop to explore regional implementation issues and identify important observations, subject to available funding.

Background

1. The 2016 GCOS Implementation Plan²⁷, endorsed by the WMO²⁸ and UNFCCC²⁹, in action G8, asked GCOS to hold regional workshops. The plan states that to improve the global climate observations, particularly in light of the importance of adaptation, there should be a focus on those areas identified as most in need: Africa, Asia, South America and Small Island States. GCOS will hold regional workshops to identify needs and potential regional cooperation. These workshops will result in regional plans that will highlight the greatest needs and benefits of the proposed observational improvements. Donors would be encouraged to address these needs, either through the GCOS Cooperation Mechanism, other actors or directly. These regional workshops will include representatives of countries in the region, potential donors and technical experts.
 2. The *first* joint GCOS/WIGOS Regional Workshop, held in Fiji (October 2017), planned how to establish and maintain a regional network of upper air stations that will lead to regional and global improvements in weather forecast and climate modelling in a regional with limited resources.
 3. The second joint GCOS – Copernicus – WIGOS – Global Framework for Climate Services (GFCS) Regional Workshop, held in Uganda (October 2018), focused on improving the value chain from observations to climate services to support climate policy, adaptation and mitigation in East Africa.
 4. The third WMO GCOS/WIGOS Caribbean Regional Workshop on Observations of Climate and Meteorology in association with the UNFCCC was held in Belize City, Belize on 10-12 July 2019.
-

²⁷ The Global Observing System for Climate: Implementation Needs, 2016, GCOS-200

²⁸ Decision 14 (EC-69) WMO 2017

²⁹ FCCC/SBSTA/2015/L.18 Research and Systematic Observation and Decision 19/CP.22 Implementation of the global observing system for climate.

Annex to Decision 8.6 (SC-27)

Key messages from Belize Workshop

OBSERVATION

- The value of basic observation systems cannot be over-emphasized - Terrestrial and radiosonde observations (e.g. WIGOS/GBON) are an important part of the GCOS Implementation Plan. Putting the data into international systems leads to increased accuracy of weather and climate models which, in turn, leads to improved forecasting and climate services.
- Sustainability of observations, following the GCOS monitoring principles, is required to support climate monitoring and climate-change decision making. The most important need is to support unbroken long-term data acquisition not new systems. Maintaining, strengthening, upgrading, and improving existing systems is needed (e.g. through support for maintenance, calibration, repair and supply of spare parts): Mostly items that are relatively low cost.

TRAINING

- Needed for staff to interpret the meteorological information to provide climate services, e.g. on agriculture, extreme events. Training is also needed to support the underlying observations especially covering GBON and the associated IT.
- Year-long fellowships have been successful and should be supported and encouraged.

WIGOS

- WMO is developing GBON as part of the WMO Integrated Global Observing System (WIGOS) to meet the global monitoring needs for climate and weather. Regional WIGOS centres are needed to support the regional development of WIGOS and GBON. In the Caribbean region the regional WIGOS Centre will need to be setup, with appropriate funding, to support GBON site identification, data entry, calibration, training, procurement, IT etc.

FUNDING

- From all three GCOS regional workshops held so far (S. Pacific, E. Africa and Caribbean) the same message has been clearly articulated: Short-term project funding from international donors does not lead to sustainable, systematic observation of the climate. Piecemeal funding has caused a range of issues for effective operation and has not established sustainable long-term operation.
- There is a need for alternative models of funding, one good example in the Caribbean is the long-term funding of large parts of the radiosonde network by the US.
- Observations made within any region in the World supports national weather and climate predictions for all countries worldwide. The funding mechanisms should recognize and facilitate this contribution to the global common good for those countries that do not have the national resources to meet the observational data requirements on their own.

GCOS Panel Members Terms of Reference

(Submitted by the GCOS Secretariat)

Decision 11 (SC-27)

The GCOS Steering Committee decides to adopt the GCOS Panel Members Terms of Reference as in Annex 1.

Background

During the Steering Committee 26 in Helsinki, the Terms of Reference for panel membership was discussed and changes were recommended to the proposed draft. The changes have been included and the revised ToR can be found in Annex 1.

Annex to Decision 11 (SC-27)

GCOS PANEL MEMBERS TERMS OF REFERENCE (Draft 9 October 2019)

Members of the GCOS Panels shall:

- 1) Lead the evolution of sustained and systematic observations of the global climate system in accordance with their expertise, as part of a GCOS expert panel.
- 2) In agreement with the panel chairperson(s), take responsibility to report to the panel for one, or a few, Essential Climate Variables and/or networks on:
 - a) The ECV requirements for long-term monitoring of the Earth's climate;
 - b) The adequacy of observing networks (in-situ, satellite-based), compared with the ECV requirements;
 - c) Progress on actions contained on the latest GCOS Implementation Plan.
- 3) Contribute to the revision of the ECV, based on user needs for climate monitoring, adaptation and mitigation.
- 4) Contribute to the regular updating of the GCOS Status Report and Implementation Plan.
- 5) Liaise with relevant research and operational communities.
- 6) Undertake, in agreement with the panel chair(s) other tasks in line with the panel Terms of Reference
- 7) The term of a panel member shall be 3 years with a possible extension of a further 3 years, if approved by the GCOS steering committee. The GCOS secretariat will support travel to meetings and related costs.
- 8) The total commitment is expected to be about 10 days per year, including:
 - a) One panel meeting a year (usually in the first quarter of the year);
 - b) Taking part in panel teleconferences as decided by the panel chairs, (expected to be at least 4 times a year).
- 9) The panel chairs, supported by the GCOS Secretariat, shall lead the panel, guiding and prioritizing the panel's agenda and work. Specific duties include, proposing experts to join the panel and attending the GCOS Steering Committee as ex-officio member once a year.

ANNEX 4: CONSOLIDATED LIST OF ACTIONS

Number	Action	Responsibility	Notes
SC-27/1 Recommendation	Organize a consultative meeting with broader stakeholder community to support pro-actively the WMO change management process.	GCOS Secretariat	
SC-27/2 Action	Propose a plan on how biannual SC meeting with intermediate online meetings of task teams, could be organized.	GCOS Secretariat	4. GCOS Goes Green
SC-27/3 Action	Change title of section in the climatedata.wmo.int from "Essential Climate variables" to "GCOS Essential Climate Variables".	GCOS Secretariat	5. Communication
SC-27/4 Action	Inform the president of the infrastructure commission of the panel's concerns on the WMO Climate Data Catalogue.	GCOS Panel Chairs	6. Discussion on the WMO Climate Data Catalogue
SC-27/5 Action	Withdraw the name of GCOS from the website on the WMO Climate Data Catalogue.	GCOS Secretariat	6. Discussion on the WMO Climate Data Catalogue
SC-27/6 Action	Investigate whether GCOS should add process studies to its application areas.	GCOS Steering Committee	6. Discussion on GCOS Application Areas
SC-27/7 Action	Provide comments to WIGOS on the concept note produced in July (to be provided to the SC members by the GCOS Secretariat).	GCOS Steering Committee	8.2 GBON
SC-27/8 Action	Provide all documents for the SC committee, including panel reports and an update on progress on the IP actions and any requests from the panels to the SC, two weeks in advance of the SC meeting.	GCOS Secretariat	12. AOB

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