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1. SESSION 1

Han Dolman, the Steering Committee Chair, welcomed participants to this virtual meeting apologising that the time cannot be good for all participants. He noted next year will be the 30th anniversary of GCOS.

Petteri Taalas, the Secretary General of WMO welcomed participants to the meeting. He noted that increasing mitigation ambition was an urgent need under the Paris Agreement with transparent monitoring essential. The GCOS Status Report was well received by the United Nations Framework Convention on Climate Change (UNFCCC) COP 26 in Glasgow in November. GCOS is highly valued by the observing community, by the UNFCCC COP 26 ESA, EUMETSAT, The IPCC emphasised the importance of GCOS in setting requirements and serving as the backbone of global climate observations. Petteri Taalas thanked everyone contributing to the Joint Study Group on GCOS and hopes to physically meet next year. The Secretary General thanked the sponsors of GCOS, the US State Department, Copernicus, European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), Deutscher Wetterdienst (DWD) and others for their important contributions.

The agenda was approved. Due to the limited time in the on-line meeting, much of the reporting to the meeting was through on-line documents reserving the meeting time for discussions.

1.1 Actions from Previous Meeting

PRESENTATION

Number	Action	Responsibility	Status
SC-28/1	It was agreed to establish a Task Team to look at what the steering committee can do to support the raising of additional funds for the GCOS Trust Fund	Initial volunteers: Sue Barrell and Youba Sokona	Merged with Joint Study Group on GCOS
SC-28/2	SC agreed to take a more proactive approach to GCOS: e.g. involvement in task forces, virtual meetings and decisions by email.	SC	Done and ongoing
SC-28/3	It was agreed that the Steering Committee should meet at least every six months, virtually or in person, with some decisions made by email exchanges in the interim periods. Steering Committee members will also participate in task groups as needed.	SC	Done
SC-28/4	Agree SC members reaching the end of their term shall continue to serve until the Joint Study Group Finishes. The Secretariat to check the procedure for doing this.	GCOS Secretariat	Done
SC-28/5	Secretariat to prepare a note on improving the integration of GCOS ECV and climate needs into the WMO regulatory system and WIGOS for discussion by the SC.	GCOS Secretariat	Discussed in item 1.5
SC-28/6	The SC will hold an off-line discussion on how to be more proactive on adaptation, and relevant links to IPCC and other organizations.	SC	Still to be done. GCOS Adaptation Task Team (GATT) revitalised
SC-28/7	Secretariat to contact Copernicus and GEO over user requirements.	GCOS Secretariat	

Number	Action	Responsibility	Status
SC-28/8	TOPC should look at definition of other hydrological ECV as TWS is included to ensure consistency and reduce duplication.	TOPC	Done
SC-28/9	Panel Chairs to suggest possible members of cycles task team.	3 panels Chairs	Done
SC-28/10	SC to volunteer and/or make proposals for coordinator and members of IP writing team to GCOS Secretariat by end 2020.	SC	Done
SC-28/11	Secretariat to ensure GCOS IP is incorporated into WMO processes	GCOS Secretariat	Discussed in item 3.3
SC-28/12	The SC agreed to support the ad-hoc coordination group (supported by the UNFCCC secretariat) on systematic observation and monitoring of the progress the Parties are making towards their collective targets. It should be led by the SC Chair supported by the GCOS secretariat, with technical contributions from the panels as needed.	SC Chair	Done
SC-28/13	SC to form a task team to work with Secretariat how to broaden GCM activities and funding for SC-29	SC and GCOS Secretariat	Discussed in item 3.4

Decisions requiring Action or Discussion:

Number	Action	Responsibility	Status
Dec.28/3	Establish a task force to oversee the cycle work in the future and to make sure that recommendations feed into the next IP		Discussed in item 2.1
Dec 28/7	TOPC will review and, if necessary, make proposals about the relationship between the Global Terrestrial Networks and GCOS	TOPC	This has been reviewed and is compatible with other hydrological ECV, also part of the discussion under item 2.3
Dec. 28/8	The Steering Committee decides to ask the GCOS Secretariat to present options regarding the future of the GCM and report back to the next SC meeting.	GCOS Secretariat	Report in item 3.4

1.2 Reports from the UNFCCC and COP 26

PRESENTATION

Joanna Post of the UNFCCC Secretariat gave an update including a report on the COP26. GCOS is important in the UNFCCC process especially now there is a mandate for Earth Information Day giving a high priority to systematic observations. Several parties raised this in the final plenary. GCOS and ECVs were very important at the Earth Information Day.

The Global Stocktake (GST) will take information on adaptation, mitigation and loss and damage. Relevant to GCOS, the Glasgow Climate Pact agreed:

- Adaptation
 - Adaptation communications should be in time for GST, it is important for GCOS to further the understanding of local impacts, response options and adaptation needs. How will we measure adaptation?

- There will be a 2-year Glasgow-Sharm el-Sheikh work programme on adaptation, with a strong involvement of the science community and a call for submissions.
- Mitigation
 - A call for stronger ambition with a work programme on how to scale-up mitigation and the need for immediate mitigation;
 - A common timeframe for NDCs (10 years starting in 2025).
- New ocean mandate.

Subsidiary Body for Scientific and Technological Advice (SBSTA) 52-55 encouraged parties and relevant organizations to strengthen support for sustained systematic observations of the climate system, improving density of observations, developing and providing long-term datasets and facilitating free and open access to data, as well as strengthen datasets for Least Developed Countries (LDCs) and Small Islands Developing States (SIDS). SBSTA also recognised the importance of GBON, SOFF and the WMO Unified Data Policy. There was also an emphasis on Nature-based Solutions, data and information exchange and improving regional and sub-regional models to improve local decision-making.

Looking forward, GCOS should consider how observations can support the Paris Agreement, in particular, it should consider:

- Adaptation
 - Standardized national, long-term datasets upon which countries can build according to their needs;
 - Adaptation indicators (including biodiversity).
- Mitigation
 - Observations can support verification of GHG reporting and the support to GHG inventory monitoring, reporting and verification. This is an area where the private sector is getting involved.
- Loss and Damage
 - Better understanding the exceedance of thresholds and attributions to climate change;
 - Understand importance of cascading risks.
- Global Stocktake
 - First deadline of end of February 2022;
 - Ad hoc group from systematic observations community report is developing a paper as input;
 - Aggregated information on the above is needed. As this is new it is an opportunity to think about how this can be done: an opportunity to have a stronger involvement;
 - Three Technical Dialogues where inputs can be made will be held.

At COP 26 Parties will look for a decision on systematic observations, in response to the GCOS Implementation Plan.

1.3 Copernicus

PRESENTATION

Hugo Zunker of the Earth Observation Unit, of the European Commission's Directorate-General for Defence Industry and Space, a major supporter of GCOS, updated the Steering Committee on the Copernicus Programme.

The most important change is that the EU has put all space-related activities into one programme. Copernicus has four blocks, data gathering (including satellite and in situ, maybe also commercial), information processing, access and distribution, and user uptake.

The satellite component consists of Sentinels 1 to 3 (2 satellites each) and Sentinel 5-p and 6 (1 satellite each). Sentinel 4 and 5 will be launched in 2023 as payloads on meteorological satellites. Looking forward, expansion missions include, as a priority, a CO₂ monitoring mission. Other possibilities include sub-daily monitoring of sea ice in the arctic; monitoring of crop water use; land ice elevation, sea ice thickness and snow loading; forest cover and ground movement; and the sustainable use of natural resources. While the sentinel data is all free and open, there are also a number of contributing missions that may be commercial and whose data is subject to the owner's own data policy.

In situ data is also important. Copernicus works with the European Environment Agency and national agencies for in situ data in Europe while it also collects data across the globe working with organizations such as WMO. Copernicus also produces 6 services including land ocean and land monitoring and climate change.

An important service for GCOS is the CO₂ Monitoring and Verification Support Capacity which will be operational in 2026, in collaboration with China, Japan and USA as well as ESA. The climate change service monitors 22 ECV with seasonal predictions. This is increasing to 35 ECV with global reanalysis back to 1979 and decadal predictions and a service for extreme events.

For Copernicus, GCOS is key for maintaining ECV and requirements for climate monitoring including those beyond the ECV themselves as well as ensuring global efforts are coordinated. The 2022 GCOS Implementation Plan should support this systems approach and, in particular, Agriculture, Forestry, and Other Land Use (AFOLU) initiatives. Copernicus is also looking forward to the GCOS Science Conference where it would like to be represented.

1.4 Update on 2021 Extraordinary WMO Congress

PRESENTATION

The Extraordinary Congress approved three, linked, key resolutions:

- The WMO Unified Data Policy (Resolution 1);
- The Global Basic Observing Network (GBON) (Resolution 2);
- The Sustained Observations Financing Facility (SOFF) (Resolution 3).

These are the result of 2 years work. They work together to completely update and reform WMO data exchange which is one of the key purposes of WMO. The ideas for the GBON and SOFF developed from the GCOS/WIGOS Regional Workshop in Fiji in 2017.

The data policy lays down mandatory free and open exchange of core data and encourages exchange of other important data. The GCOS Secretariat worked with WMO to include climate data and the need for historic archives. GBON lays down minimum resolution of certain variables and the SOFF is a funding mechanism to support developing countries meet the requirements of GBON. Several partners have promised contributions and when the SOFF is launched in mid-2022 it is expected there will be about US\$ 60 million for observations. It was noted that, currently, GBON and SOFF cover basic meteorological observations over the land and oceans. While extension to other variables is anticipated it will be many years before this is extended to other domains such as hydrology, oceans, cryosphere and the land surface.

It is anticipated that there will be improvement of the coverage of some ECVs, and GCOS can monitor of the availability of ECVs. Currently the long-term occupancy of stations is not

covered by GBON, and GCOS should work on this. There is also a clear potential overlap between the SOFF and the GCM which will be considered later.

1.5 WMO and GCOS

[PRESENTATION DOCUMENT](#)

The 28th Session of the GCOS Steering Committee agreed on action SC-28-5:

Secretariat to prepare a note on improving the integration of GCOS ECV and climate needs into the WMO regulatory system and WIGOS for discussion by the SC.

The document for this agenda item, lists the many ways that the GCOS secretariat has been working to include, where appropriate, the outputs of GCOS in WMO regulations and procedures.

These activities demonstrate how the GCOS Secretariat has worked towards the better integration of GCOS ECV and climate needs into the WMO regulatory system and WIGOS. The Joint Study Group on GCOS is considering the formal relationship between the GCOS Programme and its sponsors and will report in due course.

ACTION SC 29/1	<p>The GCOS steering committee welcomes the work of the GCOS Secretariat to, where appropriate, better integrate the GCOS ECV and climate needs into the WMO regulatory system and WIGOS.</p> <p>The GCOS Steering Committee also recognises that, if fully implemented, the GBON, SOFF and the new WMO Data Policy will significantly improve availability and coverage of some climate observations.</p> <p>The GCOS Steering committee asks the GCOS Secretariat to continue to work with WMO on all the issues noted in this report and to assist in the implementation of the GBON, SOFF and the new WMO Data Policy.</p>
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The Steering Committee also noted that some organizations making in situ observations are not affiliated with WMO.

ACTION SC 29/2	<p>The GCOS steering committee asks the GCOS Secretariat to consider how to ensure the recommendations and guidance of GCOS are implemented in those areas not currently addressed by WMO (e.g. parts of the cryosphere, oceans and biosphere).</p>
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1.6 The Joint Study Group on GCOS (JSG)

[PRESENTATION](#)

Qingchen Chao, one of the Co-Chairs of the Joint Study Group (JSG) updated the Steering Committee on progress. This JSC includes 15 members nominated by the GCOS co-sponsors. The JSG will recommend that the MoU is updated to distinguish between long term ambition and short-term technical execution, clarify the functions and responsibilities of the signatories of the MoU, better reflect the link between the UNFCCC and GCOS and ensure better engagement with all GCOS stakeholders along the whole value chain.

The final report is being drafted and will be reviewed by the four co-sponsors before it is finally reviewed and published. The final report will not be considered by the sponsors governing bodies before the end of 2022.

1.7 Reports

[IOC Report](#)

Vladimir Ryabinin, Executive Secretary of the Intergovernmental Oceanographic Commission of UNESCO expressed his commitment to continuing to sponsor GCOS. He thanked the JSG and thinks it is on the right track and will provide good guidance for the development of GCOS. IOS is moving forward with the decade of ocean science where the contribution of GCOS will be welcome.

[ISC Report](#)

Mathieu Denis, Science Director of the International Science Council (ISC), added his voice about the importance of the JSG. GCOS is one of the 15 bodies ISC sponsors. Currently ISC is considering its role, responsibilities and inputs to sponsored organizations including GCOS where the involvement of ISC may go back decades. Transform 21 was the official knowledge sharing platform for COP26. ISC is working on new partnership with the UK COP presidency and others on climate risk assessment for governance working closely with GCOS and WCRP.

[UNEP Report](#)

Hartwig Kramer, Head of Global Environmental Monitoring, UNEP, reported that UNEP has had discussion around the UNEP global monitoring initiatives, air quality, oceans and freshwater. UNEP has a medium-term strategy of which the first pillar is climate actions. UNEP should have a down-stream contribution – making quality assured data to decision makers. UNEP fully supports what has been presented, noting UNEP is a downstream organization addressing two things: adaptation and mitigation. Finally, Andrea Hinwood has been appointed as the new UNEP Chief Scientist.

2. SESSION 2

2.1 GCOS and WCRP

[WCRP PRESENTATION](#)
[GCOS PRESENTATION](#)

Michael Sparrow presented the new World Climate Research Programme (WCRP) Structure responding to the WCRP Strategic plan with 5 lighthouse activities (key science, shorter term), and 6 core projects (long term, 2 of them are new). WCRP will hold an Open Science Conference at the end of 2023.

Michael Sparrow apologised as WCRP has been slow on providing an answer concerning coordinating efforts around earth cycles monitoring and science. This has been due to the need to re-organize internally those efforts and coordination with the WCRP Earth System Modelling and Observations (ESMO) project). He insisted on the strong willingness to collaborate with GCOS.

Nico Caltabiano provided an overview of ESMO, which encompasses observations, modelling, data assimilation and carbon cycle. Several of the ESMO activities have strong connections with GCOS, facilitated by experts who are involved both in WCRP and GCOS. Similarly, WCRP Lighthouse on *Explaining and Predicting Earth System Change* can take advantage from GCOS outputs to improve comprehensive climate model calibration.

The Chair recalled the decision taken in the last GCOS Steering Committee 28 concerning the establishment of a task force to oversee the cycle work and the three papers which have been produced. However, GCOS has not received the desired response from WCRP members.

The GCOS Steering Committee discussed how to strengthen the joint work between WCRP and GCOS, recognizing the existence of on-going activities where this is already happening, such as the GCOS Adaptation Task Team. The Steering Committee also acknowledged the desirability of working together in the climate cycles activities. The EMSO activity on requirements and uncertainties appears to duplicate GCOS's role.

It was noted that the expectations around ECV requirements had increased and were more complex, and WCRP is still important in the context of understanding better the needs. However, GCOS is best placed to establish some kind of standardized approach to defining those requirements and being consolidator and curator of the requirements.

ACTION SC 29/3	Arrange a meeting between WCRP and GCOS Chairs and Secretariat to define the timeline and implementation steps to establish a more structured collaboration between both programmes and a clear delineation of the roles of each organization.
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2.2 Rationalize ECVs

[PRESENTATION](#)

The GCOS SC chair presented a proposal for rationalizing the current list of ECVs, which is considered too large and complex, by establishing combining similar ECV into a single ECV with several products. For example, several ECVs measuring the same property but measured in different locations (e.g. currently there are 5 ECVs related to temperature) or they may describe complementary aspects of the same variable.

The Steering Committee welcomed the initiative, which it thought can provide a more consistent, integrative and understandable framework, even though the requirements finally delivered to the user will likely remain the same.

Some concerns were raised that the simplification may hide certain (current) ECVs which are particularly relevant in a UNFCCC/Paris Agreement context such as the global surface temperature, GHG, as well as the 7 global climate indicators. There were also concerns about how this would impact funding and agencies implementing requirements, who may be confused by the change. Therefore, traceability between the initial ECVs and new ones must be ensured, and the change must be communicated adequately to all interested parties, like satellite agencies.

It was noted that the new ECVs will likely be cross-domain: i.e, ECV products from different domains be comprised in the new ECV, so this needs to be considered in a cross-panel manner.

Another point which was raised is that the real problem may be the list of current products now, which has grown throughout the years without a revision of their adequacy. This is also important when considering the differentiation between core and non-core variables in WMO Date Variables.

The Steering Committee discussed whether the rationalization of the ECVs should be included in this IP. Both AOPC and TOPC were supportive of the rationalization. The cross-cutting nature of this task will require the panels to work together in identifying the best grouping and make an attempt to be ready for this Implementation Plan.

DECISION Dec.29/1	The Steering Committee agreed to work towards presenting the ECV in this rationalized, with similar ECV Products grouped together under one ECV.
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ACTION SC 29/4	Secretariat in consultation with the panel co-chairs to propose a new grouping of ECVs which can be discussed in the panels and the next SC and ideally form the basis of the new IP.
ACTION SC 29/5	Stakeholders and users, such as in-situ and satellite communities, will be approached to explain to them the idea about the rationalization and reassure them that there will be no direct impact on their work. If their reactions to this proposal are positive, GCOS can move on working on this concept.
ACTION SC 29/6	The GCOS Secretariat, together with the panel chairs and couple of volunteers from the Steering Committee, will work on the rationalization of the ECVs. Michael Zemp volunteered to join the Secretariat and GCOS panels chairs in this task bringing into the discussion its expertise on the cryosphere ECVs.
ACTION SC 29/7	A final decision on whether to include them in the IP will be taken in January 2022 during the writing team meeting. If the concept is not yet sufficiently mature to be included in the IP, a small section will be anyway added to the IP, explaining that there is a plan to restructure the ECVs, and including also an explanation of the process.

2.3 A community proposal for new Sea Ice ECVs

PRESENTATION

Thomas Lavergne, from the Norwegian Meteorological Institute presented his proposal on behalf of a group of +30 experts from the sea ice community, working under the auspices of the Global Cryosphere Watch, who is also establishing requirements for Sea-Ice variable. This proposal has been reflected in a paper submitted to [BAMS journal](#). He introduced the relevance of sea ice as a key element of the climate system and how the group of expert had concluded upon a set of 7 geophysical variables which in their view qualify as ECVs on its own: sea-ice concentration, thickness, snow-depth, surface temperature, surface albedo, age and drift.

He claimed that the current approach of a single ECV sea ice with multiple products does not allow to do a proper reporting in the GCOS status report and makes it difficult to get adequate funding. It also contrasts with the proliferation of ECVs in other domains (e.g. ocean surface).

The consistency and validity of the proposed sea ice variables to be measured was acknowledged and it was suggested that the GCOS panels co-chairs in GCOS IP expert team discuss whether the variables put forward by the Sea Ice group of experts can be included in the new simplified framework (previous Item 2.2).

Some concerns were raised that there may be some overlap with ECV products which may already be covered by terrestrial ECVs (snow, albedo).

The Steering Committee noted comment on the status report and that for the future work on rationalization has implications: it implies reducing the number of separate ECV rather than increasing them. It was acknowledged that funding all observations is difficult and that the cost of implementing observations varies greatly between ECVs.

Thomas Lavergne offered assistance and the chair ensured the proposal will be taken into account and we would come back on that offer.

ACTION SC 29/8	Review the proposal with all the panels to ensure there is no overlap with existing ECV, especially albedo and snow. Consider the proposal for more Sea Ice parameters as part of the activities around rationalization of ECV.
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2.4 GCOS National and Regional Engagement

PRESENTATION DOCUMENT

The Secretariat provided an overview on the existing activities and structures operating at a regional and national level by GCOS including the GCOS regional workshops, GCOS national focal points and national GCOS, the GCOS Cooperation Mechanism and GCOS network manager. CBS-LC-GCOS and GOOS regional alliances were also mentioned. These activities lack a common focus, and it was suggested that this could be *"to identify, support and advocate for solutions to the difficulties faced by countries with limited resources in implementing, archiving and disseminating climate observations."*

It was noted that in-situ and airborne observations are very dependent on efforts done at a country level, hence the importance of fostering connections at that level, through the national

focal points and co-organising the regional workshops with the local contact. Regional and national contact points could also provide valuable input when collecting requirements on adaptation.

It was suggested that the GCM fund could be used to support national projects. It was also mentioned that pairing countries (more developed with less developed countries) to work on projects could be useful.

Regarding the regional workshops, currently plans are being developed to organize 6-8 workshops jointly with WIGOS, but the focus still needs to be determined. Data Rescue and identification of sources of data for the sustainable provision through time in certain regions were put forward as possible themes. The need to set clear objectives for those workshop that can be evaluated afterwards was highlighted. It was suggested that the Regional Climate Centres could play a role in organising the workshops.

The Steering Committee expressed concerns about replicating efforts with on-going national structures like WIGOS focal points; an integration under WIGOS could be a possibility and this needs to be carefully considered, however GCOS has a broader scope and WIGOS provides no link to climate needs.

Similarly, it was noted that GOOS also has a network of national focal points, whose structure and operations are currently being revised, and this needs to be considered.

A final comment suggested including users of climate information in the workshops, to establish the link between observations and the development of climate services useful in the region as has been done in the past.

In view of this, the following decision was accepted:

<p>DECISION Dec.29/2</p>	<p>The GCOS steering committee agrees that the aim of regional activities is to identify, support and advocate for solutions to the difficulties faced by countries with limited resources in implementing, archiving and disseminating climate observations.</p>
<p>ACTION SC 29/9</p>	<p>That the GCOS Secretariat 1) prepares a plan for these regional activities for the next session of the GCOS Steering Committee including draft ToR for GCOS Focal Points, being mindful of the existence of other national focal points networks (e.g. WIGOS, GOOS) and 2) also restarts the regional workshop</p>

2.5 Reports of the 3 Panels

[Atmospheric Observation Panel for Climate \(AOPC\) Report](#)

[Ocean Observations Physics and Climate Panel \(OOPC\) Report](#)

[Terrestrial Observation Panel for Climate \(TOPC\) Report](#)

The panel reports were accepted without comment.

2.6 Other Reports

[GCOS Adaptation Task Team \(GATT\)](#)

[DOCUMENT](#)

The GATT has been revitalized and is restarting its work. The report was accepted without comment.

Global Surface Reference Network (GSRN)

[DOCUMENT](#)

Work of establishing the GSRN is proceeding with WMO. China has been accepted as the lead centre. The document was accepted without comment.

GCOS Networks

[DOCUMENT](#)

A document outlining how the panels will implement the decision of the GCOS Steering Committee on allowing networks to describe themselves as "GCOS" was accepted without comment.

3. SESSION 3

3.1 Climate conference

PRESENTATION

The Chair presented the plans for the climate conference. The conference will take place at Darmstadt, hosted by EUMETSAT, from 28 November to 1 December 2022. It was noted that this is very close to the COP and people involved in the COP might not be able to attend the GCOS Conference. However, it is expected that participants to the conference will be different than to the COP¹.

WCRP is no longer a co-convenor and will have its own Conference in 2023. In both GCOS and WCRP conferences there will be a joint GCOS/WCRP session. The new chair of the conference science committee is Sabrina Speich. The scientific committee will be extended to include more participation from outside Europe and the Northern America and have a more balanced gender ratio.

The focus of the conference will change as the 2021 conference was meant to provide input for the GCOS IP while the 2022 conference should focus more on the implementation of the actions from the GCOS IP.

The new proposed elements are:

- Ensuring Sustainability;
- Filling data gaps, Improving;
- Data Utility;
- Managing data;
- Engaging with countries and stakeholders;
- Emerging needs.

The SC agreed with the new planning, recognized the new chair and mandated the secretariat and chair to extend the old committee with more balanced geographic and gender participation.

ACTION SC 29/10	The secretariat and chair of the conference science committee, (Sabrina Speich) will enhance the old committee with better geographic and gender balances. The secretariat and chair will report to the SC about progress in 6 months.
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3.2 GCOS Implementation Plan

PRESENTATION

A lead Author was recruited but he has resigned without substantive outputs. The secretariat is filling the gap as best as possible. The GCOS Director apologized for the need of additional work created by the resignation of the consultant.

The panels have drafted lists of most important actions, and specific experts have been asked to draft various sections and chapters. There will be a small group meeting in January to finalize the drafting.

¹ The final date for the Conference was decided in January 2022 and it is fixed on 17-19 October 2022

The outline of the IP, which has been already approved by the Editorial Board, was presented to the SC. Actions have been grouped in themes and are now being reviewed by the panels to add details. The first draft of the Implementation Plan will be reviewed by an expert to make sure there is a broader perspective, and the Steering Committee members will also have the opportunity to review the draft. After the meeting of the writing team, the Secretariat will review progress and propose a revised timeline.

The actions have been grouped in six themes:

- ensuring sustainability;
- filling data gaps;
- improving data usefulness;
- improving data management;
- engaging with countries and stakeholders;
- addressing emerging needs.

The themes have already been presented to the panels who have agreed.

The SC was also shown the template for the actions. It includes different activities needed to implement the action, and for each of these activities there will be benefits, implementers, means of assessing progress and more specific details.

A public review is expected in 2022 as a final version needs to be ready for submission to UNFCCC COP 27. Given the impact of the COVID situation which is impacting the ability of the panels to meet in person, a revised timeline will be proposed after the meeting in January where progress and completeness will be evaluated.

3.3 IP incorporation into the WMO processes:

There is overlap between activities in the Infrastructure and GCOS. For example, the new WMO data policy links to the ECVs, GBON makes reference to GUAN and the Secretariat has been strongly involved with GSRN.

We are slowly building these linkages, and we have engaged a consultant with deep experience in both WIGOS and GCOS, Sue Barrell, to start looking at how the connection between GCOS and WIGOS can be formalized.

Regarding GCOS IP, actions of the IP that apply to WMO and its members can go to INFCOM and be dealt by the INFCOM president. There has already been a agreed to produce a set of annexes to the IP aimed at the different stakeholders (satellite, WMO members, funders etc).

To align the objective of GCOS and the climate objectives of WMO, GCOS guidance should be included in WIGOS regulatory material so that managers of NMHS will not need to take into considerations both the guidelines from WMO and the ones from GCOS, avoiding also some possible inconsistencies between these.

The Chair asked for some explanation about the High-Level Guidance for the observing system (HLG) from WMO on which GCOS has been asked to comment. It comes from the Standing Committee on Observing Networks, with the aim of giving members high-level guidance on the implementation of WIGOS including design principles. GCOS is among the stakeholders who have been asked for feedback. Comments received so far point out that the document is too long to be useful. Sue Barrell has been involved in writing the WIGOS Vision 2040, from which

this HLG was drafted, which had the purpose to frame the developments of plans and to provide a context and a background document. GCOS should look at the vision and use it to understand how the vision affects the future plans of GCOS.

ACTION SC29/11	GCOS will provide a compiled list of all comments to Anthony who will then bring them to the experts in charge of the High-Level Guidance.
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Climate activities need to be coordinated through the two WMO commissions, Infrastructure and Services, therefore a climate coordination panel was created that report to the Executive Council. It is important that GCOS is represented in upcoming Second session of the climate coordination panel (CCP), either by the chair or by a member of the Steering Committee in order to understand what the activities within the CCP are, and also to ensure that GCOS is visible within the climate framework on WMO.

3.4 The GCOS Cooperation Mechanism (GCM)

PRESENTATION

Tim Oakley, the GCOS network manager, presented the GCOS Cooperation Mechanism (GCM). In particular, there was an action in the previous steering committee asking the Steering Committee to form a task team to work with the Secretariat on how to broaden the GCM activities and a decision to ask the GCOS Secretariat to present options regarding the future on the GCM and report back to the next Steering Committee. There was one meeting of the team that discussed the finance that then was merged to the team on financing of the Joint Study Group.

The GCM was established in 2004 to “enable developing countries to collect, exchange and utilize data on a continuous basis in pursuance of the UNFCCC” in response to decision UNFCCC 5/CP.5. Since 2004, 4 million US\$ was raised to accomplish projects dedicated to improving climate observation systems. The GCM should work across all observing system, however donors dictate what project to support.

The GCM is still operational. There are three GUAN stations operating today because of funds through GCM, Tanzania, Maldives and Armenia. Looking at a timeline of the number of GUAN sounding operating since 2018, it can be seen that the network is still sustaining observations.

GCM has very limited funds and in 2021 there were no donations and therefore there are no current projects. There are a lot of changes, in the donors that either don’t have money at the moment or are looking into other projects to fund; in the GCOS Secretariat and in the WMO, where the focus in GBON and SOFF has an impact also on the GCM. The GCM does sit under the governance of the GCOS Steering Committee.

Three possible scenarios for the GCM:

- GCM could remain similar to what it is at the present. This would require a re-launch with different process, a new focus and increased funds avoiding duplication of the SOFF;
- GCM to become more aligned with other mechanism, such as SOFF, integrating our work with someone else. This requires deciding what GCM is aligning with, as the SOFF is not the only option;
- GCM could be ended, but it needs a decision on what GCM is going to be replaced with.

At the moment, a possible solution is to wait with this decision as there are many changes already going on, such as the work of the JSG-GCOS looking at the future of GCOS.

Points raised during the discussion:

- The need to raise the profile of what GCM offers. This could be done by communicating what GCM is able to do, developing something that highlights the importance of the GCM, linking to the data policy and the COP. Video for example could also be used to promote it;
- GCM should be affiliated with the SOFF rather than fully absorbed by it. GCM focus is broader than the SOFF, including also ocean and terrestrial networks;
- The GCM could also provide support to members that it might be too small to be considered by SOFF. While GCM helps on the technical side, by making the station operational again, the SOFF focuses more on the finances needed to support the long-term running of the station.

ACTION SC 29/12	<p>The GCOS Network Manager shall ensure communication between the GCM and SOFF.</p> <p>The GCOS Secretariat shall add an item on the future of the GCM to the agenda of the next session of the Steering Committee, after the reports of the JSG are finalized.</p>
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3.5 Budget outlook 2022:

The starting point in January 2006 was 2 million CHF but with expenditures being consistently more than revenues since 2006, the financial position became unsustainable. Anticipated revenue for 2022 include funds from Copernicus, from the US State Department, from NOAA Wood Hole (GCOS three major donors), and from EUMETSAT, DWD and WMO.

In terms of expenditures, there are the salaries and the cost of the GCOS Network Manager. Budget for meetings and travels is reduced compared the one from previous years, due to the current COVID-related travel restrictions. Thus, the financial position in 2022, considering the opening balance, shows an ending balance slighter above the initial one.

There is a large risk in having 3 big donors, and it would be advantageous to have several small donors as well. GCOS needs to raise additional revenue.

There is a suggestion to hire a consultant who will take care of the communication outreach and will prepare material that can be used for fundraising.

ACTION SC 29/13	<p>The GCOS Director will explore the possibility of hiring a consultant to work on the communication outreach and will go back to the SC with a proposal.</p> <p>A circular letter will be sent to the WMO members calling for funds in the GCOS Trust Fund.</p>
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ANNEX 1: LIST OF ACTIONS AND DECISIONS

1. List of Actions:

ACTION SC 29/1	<p>The GCOS steering committee welcomes the work of the GCOS Secretariat to, where appropriate, better integrate the GCOS ECV and climate needs into the WMO regulatory system and WIGOS.</p> <p>The GCOS Steering Committee also recognises that, if fully implemented, the GBON, SOFF and the new WMO Data Policy will significantly improve availability and coverage of some climate observations.</p> <p>The GCOS Steering committee asks the GCOS Secretariat to continue to work with WMO on all the issues noted in this report and to assist in the implementation of the GBON, SOFF and the new WMO Data Policy.</p>
ACTION SC 29/2	<p>The GCOS steering committee asks the GCOS Secretariat to consider how to ensure the recommendations and guidance of GCOS are implemented in those areas not currently addressed by WMO (e.g. parts of the cryosphere, oceans and biosphere).</p>
ACTION SC 29/3	<p>Arrange a meeting between WCRP and GCOS Chairs and Secretariat to define the timeline and implementation steps to establish a more structured collaboration between both programmes and a clear delineation of the roles of each organization.</p>
ACTION SC 29/4	<p>Secretariat in consultation with the panel co-chairs to propose a new grouping of ECVs which can be discussed in the panels and the next SC and ideally form the basis of the new IP.</p>
ACTION SC 29/5	<p>Stakeholders and users, such as in-situ and satellite communities, will be approached to explain to them the idea about the rationalization and reassure them that there will be no direct impact on their work. If their reactions to this proposal are positive, GCOS can move on working on this concept.</p>
ACTION SC 29/6	<p>The GCOS Secretariat, together with the panel chairs and couple of volunteers from the Steering Committee, will work on the rationalization of the ECVs. Michael Zemp volunteered to join the Secretariat and GCOS panels chairs in this task bringing into the discussion its expertise on the cryosphere ECVs.</p>
ACTION SC 29/7	<p>A final decision on whether to include them in the IP will be taken in January 2022 during the writing team meeting.</p> <p>If the concept is not yet sufficiently mature to be included in the IP, a small section will be anyway added to the IP, explaining that there is a plan to restructure the ECVs, and including also an explanation of the process.</p>
ACTION SC 29/8	<p>Review the proposal with all the panels to ensure there is no overlap with existing ECV, especially albedo and snow.</p> <p>Consider the proposal for more Sea Ice parameters as part of the activities around rationalization of ECV.</p>
ACTION SC 29/9	<p>That the GCOS Secretariat</p> <ol style="list-style-type: none"> 1) prepares a plan for these regional activities for the next session of the GCOS Steering Committee including draft ToR for GCOS Focal Points, being mindful of the existence of other national focal points networks (e.g. WIGOS, GOOS) and 2) also restarts the regional workshop

ACTION SC 29/10	The secretariat and chair of the conference science committee, (Sabrina Speich) will enhance the old committee with better geographic and gender balances. The secretariat and chair will report to the SC about progress in 6 months.
ACTION SC29/11	GCOS will provide a compiled list of all comments to Anthony who will then bring them to the experts in charge of the High-Level Guidance.
ACTION SC 29/12	The GCOS Network Manager shall ensure communication between the GCM and SOFF. The GCOS Secretariat shall add an item on the future of the GCM to the agenda of the next session of the Steering Committee, after the reports of the JSG are finalized.
ACTION SC 29/13	The GCOS Director will explore the possibility of hiring a consultant to work on the communication outreach and will go back to the SC with a proposal. A circular letter will be sent to the WMO members calling for funds in the GCOS Trust Fund.

2. List of Decisions:

3.

DECISION Dec.29/1	The Steering Committee agreed to work towards presenting the ECV in this rationalized, with similar ECV Products grouped together under one ECV.
DECISION Dec.29/2	The GCOS steering committee agrees that the aim of regional activities is to identify, support and advocate for solutions to the difficulties faced by countries with limited resources in implementing, archiving and disseminating climate observations.

ANNEX 2: AGENDA

Day 1: 7 December 12:00-14:00 CET				
Item	Time	Subject	Presenter	Documents
1.1	12:00-12:20	Review of actions and decisions	Han Dolman	
1.2	12:20-12:40	COP26 – Status Report and feedback	Joanna Post	
1.3	12:40-12:55	The Copernicus perspective (2021-2027)	Hugo Zunker	
1.4	12:55-13:10	WMO Congress Updates	Anthony Rea	
1.5	13:10-13:20	Action 28.5 (Integration of ECV into WMO)	GCOS Secretariat	
1.6	13:20-13:40	JSG-GCOS Updates	Qingchen Chao	
1.7	13:40-14:00	Questions and discussion on Information documents		Sponsors reports
Day 2: 8 December 12:00-14:00 CET				
2.1	12:00-12:30	GCOS & WCRP; Decision 28:3	Han Dolman	
2.2	12:30-12:50	A community proposal for new sea ice ECVs	Sabrina Speich/Thomas Lavergne	Sea Ice – PPT Sea Ice – Draft manuscript
2.3	12:50-13:10	Rationalize ECVs	Han Dolman	
2.4	13:10-13:40	GCOS National Engagement		
2.5	13:40-14:00	Questions and discussion on Information documents		Panels reports, GATT report, GSRN report, GCOS Network document
Day 3: 9 December 23:00-01:00 CET				
3.1	23:00-23:30	Climate Conference – Discussion	Han Dolman	
3.2	23:30-23:50	IP presentation	GCOS Secretariat	
3.3	23:50-00:00	Action 28.11 (Ip incorporated into WMO processes)	Anthony Rea	
3.4	00:00-00:10	GCM – Action 28.13	Tim Oakley	
3.5	00:10:00:30	GCOS Budget	Anthony Rea	
3.6		Questions and discussion on Information documents		Budget, GCOS network Manager Report

ANNEX 3: LIST OF PARTICIPANTS

STEERING COMMITTEE MEMBERS				
Chair	The Netherlands	Prof.	Albertus Johannes Han	Dolman
Member	Australia	Dr	Sue	Barrell
Member	China	Dr	Qingchen	Chao
Member	Kenya	Dr	Hartwig	Kremer
Member	Canada	Dr	Sybil	Seitzinger
Member	Japan	Mr	Kazuto	Suda
Member	Japan	Dr	Toshio	Suga
Member	Zürich	Dr	Michael	Zemp
EX-OFFICIO MEMBERS				
AOPC Co-chair	Ireland	Prof.	Peter	Thorne
OOPC Co-chair	France	Prof.	Sabrina	Speich
OOPC Co-chair	China	Dr	Weidong	Yu
TOPC Co-chair	Brazil	Dr	Thelma	Krug
TOPC Co-chair	Germany	Dr	Martin	Herold
SPONSORS				
IOC of UNESCO	France	Dr	Vladimir	Ryabinin
ISC	France	Dr	Mathieu	Denis
UNEP	Represented by Dr Hartwig Kremer			
WMO	Switzerland	Prof.	Petteri	Taalas
WCRP	Switzerland	Dr	Michael	Sparrow
WCRP	Switzerland	Dr	Nico	Caltabiano
INVITED EXPERTS				
GEO	Switzerland	Ms	Yana	Gevogyan
GEO	Switzerland	Dr	Sara	Venturini
UNFCCC	Germany	Dr	Joanna	Post
Copernicus	United Kingdom	Dr	Jean-Noël	Thépaut
Copernicus	Belgium	Dr	Hugo	Zunker
Copernicus	Italy	Dr	Mark	Dowell
WGClimate	Germany	Dr	Albrecht	von Bargaen
CMESMS, C3S	Norway	Dr	Thomas	Lavergne

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